

(cover slide) Good evening, my name is etc.

Today we're going to talk about native plants, and while there's always a tendency to turn this into a slideshow list of stunning flowers, I've decided to also talk about the reasons why we should be interested in native plants and why we should grow them. But have no fear, there will also be a lot of slides of beautiful native flowers.

(slide 2 – why grow natives)

One great reason to grow native plants is that a lot of them are gorgeous. This is *Hepatica acutiloba*, also known as sharp-leaved hepatica – acutiloba actually means sharp-leaved. Other common names are liverleaf (hepatic means liver) and spring beauty. It's a small plant, only 3-6 inches tall, but since it's one of the first herbaceous perennials to bloom in spring – March and April around here – it's very noticeable. It's also a source of pollen for early pollinators. The flowers range in color from white to blue to mild pink and hot violet. The foliage is evergreen and turns red through late fall and winter.

Other reasons to grow natives are because they've been proven to grow successfully here and because many fill important roles in the environment and food web.

(slide 3 – Mass ecoregions)

When I say that native grow well here, I mean that in general. You still need to understand the particular environment that the native flourishes in. This is a map of the ecoregions of Massachusetts, prepared by the EPA (Environmental Protection Agency) and the USDA (US Department of Agriculture) Forest Service. The divisions are based on soil, elevation, rainfall and other factors which influence what grows there, such as how long since agriculture finished there and the trees moved in. For example, the Northeast Coastal Plain is predominantly white pine and oak and the plants that grow well with them. The Worcester Plateau has progressed to beech-maple-birch forests in the north and oak-hickory further south. Why is this important for a gardener? Well, there's one region that's nothing like the others, the western Taconic Mountains and Marble Valleys. This is an area where an underlying limestone and marble bedrock comes near the surface and the soil here is not at all acidic.

(slide 4 – maidenhair fern)

Many of the plants that grow there prefer alkaline soils; this Maidenhair Fern likes the pH in the 7-8 range. It will tolerate lower pH, but will never thrive like it does in western Massachusetts. Our local pH tends to run around 5.5 to 6 before we add lime. The soil tests give recommendations that bring it up to 6.5 for most plants – lower if we indicate we're growing blueberries. So unless you love this plant and are willing to baby it, or you have an old concrete foundation leaking lime into your soil, this may not be the best plant for you despite its being a Massachusetts native.

(slide 5 – surficial materials map of this town)

It also helps to know a bit about the soil structure. This is a surficial map of this area which means that it maps the soils near the surface around here. Soil isn't everything; altitude, exposure, water availability

and other things also play a role. But it's one indicator of growing conditions, and it shows how variable things can be even in a small seemingly homogenous area. The purple areas are "salt marsh and estuarine deposits" which are "dominantly peat and muck" – that's a quote from the USGS report. "Coarse deposits", this orange, have much more sand and gravel, much better drainage. Plants adapted to grow well in salt marshes won't do well in coarse deposits, and vice versa. You can adjust your soil to some extent to make up for that, but a cactus growing in a salt marsh will never be happy.

(slide 6 – key for surficial map)

(slide 7 – our native cactus)

By the way, there is one cactus native to Massachusetts, the Eastern Prickly Pear or *Opuntia humifusa*. It grows wild in Nantucket, but will grow anywhere that is hot, sunny and dry. In winter, the pads deflate and it lies flat through the cold. In spring, the pads re-inflate and it perks up to 15-20 inches tall. It is visited by many native bees, which brings up our next topic.

(slide 8 – headlines)

Most days when we read the news or a science journal, there's something about pollinators, and all of them sound like there's a real crisis brewing, not just with the world's food supply but with the environment in general. This can be puzzling, because, for one thing, we're not having food shortages here in Massachusetts, but for another, when we walk out into our gardens in mid-summer, there are small buzzing things everywhere. Butterflies, hummingbirds – especially if we put up a feeder, and bees. It makes it seem as if the problem must be somewhere else in the world, not here.

