

Profiles of On-Farm Creatures in Columbia County, NY:

The Effects of Nature on Farm Production; the Effect of Farm Use on Nature.

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A Word of Caution. This is a 'working' document. We hope to update, expand, and correct it over time. It is still a very patchy in terms of detail and coverage. Input is welcome.

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INTRODUCTION

There are two broad directions of interaction between farms and nature: farms can influence the ability of nature to exist on or near a farm, and, conversely, nature can influence the production of a farm. In either case, the directions can be positive or negative. This report, based largely on work we have done in Columbia County (NY), looks at those interactions from the perspective of specific organisms. The report is hardly exhaustive; it does not pretend to be. Instead, it is meant to help farmers and others understand the ecological stories of some of the creatures with whom they share the landscape.

One of the inherent assumptions in this report is that agricultural production and nature conservation are both desirable ends. Our purpose here is not to raise one above the other, nor to justify one through the other (in other words, we believe nature has inherent value regardless of any 'ecological services' it might provide and that farms have value regardless of any role they may have in nature conservation). That said, we believe that both conservation and production can benefit if synergies between the two are emphasized.

The following collection of profiles is divided into wild organisms that affect the farm, and wild organisms that are affected by the farm. We primarily discuss animals that can be seen with the naked eye. Microscopic creatures, plants and fungi are clearly all very important for farm production and ecology, but are beyond the bounds of this report.

In each profile, we try to provide a basic physical description of the given organism or group of organisms, together with some information on natural history and interaction with agriculture. Our hope is that this information might spur the reader to learn to identify some of these organisms and then to think about what their presence or absence might be saying in terms the interaction of management and nature on a given farm.

'WILD' ORGANISMS THAT AFFECT THE FARM: PESTS.

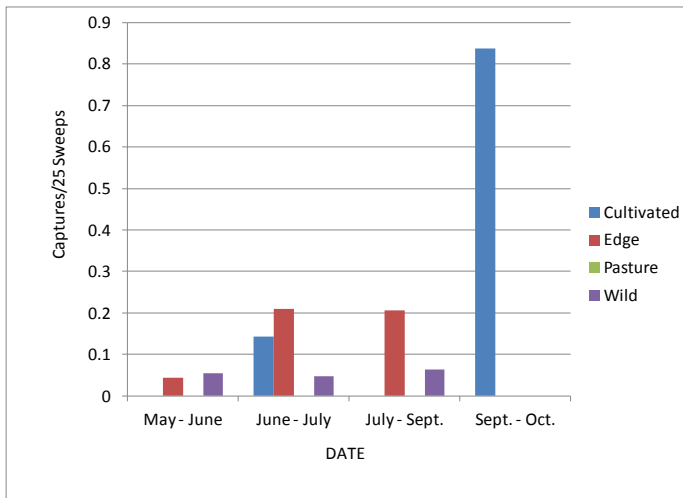


Striped Cucumber Beetles (*Acalymma vittata*). Striped Cucumber Beetles are relatively small (ca. ¼" or half centimeter) beetles, with bold yellow and black striping on their backs, a yellow "neck" and a black head. These native pests of cucurbits were found on five out of 19 farms studied during 2010 (but sampling for that study focused on tomatoes rather than cucurbits). Three farms cited 'cucumber beetles' as an appreciable pest for their overall operations, although Striped and Spotted were not distinguished. It was widespread in the gardens during a more extensive study of Hawthorne Valley Farm in 2009.

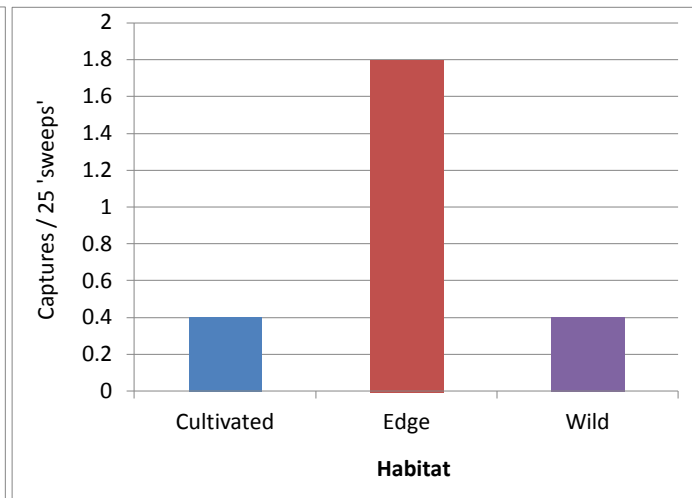
According to [the literature](#), adults often overwinter in woods or grasslands, begin the season by feeding on the pollen of wild plants, and then move into crops as cucurbits mature. This migration can make trap cropping effective as arriving adults are 'intercepted' by a swath of attractive crops. During our Hawthorne

Valley study, this species was first (prior to mid June) found in edges and wilder areas (mainly riparian); it then spread into grassy margins and crops and, by the end of the growing season, was being found mainly in crop beds themselves. In our early to mid September, 2010 sampling across 19 farms, the majority of Striped Cucumber Beetles which we found were in grassland or woodland, as opposed to cropland. During our current study of grasslands (not vegetable crops) around the County, this species and Tarnished Plant Bug are the two main crop pests we are regularly encountering. There was no positive correlation between Striped Cucumber beetles in July or September crops and the amount of surrounding forest in the landscape, but they were generally rare in tomatoes. In the September 2010 samples taken across habitats, the number of Striped Cucumber Beetles in surrounding grass was significantly, positively

correlated with the number in both woods and veggies suggesting, at the least, demographic interactions among these habitats.



Captures of Striped Cucumber Beetles across three cover types in and around the Hawthorne Valley vegetable gardens in 2009.



Captures of Striped Cucumber Beetles across four cover types in and around 19 Columbia County tomato beds in 2010.

Spotted Cucumber Beetle (*Diabrotica undecimpunctata*). Spotted Cucumber Beetles are the same size as Striped Cucumber Beetles, but their base color is a light, pea green and their back has black spots rather than stripes. These beetles were found on nine out of 19 farms studied and, as noted above, three farmers cited 'cucumber beetles' in general as a pest. The Spotted is reported to be somewhat less common than the Striped, and this seemed to hold true to a degree in our own data from Hawthorne Valley Farm. We rarely encounter the Spotted Cucumber Beetle while sweep netting in fields.



There [appears to be uncertainty](#) about how this species overwinters, and a couple of different strategies may be occurring. Some individuals may overwinter on-site in crop debris while others re-invade from a year-around stronghold in the South. In either case, however, the surrounding habitats may have little relevance for species abundance. Management suggestions do include removal of crop debris and crop rotation as one possible way to reduce infestations from overwintering beetles.



Tarnished Plant Bug (*Lygus lineolaris*). These true bugs (an insect group that has needle-like mouthparts for sucking plants or other insects) are, again, about ½ cm or ¼ inch long. They are a dirty brown-black with discrete yellow triangle (or at least "V") at the center of their body and lighter wing tips on either side of a darker butt-end. These are native pests of a wide variety of plants ([somebody once calculated](#) that they feed on at least half of our cultivated species). Aside from crop plants they also feed upon numerous weeds. In fact, under certain conditions, they also feed on other insects, including fellow pests, and can be considered beneficial. Their generalized tastes are reflected in their widespread occurrence. During our 2010 study, this bug was found on all but two of the 19 farms; although no farmer reported them as a pest of major concern. In 2009, they were

widespread in and around the Hawthorne Valley Farm main gardens. Throughout the year, they could be found in both cultivated areas and wilder hedgerows and grasslands. During our current study of grasslands and old fields, they appear regularly.

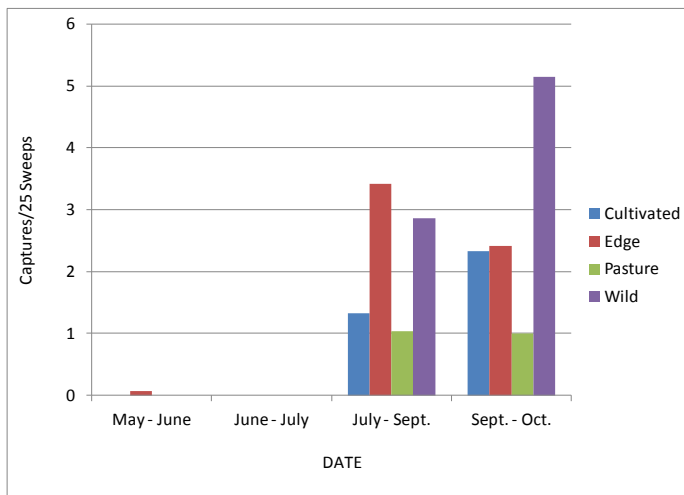
While this species shares a relatively widespread occurrence with the Striped Cucumber Beetle, the [explanation for this distribution](#) seems somewhat distinct: this is a generalized species that can survive and prosper in a variety of habitats on a variety of plants. In most of these habitats, it apparently overwinters as an adult in ground litter. Unlike the Striped Cucumber Beetle, there does not appear to be a consistent seasonal migration from a winter to summer habitat, although one can well imagine that high densities in one habitat can spill over into another. Their on-site overwintering suggests that control of ground litter in crop beds may be somewhat effective in avoiding early build up, especially if paired with row covers. In the long term however this species is so ubiquitous that some damage may be unavoidable. Row covers are one suggested measure of protection.



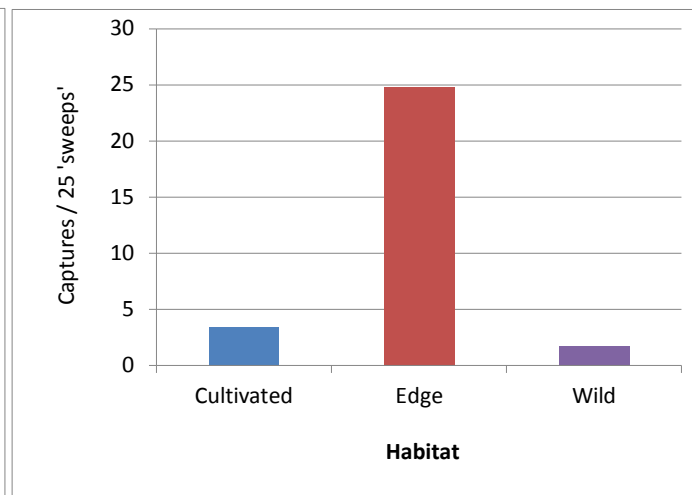
Tarnished Plant Bugs seemed to build up across the year with edge habitat (i.e., weeds and grass around crop beds) often having relatively high numbers. The apparent importance of 'wild' habitat in 2009 vs 2010 may reflect that fact that the 2009 'wild' habitat included more open wetland, while 2010 'wild' habitat was consistently forest.

In September 2010 sampling, the number of Tarnished Plant Bugs in edge areas surrounding the vegetables was correlated with the number of such bugs in adjacent forest, but neither number was correlated with captures within the cultivated vegetable beds. July and September vegetable bed captures were generally uncorrelated with vegetation surrounding the beds, although the amount of adjacent low-grass edge was weakly, positively correlated with September numbers in cultivated areas.

The general suggestion from our data is that Tarnished Plant Bugs are distributed across the open parts of the landscape, and there may be some movements across those cover types.



Captures of Tarnished Plant Bugs across three cover types in and around the Hawthorne Valley vegetable gardens in 2009.



Captures of Tarnished Plant Bugs across four cover types in and around 19 Columbia County tomato beds in 2010.

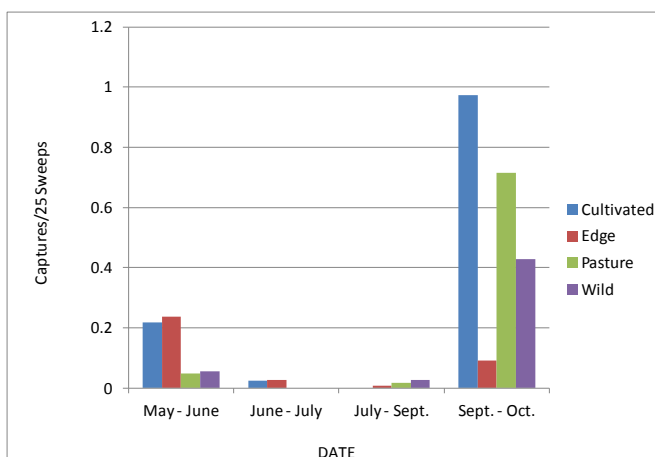
Flea Beetles (Alticinae, Chrysomelidae). These are generally small beetles, often no more than 1/4 cm or 1/10 inch. They are easily identified by their jumping ability powered by the huge 'thighs' of their hind legs. Most are predominately black, although [other colors and patterns exist](#). A 1928 book listed 81 New York species. Flea Beetles, as a group, are perhaps the most consistently damaging pest on ecologically managed farms around the County. During our 2010 study, they were recorded from 17 of the 19 farms, and were listed as substantial pests by eight farms, especially on brassicas and eggplant. During 2009, they were found throughout the cropped and uncropped lands around Hawthorne Valley's main garden, although they seemed to be most common in the former. There are various species of Flea Beetle and, because we did not try to distinguish them, precise knowledge of their ecology is blurred by the fact that different species may differ in their habits. However, some generalities are possible.



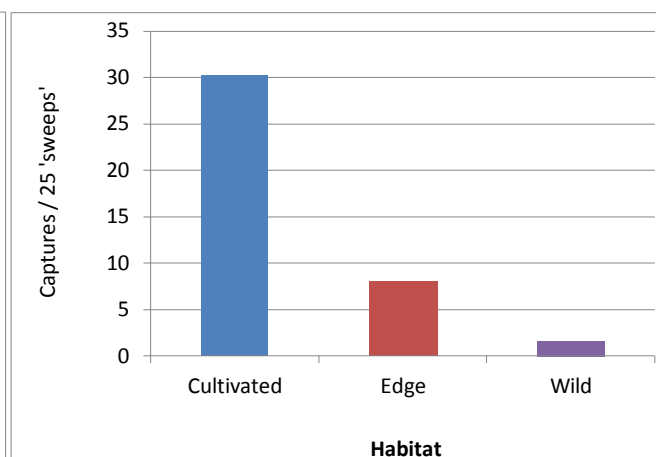
Because of the relatively broad diets of some species they may, like the Tarnished Plant Bug, occur in non-crop habitats and overflow into crops. However, several species (such as the Potato Flea Beetle, a common local species that feeds on a variety of crops, especially Solanaceae) can overwinter as adults buried in open soil. They emerge in spring and seek whatever food plants they can find. If a solanaceous crop plant is at hand, they will feed on it and so can pass their entire lifecycle within a

crop bed if crops aren't rotated. If crops are rotated, then row covers can reduce infestations of new crops from previously infested areas. While non-crop habitats (such as hedgerows near crop beds) can serve as sources for these species, many beetles can probably survive in the crop beds and immediate surroundings, and are not dependent on the wilder habitats. In some cases, non-crop habitats may even provide alternative food that delays arrival to crops.

In our Hawthorne Valley study, the earliest and latest Flea Beetle buildups occurred in both cultivated and uncropped areas, although densities generally seemed less away from the gardens. More than three quarters of the Flea Beetles we captured during our multifarm study of cropfields and adjacent habitats were in the vegetable fields themselves. In our current study of grasslands, we only rarely encounter Flea Beetles. Flea Beetle numbers across habitats were generally uncorrelated, and Flea Beetle numbers within vegetables were generally uncorrelated with surrounding land use.



Captures of Flea Beetles across three cover types in and around the Hawthorne Valley vegetable gardens in 2009.



Captures of Flea Beetles across four cover types in and around 19 Columbia County tomato beds in 2010.