(slide 9 – abundance versus diversity)

We don't tend to look too closely at what's buzzing around our gardens. We notice different butterflies, at least the showy ones, and we certainly notice hummingbirds, but most of the rest is just "a bee". There are over 120 species of butterfly native to Massachusetts and 380 species of bees native to Massachusetts, all of which are pollinators. Also 2 families of flies (flower flies aka hoverflies aka syrphid flies, and bee flies aka humbleflies) that are important pollinators, a bunch of wasps, hornets, beetles and even some ants. There's a rumor going around in academic circles for the last 100 years or so that slugs can even be pollinators, but recent work by Kenji Suetsugu in the Journal of Mollusca Studies seems to refute that. So with all these pollinators around, does it really matter which ones come to the garden? Said another way, why does it matter if some obscure bumblebee goes extinct?

(slide 10 – pollination)

Before I answer that, I want to refresh everyone's memory on how pollination works. This is a turk's-cap lily, probably the most spectacular of native American lilies. It can have up to 40 flowers per plant when it's grown in full sun and evenly moist soil. I picked it for this slide because it's easy to see the flower parts in a lily and because it's a really pretty plant. The male parts of the flower are collectively called stamens, each of which includes an anther, which makes pollen, and a filament, which holds the anther up. Pollen is the male gametophyte, which is to say it has half the genetic material of the plant. The

female parts are collectively called the pistil, and that includes the ovary, where the ovules are; ovules are the female gametophytes, and they also include half the genetic material of the plant. Connected to the ovary is a style, which positions and supports the stigma, and the stigma, which is a sticky receptacle for pollen.

A plant is pollinated when a grain of the right pollen makes it from the anther to the stigma. This is a lot harder than it looks. Many flowers have a chemical block against the pollen from a flower fertilizing that same flower, or even another flower on that plant. Some plants have separate male and female flowers, and some plants even have separate male and female plants.

To make matters worse, the stigma has no mechanism for removing “bad” pollen. So it’s possible for a stigma to become covered with pollen that can’t fertilize this flower; pollen from a completely different genus, for example. If that happens, the ovules in the flower don’t get fertilized; don’t become seeds. Every seed in a flower requires its own compatible pollen grain – think how many seeds there are in a watermelon – each one of those was a successful pairing of a pollen grain with this female flower.

(slide 11 – the specialization continuum...)

This marvelous graphic illustrates the point further. There’s a tremendous pool of animals that pollinate something. For them to pollinate this plant, they need to be attracted to it – that’s the advertisement filter. It might be a color, a fragrance, a shape, or simply that it’s open this time of day. With a few plants, mostly tropical, there’s also a reward-chemistry filter; certain bees pick up a scent from certain plants that makes them irresistible to the other sex; male bees are very inclined to visit these flowers. If the animal is attracted enough to the plant to make contact, the next filter is a visitor fit filter. Some plants have arranged their nectaries to be accessible only to long-tongued bees, for example. The flower visitors that can’t reach the nectar reward learn not to return to this flower. The remaining visitors then need to pick up pollen – not all can do that – and then move it to the stigma usually of another plant – and not all can do that. Looking at this graphic, it seems surprising that anything ever gets pollinated.

(slide 12 – some plants specialize)

Here are some cases of that filtering approach working and not working. The red flower is a cardinal flower – *Lobelia cardinalis*. It’s a New England native that likes moist soils; it’s usually found at the side of ponds and streams. It is adapted to be pollinated only by hummingbirds, and has moved its anthers and stigma so that most flower visitors miss them. It has separate male and female flowers on the same plant, and nectaries buried deep in the flower. When a hummingbird comes to a male flower for nectar, the fused filaments holding the anthers touch the hummingbird on the head and deposit pollen. When the hummingbird switches to a female flower, the style positions the stigma to the same point on the hummingbird’s head and picks up the pollen.

Here’s a bumblebee on a cardinal flower. It can’t reach the nectaries going down the throat of the flower, so it cuts a hole in the side and gets the nectar out that way. Wasted nectar from the flower’s perspective, but at least not wasted pollen.

A zinnia is not a native, but it's an example of a plant that doesn't specialize, or at least not much. Pretty much anything can get the nectar reward from a zinnia. If the hummingbird visits a zinnia it gets the nectar, but since it doesn't land on the flower, it doesn't pollinate the plant. A bumblebee lands on zinnias, so it is a zinnia pollinator. The point of this is that you can't talk about pollinators separate from flowers – no animal can pollinate everything it visits.