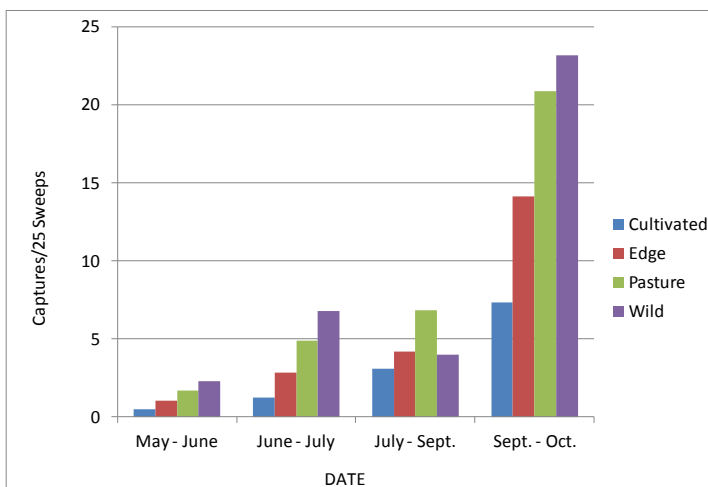


Leafhoppers and related Spittlebugs and other hoppers come in an array of patterns and colors; these are four of the local varieties

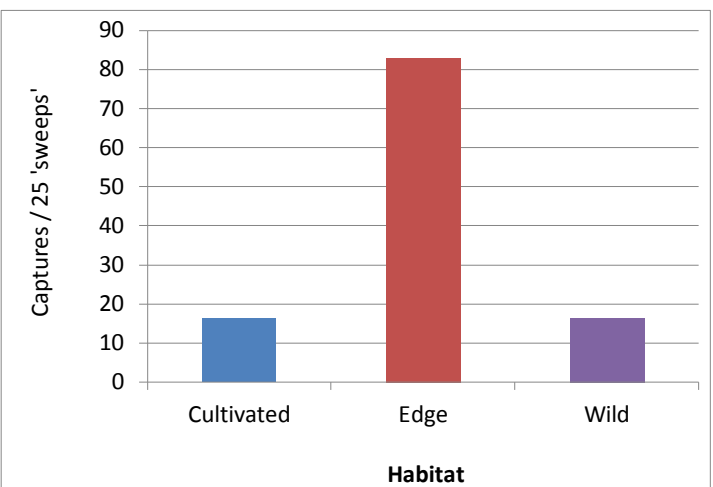
Leafhoppers and Allies (Cicadellidae). Like Flea Beetles, “Leafhoppers” and their close relatives encompass [a variety of species](#). There are around 2500 species in North America and an early 20th century work on New York listed nearly 300 species. Most tend to be torpedo-shaped with boat-keel heads and powerful, grasshopper-like hind legs. Colors vary dramatically, and some tree- and plant-hoppers have more sculptured bodies. Only a handful are considered vegetable pests, and the Potato Leafhopper is probably chief amongst these locally. In general, we found leafhoppers on all 19 farms we studied, and three farmers described them as major pests, especially on potatoes.

The Potato Leafhopper (which feeds on a variety of plants, not just potatoes) reportedly does not survive our winters. Instead, in ‘blows in’ from the south every year, settling and prospering on suitable plants. Because of this life-cycle, non-crop habitat probably plays a minor role in supporting this species, although instances of initial settlement on a non-crop plant, such as susceptible forest trees, followed by secondary invasion of crops have been reported. In any case, row covers can be helpful. In our studies, we have generally not distinguished Potato Leafhoppers from other species, however, based on our recollections, most of the leafhopper-type insects encountered outside of gardens have been species such as the introduced Meadow Froghopper (also known as the Meadow Spittlebug) which is not considered a vegetable pest.

Leafhoppers in general (we are mixing a multitude of species here) were most abundant in non-crop habitats, both in our 2009 and our 2010 data. Doubtless, this in large part reflects the abundance of grass-eating leafhoppers in those wilder areas. The likelihood that in-crop species are largely distinct from the species in non-crop areas is illustrated by the fact that leafhopper numbers were generally uncorrelated across habitats and unrelated to cover types around the crop bed, except for a slight positive correlation between July leafhopper numbers in the veggies and low grass within 50m of the bed.



Captures of Leafhoppers across three cover types in and around the Hawthorne Valley vegetable gardens in 2009.



Captures of Leafhoppers across four cover types in and around 19 Columbia County tomato beds in 2010.

Cabbage Worm (*Pieris rapae*). The so-called Cabbage Worm is the caterpillar of the Cabbage White, a butterfly that was introduced to North America in the second half of the 19th century. The adult is probably familiar to many people as its white form is often seen over fields and lawns. The [generally greenish caterpillar](#) grows up to 1 ¼ inches (3cm) long with dark speckling and hints of yellow. We documented cabbage white on 12 of the 19 farms we studied (although it was certainly more common than that because butterfly notes were only incidental). Four farmers described it as a notable pest. It feeds mainly on brassicas, including cabbage and kale. It also feeds on a variety of wild mustards, such as Garlic Mustard and Winter Cress. In over 350 butterfly surveys done on open lands in the County, the Cabbage White was the most frequently occurring species, being found more than 70% of the time.

Given its broad diet feeding on a variety of common crops and weeds in the mustard/cabbage family, this is a nearly ubiquitous species, occurring on almost any open area with an ounce of vegetation. They occur occasionally in wood openings but are generally not a forest species. They overwinter as pupae which are fixed to food plants or other structures such as woody debris. However, the butterfly pupates on a variety of surfaces, and it is a strong flyer and so can even reach plots far from other suitable habitat. They may have at least three generations in our area (that means that adults can settle at a given site and their young grow to adults at least a couple of times after the founding generation). Uncultivated land probably plays a relatively minor role in supporting this species on farms. Parasitic wasps have been introduced to control this species but have, instead, apparently helped drive at least one of our native whites, the Mustard White, to near extinction.



Aphids (Aphididae). Somebody once said, more or less, that aphids are little more than tiny balloons of plant sap on legs. They are tiny creatures with sucking mouth parts and bulbous abdomens that are often equipped with two 'tailpipes' (these are the tubes that secrete honey dew for attentive ants). They are often green but come in an array of colors. Colonies often reach a huge size, and, at least in some species, can be founded by a single female who reproduces without need of a male. There are many species of aphids, but less than ten appear to be potential pests in our area. Aphids were found on all but one of the 19 farms studied where almost 90% of these captures occurred in vegetables (as opposed to surrounding weeds or forest). They were widespread across habitats at Hawthorne Valley, although tending to concentrate in the vegetable garden during late July – early September. They have appeared regularly but not abundantly

during our current sweep netting in grasslands. However, because of the range of species' ecologies and the fact that we did not attempt to ID species, these data cannot reveal detailed patterns.

Local aphids exhibit [three basic overwintering strategies](#): 1) adults move to a woody winter host plant where they subsist until summer when they move back to their summer host which is sometimes a crop plant (Potato, Lettuce, Green Peach, Bean, and Melon Aphids); 2) they overwinter as eggs on or near the crop plant (Cabbage Aphid and, to a certain degree, Pea Aphid); or, 3) the species does not overwinter, but reinvades each summer from haunts farther south (Corn Leaf Aphid). The first group is the one most likely to be influenced by the nature of surrounding habitats. Reported winter host plants for these species include *Ribes*, *Prunus*, *Rosa*, *Rubus*, and *Catalpa*, although one gets the feeling that taxonomic and natural

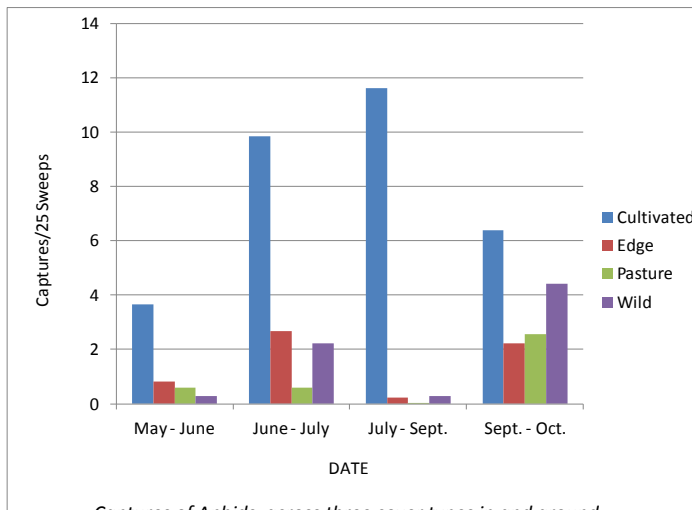




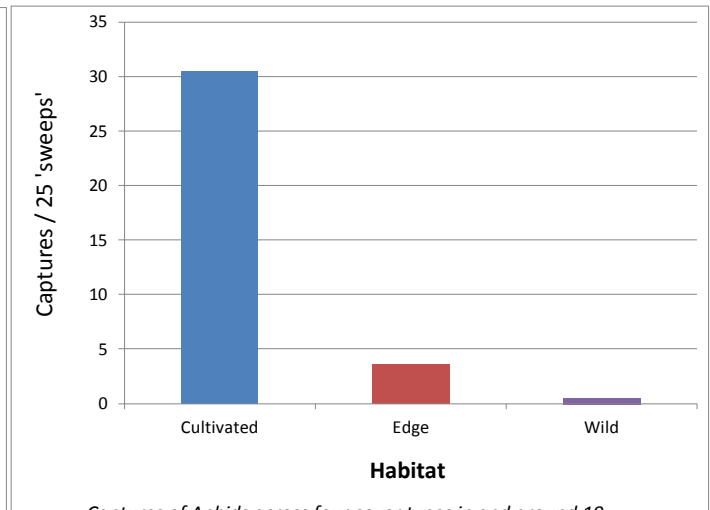
history uncertainty have left much to be learned.

In some cases, landscaping to remove overwintering woody plants has been undertaken; however, given the wide dispersal ability of the winged stage of these light insects, the commonness of the host plants, and the only occasional severity of their infestations, such action might be ineffective and/or unnecessary except perhaps in cases where adjacent host plants are scarce and pest pressure high. Row covers should be effective for most species, the exception being Cabbage and perhaps Pea Aphids which overwinter in the soil or, in the latter case, on leguminous weeds in the bed.

There was no significant correlation between July and September vacuum collections of aphids on the vegetables and adjacent forest cover. July pit trapping, however, did suggest a positive correlation between aphids in adjacent weeds and in-crop aphids.



Captures of Aphids across three cover types in and around the Hawthorne Valley vegetable gardens in 2009.



Captures of Aphids across four cover types in and around 19 Columbia County tomato beds in 2010.

Summary of Relationships to Land Cover. In sum, for the pest species described above, our observations suggest that densities in vegetables are not strongly connected to pest populations in adjacent, non-crop habitats, although the generality of our identifications of Aphids, Flea Beetles, and Leafhoppers means that the results for these groups may be misleading. Similarly, adjacent land use did not have an obvious relation with most pest numbers. This does not mean that habitat outside of the farm fence is irrelevant for pest populations, only that local variation among farms in the County did not have an obvious effect. Ours is a varied landscape, and any pests that did require certain, more wild habitats may have been able to find sufficient amounts anywhere in the County. Farms located in extensively urbanized or cultivated landscapes might show distinct pest populations. Deer, for example, are ubiquitous in Columbia County and affect production on many farms, regardless of immediately adjacent cover. Obviously, deer do have certain habitat requirements and are probably rarely a problem for vegetable gardens in the middle of a big city.

These results in no way tested the value of *within-farm* habitat manipulations such as trap or buffer crops. It has been shown in the literature that certain crops are more attractive to pests than others and can sometimes be used judiciously to manipulate pest distributions on individual farms.

'WILD' ORGANISMS THAT AFFECT THE FARM: BENEFICIALS.

"Beneficials" are organisms that, in one way or another, benefit the crops. They may do this by controlling organisms that damage the crop plants (that is, they are predators or parasites of pests) or by directly benefitting the plant (for example, pollinators and, potentially, some soil manipulators). As with pests, the list of potentially beneficial organisms is extensive, and it is sometimes hard to know the net effect of each species' interactions. For our purposes, we have identified the follow species or groups of species as beneficial based on their observed abundances on local farms and published information on their natural histories.

Noticeably missing from our list are several organisms which either are so common that they must be having some effect, but the net effect is unclear (for example, flies and ants) or have widely been accepted as beneficial but were only rarely encountered during our work (for example, Praying Mantis and Lacewings).

Introduction to Ground Beetles. Ground Beetles are a diverse group. We have found nearly 200 species so far in Columbia County, of which 85 have been found at least once in or around farm beds. Of these, however, less than 20 species appeared to be common farm residents.

Several species were commonly found on farmland, but almost never in the vegetable beds themselves. These appeared to be species that, while present in the environs, did not regularly inhabit cultivated soils. While they may play a role in controlling weed and pest populations in adjacent habitats, they are unlikely to be ecologically important in the crops themselves. Such species included the following: *Agonum melanarium*, *Patrobus longicornis*, *Platynus hypolithus*, *Pterostichus mutus*, *Pterostichus stygicus*, and *Sphaeroderus stenostomus*. Several other species were at least occasionally in the cultivated areas, but were few in number. These species included *Agonum muelleri*, *Amara aenea*, *Amara cupreolata*, *Bembidion mimus*, *Bradycellus rupestris*, *Clivina impressifrons*, and *Poecilus lucublandus*.

A table summarizing the captures of our most common on-farm ground beetles according to habitat. N = the number of beetles captured. The 2009 study occurred at Hawthorne Valley Farm, while the 2010 study included 19 different vegetable farms around the County.

	Year	N (# of 2010 farms)	Cultivated	Edge	Wilder
<i>Anisodactylus sanctaecrucis</i>	2009	31	0.3	0.1	0
	2010	14 (9)	93%	7%	0
<i>Bembidion quadrimaculatum</i>	2009	84	0.6	0.6	0
	2010	174 (18)	74%	25%	1%
<i>Elaphropus anceps</i>	2009	3	<.1	<.1	0
	2010	23 (12)	78%	22%	0
<i>Elaphropus incurvus</i>	2009	54	0.5	0.2	0.1
	2010	127 (17)	88%	11%	1%
<i>Harpalus pensylvanicus</i>	2009	52	0.5	0.1	0
	2010	23 (12)	57%	43%	0
<i>Harpalus rufipes</i>	2009	320	2.8	1.6	0
	2010	39 (9)	63%	29%	8%
<i>Pterostichus melanarius</i>	2009	57	0.4	0.5	0
	2010	5 (4)	20%	60%	20%
<i>Stenolophus comma</i>	2009	17	0.1	0.2	0
	2010	7 (6)	100%	0	0

However, another eight species were regularly found in the vegetable beds and seemed to be at least moderately common; these species are presented in the above table. Because we do have the more detailed information available for this group (unlike our data for aphids, flea beetles and the like) and because their natural histories do vary, it's worth asking who these species are and what they are likely to be doing. We have three main sets of data for exploring the

occurrence of these species: our free-wheeling collections in different wild habitats around the County including intensive work in floodplains, our detailed 2009 work exploring distributions in and around the main Hawthorne Valley vegetable garden, and our 2010 work looking at insect distributions in and around vegetable gardens on 19 different farms in the County. Because effort across habitats was unequal in 2009 but method (pit traps) was constant, 2009 data are standardized as beetles captured / set of five pit traps. In 2010, we used a variety of techniques (pits and digs), but effort was constant across farms and habitats so results are presented simply as number of individuals captured on each farm.

The information below deals mainly with adults; the larval beetles can be just as important ecologically as the adults. However, their natural history is much less well known.



Anisodactylus sanctaecrucis is a medium-sized beetle (about 1 cm or 4/10ths of an inch). Its dark head and pronotum (the part behind the head) contrast with brown of the wing covers. These tend to be darker towards the tip with a lighter band nearer the head. Legs are light-colored. This species has been recognized as a weed-seed consumer on [North Carolina](#) and [Pennsylvania](#) farms. It has been reported from farms and open areas throughout the East and Midwest. In our studies, it was most common in the cropfields, although it was widespread in the County and also was found in floodplains. This beetle reportedly feeds on a variety of weed seeds, including lambsquarters, fescue and velvetleaf, and has also been reported to prey upon certain beetle pests. It's a good flier who apparently overwinters in debris in hedgerows, forests and other locations near the crop fields. Further west, it is a resident of tall grass prairies, but, at least in the East, seems to benefit from the

human opening up of land. This species would probably benefit from 'beetle banks', and, given its good flying abilities, is probably an able disperser.

Bembidion quadrimaculatum is small (< ½ cm, <1/4") and generally dark, but its wing covers are marked by four light spots located, more or less, at the four corners. This species seems to be a tiny workhorse of farm plots. The species is apparently native to the more northerly parts of North America and Europe. It is often most common in cultivated farm fields, but also abundant in naturally disturbed areas such as floodplains and in uncultivated edges. This beetle is a predator and reportedly eats the eggs and/or larvae of various other beetles (such as corn borer), flies (such as onion maggot) and moth/butterfly pests, together with adult aphids. Its small size and soil-entering habits suggest that it can probably overwinter in cultivated fields, although it is also frequently found overwintering in more sheltered edge habitats.



Elaphropus anceps and ***E. incurvus*** are even smaller than the above species, mere shiny, scurrying specks. They tend to be a chestnut brown with hints of light color on the wing covers. Those covers are smoother and more polished than on many ground beetles. These are predatory beetles which we found in cultivated soils and, to a lesser degree, in surrounding grassy/weedy areas. We also encountered them occasionally during our study of floodplains, and this was the most common habitat [reported for Connecticut](#). *E. incurvus* was apparently substantially more common, although separating these two species can be tricky. They have regularly been reported from agricultural areas by others, but only occasionally appear to be common. It has [been suggested](#) that, at least, *E. anceps* can

contribute to control of soybean aphids, and *E. incurvus* has been observed to eat fly eggs in captivity. There is some [suggestion](#) that *E. incurvus*, at least, may be associated with ants (Larochelle and Lariviere). While they may be able to overwinter in cultivated fields, the fact that they are fliers and overwinter as adults suggests they could make good use of beetle banks and other shelters.



Harpalus pensylvanicus was regular, if not abundant, in cultivated fields and surrounding weedy grasslands which we studied. This is a stocky, black beetle with light legs approaching 2cm or $\frac{3}{4}$ " in length. It has few hairs on its body, giving it an overall smooth, sometimes shiny look. During our farm studies, we never found this species in adjacent woods and it was rare in our floodplain studies (where occasional specimens could have represented individuals washed in from elsewhere). In [CT](#), it was often found in around houses and on other developed land. [PA](#) and [NC](#) publications on agriculturally-important ground beetles both highlight its role, and it shows up in most North American studies of farmland ground beetles. *H. pensylvanicus* is reported to eat numerous weed seeds

(including lambsquarters, amaranth, velvet leaf and foxtails) and insect pests (including cucumber beetles, aphids, corn borer and armyworm (Carvahlo et al). *H. pensylvanicus* is unusual amongst agricultural ground beetles in that it overwinters as a larva and doesn't breed until late summer. It has been suggested that such a strategy hinders autumn exodus from the fields and spring re-invasion; and may help account for the fact that, in [a published study](#) of ground beetle abundance under different tillage regimes, *H. pensylvanicus* was found to be favored by no-till situations.

Harpalus rufipes is about the same size and proportions as the above species, but its wing covers are coated with a fine, golden fuzz. This is best seen at an angle and often is evident because of the dust that it catches. This was the dominant ground beetle during our 2009 fieldwork at Hawthorne Valley Farm and was a regular find during our 2010 multi-farm study. It was most common in the vegetable fields themselves, but was not rare in edge habitats either. It was only occasional in floodplains and forests. This is a European species that is now broadly naturalized in northeastern North America. In Europe, as here, it tends to abound in cultivated fields. It seems to have a general diet, consuming both weed seeds and invertebrates (including pests such as aphids, cabbage worms). It is occasionally a pest of strawberries. Unlike *H. pensylvanicus*, this species can overwinter as an adult and breed in the Spring, suggesting that it could easily re-invade fields in the spring and retreat to sheltered areas in the autumn. However, at least in our own work, this pattern was not evident, and this species may be overwintering in the fields themselves. Some individuals do overwinter as larvae. Low (or no) tillage and surface crop residue has been documented to increase the abundance of this species.



Pterostichus melanarius is another European, omnivorous ground beetle. This species tends to be slightly longer and slimmer than the two species above. Unlike those species, the legs, as well as the body, are black. The shape of the pronotum gives it a somewhat 'hunched shoulder' appearance from the side. It can reportedly help control earwigs and may also consumes fly eggs/maggots, Colorado Potato beetle eggs, aphids, cut worms, corn borers and a variety of other insect pests. It has been reported to eat weed seeds including those of foxtail, lambsquarters and chickweed. It is, however, also

sometimes a pest of strawberries. It is apparently more of an edge and forest species than many of our farm beetles: it was common in floodplains, and, in both our Hawthorne Valley Farm and multi-farm studies, was most frequent in edge habitat. It was relatively common at Hawthorne Valley Farm, but not widespread nor abundant in our multifarm study. Adults apparently overwinter in the fields themselves, and [do not seem to be](#) dependent on beetle banks or other sheltered habitats.



Stenolophus comma is around ¾ cm or ¼" long; it is a deep brown beetle with tan 'highlighting' around its edges. This species reportedly feeds on the immature stages of such potential pests as aphids and caterpillars. Although primarily carnivorous, it has also been reported to occasionally be a bad pest of corn, a fact that accounts for the common name of "seedcorn beetle" applied to it and related species. Our own results reflect those of others (e.g. Boivin and Hance): in a mixed landscape with forest and field, this species appears to favor cultivated lands rather than forest, although it does occur at lower densities in the latter. We did not find it during our floodplain forest studies.

Introduction to Bees (& Wasps). Bees and wasps benefit crops in different ways – the former assist crop pollination while the latter can provide important pest control, often as pest parasites. Both consume flower nectar but, with exceptions, wasps do not usually collect pollen whereas bees usually do gather it, often as food for their young. Because of this overlap in their tastes, management that favors bees will often favor wasps. Most wasps are minute and pose no threat to humans but can provide important ecological services to farms. In our study of 19 farms, both native bees and tiny, parasitic wasps increased in abundance with increases in flower density in land immediately adjacent to the crop field. However, aside from recording the small ("Micro") wasps which we captured with our vacuum, we have done almost no work with wasps, and so this section focuses on bees.

A table summarizing the bee bowl captures of our most common on-farm native bees.

	Focal Bees as % of All Captures	
	2008 (6 farms) May-July	2010 (19 farms) July & Sept
Total Bees Identified	811	412
<i>Agapostemon virescens</i>	15%	10%
<i>Apis mellifera</i>	5%	6%
<i>Augochlorella aurata</i>	6%	5%
<i>Halictus confusus</i>	2%	5%
<i>Halictus ligatus</i>	6%	7%
<i>Lasioglossum spp</i>	44%	63%
<i>Mellisodes bimaculata</i>	3%	2%

To date, we have found approximately 110 species of bees in Columbia County, with at least 78 of these recorded from cultivated farm fields. The most common farm bees are primarily in the families Apidae (includes the European Honey Bee and our native Bumblebees) and Halictidae (includes the Green Sweat Bees).

Below we provide photos and short profiles of the most common farm bees in Columbia County. The Honey Bee, *Apis mellifera*, was common on all farms studied, but, given its widespread familiarity, we don't profile it here. The table on this page summarizes the

relative abundance of these species in our two sets of standardized on-farm data from Columbia County; five of the six farms sampled in 2008 were included in the 2010 sampling. These are bee-bowl data (bee bowls are shallow, colored, water-filled bowls used to sample bees), and bumblebees are generally uncommon in bee bowls. The Bumblebee species included below were chosen based on unstandardized netting during the above projects and subsequently. There are few general resources available for understanding specific bee groups although there is an excellent, recent [Bumblebee guide available free on-line](#).



Twin Spotted Bumblebee (*Bombus bimaculatus*). We have so far found 13 species of Bumblebees in and around Columbia County; this is our most common species and one of the most common Bumble bees in the Eastern US. It commonly nests in the ground, but apparently also in above-ground cavities. The females (what one most commonly sees) have a yellow thorax with a black dot between the wings. The yellow on the abdomen is confined to the first one or two segments closest to the wings. It reportedly has a medium-long tongue and frequents many common field flowers including clovers, goldenrods, roses

and thistles.

Common Eastern Bumblebee (*Bombus impatiens*). As the name implies, this is also a common Bumblebee, both regionally and throughout the Eastern United States. It is generally similar in appearance to the Twin-spotted, although



there is normally little or no black between the wings and the yellow of the abdomen occurs entirely on the first abdominal segment. Its habits also appear generally similar to those of the previous bee; although [one paper](#) documenting bee flower visitations on a Michigan prairie found only partial overlap in flower choice between these two species. The Twin Spotted, for example, visited Hawkweeds and Hawthorn, and Stiff Goldenrod, the Common Eastern Bumblebee included Dewberry and Grey Goldenrod, while they overlapped at Monarda and Stiff Goldenrod. These preferences may or may not be evident in our area, but illustrate the potential for differences in foraging ecology. It may be less likely than the

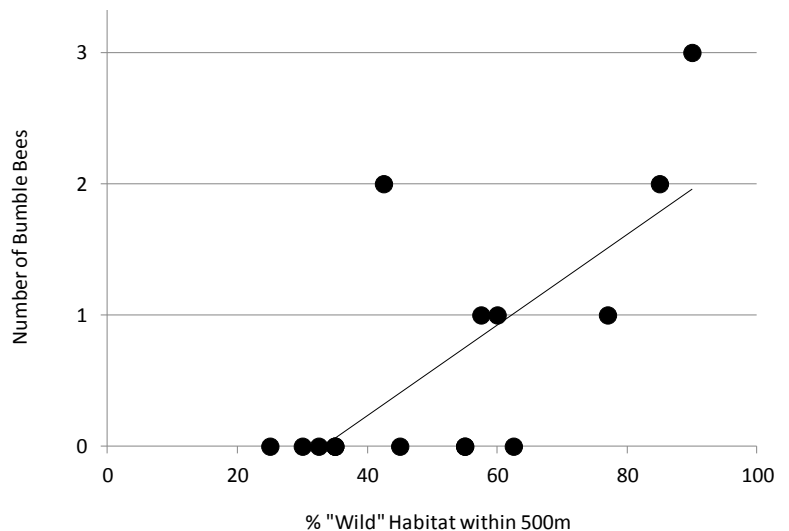
above species to nest above ground. This Bumblebee [reportedly](#) pollinates a variety of commercial crops including Blueberries, melons and squashes.



Tri-Colored Bumblebee (*Bombus ternarius*). This species is characterized by the bright orange 'midribs' on the abdomen; it has a shorter tongue than the preceding two species of bumble bee and so may tend to avoid certain flowers with longer corollas such as some of the clovers. This species has a more limited distribution – in the East, it extends little farther south than Pennsylvania, while both other species extend as far south as Florida; it is, however, more

widespread in the West than either of the others. This is a ground nester.

As others have found, Bumble Bees seem to be quite dependent on the presence of semi-wild areas 'in the neighborhood'. The graph above illustrates this using our own data from 19 farms studied in Columbia County (three of which were discarded from this sample because of problems with bee sampling and preservation). Bumble Bees were most likely to occur on farms which have relatively high amounts of semi-wild land within a quarter mile of the tomato-bed sampling location.



The relationship between Bumblebee abundance and wild habitat within 500m of trap site; data from 19 Columbia County vegetable farms. (Note small sample size.)



The Small Carpenter Bee (*Ceratina dupla*). This is one of several hard-to-distinguish East Coast species of Small Carpenter Bees. These are relatively small bees, often with white facial marks. Despite the name “Carpenter Bee”, these bees are not known to worry wooden structures. Instead, they nest in the hollow stems of plants; in the Niagara region of Ontario, this species primarily used Teasel and, secondarily, Raspberry or Blackberry. Adults overwinter and so this bee can be found afield during almost any month when the weather is warm. Bees of this genus are considered potentially important pollinators of certain [melons](#) and alfalfa; however, they

are likely generalists and visit a variety of crop plants.

Long-horned Digger Bee (*Melissodes bimaculata*). This is a generally black bee, often with lighter hairs on the forehead and, in females, light ‘socks’ formed by the pollen collecting hairs on the hind legs. The “bimaculata” of the Latin name refers to the paired white spots on the top and near the tip of the dark abdomen. As the name implies, this is a ground-nesting bee, although it did not seem to be particularly associated with sandy soils. While generalists, these are apparently particularly common on a variety of melons and squashes. This was the rarest of the bees included here, accounting for only 2-3% of the captures.



Jailbird Sweat Bee (*Agapostemon virescens*). The head and thorax of this half-inch long bee are emerald green while the abdomen is black-and-white striped. This is one of our most numerous native bees; and was common in all years when we have done field sampling. It is a ground nester, and hence favors sandier soils. During our study of 19 county farms, the highest number (more than 25% of our total catch for this species) came from the farm with the sandiest soils. The Jailbird Sweat Bee is considered a generalist pollinator; [one study](#) found them to be a common soybean pollinator, and they have also been observed on such crops as [squashes](#), [apples](#), [blueberries](#)

and sunflowers.

Emerald Sweat Bee (*Augochlorella aurata*). This is a small, emerald-green to bronze-green sweat bee, so called because you’ll sometimes find them lapping salt from your sweaty skin. These are ground nesters, and we have found them commonly in open fields and, at least occasionally, in wooded floodplains. They are often numerous at particular locations. Unlike many other bees in this family, this species is, as described [here](#), truly social, meaning that it will usually (although not always) establish multi-individual colonies with a queen and designated worker-daughters. Colonies are relatively small, probably



not containing more than 20 bees at any one point in time. The Emerald Sweat Bee, like most other bees of this family, is generalist pollinator. It is said to pollinate the likes of melons, peppers, blueberries, black berries/raspberries and strawberries.



The Dark, Small Jailbird Sweat Bees (*Halictus ligatus*/*H. confusus*). Like our earlier Jailbird Sweat Bee, these species have dark abdomens with white stripes. However, their thoraxes are usually dark, and they are only about 70% the size of *Agapostemon*. As the Latin name of “confusus” implies, these bees are not easy to distinguish without microscopic examination. While also ground nesters, they seek open, but not necessarily sandy soils. *H. ligatus* was not particularly common at farms with sandier soils, although *H. confusus* was. They are truly social, forming small (<25 workers), queen-led colonies. A [Pennsylvania report](#) describes *H. confusus* as a particularly good pepper pollinator, and they are both common, generalist pollinators.

Despite their apparent similarities, [one old field study](#) near Ithaca, NY found *H. ligatus* to favor Oxeye Daisy and Black-eyed Susan while *H. confusus* had a taste for Hop Clover. This result was echoed by [work in Oregon](#). It is unclear whether differences are reflected in crop pollination preferences; the [one work](#) I found which compared species, showed little difference in their preferences across four crop types. *H. ligatus* is apparently a particularly common bee on the Prairies.