(slide 13 – some animals specialize too)

On top of that, some animals specialize too. This is the *Lindera benzoin*, also known as Spicebush and sometimes as American Forsythia. It blooms a beautiful yellow in March, a less garish color than Forsythia, and it's much more shade tolerant, though it tends to get leggy in full shade. It likes moist soil. It's dioecious so there are male plants and female plants, and the female plant produce berries if they get pollinated. Foliage of both male and female turns a nice yellow in fall.

One of the insects that depends on Lindera is the Spicebush Swallowtail. It's a nice enough looking butterfly, but the caterpillars are really outstanding with that marking that makes them look kind of like a snake. Those aren't actually its eyes but they're very convincing. Spicebush Swallowtail caterpillars only eat plants in the Lauraceae order, which includes laurel, sassafras, lindera and a few others. They've done tests where they put newly hatched caterpillars on a different order of plant, and they starved to death rather than eat it. There are reports that the caterpillars become less stubborn when they older, but those are unsubstantiated. ([http://entnemdept.ufl.edu/creatures/bfly/spicebush\\_swallowtail.htm](http://entnemdept.ufl.edu/creatures/bfly/spicebush_swallowtail.htm))

Other caterpillars specialize too, and the science says that most caterpillars that specialize have reduced predation from birds and other insects. We're all familiar with the monarch butterfly caterpillar only eating milkweed; actually it eats a few other plants, but all of them build up the levels of poison in the caterpillar and reduce its predators.

(slide 14 – getting through winter)

This is one of the many goldenrods that are native to New England. It is NOT what causes your hay-fever. Whenever you see a showy plant like this, you can tell that it is pollinated by biotic means, that is to say by an animal. The color is there to attract the animal, and the pollen is specially adapted to stick to the animal on the trip from the anther to the stigma. It does not go floating around in the air. Goldenrod has gotten a bad rap because it starts blooming right at the same time as ragweed, which is wind pollinated. Ragweed stays a dull silver-green throughout the summer – it is not at all eye catching – and it pumps millions of spores into the air in mid to late summer. So when our noses start to run, we spot the goldenrod and blame it.

Goldenrod offers pollen and nectar to its visitors. Nectar gives insects the energy they need to live, and pollen gives them the protein they need to reproduce. I've seen many kinds of insects on goldenrod. And then there's the goldenrod gall fly. It's a relative of the fruit fly which lays an egg on a goldenrod bud in spring. When the egg hatches, the larva burrows down, and the plant generates a gall around it. The larva lives in that gall through the rest of the summer, fall and winter – scientists are quite intrigued at how it avoids freezing since the gall doesn't offer much insulation. In spring it emerges as an adult

goldenrod gall fly, and the cycle starts over. Some birds and wasps have figured out how to get the larva in the gall, but it's safe from most predators.

Goldenrod is also the larval host for the most butterflies and moths of any herbaceous plant in New England, and I'll tell you why that's important next.

(slide 15 – functional diversity)

The way all of these plants and animals interact is what we call functional diversity. A recent study showed that Carolina chickadee populations decline in urban areas with less than 70% native plants. They think that's because the babies need protein to grow fast, and the parents provide that in the form of insects. Plants from abroad are called exotics, and one of the advertised attributes of many is that nothing eats them. Well, if nothing eats them, there's no food for the caterpillars, so there won't be the next generation of butterflies. And without the caterpillars and other larvae eating the plants, there's no food for the next level of predator, which includes a lot of the animals we love, like birds. The best argument I've heard for growing native is to keep that whole food web going; it makes for a very lively garden.

(slide 16 – not all are equal)

Here's where it gets even more complicated – not all natives support that food web equally. Here are two yellow daisies that are natives of New England. There's not much to select between them on looks, but the *Helianthus* supports 58 different species of moth and butterfly as larval food, where the *Heliopsis* only supports 1. We don't know what, that's just the way it is. So if you fall in love with a particular *Heliopsis* or someone gives you one, by all means take it – it's a lovely plant. But if you're still deciding which to get, take the *Helianthus*.