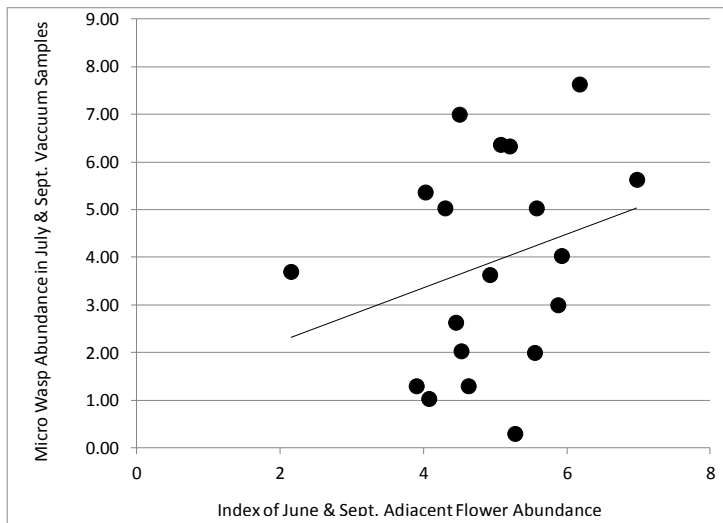
LBJs: Little Black Jobbies (*Lasioglossum* species). *Lasioglossum* are small, dark bees, many of whom are difficult to identify. There can be numerous species at one site: 20 species of *Lasioglossum* were found by [one researcher](#) in NY apple orchards. Despite their inconspicuousness and obscurity, they are important generalist pollinators. These are primarily soil nesters, although a few species nest in rotten wood. *Lasioglossum* bees have recorded from such crops as apple, blueberry, Rubus, cucurbits, peppers, tomatoes and watermelon. Given their taxonomic and related ecological diversity, LBJs are some of the nameless workers that can assist crop pollination and that would benefit from the general recommendations of maintaining semi-natural surroundings, providing flowers throughout the growing season and avoiding pesticides.

Managing for Native Bees. Much has been written about managing for native bees, and it seems worthwhile to briefly summarize some of that information here. In general, native bees can benefit from two types of management: that which increases their food resources and that which provides suitable nesting conditions. These two approaches are briefly considered below.

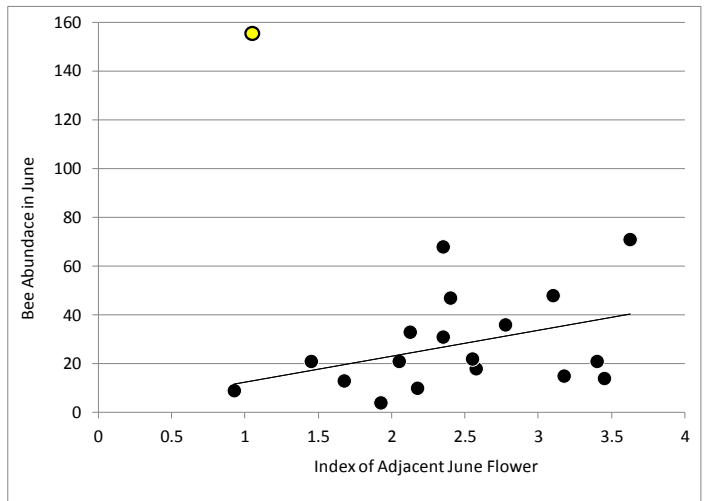
Adult bees feed themselves and their young with nectar and pollen. Nectar primarily provides energy while pollen is a protein source. Although bees are generalists and so forage on a variety of flowers, having nectar and pollen sources *throughout* their flight period is crucial. Given that some species of bees fly for up to four months but most native flowers bloom for 2 months or less, providing adequate bee food often requires assuring the blooming of more than one flower species. Wildflower plantings that contain a sequence of blooming flowers are thus better than single-species plantings that are more boom and bust. [Fiedler et al.](#), for example, charts the flowering sequences of various native plants.

Another way that farmers can assure bees access to flowers throughout their flight period, aside from diversified plantings, is to conserve a variety of native plant habitats on or near the farm. Not only can such conservation provide access to a greater diversity of flowers and increase the chances that something is in bloom, but the flowers of different habitats also tend to bloom at different times. For example, during work we did in collaboration with Martin Holdrege, we found that almost 30% of the bee species we later spotted in crop fields during the summer were already out

foraging on the spring flowers in forested stream floodplains. Those floodplains exhibit one of the year's earliest flushes of flowers as certain herbaceous species take advantage of the rich soils and the sunlight that reaches them prior to leafout in the canopy. Others (e.g., Bernt Heinrich 1976) have shown, for example, that wetland plants tend to bloom relatively late in the year, at least relative to flowers in upland woods. This suggests that farms with a diversity of nearby natural habitats will be better able to support diverse bee communities without substantial flower planting.



The number of small wasps captured in relationship to abundance of flowering plants in surroundings. Data from 2010 study of 19 vegetable farms in Columbia County.



The number of bees captured in relationship to abundance of flowering plants in surroundings. Data from 2010 study of 19 vegetable farms in Columbia County. See text.

Providing shelter is also crucial. None of our native bees nest in the giant colonies we are familiar with from honey bees. A few, like the bumblebees, may create modest colonies, but most are solitary nesters looking for small openings that they can provision with one or a few eggs and accompanying food supplies. Ground nesting is common among bees – bumble bees seek out sites such as woodchuck burrows while other species do their own digging into sandy banks. Some species find openings in hollow plant stems or, like Carpenter Bees, bore into wood.

An illustration of the importance of suitable nesting habitat can be found in the above graph – the yellow point represents a site which had, for its limited amount of flower resources, a surprising abundance of bees. This point turns out to represent one of the sandiest farms we studied, and the most common bees were apparently all ground nesters who would be favored by such easy-to-excavate soils. While one cannot change one's soil textures across a farm, it has been suggested that providing a few 'sandboxes' or sand piles (located in the sun and at least 2' deep) could be useful. Likewise, for non-ground nesters such as the orchard bees, nest boxes made from a collection of hollow straws of various sizes or even from mounted boards with variously-sized drill holes can house additional species. Numerous resources are available on-line, including works outlining the [management of specific bees](#) and [broader on-farm pollinator suggestions](#).

Finally, bees are insects like many of the 'pests' that pesticides are meant to control. As a result, several pesticides are highly toxic to bees. [This publication](#) (p. 17) provides a useful summary of the toxicity of common pesticides for bees, many are moderately to highly toxic. Avoiding or at least reducing the use of pesticides is one way of encouraging bee populations.

An Introduction to Spiders. For a variety of reasons, perhaps not related to actual effectiveness, spiders are not usually the poster children of biological control. Appreciating their importance is complicated by several factors not the least being a general human aversion to spiders. In addition, spiders probably represent a good illustration of the complexity

of biological control – they are diverse (around 600 species in our region - Kaston), inconspicuous, and can differ widely in their ecologies. Nonetheless, their importance in biological control has been [widely documented](#).

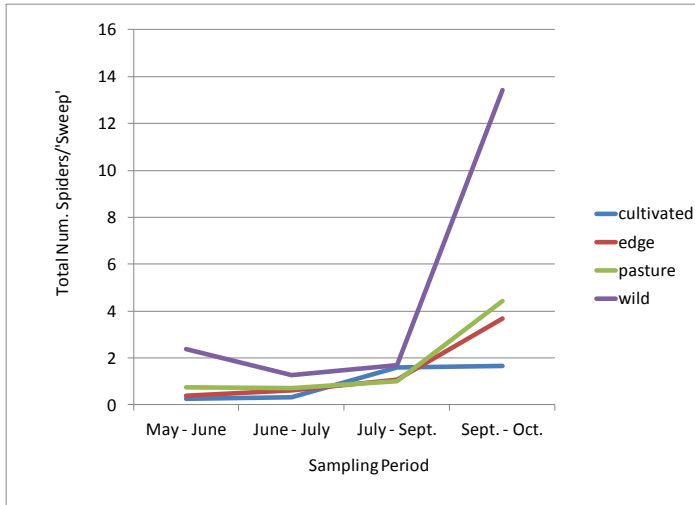
Two important aspects of applied spider ecology are dispersal mechanisms and hunting tactics. Although there are important species-specific nuances, these characteristics help determine how likely it is for a given spider to arrive to a crop field and how effective it then is as a pest control agent. Spiders have two primary means of dispersal: walking or ballooning. Walking spiders wander into fields from their over-wintering grounds; walking tends to be slow and not very extensive. Ballooning spiders uncoil a fine strand of silk which they allow to be drawn into the wind; they are then lifted off as a light child might be by a large kite. Ballooning is relatively rapid and can occur over relatively long distances. Not all spiders balloon. A variety of spiders disperse via ballooning with the families (see below) Linyphidae, Araneidae and Tetragnathidae being amongst the ones doing so most frequently. Although ballooning seems to be mainly a tactic of younger, smaller spiders, larger adults are also known to balloon especially when disasters such as flooding make dispersal at any cost important. Although ballooning is risky and means, literally, going whichever way the wind blows, it is a fine way of quickly dispersing into recently created habitats such as crop fields. The centers of crop fields may thus tend to be weighted towards commonly ballooning families. A study of forest tree recolonization by spiders (Frost thesis) found that blocking the arrival of spiders on the ground reduced the colonization of Jumping Spiders only; suggesting that ballooning was sufficient for the remaining spiders. Of five habitats around Hawthorne Valley where we studied spiders, cover crops had the highest percentage of spiders (75%) from those three top ballooning families (vegetable plots themselves were not sampled).

All of our spiders are capable of making silk, but not all use that silk to catch prey. Several common spider families grab and kill their prey without the help of silk. These include the Crab Spiders, the Jumping Spiders and the Wolf Spiders. Others, of course, such as Linyphids, Araneids and Tetragnathids, spin traditional webs. Even within these groups, however, techniques vary – Crab Spiders wait in ambush, Jumping Spiders pounce, and Wolf Spiders stalk; amongst the webbed, Orb Weavers build the classic round, sticky web; Linyphids build a tangled web which tends to knock prey onto the receiving ‘doily’; while Funnel Weavers build a flat, non-sticky web often with a tubular retreat. This variation in hunting techniques has two ramifications relevant to us: it affects [prey selection](#) and it affects habitat selection.

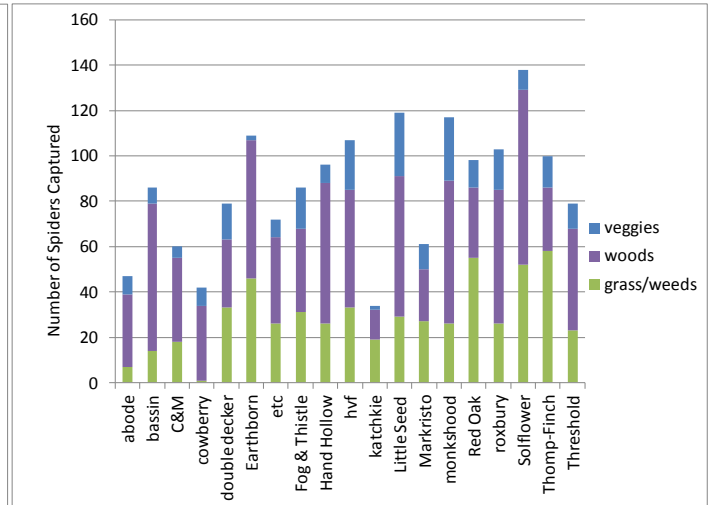
As an example of differences in prey selection, webs tend to catch winged creatures such as true flies and flying aphids; walking spiders, on the other hand, may tend to capture other walkers such as beetles or caterpillars. Overlaid on that are, naturally enough, differences in prey size related to differences in spider size, with large web builders like the Black and Yellow Garden Spider, for instance, being able to tackle adult Grasshoppers which would tear apart the webs of smaller spiders; larger Crab Spiders are capable of grasping the likes of Honey Bees. As the latter example suggests, spiders make little distinction between what we consider pests and beneficials.

The habitat consequences of these hunting differences are perhaps more subtle, but [researchers](#) have found that establishing artificial web supports locally increased the densities of web building spiders, and, more relevantly, complex, relatively stable vegetation encourages spider occupancy by providing both reliable ‘support poles’ for webs and also shelters and comfortable microclimates. Studies of farmland habitats have shown that increased complexity enhances spider populations. In our own studies (see below), we found that spider densities were lowest in cultivated habitats and higher in adjacent and more complex edges and woodlands. As others have suggested, creating a fine-scale tapestry of interwoven semi-natural and production habitats may well help to augment habitat for pest predators while breaking up the monocultures that can attract and support pests. At the same time, as farmers have long realized, relatively large, clean beds are easier to plant, harvest and manage for weeds. Furthermore, the trade-off between habitat complexity that augments beneficial populations and the habitat complexity that might enhance pest populations is not always clearly understood, although a community of beneficial insects, composed of a collection of

relative specialists, may be more sensitive to the effects of habitat complexity than most so-called pest invertebrates. In our own data from 19 vegetable farms, despite the fact that ‘wilder’ habitats tended to have higher spider abundance, there was no evidence that the presence of such habitats adjacent to crop fields enhanced spider abundance in the crops themselves. Aside from any problems in data collection, this lack of effect might be explained by no measurement of very small scale habitat diversity (i.e., structural diversification in and around the tomato plants) and the fact that all farms we studied are embedded within Columbia County’s relatively diverse landscape.



The development of spider abundance in sweep nets across habitat types in and around Hawthorne Valley Farm vegetable gardens..



The abundance of spiders in vacuum samples taken across three different habitat types. Data from 2010 study of 19 vegetable farms in Columbia County. See text.

Largely due to our own relative lack of spider expertise, we have very limited species-specific spider data. Instead, we will profile some of the more common spider families as a modest introduction to this group of beneficials.



Orb Weavers (Araneidae). These are the makers of most of the classical, round spider webs that one finds standing upright midst long grass and other vegetation. The Long-jawed Orb Weavers, as their name would imply, construct most of the remaining such webs. The adult females often have relatively large abdomens (rear body segment; males tend to be smaller and shorter lived) and shortish, spiny legs. The webs are their hunting tools, constructed of sticky silk and located where they are likely to intercept flying insects. The spiders of this family vary in size from the large Yellow and Black Garden Spider (*Argiope aurantia*), females of which may top 1" in body length, to others less than 1/5th of an inch long.

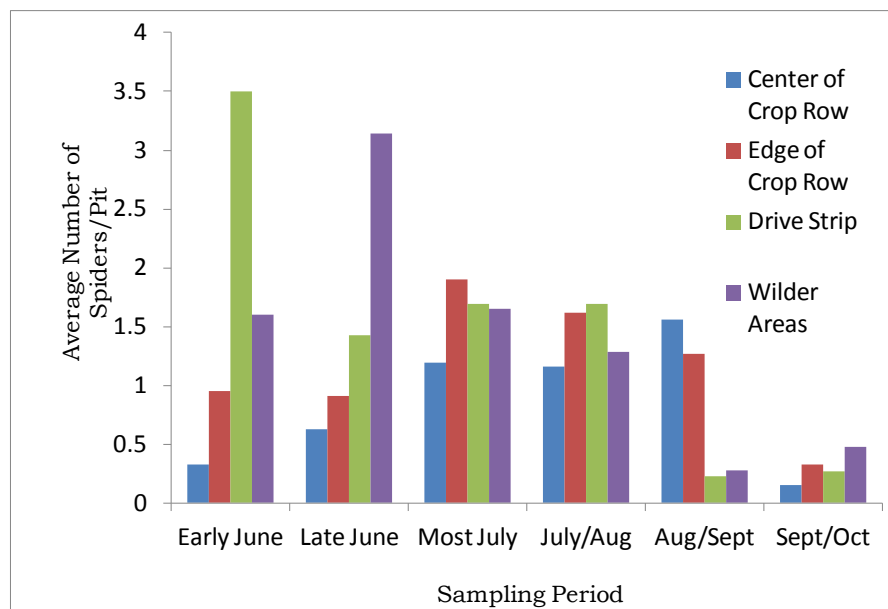
Orb Weavers can be common in cultivated fields. They made up 11-17% of the spiders in Hawthorne Valley cover crops and pastures. [One review paper](#) estimated that Orb Weavers (including the Long-jawed Orb Weavers, see below) accounted for almost 50% of the spiders in some US crop fields. The diet of the spiders in this family varies, as would be expected, according to size and habitat, but flying insects such as flies, winged aphids, and leaf hoppers appear to commonly be an important component of the diet. Beetles and True Bugs are important in the diet of some species, and, aside from aphids and leafhoppers, Orb Weavers are also reported to eat such pests as grasshoppers and blister beetles.



Wolf Spiders (Lycosidae). If you see a spider scurrying across the ground while holding a white ball underneath it, then you have probably seen a Wolf Spider. Most of these spiders don't build hunting webs although they do have silk and that white ball is a silk enshrouded egg case which the mother carries with her. They are primarily ground active, and can often be found by turning over rocks, logs or clods of soil. They have a somewhat classic spider appearance: dull-colored, hairy and with relatively long legs, they look a bit like miniature tarantulas, but none have threatening bites. If one can look into their eyes, one sees that there are two large front-facing eyes arrayed above a row of four much smaller ones. Two additional small eyes are located further back on the head. The abdomen is often only slightly larger than the rest of the body. Because of their ground-

hugging habits, they reportedly tend to be good bioindicators of changes in soil chemistry and microclimate. There are probably around 40 species of Wolf Spiders in our region.

As might be expected from their soil-dwelling ways, their primary prey may be other soil dwellers, including beetles (including the likes of the Cucumber Beetle), collembola, and the larval forms of flying insects (e.g., maggots and caterpillars). They have been reported to reduce caterpillar and leafhopper pests in agricultural environments. However, these spiders were virtually absent from our sweep netting and vacuuming, at least in part because of their terrestrial ways. Ground spiders were not identified in our studies, but, based on our recollections and data in the literature, Wolf Spiders probably made up at least the slight majority of the spiders caught in our pit traps and timed digs. During our 2010 studies looking across habitats around farms, the grassy/weedy edges and the vegetables themselves apparently had more of these spiders, with, for example, spider captures on the edge being more than twice the catch in the forest during both samples. Veggie and edge habitats traded first place in terms of spider densities between the two samples. During our Hawthorne Valley study, ground spiders of drive strip and wilder habitats (forest, wetland, pasture and hedgerow) decreased from spring/early summer highs, while crop row spiders built up and then maintained numbers through most of the season.



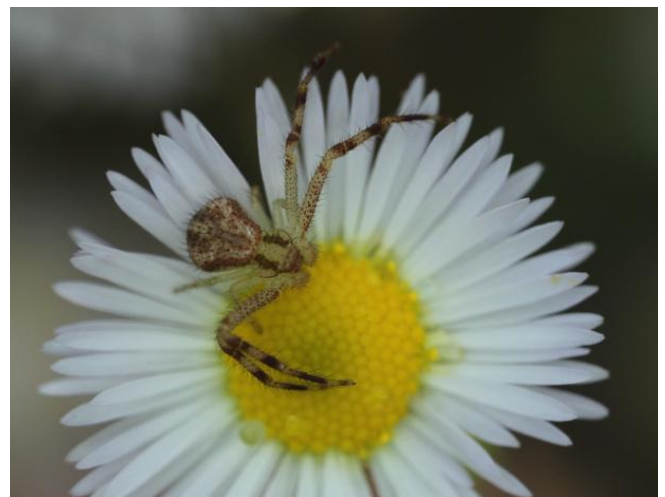
The development of spider abundance in pit traps across habitat types in and around Hawthorne Valley Farm vegetable gardens..



Jumping Spiders (Salticidae). Jumping Spiders have personality. Given their apparently keen eyesight, one often finds oneself being stared up at as one tries to photograph these creatures. Their two large, median eyes form prominent ‘headlights’. They have chunky bodies with relatively short, thick legs. As visual predators, they are apparently most active during the day. Unlike Wolf Spiders, they regularly appeared in our daytime sweep nets, and they are commonly found both at ground level and up in vegetation. Also perhaps reflecting their visual orientation is the fact that many Jumping Spiders have relatively distinct body markings that differ between males and females. Their courtship is often reported to involve visual displays. Last but not least, these spiders do jump. Their movements are so rapid that they will often seem to disappear from one spot and reappear at another. The result is that they often appear to move with the jerkiness of a Charlie Chaplin movie, nonetheless, their hunting involves a smooth, cat-like stalking followed by a sudden pounce.

Jumping Spiders have been [reported](#) to prey upon a variety of insect pests, including leafhoppers and aphids. In [one experimental study](#), they were found to be capable of significantly reducing Plant Bug populations and resulting damage to Sweet Basil. In sweep net samples, Jumping Spiders accounted for about 1% of spider captures in Hawthorne Valley cultivated land; although they accounted for around 11% of the spiders in surrounding wetlands, and about 17% in the nearby woods. During our study of 19 farms around the County, Jumping Spiders were the most common family of spider collected of vegetation under forests, composing about 20% of the captures in such habitat.

Crab Spiders (Thomisidae). Crab Spiders are the ‘wall flowers’ of the spider world: they usually wait in ambush, often in the flower head. Over a period of less than a week, some species are capable of changing their body color so as, at least to our eyes, to blend better with their flower host. Another group of Crab Spiders, with more dour coloration, inhabit the ground layer, apparently also adopting ambushing their prey. According to [one study](#), the general diets of these two groups differ predictably, with the flower-based species capturing mainly flies, together with a scattering of bees, wasps, thrips, butterflies, beetles and spiders. The ground-based species have a more diverse diet which includes sizable portions of ants, spiders, beetles, and collembola, together with lesser





amounts of a few other groups. Some of these spiders do feed on flower visitors, although pollinating bees may make up a relatively small proportion of them. The front two pairs of legs are the longest, and the spider often waits for prey with these four legs extended out and forward in a crab-like posture.

Crab Spiders [are said to](#) feed upon such pests as Tarnished Plant Bug, Armyworm, Spotted Cucumber Beetle, and Colorado Potato Beetle. They were relatively rare in the sweep net and vacuum samples accounting for less than 5% of our on-plant spider captures in both 2009 (Hawthorne Valley only) and 2010 (19 vegetable farms).

Long-jawed Orb Weavers (Tetragnathidae). Like the Araneid Orb Weavers, most (but not all) of this group weaves a classic web for prey entrapment, and these spiders have sometimes been included with the Araneidae. Unlike that later group, they weave a slightly looser web, tend to be a bit more elongate in body and much longer in leg, and, as the name implies, have markedly long chelicerae or jaws. The long jaws may have evolved more as part of this group's courtship routine than as prey-handling tools.

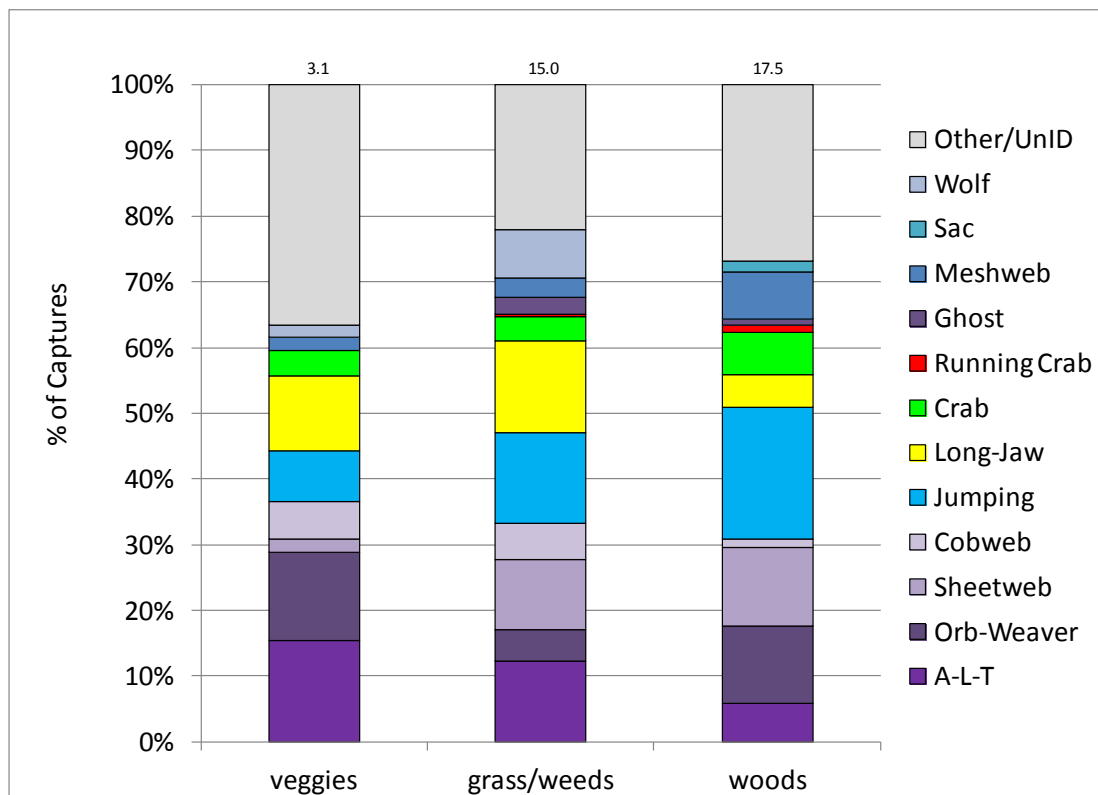
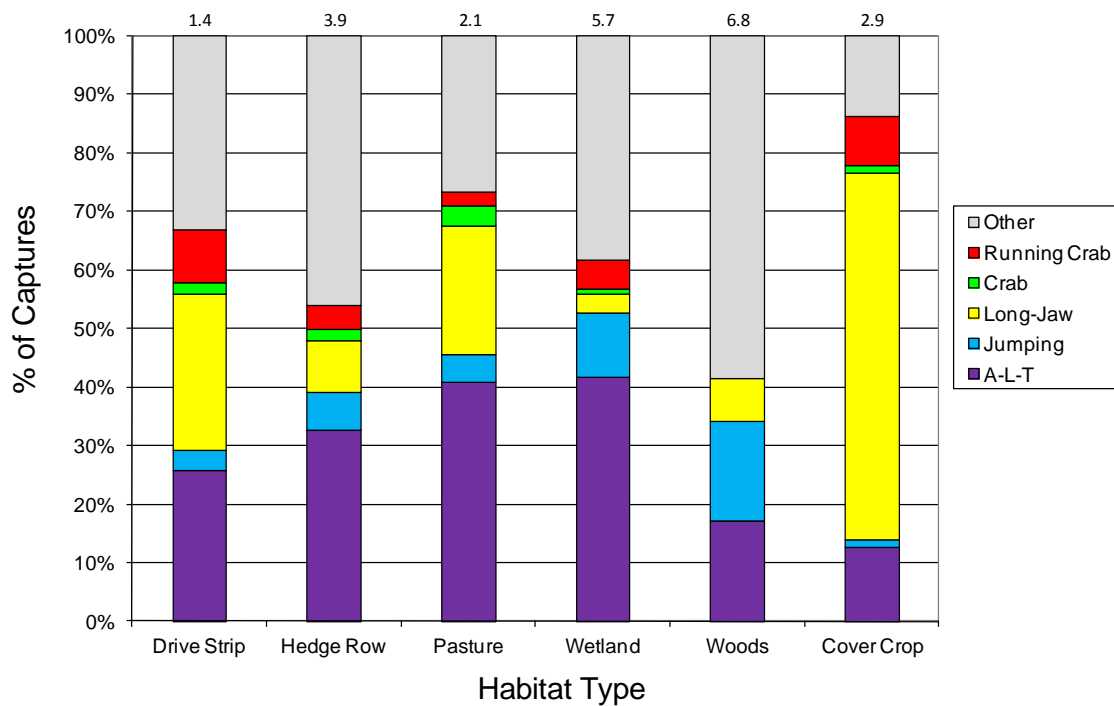
These spiders are [said to be](#) very common in some crop fields. They accounted for over 60% of the spiders we captured in cultivated fields at Hawthorne Valley; they were also common in adjacent drive strips and pasture, but accounted for less than 10% of the captures in wilder habitats. While accounting for slightly more than 10% of the captures in edge habitat in 2010, they were relatively less abundant in that study. Aphids and small flies appeared to dominate the reported prey items in crops situations. Elsewhere, spiders of this genus are important components of biocontrol in rice.



Sheetweb Weavers (Linyphiidae). These are the generally small (<1/5th"), nearly ubiquitous, hard-to-identify spiders of the farmfield. Sheetweb Weavers create a flat, pan-like web, usually close to the ground, above which they array a tangle of silk threads. A flying insect crashes into the tangle, drops to the pan, and is captured through the web by the web owner who has been waiting suspended beneath the pan. Unlike the Orb Weaver, these spiders do not rely on sticky threads to facilitate their captures. Given their small size, even as adults, Sheetweb Weavers [probably make up the majority of ballooning spiders](#). This group of spiders is reportedly most common in boreal climes, and the name gossamer (referring to the fine silk used to balloon and, by extension, collections of fine threads in general) [apparently](#) derives from "goose summer", the time of year when the abundance of these ballooning spiders made it appear as if the air were full of goose down.

Having said all that about their webs, relatively little is known about their ecology. They are [reported](#) to be important predators of small pests, such as leafhoppers and aphids, although [their prey is commonly Collembola](#) (small jumping creatures, generally not considered pests, and including the likes of 'Snow Fleas'), but they are also said to consume Tarnished Plant Beetles and some caterpillar pests. An [international review](#) found that they are one of the dominant spider families in many agroecosystems, [including NY cabbage fields](#). In our own work at Hawthorne Valley, the tally of

this family was combined with that of the similar-appearing Cobweb Weavers (Theridiidae); this group accounted for only about 1% of the captures from cultivated fields, but nearly 1/4th of all captures in pastures. In our 2010 data, these were the most common spiders of veggie plots, representing around 15% of all captures.



The abundance of different spider families across habitat types based on sweep and vacuum sampling. Top figure is from 2009 study of Hawthorne valley; bottom figure is from 2010 study of 19 county vegetable farms. Numbers atop each column are relative abundances.

An Introduction to Ants. Ants are almost everywhere in our landscape and no doubt play important ecological roles. However, isolating an effect on agricultural production is more difficult. Among the various potential roles helpful or detrimental to farming are soil aeration (through their tunnels), soil mixing and nutrient incorporation, soil fungus nurturing, mound construction, weed predation, predation on certain pests and beneficial, and the guarding of certain plants. The net effect of ants on any particular farm is difficult to know and may well differ depending on the crops being grown and the ants present. Whether or not the positive effects of ants in our fields can be accentuated by, essentially, ant management is not currently known. We present information on ants here for two primary reasons: 1) an introduction to group of creatures with an undeniable if nuanced ecological role in many fields, and 2) further evidence to address our question of ecological continuity across a cultivated/grassed/forested landscape. The common names applied here come from the recently-published [Field Guide to the Ants of New England](#); both that work and [The Ants of Ohio](#) are our primary references for ecology.

Pitch Black Aphenogaster (*Aphaenogaster picea*). As a group, Aphenogaster ants have received the nick-name of broken-back ants because of the way their thorax seems to be stretched and ‘broken’. These are medium sized, usually dark ants which, with one exception, are primarily forest-dwellers. They can be important dispersers of woodland wildflowers. So important, in fact, that oily attachments on the seeds of some of these species are thought to be ‘ant candy’ – co-evolved energy-packets that encourage and reward ants for retrieving a plant’s seeds. In keeping with their forest preferences, the Pitch Black Aphenogaster was not recorded in vegetables during our studies. It apparently occasionally ventured into the open fields but was primarily found in adjacent forests, where it was tied for third in abundance. This ant illustrates the potential distinctness of ant communities across the landscape. In our other work, we have often found this species in a variety of forests around the County, from moist deciduous ones to drier, more conifer-dominated spots. We did not, however, find it in floodplains. According to the afore-mentioned guides, this species is an omnivore often nesting inconspicuously in the forest litter. Aside from those tasty seeds, observers have reported it eating mushrooms and termites, although it surely takes a wider variety of foods.



Somewhat Silky Ant (*Formica subsericea*). The Somewhat Silky Ant is so named because of the fine coating of hairs which, overlying its dark black body, give it a silvery, “silky” cast. It is a medium to large ant that is in some ways the prototypical “black ant”. It is said to be often abundant in a variety of habitats and is known to tend aphids, planthoppers and treehoppers and has been observed collecting those ‘enriched’ wildflower seeds, and possibly gathering nectar on a variety of flowers. Fittingly, we found it in veggies, surrounding fields, and in the forest, although it was most common in the grassy, weedy fields where it was the most common species. Away from cultivated fields, we have commonly found it in a wide variety of wet and dry fields and forests

around the County. It was registered occasionally during our floodplain work. As described in *Ants of Ohio*, they form relatively large colonies in low mounds.