By the way, that's one reason why I really like botanical names. The common names are whatever someone wants to call them, but the botanical names are unique and the best way of telling similar-looking plants apart.

So how do you know which plants are better for the food web?

(slide 17 – keystone plants)

A lot of people have been doing some great research on that topic and have captured it in this website. It goes on for pages and pages and lists the number of different moths and butterflies that use each genus as a host plant, as caterpillar food. It's done by genus, which isn't ideal, but it's a great start. What's a genus? It's a grouping of plant species that are very similar botanically. Pussy willows and weeping willows are in the same genus. Are they equally effective as a host plant? We don't know. Yet. But again, this is a great start.

By the way, I admit that I grow imports and always will. It seems a shame to turn down a plant that's beautiful and well suited to grow here just because of where it was born (you can read as much into that

statement as you like). But I try to remain conscious of how the decisions I make affect the environment and strike a reasonable balance.

So now let me show you some more natives you might consider adding to your garden.

(slide 18 – Pussy Willow)

Pussy willows, and actually all the willows are a great addition to the environment for wildlife. They make pollen and nectar in quantity at a time when very few other plants are active yet, and because there are relatively few toxins in the leaves, many other creatures eat the bark, buds, wood and leaves.

Also on the positive side, it's tolerant of juglone and so can be planted under black walnuts. It can be planted in very moist areas; some places actually plant willows to dry a spot out. Pussy willows can be cut back every spring for flower arrangements; that's also a good way to control its size.

Pussy willows are dioecious – separate male and female plants. The males make the fuzzy catkins that we think of as pussy willows. The fuzz helps insulate the catkin when it's warmed by the sun. As the catkin matures, the stamens extend out past the fuzz to make their pollen available to pollinators. Most flowers that require pollinators have a strong visual clue on where to go; willows do it with smell, and both the male and female flowers provide a strongly scented nectar. The female catkins look somewhat different – more green and a bit spiky, but also attractive.

On the minus side, all willows are kind of messy. They have weak wood that's prone to breaking, so there's always some litter under them. Also, since there are so many animals relying on them for food, the foliage rarely gets through the summer unscathed. It's a good family of plants, just not for the front and center of the border.

(slide 19 – Dutchman's Breeches)

This is spring ephemeral which means that it blooms in spring under deciduous trees before they leaf out, and then goes dormant, foliage and all, by mid summer. You can plant it near hostas (not a native) since the hosta will cover the bare space left by the dicentra. This flower can only be pollinated by long-tongued bumblebees and they are also the only ones who can get at the nectar from the mouth of the flower – some insects drill a hole at the tip of the "breeches" to get the nectar. Long-tongued bees are declining in New England, so planting these may help that population.

There's a similar ephemeral dicentra (*Dicentra canadensis*) called Squirrel Corn that looks very similar – a somewhat more heart-shaped white flower – and starts blooming about a week after Dutchman's Breeches. You can grow them together to extend the bloom season a little.

Seeds for both of these have attached elaiosomes (food appendages). Ants collect the seeds to get the food and end up distributing the seeds. The seeds never dry out since they're planted as soon as they're ripe; if they seeds do dry out, they are no longer viable. Because of that, these are generally grown from corms

(slide 20 – Bloodroot)

This plant is called bloodroot because the sap from all parts of the plant is reddish-orange. The Native Americans used it for dyes.

When bloodroot emerges from the ground, the leaf is wrapped around the flower stalk kind of like Dracula's cape. The leaf gradually unfurls revealing this pretty flower, which is visited by quite a variety of bees and a few flies and beetles. Each flower lasts just a couple of days, but the colony of bloodroot may bloom for about 2 weeks. After the blooms pass, the foliage remains and looks good till mid summer when it goes dormant.

This plant is tolerant to juglone, so if you've been looking for something to grow under that black walnut tree, this is an option.

This is another plant with food appendages on its seeds for distribution by ants. It's quite an effective way to move seed around given that the plant is low to the ground and native to the woods, so wind isn't really an option.