Cornfield Ant (*Lasius alienus*). This species apparently receives its name from its affinity for cornfields in Europe. In New England, it has been mostly commonly reported from wet forests. *Lasius* ants in general are usually small, reddish creatures most commonly seen when flipping stones or logs. In our 2010 multi-farm work, it was one of the most evenly distributed species, occurring regularly in veggies, grassy field and forest, although most common in the latter habitat. In our sampling elsewhere, it was common both in floodplain forests and in the main gardens of Hawthorne Valley Farm. It was found occasionally in other habitats around the County. It is described as an omnivore and tender of other insects.



Labor Day Ant (*Lasius neoniger*). Those deans of ant study, Bert Holldobler and E.O. Wilson, have so nicknamed it on account of the timing of its seasonal mating swarms. The authors of *A Field Guide to the Ants of New England* describe it as “Likely to be ecologically very important because it is abundant in virtually every open habitat on the landscape.” True to form, this was the single most common ant species in our multifarm study in terms of average occurrence across all three habitats we studied. It was, however, particularly common in the veggies, where it was *the* most common ant, accounting for over one third of all captures. It occurred in lesser abundance in fields and forests. It was, however, a regular in our floodplain forest surveys. Like most ants, it is an omnivore, it collects honeydew but also consumes other insects. The small colony entries may be relatively inconspicuous but



colonies can reportedly be large. Ecological information on this species is clouded by its apparent regular confusion with the preceding species.

American Ant (*Myrmica americana*). *Myrmica*, the most common ant genus in our multifarm study, are medium-sized, dark-reddish ants. This species is reported from sandy openings across much of North America (hence its name); conceivably, this wide range is partially due to a failure to distinguish amongst similar species. Across Columbia County farms, it was found in all habitats, although not particularly common in any of them. It is likewise uncommon in our samples from other lands in the County. Like most ants, it is described as an omnivore. It is a regular feeder on the honeydew that aphids and related insects excrete as evolution-derived ‘payment’ for ant tending.



(For *Lasius* and *Myrmica* ants, the associated images are of the respective genera but not necessarily the particular species being discussed.)

Detrital Ant (*Myrmica detritinodis*). Apparently, the source of the not-very complimentary scientific name and derived common name may either be due to an eroded appearance on part of its anatomy or its habitat amongst forest detritus. The *Field Guide* describes it as “a good indicator of mature forests”, although in our own multi-farm work it was quite common in both veggies and surrounding fields and relatively rare in forests. This might reflect mis-identification on our part, or illustration of the fact that, as the *Field Guide* notes, this species extends into openings if competitors are absent. We have found it a couple of times in woods and meadows around Hawthorne Valley Farm. Little additional information has been published on its ecology.

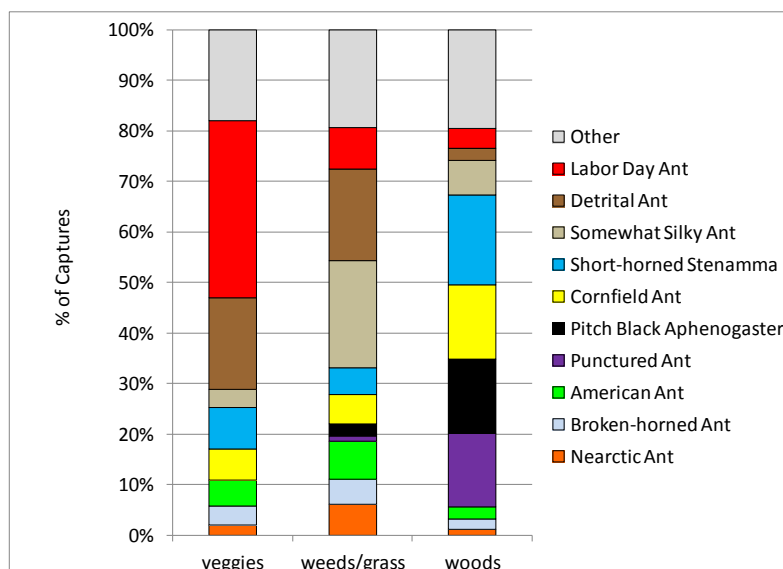


Broken-horned Ant (*Myrmica fracticornis*). Another honey-dew feeder named after a sharp angle in the base of its antenna, this species is reported to be a species of edges and young forests. It was not a particularly common species in our work but, appropriately, was most abundant in the rough fields surrounding many of our vegetable gardens. Outside of our multi-farm study, we have found it along a creek and in the middle of a field. Its main food is reported to be honeydew, and it is said to nest in moderately sized colonies forming low mounds.

Nearctic Ant (*Myrmica nearctica*). This has been described as an ant of deciduous forests, although in our own work it was most common in fields and least common in woods; it was, however, abundant nowhere. We have not definitively identified in any of the samples we have collected elsewhere in the County, although this is a tricky genus, and we expect our ideas of species distributions will change if our familiarity grows. This is not a well-documented species.

Punctured Ant (*Myrmica punctiventris*). The somewhat gruesome common and scientific name derives from the fact that abdomen hairs appear to make small dimples. The *Field Guide* reports that this ant occurs primarily in deciduous forests where it is common and one of the most important of those forest wild flower seed dispersers. It also is said to come to fruit bait. It was definitely a forest ant in our work, accounting for almost 15% of the forest ant captures and yet almost completely absent from the fields and veggies. It was relatively common in floodplain forests. Reportedly, its small colonies often nest in association with rotting wood and debris; curiously, it is said to sometimes ‘play dead’ when alarmed.

Short-horned Stenamma (*Stenamma brevicorne*). The Short-horned Stenamma is not a new and novel cattle breed, but rather a relatively uncommon (according to the *Field Guide*) ant of forests and edges. While it was, in fact, the most common forest ant in our multi-farm study, it was also relatively common in both veggies and surrounding fields. It was also often found during our floodplain forest study, although apparently rare in drier uplands. Its small colonies are stated to be carnivorous, although detailed information is lacking.



The abundance of different spider families across habitat types based on sweep and vacuum sampling. Top figure is from 2009 study of Hawthorne valley; bottom figure is from 2010 study of 19 county vegetable farms. Numbers atop each column are relative abundances.

‘WILD’ ORGANISMS AFFECTED BY THE FARM.

Initial Thoughts. As with the influence of nature on farms, the effect of farms on nature can also be negative and positive. The negative aspects, such as habitat destruction, chemical poisoning, excess nutrients, have been widely documented (e.g. [Fatal Harvest](#); [Birds, Scythes and Combines](#); [World Agriculture and the Environment](#)) and will not be discussed here. Instead, we will stress the potential synergies, in part because this is most in keeping with our general approach of introducing on-farm organisms and discussing their relations to farm management, and, in part, because this is a report on the creatures which *can* rather than *cannot* be seen on farms.

In some ways, this division of creatures into two groups (those that affect farms, those that are affected by farms) is largely arbitrary. We could, for example, discuss the role of farms in conserving bees, ground beetles, spiders or ants or the role of birds, amphibians or dragonflies (groups to be discussed below) in controlling on-farm pests. Many organisms fall into both camps, and we urge readers to keep in mind both perspectives as they look at the land around them

Although this section will concentrate on a few relatively rare species, it is important to realize that one of the primary reasons why some species currently are *not* rare is because they do have adequate habitat. In some cases, that habitat is partially associated with farms. Therefore, just because we don't mention a species doesn't mean that farms aren't relevant to its conservation: many species rely on larger portions of the landscape than just farmlands, but farmlands are often one piece of the puzzle.

The list of species below is hardly complete. There are, for example, innumerable insects which we can barely identify, let alone understand their ecology. The species we single out below are ones that illustrate some aspect of farming's relationship to unmanaged nature. They are apt to be found on regional farms if one looks.

History and Ecological Analogies. Imagine what a given farm and its surrounding landscape looked like 400 years ago. Here in our region, that land was probably primarily forested. However, at least when viewed across time, it was probably not uniformly treed – there may have been charred patches on drier soils (lit by lightning strike or human intention); beaver ponds may have pulsed on and off, and unchanneled streams may have wandered. For at least half a millennia prior to European arrival, the small, temporary openings of Native American agriculture punctuated the forests on richer soils. In short, disturbance happened. It knocked forests back to earlier stages of succession such as rough meadows and shrubland. Such disturbance had been happening constantly, if irregularly, for 1000s of years and had attracted a suite of native plants and animals who could make a living on such lands. The arrival of Europeans created rapid changes in their landscape.

Throughout most of the 19th century, those creatures probably benefitted from the expanding European agriculture (while other creatures suffered). While there were large cultivated fields, much farmland was also in somewhat more loosely managed hayfields and pastures – lands that in *some* ways and for *some* species represented those post-disturbance habitats that beaver trapping and flood control were otherwise reducing. Wildfire control was yet nascent and the accumulated slash of logging and the sparks from railroads probably added to natural burns. At the same time, mechanization, while well underway, had yet to become extensively motorized, meaning that existing farms were probably 'messier' and more diverse. The very limited use of pesticides and herbicides also allowed for more nature in the farmfield.

The 20th century brought radical changes. Accelerating farmland abandonment meant that shrublands experienced a renaissance while fields dwindled. Wildfire control became widespread and effective even while changes to the logging industry and railroads reduced tinder and sparks. Flood control continued; beaver, while repopulating to some extent, had their actions carefully circumscribed. Motorization resulted in new geographies of farming – fields were expanded,

hedgerows removed. Dispersed residential and commercial development meant that some lands neither remained in field nor returned to forest.

By the end of the Century, a simplified view of the landscape would suggest that space for those organisms who had once reveled in early successional habitats was shrinking radically. There was more forest, but it was forest in which certain important forms of natural disturbance were controlled (wind and ice, sometimes working on disease or pest affected individuals, were the major unregulated agents of disturbance in our region). There were fewer fields and what fields remained were often more intensely managed both because of motorization/‘chemicalization’, and because the remaining fields tended to be on the better, more heavily used soils. Rising land prices may have put greater emphasis on the use-value of land, be that farming or development. In short, and somewhat over simplifying, we had gone from a land where forest frequently graded through shrubland and into field to a land where it was often a case of forest *or* field (or lawn) with little chance for the areas of transition vegetation, wet or dry, which had hosted those early successional species.

By the start of the 21st century, farmland (broadly defined to include not only regularly worked fields but woodlands and edges) is probably the main source of habitat for transition species in our area, even as changes in farm practices have dampened that role.

One way of thinking of this changing landscape and the current role of farmland in nature conservation is to think in terms of ‘ecological analogies’. For the wild creatures drawn to farmland, what were their original habitats and how can farms best provide working analogies of those habitats? Long-term nature conservation will need a variety of tools, finding space for nature in worked landscapes is one of them. On-farm habitat analogies won’t help all species and won’t substitute for the conservation of pristine areas, but they can provide important homelands for some species that can exist in this middle ground. For example, occasionally grazed wet meadows welcome some of the beaver-meadow dragonflies; late-cut, grass-based hayfields provide structurally-welcoming nesting sites for some prairie grassland birds; certain dry, thin-soiled pastures accommodate some native grasses (and associated insects) that may have sought burnt hilltops; and shrubby fields are home to some of the birds and butterflies that may have originally flown about shrubby wetlands.

In this light, the section below addresses the question of ‘what can farms provide to nature conservation?’ by profiling some native species that might potentially be benefiting from some of those on-farm ecological analogies. It is ***not*** complete – we have left out many species that could be mentioned - but we hope it’s illustrative. We have only included species which we have personally worked with. Some of the rarer, regional farm-related species such as the Bog Turtle and New England Cottontail are thus not included.

Leopard Frog. This is are one of our greenish, medium-sized frogs. They are easily confused with the Green Frog or, even more so, with the Pickerel Frog. They can be easily distinguished from the former by the blocky black blotches on their backs and from the latter by the lack of yellow on the thighs and the more square shape and regular distribution of those black blocks. Their call sounds like a squeaky door opening very slowly.

In our work, we have found Leopard Frog to be a relatively rare species of grassy, sedgy wetlands. We have found it both along the margin of a stream, where natural erosion



and deposition had created new lands being colonized by grasses or sedges, and in the wet meadows of a farm, lands that had been kept open by a long history of agricultural use. Unlike most of our other frog species, the Northern Leopard Frog is less a species of large ponds or streams, and more a species of moist grasslands. Historically, in fact, it was called the “Meadow Frog”. As [Michael Klemens](#) and several others have pointed out, Leopard Frogs “flourish in rural areas, using open wet meadows created for and maintained by grazing cattle and hay production”. [According to the most recent guide to NYS amphibians](#), part of this habitat preference relates to their larvae’s inability to thrive on the sorts of algae found in woodland pools and competition with forest-dwelling wood frogs. It is likely that Northern Leopard Frog distribution prior to European settlement was closely tied to beaver ponds and meadows. As [one reference](#) put it, “Beaver ponds can be one of the richest habitats for northern leopard frogs because the frogs use the beaver ponds and associated wetland complexes for breeding. The moist, dense vegetation of upland habitats around these complexes is often ideal for foraging.” Like many other organisms, Leopard Frogs use different lands during various stages of their lives. Specifically, Leopard Frogs apparently develop as tadpoles in open shallow ponds, feed as adults in meadows, and over winter in deeper water bodies. The beaver pond/meadow/stream mosaic can supply all or most of this. In their absence, suitably managed farmland can provide analogous habitats.



Prairie Warblers. These are typically sized and shaped warblers. The body plumage is bright yellow with black streaks on the breast under the wing, the wings themselves are darker, and there are black ‘circles’ under their eyes. They are most easily confused with the co-occurring Yellow Warbler, although that species has a distinct, hurried song and, on the mating male, orangish breast streaks.

Despite their name (the bird was actually named after a specific geographic location called ‘Prairie’), Prairie Warblers are birds of shrublands. We see them or, more commonly, hear their characteristic rising call in fields dotted by shrubs or where open woodlands intergrade with dry pastures. During formal surveys, we have found it on six (out of 27) farmlands around the County; more

specifically, five of those six observations were on farmland where the only current activity is light grazing or occasional haying; it was heard on only 1 of the 14 vegetable farms we surveyed for birds in 2010. In general, it is rarely found in or around more intensively used farm grounds such as regularly cut hayfields, intensively grazed pastures, field crops, or vegetable gardens.

The distribution of Prairie Warblers has an interesting history which illustrates the interplay of natural and human-created habitats. At least on the East Coast, it seems that Prairie Warblers were largely a species of dry land grassy scrub such as occurred in the Hempstead meadows of Long Island and other sandy, often near-shore locations. Potentially, they were also present in similar habitats around the Great Lakes and may have occasionally strayed into the open woodlands or burned over areas of hills. They were also considered a bird of dry oak scrublands where they seemed to benefit from fire. However, in New York State, at the beginning of the 20th century, they were primarily birds of Long Island. During subsequent decades, they spread through the State, apparently following the spread of analogous, shrubby dry upland pastures (probably some of the first lands abandoned as farmland shrank). By the 1930s, Prairie Warbler was reported breeding in the Albany Pine Bush, although the first Columbia County breeding record is apparently 1966 (Bull). When it arrived to Long Island and the source of the populations that now occupy much of NYS south of the Adirondacks is unclear; one ornithologist (Bull) suggested they had moved up the Mississippi River and then east. After a substantial expansion of distribution and, apparently, of number during the last century, Prairie Warblers are now declining over much of their range, although the most recent breeding bird Atlas notes no NYS decline, and county breeding bird survey records are likewise equivocal. It is however considered a New York State ‘Species of

Greatest Conservation Need’. Clearly, this is a species which has taken advantage of scrubland-like dry fields provided by some farms, and whose future throughout most of its range maybe closely tied to such fields.

Azure Bluet & Sedge Sprite. During a study looking at almost 100 ponds around Columbia County, we found a significant positive correlation between the abundance of what we called “specialist” dragonflies (and damselflies) and the percentage of land covered by pasture within 100’ of the pond. “Specialist” was a category that we determined ahead of time by reviewing published natural history summaries and tagging those still-water species who seemed somewhat particular in their choice of breeding grounds. Some species seemed able to breed almost anywhere there was calm water, while others were associated only with shallower, often marshy conditions.

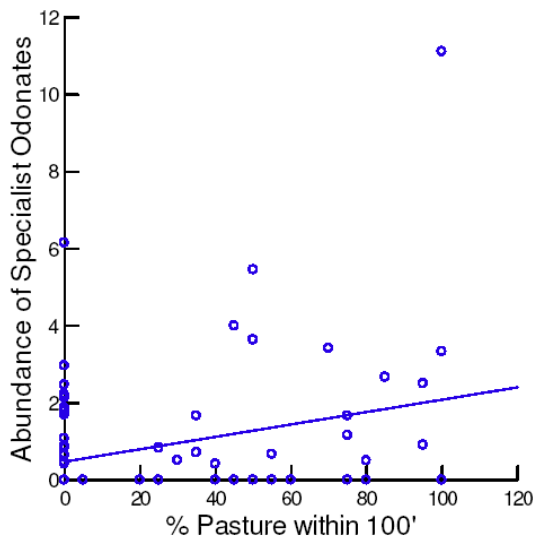


The two of the most common ‘specialist’ species were the Azure Bluet (pictured) and the Sedge Sprite. These are both damselflies -those delicate, small relatives of the dragonflies who, unlike dragonflies, generally rest with their wings closed over their backs. The Azure Bluet’s body is, appropriately, a bright blue. It has black highlights and much of the tail is black until the characteristically blue tail tip. Unlike all of our other blue-tipped damselflies, the last four, as opposed to three, tail segments are largely blue. The Sedge Sprite is less conspicuous. It is smaller (little more than 1” long) and even thinner. The dark green of its upper body and tail easily disappear in the vegetation, leaving only the male’s bright blue tail tip to mysteriously hover in the air.

The Azure Bluet occurred at about ¼ of our ponds, while the almost-invisible Sedge Sprite was found at roughly 1/10th of them. They ranked 11th and 20th in abundance, respectively, out of all 48 dragonfly species we recorded from ponds. While neither species is considered rare, both may be favored by certain conditions found on farms. Ironically, agriculture may have been one of the prime destroyers of their habitat and yet farmland is currently one of the locations of open, wet habitats that they need.

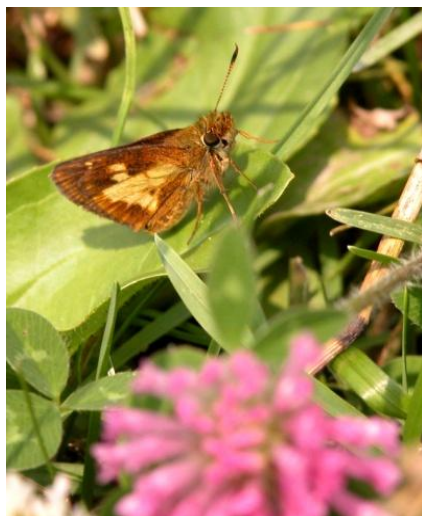
At least two distinct ecological factors explain these species’ association with shallow, vegetated wetlands: sensitivity to fish predation and certain preferences for mating and reproductive sites. The Azure Bluet is widely said to be associated with fishless waters. [Researchers](#) have shown that the behavior of the aquatic larvae help determine a damselfly’s susceptibility to fish predation: those nymphs that actively flee approaching fish are more sensitive than those that freeze; flight, on the other hand, is the best response to predation by fellow dragonfly larvae. Azure Bluets can be found at deeper ponds where fish are not present but, more commonly in our area, they occur in relatively shallow (and hence often vegetated) bodies where low summer oxygen and/or winter freezing preclude fish populations. Sedge Sprites may also be sensitive to fish predation. Habitat preference also helps determine occurrences. Both species lay their eggs on aquatic vegetation, with the females even doing ‘deep diving’ and climbing down submerged plant stalks to oviposit well below water. Adult Sedge Sprites in particular are said to avoid open water as they seek food and mates.

In our pond study both these species, and several other ‘specialized’ species, averaged around twice as common at ponds in farmland than at non-agricultural, landscape ponds. In fact, Azure Bluets occurred at more than a third of all farm ponds and those ponds averaged more than three times the density of residential ponds. Sedge Sprites did not occur at residential ponds, but were found at more than 17% of the farm ponds. This was almost surely due to the ‘looser’ management of the farm ponds we studied. We did not study any ponds located in cattle loafing yards. Most of our farm ponds were located in hayfields or on occasionally-grazed pastures. Some such ponds had no immediate



Relationship between the abundance of specialist dragonflies and damselflies and the abundance of pasture within 100' of the study pond. Data from study of about 90 Columbia County openland ponds.

Baltimore Checkerspot and Mulberry Wing. The Baltimore Checkerspot (pictured right) is a handsome, mid-sized butterfly sporting a fine checkerboard of Lord Baltimore's colors (white, orange and black). The Mulberry Wing (pictured below), a so-called skipper, is perhaps one third the size, and less ornately patterned. It has stubby wings that, when closed, display a light cross on a darker background. Skippers in general are often mistaken for moths.



The difference is clearly perceptible if one visits farm ponds where filling in, seepage and/or cattle trampling has resulted in at least a partial ring of marshy vegetation. Such an undefined buffer is rarely allowed around landscaped ponds.

While dragonflies might benefit from the structure of such a margin, some butterflies, due to the feeding habits of their caterpillars, benefit from the plants themselves. Specifically, the caterpillars of the Baltimore Checkerspot and Mulberry Wing butterflies feed upon Turtlehead and sedges, respectively; both are wetland plants. While rare – we recorded a total of just five occurrences of these two species during our pond study – they were only found around *on-farm* ponds. Such species also occur in wet pastures or hay fields away from open ponds (see table below for occurrence patterns of these and other openland butterflies). Agricultural habitats apparently work as analogies for what were probably these species' main natural habitats: beaver meadows and stream or river margins.

Table of openland butterfly occurrences classified by habitat affinities. Based on [our summary report](#) of 350 butterfly surveys in and around Columbia County.

DRY, THIN-SOILED FIELDS & OPENINGS (with abundant native grasses)

Cobweb Skipper
Indian Skipper
Leonard's Skipper
Little Wood Satyr

VISITORS (visit for nectaring, caterpillars develop elsewhere)

Juvenal's Duskywing
Occasional Hairstreak
Red Admiral
Red-Spotted Purple
Spring/summer azure
Tiger Swallowtail
Viceroy

INTENSIVELY MANAGED FIELDS AND LAWNS

Cabbage White
Clouded Sulphur
Common Sootywing
Orange Sulphur
Silver-Spotted Skipper
Wild Indigo Duskywing

WETLANDS (inc. pond edges)

Appalachian Brown
Baltimore Checkerspot
Black Dash Skipper
Broadwing Skipper
Bronze Copper
Dion Skipper
Eyed Brown
Harvester
Least Skipper
Little Glassywing
Mulberry Wing

OLD FIELDS & MATURE HAYFIELDS

American Copper
American Lady
Black Swallowtail
Common Checkered Skipper
Common Ringlet
Common Wood Nymph
Delaware Skipper
Dun Skipper
Eastern Tailed Blue
European Skipper
Great Spangled Fritillary
Hobomok Skipper
Meadow Fritillary
Monarch
Northern Broken Dash
Painted Lady
Pearl Crescent
Peck's Skipper
Tawny Edged Skipper

RIPARIAN AREAS (semi-open banks of streams & riversides)

American Snout
Eastern Comma
Hackberry Emperor
Question Mark

Based upon estimates of beaver densities (per length of stream) from untrapped situations elsewhere, upon average beaver pond areas and certain assumptions about the life-span of ponds and post-pond wetlands, we can guestimate that historic extents of beaver ponds plus meadows in the County was roughly 4-5,000 acres or about half the amount of surface currently occupied by lakes and ponds. But these modern ponds are a very different kind of wetland habitat - many of these ponds are, through the efforts of their owners, frozen in time in so far as filling in and the development of wetland vegetation is, through one tool or another, prevented. Furthermore, beaver ponds occupied areas which included temporarily flooded uplands. When dams were abandoned, not only did natural in-fill reduce pond area but draining often revealed a moist landscape begging recolonization. Thus, what is missing from our landscape is not open water, but rather open wetland. To a certain degree, some of this loss is currently being compensated for by the re-birth of wetlands on former farmland as in-field drainage systems collapse. Miles of

drainage pipes and tiles were installed in area fields during the 19th and 20th centuries; many of these are not now being maintained. As result, we have seen wetlands re-appear in places where, in the 1940s, only dark soils hinted at past wetness. In some cases, however, drainage has been re-established or extended into previously undrained areas.

Clearly, on-going wetland drainage and potential water quality issues associated with nutrients and agrochemicals pose threats to wetland organisms. Although, in our study, farm ponds were, on average, no more eutrophied than residential ponds, perhaps partly because leaking residential septic systems also contribute to eutrophy. At the same time, open wet meadows and loosely managed pond edges offer functional habitat analogies for some species. These synergies can be built upon by realizing a farm's context. For example, one wetland-surrounded farm we know of plants ample wildflower cover crops and has permanent wild-flower strips. As a result, it is the location where we have seen the highest densities of Bronze Copper and that is our only county record of Dion Skipper, both wetland butterflies. Mulberry Wings were also observed at this farm. The juxtaposition of the adjacent semi-natural wetlands with ample on-farm nectaring sources apparently benefitted these species.

While butterflies may accomplish some pollination, in an agricultural setting they are most commonly mentioned because of the crop- or weed-eating propensities of their caterpillars. So far as we know, none of these wetland butterflies feed upon important regional crops.



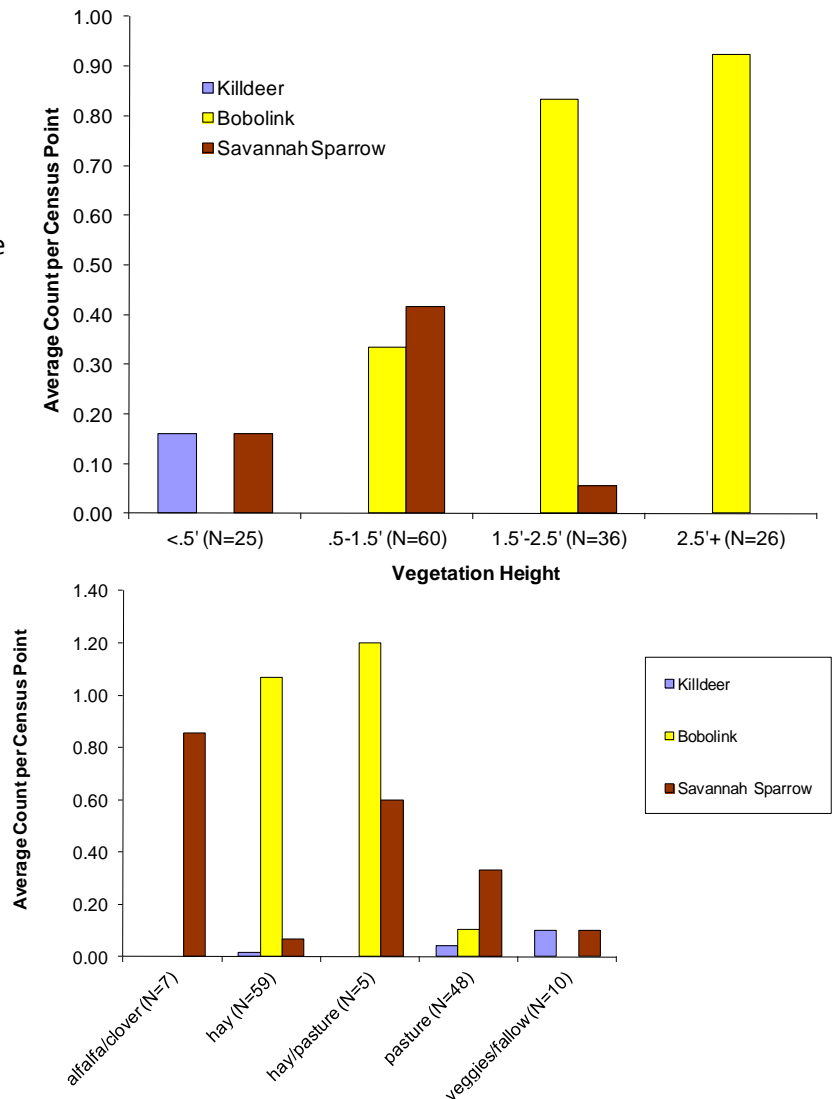
Killdeer, Bobolink, and Savannah Sparrow (pictured above in that order). The late 18th and almost entire 19th century saw great opportunities arise for grassland birds in the East. The spread of grassland-based farming in the form of extensive pastures and hayfields led to a widespread increase in habitat for birds that had previously been largely confined to natural openlands, such as prairies, desert edges, and sand plains. The Killdeer, Bobolink, and Savannah Sparrow are three of the birds that responded to that increase in habitat with apparently large population increases and range expansion. The 20th century has seen a reversal of fortune for these species, as farmland dwindled and the analogies between hayfield and prairie collapsed. Several other species, such as Eastern Meadowlark, Vesper Sparrow and Upland Sandpiper, took a similar rollercoaster, although the exact habitat preferences of each species is a little bit different and thus their exact demographic trajectories vary.

“Grassland birds” refer to species which not only forage in fields but also nest there. All three of these bird species build their nests in the grass and forbs of fields. Much has been written about grassland birds and their plight (REFS), but these short profiles are included here for the sake of completeness. While habitat loss and other perils along their migratory route and at their overwintering sites are doubtless important, habitat availability and suitability on the nesting grounds is also crucial and is the portion of their life cycle within our purview. It is useful to briefly consider where, in a biogeographical sense, these birds are coming from and what they ‘looking for’ in our landscape

According to the work of Wells and Rosenberg, these species have affinities for different natural openlands. They calculated that almost 50% of the Bobolink population occurred in the Midwest and Great Plains, with roughly another 14% in the Northeast. In contrast, more than 80% of the national Savannah Sparrow population was estimated to occur in the plains and tundra of Canada; home to less than 40% of all Bobolinks. Those authors provided no comparable information for the Killdeer but it is the most widespread of the trio – breeding from northern Mexico and the Caribbean through southeastern Alaska.

It is difficult to know the original habitats of these species, although all three [reportedly](#) co-occur, in a gross sense, on the prairies of the Midwest. Although the killdeer, true to its shore-bird origins, nests primarily on areas that are completely open (e.g., dunes) or have very short vegetation (e.g., short grass prairies). Historically, in addition to suitable prairie areas, river banks and open shores may have been a primary habitat. Bobolink and Savannah Sparrow apparently coexist to a large extent in taller-grass prairies, although the latter seems to be more tolerant, venturing onto oceanside grasslands and willing to nest on smaller patches of open ground.

As illustrated by the charts to the right (derived from [an earlier report](#)), the local habitat preferences of these species are also distinct. The early-arriving Killdeer occurs in the lowest vegetation and is familiar from large lawns, close-cropped pastures, and even gravel flats. They have probably long been residents of bare or patchy lake and stream shorelines; they spread upland as openings appeared. These birds form a shallow nest in the open, relying on distraction and camouflage to deter predation. The Savannah Sparrow, which occasionally co-occurs with the Killdeer, are often heard from fence tops surrounding relatively well-grazed pastures with good ground cover or short-grown hayfields, such as those in clover or alfalfa. While they probably nest in higher tufts of vegetation, they seem most at home on pastures experiencing moderately intense use such as rotational grazing. As was the case with the Prairie Warbler, the “Savannah” of their name refers to a place - Savannah, Georgia - rather than a habitat; this species is thought to have the closest evolutionary link to the Prairies. Bobolinks are birds of our high-grass hay fields where, although almost all vegetation is exotic, they find a working structural analogy with the lowland meadows that [some suggest](#) may have been their original homeland in the East.