(slide 21 – Rue Anemone)

This is the last of the little white flowers I'll tell you about, though this one sometimes comes in pale pink. Like the others, it's considered a spring ephemeral. It likes a lot of sun in spring before the trees leaf out but can tolerate fairly dense shade in summer after it's finished blooming. It generally goes dormant in summer. This one's claim to fame is a slightly later bloom period – April rather than March – and the fact that it can flourish in dry areas.

(slide 22 – Wild Columbine)

The wild columbine is a short lived perennial but it self seeds enough to maintain a presence in the garden once established. It's more dainty looking than many of the cultivated columbines which are a different species; it's also more resistant to leaf miners than many other columbines. It thrives in full sun or light shade. The foliage will go dormant after the flowers finish if allowed to dry out, but the foliage will persist if watered or planted somewhere moist.

If this columbine is planted in rich garden soil, it gets lanky and becomes even more short lived. It seems to do best in somewhat poor soil with bright shade.

Native American men reportedly rubbed crushed seeds on themselves to attract amorous attention – there is no record of whether this worked. On a possibly related note, herbalists rub a salve of crushed seeds on their skin to kill parasites such as lice and to treat rashes. The medical administration has not weighed in on whether this works either.

(slide 23 – Bearberry)

Bearberry is a great shrub to use for erosion control or just to plant on a slope you don't feel like mowing. It spreads by layering, which means that where the horizontal branches touch the ground,

they root. The look is particularly effective when seen from the bottom of the slope since the flowers and fruit are small, though very numerous. It will thrive in poor, dry soil and look good doing it. The leaves are evergreen – sort of – they turn red or dark red through the winter.

I can't see putting this in the middle of a formal garden bed, but it's a good choice to fill in a dry sunny area as sometimes occurs near a beach.

(slide 24 – Goldenseal)

This doesn't appear to be an especially important plant environmentally – not many things visit it or rely on it – but it's a little charmer. The little puffball flower comes in April or May above plants big enough for two leaves. If pollinated, it forms a fruit that looks like a raspberry and doesn't last long – something is bound to come eat it and distribute the seeds. It forms a colony over time, not aggressively, but enough to form a really pretty ground-cover that can tuck itself in around larger plants.

This plant is rare in the wild because of overcollection. The root is yellow (probably the source of its name) and contains a mild broad-spectrum antibiotic.

(slide 25 – Jack-in-the-Pulpit)

This is a jack in the pulpit, one of those plant for people who don't mind explaining to visitors what's going on. The spathe – that the pulpit – emerges in spring with the flower inside. If it's pollinated – which would be by fungus gnats – a fruit head may form later in the year. By this time the spathe and the jack's leaves have died back leaving a cluster of berries on top of a stem.

Jack-in-the-pulpits are sometimes monoecious and sometimes dioecious. If they are dioecious, they can change gender. What generally happens is that a young jack just has male flowers. After a few years, when it has built up some energy, it either becomes monoecious or female. After a particularly successful pollination, it may go back to being male to build up enough energy to create fruit again in a few years.

(slide 26 – Redbud)

Redbud is a small tree that is happy in full sun or part shade as long as it's planted out of the way of strong winds – it has relatively weak wood which can break in a storm. It sets a stunning display because it flowers before the leaves come out. The flowers seem to come directly out of the twigs with no pedicel, and are very popular with bees. The seeds develop in pods – it's a legume – and birds come and harvest them.

There are quite a few redbud cultivars on the market including at least one with purple foliage called Forest Pansy that is quite handsome. Others have white flowers, though they're still called redbud.

(slide 27 – Trillium)

This is one of the many species of trillium native to New England, the showy trillium. It doesn't seem to be especially critical to the environment, but it really stands out in the shady garden, especially since the



flowers fade to pink as they mature. Some of the other New England trilliums have red or maroon foliage or mottled foliage. One trillium – the painted trillium – has white flowers with a pink rim on its throat.

The issue with trilliums is that they come very slowly from seed – Native Plant Trust’s experience is that germination can take 2 years, and seed to flower takes about 10 years. If you see trilliums sold cheaply – 3 for \$10 – it’s really likely they were harvested out of the wild, which is frowned on. The easiest way to get a mass of trilliums is to buy one and plant it in the perfect spot. It will double in size every year or two.