The occurrence of Killdeer, Bobolinks, and Savannah Sparrows across vegetation heights and habitats on Columbia County farms. N= the number of bird counts done in each habitat type.

The slight nuances in site preference amongst these and other grassland birds, together with the unavoidable flukes of ecological happenstance, mean that grassland bird populations can differ markedly among similar-looking fields. Before considering any bird-focused changes to management, we strongly encourage farmers to familiarize themselves with the common grassland birds (a process we’d be glad to help with) and then take a birding walk through their fields. Accentuating the positive (that is, trying to preserve existing grassland bird populations) is an important first step in conservation. Subsequent management can then attempt, where feasible, to expand habitats from those cores.

We have found that Finally, analogies can breakdown because novel (in terms of the bird’s evolution) actions in that habitat destroy its value. Poisoning or overhunting might be such ‘actions’. For grassland birds that event is often haying. While Killdeer, who are rarely residents of hayfields, may escape this particular threat, both Bobolinks and Savannah Sparrows regularly encounter it. When haying started in July, as was the case for much of the 18th and 19th centuries, and progressed relatively slowly, almost all birds could fledge their young before their nests were destroyed by the sickle. As haying was mechanized and motorized, and new hay crops and fertilizer made fast, early growth possible, haying progressively came earlier in the year. Today, many fields are cut in May or June, well before the young birds can take wing. Commonly, fields are then re-cut one or two times before fall. As [work in Vermont](#) has summarized,

farmlands can support these birds by delaying the first cut until after fledging or, at least, ensuring a sufficient window between an early first cut and a second cut for birds to fledge. Such delays may sometimes result in less or poorer quality hay.

All three of these birds can contribute to pest control on regional farms. Writing shortly before the widespread application of chemical pesticides, at a time when ‘economic ornithology’ (which included the potential of birds to benefit farmers by destroying pests) was still a respectable pursuit, [Edward Forbush](#) wrote of the Bobolink, “The bird is very destructive to grasshoppers and caterpillars, particularly the Army Worm.”; he did go on to acknowledge its grain consumption elsewhere during migration. Of the Savannah Sparrow, he wrote, “Nearly half the food of the Savanna Sparrow while in Massachusetts consists of insects, mainly injurious species... It is particularly fond of beetles.” In other publications, he describes the Killdeer as “a friend of mankind” and as “very beneficial – a beautiful and desirable bird to protect and cultivate.” We have included these birds in our section concerning ‘what do farms provide to nature conservation’; this is a sign of our times when concern over the fate of grassland birds ranks higher in the mind than appreciation of their pest control ‘services’.

Spotted Salamander and Wood Frog. The Spotted Salamander (pictured right) is unmistakable: it is a lumbering, jet-black salamander with bright yellow polka-dots; large individuals may approach 8 to 10” in length. The Wood Frog (below) is more frequently heard than seen: during its week-long spring mating period some area ponds appear to be occupied by a flock of invisible ducks as the loud ‘quacking’ of these inconspicuous animals hails passersby. These are medium-sized frogs more or less the color of dry leaf litter – their bodies are a brownish tan and their faces are highlighted by a dark mask.



Despite having already drawn attention to wetlands through profiles of other creatures, these two species are worth including because they not only favor a different flavor of wetland but also, importantly, because they exemplify the landscape-scale linkages needed for healthy ecology.



Spotted Salamanders and Wood Frogs breed in ‘vernal pools’. Vernal pools are what one ecologist termed ‘glorious puddles’. They are shallow ponds which fill up with water during the wetter times of year (such as spring or “vernix” in Latin, hence the name). Such temporary filling has at least two ramifications for these amphibians, one positive, one negative. First, by periodically drying out, such ponds exclude fish and predatory amphibians such as Bullfrogs which require year-around water for their life cycles. The exclusion of these predators provide fertile ground (or waters) for the young of these species provided they can develop to their terrestrial stage prior to the next drying out. Second, humans seem to be less respectful of temporary wetlands – after all, ‘Preserve the Puddle’ is not the most compelling-sounding slogan. As a result, many vernal ponds are destroyed by development of one sort or another.

These creatures (and a few other amphibians like them) spend but one or two weeks in vernal pools as adults, albeit one or two weeks that are crucial to their reproduction. Nonetheless, the great part of the year is spent in upland forests. Just as surely as paving over a vernal pool can doom these species so can surrounding a vernal pool with inhospitable habitat. Spotted Salamanders belong to a group of salamanders called ‘mole salamanders’ for their tendency to occupy burrows for much of the year; they probably do minimal amounts of digging on their own, instead taking advantage of natural cracks and crevices and the tunnels of others. Occasionally, one finds them under logs or rocks. They evidently feed on invertebrates encountered in such haunts. Wood Frogs also spend most of their adult days in the forest, although they are more commonly found out and about. Both species apparently seek upland retreats where they spend the winter, sometimes well-frozen. If a suitable pond is too far from forest, then adults arriving to/leaving from breeding and dispersing juveniles will likely be killed by predators, cars, lawn mowers and other dangers.



Farms rarely create or maintain vernal pools. Once land is cleared, these shallow depression are often erased by plowing or other management. However, some permanent farm ponds can serve as partial analogies for vernal pools. While drying is perhaps the most certain way of removing predators such as fish, shallow ponds that freeze solid in the winter and/or have little oxygen in the summer can also function as vernal pools. Even deeper ponds, as long as they have no fish, can serve as important breeding sites. As a result, we have found ‘vernal pool amphibians’ breeding in farm ponds [as have others](#). Due to the differences in management already mentioned, [our earlier study](#) found them more common in farm ponds than in landscape ponds: Wood Frogs occurred in 38% of the 37 farm ponds we surveyed,



Spotted Salamanders visited at least 62% of these ponds; at the 25 residential ponds, occurrence was 16% and 28% respectively. Occurrence doesn’t automatically equate with successful breeding; for example, adults may be attracted to lay their eggs only to have those eggs consumed by in-pond predators. However, the numbers of breeding adults we found at these ponds, many of which were relatively old, suggest that at least some are indeed successfully reproducing. Keeping an eye (or an ear) out for these species during the proper time of year can help highlight hidden ecological values of on-farm ponds.



Little Bluestem and Grey Goldenrod. While we often think of vegetation as creating habitat, plants too need certain conditions in which to survive. And so, while we’ve focused on animals in this report, we’ll end with a pair of plants. Little Bluestem is a warm-season wisp of a grass, coming

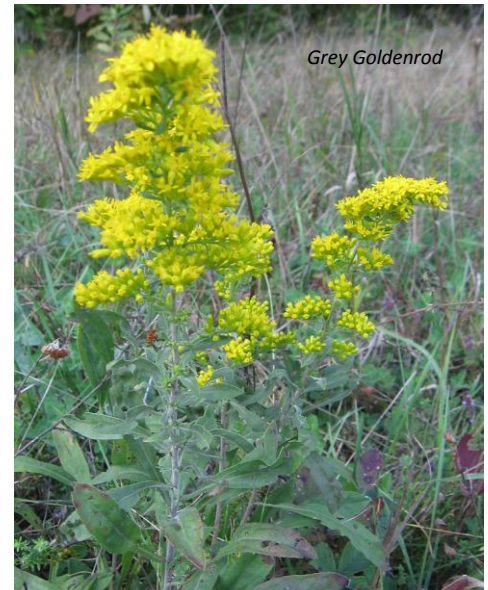
into its own in August and September when fields where it is common will be burnished with an auburn tint. Rarely growing much beyond knee-height, young plants (left) will have a dark green, slightly red color that fades to the auburn with time (top next page). The mature seeds are delicate with feathery awns (left side next page). In the late summer/early autumn fields, few other local grasses resemble it. Grey Goldenrod is another plant that is most apparent later in the growing season when it, and a variety of other goldenrods, burst into flower. Rarely more than a foot high, it has a spike of small yellow flowers that tends to bend into a flat-topped arch. The stem and relatively small, stretched-oval leaves are covered with fine grey hairs.

While most of our hayfields and pastures are composed primarily of European grasses and forbs, some of our openland plants are indeed native. They have spread into agricultural areas as suitable lands became available. These two species are plants of dry uplands. They have probably long occurred in open pockets amongst rocks and were favored by fires which regularly swept dry hillsides. At least in the Midwest, both of these plants are considered fire-resistant species which benefit from regular burning. As pastures were opened on dry hillsides, these species found new openings into the landscape.



In 1929, H. P. Cooper and colleagues published [a study](#) of northeastern pastures. While their goal was to describe and improve pasture management for forage, they incidentally illustrated an ecological pattern still visible on the land today: many of our native plants, including these two, are poor competitors with traditional, European pasture plants when growing on rich soils; however, when, due to landscape position and/or soil exhaustion, pastures occur on thin, nutrient-poor soils, then native species such as these tend to get the upper hand. They are also regularly found where human activity has stripped away top soil, such as along the road-construction swath of the Taconic State Parkway or around gravel pits. Grey Goldenrod often overlaps with Little Bluestem, although it is less common, and occasionally occurs in old field situations from which Little Bluestem is largely absent.

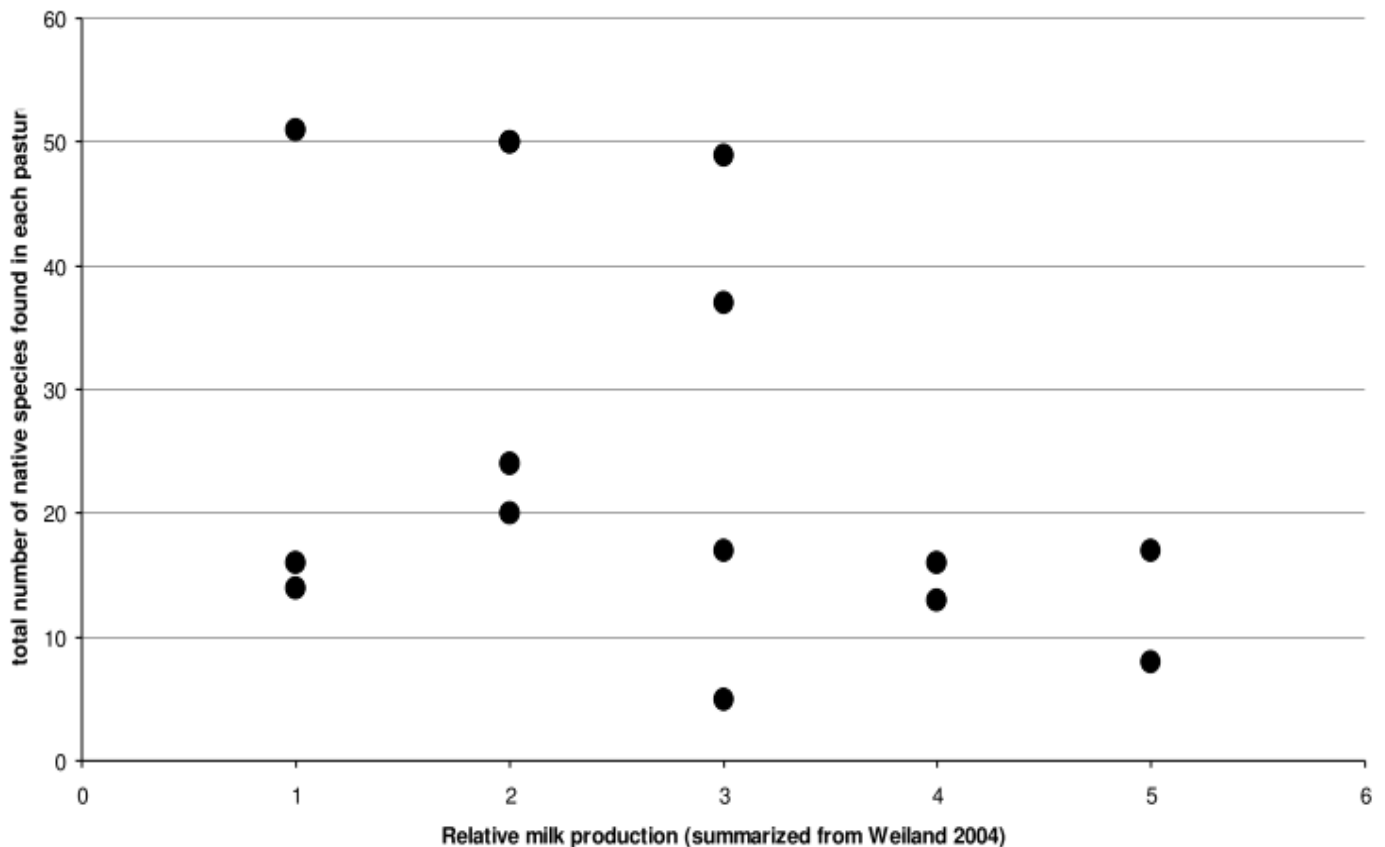
Through fieldwork and car surveys we have identified 61 Little Bluestem meadow sites in the eastern part of Columbia County (the work has not been done for the western part of the County). Using published soil survey data we compared Little Bluestem sites to averages for the entire eastern region. The pH of Little Bluestem sites was equal to the region-wide average, however, these fields tended to be particularly common on mid slope locations – such sites accounted for 72% of the observed meadows, but only 52% of the region-wide soils. Little Bluestem was less common



Grey Goldenrod

on both steeper (where open fields were rare and our fieldwork certainly underrepresented sites on small outcrops) and flatter land (where soils were probably naturally better and fields were better maintained). It was especially common on rocky “channery loams”; these made up almost 40% of the sites but only a quarter of the regional soils. A separate historical analysis has indicated that steeper fields in the County were amongst the first to be abandoned during the 20th century. Here at Hawthorne Valley, we found (see figure below), that the most botanically diverse pastures (usually on the such steeper grounds and sometimes hosting Little Bluestem) were associated with lower milk production by the grass-fed dairy cows. As these data illustrate, these are plants of lands that were once good enough to open up, but now, because of their suboptimal quality, may be relatively infrequently maintained.

Today, fires in the County are widely controlled, and so the natural habitats of these species may be declining. At the same time, those marginal agricultural lands are often either abandoned or enriched through fertilization, two processes that exclude this pair of plants and a cohort of co-occurring plant species such as the more exotic sounding and looking Blue Curls and Venus’ Looking Glass. Some of these are prairie plants impacted by intensive agriculture in the Plain States. Not only are certain plants tied to these hill fields, but there is also a collection of native animals that favor such sites. These include the Indian, Cobweb and Leonard’s Skippers (see earlier table), a group of butterflies which we have only found on fields where Little Bluestem, a favorite food for their caterpillars, is abundant. Like many of the other creatures we have mentioned so far, these plants and animals, while occurring on farms, often occupy land that does not have immediate, high agricultural value. Their persistence will thus likely require some tolerance of suboptimal agricultural production on certain farmlands that are nonetheless kept open.



The relationship between relative milk production (higher value = higher production) and pasture plant diversity at Hawthorne Valley Farm.

Conclusions. In some ways this report is a hodge-podge of creatures and interactions. While some of that may reflect the writer's lack of organization, it is also a true reflection of the complexity of on-farm ecology. Even the term 'on-farm', in a situation where few creatures respect farm fences, is an oversimplification. The web of ecology ensnares many characters and the result of their multitude of interactions, while potentially dramatic and sometimes observable as isolated components, can be largely unpredictable when taken as a whole. It is for each farmer to explore the ecology of their lands and ask, through observation and adaptive management, what can this land produce for humans and what can it provide for our non-human co-inhabitants? Answering this as a single, fused question is not so much a task proven by reason and the bottom line as a responsibility urged by a compassion for life.