Garden in the Woods has a large collection of trilliums and even has “trillium days” sometime in spring. Their collection was boosted by 1000 or so by a builder. Builders have a bad rap when it comes to dealing with the environment, but this guy was called out to bulldoze a piece of property where the former owner had lovingly propagated trilliums for the last 40 years or so. He showed up when the trilliums were in full bloom and decided he couldn’t do it. He called Garden in the Woods to rescue them, and so the trillium vale was born.

(slide 28 – Celandine Poppy)

Garden in the Woods in Framingham Mass has a display of spring ephemerals that’s just beautiful. There’s one area that combines a few white trilliums with blue phlox and blue or pink Virginia bluebells – that’s the plant in the back here – with Celandine poppy, which is the yellow plant in the front. Add in a few white-blooming giant Solomon’s Seals arching over the plantings for a vertical component – simply stunning for about a month in spring.

Celandine poppy is not the same as celandine. Celandine has much smaller flowers – usually smaller than an inch, where Celandine Poppy’s are 1-2 inches. And Celandine Poppy isn’t invasive. It will spread if happy, but politely.

(slide 29 – Virginia Bluebells)

Here are the Virginia Bluebells up close. The sky blue flowers are made more interesting by the pinkish buds. Sometimes the flower itself is pink, but that remains rare enough to be a seasoning rather than the main look. These will also spread enthusiastically in the right spot, but I’ve never heard of anyone struggling to get rid of them. Along with the trillium and celandine poppy, they form a loose groundcover that allows them all to coexist.

Foliage for this and the celandine poppy go dormant in mid summer.

(slide 30 – Sundial Lupine)

This beauty is the sundial lupine. Unlike the lupines growing along some of our highways, it’s a New England native. It’s usually blue but has been seen in white and pink. It tolerates moist or dry soil and grows well in sun or part shade.

It is a pollen source for many bees and actually has a mechanism for forcibly blowing the pollen onto the faces of the visiting bees. It has no nectar, so while butterflies and hummingbirds sometimes visit, they don't return regularly.

It is the sole larval host for the critically endangered Karner Blue butterfly. This butterfly's original range in New England was limited to two spots in New Hampshire – there are more in the mid-west, and as the sundial lupines were replaced by lawns or other lupines, it has suffered from habitat loss. I'm not sure planting this lupine here will help it at all, but it can't hurt and this is a beautiful plant.

(slide 31 – Mountain Laurel)

*Kalmia latifolia* is just one of the native mountain laurels. They are all evergreen shrubs. This one rarely grows into a small tree. The flowers are very characteristic – a pentagon with 10 stamens and a central pistil. The stamens are all tucked into little divots in the fused corolla. When a bee nudges one of the stamens, it springs out of the divot and dabs a bit of pollen on the bee's head. It's ingenious since it can apply the pollen to different sized bees. Next time you see a mountain laurel in bloom, nudge a couple of the filaments to see the spring action.

Mountain laurel is much hybridized, and we don't know if all the hybrids fill the same role in the environment as the species. I'll talk more about that problem before the end.

(slide 32 – Carolina Rose)

Here's as pretty a rose as you'll find anywhere. It has a nice fragrance, few fungal problems, some thorns but not a lot. Its 2" flowers last for about a month in early summer, and produce bright red rose hips in late summer that sometimes persist into winter – they're sweeter after a frost.

If you like the idea of a native rose but want something a little different, check out the swamp rose (*Rosa palustris*) and Virginia rose (*Rosa virginiana*). The swamp rose is narrower, no more than 6 feet wide, and is tolerant of wetter soils. The Virginia rose is a little more tolerant of dry soils and even partial shade.

(slide 33 – Yellow Wild Indigo)

Here's a bright cheerful plant for dry sunny spots. It's technically herbaceous, but it tends to form a shrubby mound over time. It can be pruned to keep it more compact, but this eliminates the dry seed pods which turn black when ripe and have ornamental interest. The rattling sound the pods make when shaken gives this plant one of its alternate names – rattleweed.

(slide 34 – Bowman's Root)

I think Bowman's Roots appeals to me in part because the flower petals aren't symmetrical. They just kind of hang out and look very relaxed. They stand above the foliage and move in the wind, which makes a pleasant, airy effect. The leaves turn red in fall, so you get a good two seasons out of this plant.

There was a bowman's root growing in a dry spot with poor soil at Garden in the Woods for a few years and looked pretty good. I've heard it can be slow to get established.

(slide 35 – Self-heal)

Unlike the other plants in this presentation, Prunella is more likely to show up in a weed list than a wildflower list. It is very tolerant to being mowed, and you can find it in many lists labeled – “how to eradicate these weeds”. If you want a perfect, magazine-cover lawn, it can be a real nuisance. But if you're one of those people who has considered planting clover in your lawn to help feed the bees, please consider planting prunella instead. Some studies have shown that given the choice between white clover and prunella, almost everything will pick prunella, maybe because white clover is an import.

It is a pretty little flower with a long bloom time, and an awful lot of things will feed on its nectar. Just a thought... By the way, its name comes from its widespread use as an herbal remedy for a variety of complaints, and it does seem to manufacture some antimicrobial compounds.

(slide 36 – Black Cohosh)

Think of this as a giant astilbe; it's advertised as reaching 6 feet to the top of the flower spires, but under ideal conditions can go as high as 8. It prefers moist soils; if grown in dry soil the foliage may scorch. The flowers don't smell very good – probably the source of one of its other names which is bugbane – but it's not a very strong smell so it's easily overlooked.

This really is a terrific plant for a shade garden. Not much else blooms in mid to late summer in the woods, and the white spires of flowers waving in the breeze really make a beautiful effect.

(slide 37 – Elderberry)

This is the American elderberry, and there's a very wide variety of wildlife that visits its flowers, leaves, stems or fruit. It grows vigorously in damp ground and partial shade and looks good all season. The fruit can be eaten by people too – it tastes sweet with a slightly bitter aftertaste. Some people bread and fry the flowers too (some people will bread and fry almost anything).

The only negative I can think of about this plant is that there is so much fruit and the birds like it so much, that sooner or later you'll end up with purple poop marks on your car. Still worth growing, just maybe park somewhere else in late summer.

(slide 38 – Northern Bush Honeysuckle)

For those of you who really want to grow a honeysuckle but have dissuaded by reports of how invasive it is, here's one of the native honeysuckles. OK, it's not a true honeysuckle since it's not a Lonicera, but you have to get pretty close to notice that. Besides the pretty yellow, orange or purplish-red flowers, it has exfoliating bark with orange inner bark, and the foliage changes to yellow, orange or sometimes red in fall. This bush suckers, so a little care needs to be taken to keep it in bounds.

(slide 39 – White Meadowsweet)

This native spirea plays a big role in the environment. Many insects visit it for nectar and pollen and there are a few insects whose larva depend on it for food. In addition, various birds eat its leaves, buds and seeds, and other shelter or nest in it. It doesn't have the same arched appearance of the imported bridal veil spirea, but it has the same showy white flowers which work as cut flowers, and it's one of the plants that can be grown in a mucky spot.

(slide 40 – Orange Jewelweed)

Jewelweed is one of those rare plants that likes wet shade, and blooms in mid to late summer. The nectaries are deep in the cornucopia-shaped flower, so only long-tongued bees, hummingbirds and some butterflies can reach them. Short tongued bumblebees may drill a hole at the base of the flower to get at the nectar, and then other bees and flies may exploit this hole.

One of the wonderful things about this plant is its seed dispersal technique, which gives it its other name – touch-me-not. The seeds are encased into spring loaded capsules which burst when the capsule is touched, flinging the seed up to several feet away.

There's a common story that the sap of the jewelweed is good against poison ivy rash and also athlete's foot. Science has confirmed anti-fungal properties of the sap, but no word on whether it actually helps with poison ivy.

(slide 41 – Wild Senna)

This wild senna is a big plant but is considered by some to be one of the more important food sources for bumblebees in late summer. It's also visited by butterflies and hummingbirds – not everything that hummingbirds visit is red.

It has black seed pods that are somewhat decorative. Do not eat any part of this plant – despite it's being a part of some herbal remedies, all parts of this plant are poisonous to consume. It's perfectly safe to work around though.

(slide 42 – Great Saint John's Wort)

St. John's Wort has many species some of which are American, others European, others we're not sure. Some taxonomists think this is the same as the European *Hypericum ascyron*; others think it's a separate species and dub it *H. pyramidatum*. Almost all of the St. John's Worts have the same characteristic yellow flower with an exuberant tuft of several dozen stamens around a central pistil. Each plant seems not to bloom for a long time, but if you have a few plants, the bloom time extends for a month or more.

The sap in the leaves causes phytophotosensitivity in some people (also pink pigs). That's a fancy term for making the skin more sensitive to the sun. If you get a sunburn after weeding around your St. John's Wort, consider wearing long sleeves next time.

(slide 43 – Blue Vervain)

This is a blue vervain, native to moist meadows across eastern North America. It blooms for a long time in part because each candelabra of flowers opens a bit at a time, working their way up. In full sun and moist soil, it will grow tall and since it looks kind of rough, it's best used at the back of a border.

Several types of bees visit it for the nectar and sometimes the pollen. There are ten species of butterfly that rely on it for caterpillar food. Birds, including cardinals, collect the seeds. Not many mammals eat it – an occasional rabbit, but it seems to taste bad. For a long blooming, nearly clear blue plant, it's hard to beat.

(slide 44 – Hoary Mountain Mint)

All the mountain mints are great sources of pollen and nectar for butterflies and beneficial wasps. The wasps nuzzle around in the flowers and get themselves all covered in pollen and act kind of drunk (they're very calm drunks). The reason you want wasps in your garden is that they feed their larvae bugs that they kill in your garden.

There are 6 mints native to New England, including bee balms (*Monarda* spp.), hyssops (*Agastache* spp.) and mountain mints (*Pycnanthemum* spp.). All are pollinator magnets, and all are a bit aggressive in the garden. But they're worth it.

(slide 45 – Ironweed)

When ironweed grows in a spot it likes – full sun and moist to wet soil – it can grow 9 feet tall and its top is covered with these deep purple flowers that are a magnet for all kinds of bees. It can stand flooding for short periods of time especially if the soil is rich. It grows narrow and doesn't flop so it's easy to integrate with other plants, as long as they like the same conditions. Without any competitions for space, it will spread to fill the area.

(slide 46 – Boneset)

Consider growing ironweed with silphium also known as boneset or cup plant. They like the same conditions and well keep each other under control. Besides being a useful plant to pollinators, birds like boneset for the seeds in fall and also as a source of water all summer. The leaves fuse around the stem to form cups (hence the name cup plant) that hold rainwater; drinking from these cups lets the small songbirds stay off the ground where they are more likely to be caught by predators. Small birds also seem to enjoy resting in the shade of the relatively large leaves on a hot day.

Those leaves are the origin of its other name – boneset. Early healers thought that the plant must have some property that would help it fuse bones if it could fuse its leaves around its stem.

(slide 47 – Joe Pye Weed)

There are 4 different species of Joe Pye Weed in New England, all largely interchangeable unless you look closely. The stems are a handsome purple, the leaves look good through the summer, and the whole thing is topped with large panicles of pinkish flower that are very attractive to pollinators. When

the flowers go by, the flower heads look whitish since the achenes have tufts of hair to let them be spread by the wind.

Joe Pye Weed grows a bit shorter than boneset and ironweed and mingles very happily with them.

(slide 48 – Great Blue Lobelia)

And then consider planting great blue lobelia in the same spot in front of your ironweed, boneset and joe pye weed. This beauty will bloom for about 8 weeks and form a nice tidy colony if it likes the conditions, which is to say sun or bright shade and moist to wet soils. It's a great counterpart to the Cardinal Flower – *Lobelia cardinalis* – that I showed you earlier. Because it blooms so late into the fall, sometimes into October, it's very helpful as one of the last meals before the bumblebees bed down for the winter and the hummingbirds head south.

The specific epithet comes from the idea that this plant would cure syphilis. It doesn't.

(slide 49 – Bluestem Goldenrod)

Most flowers for shady places aren't yellow. For those of you gardening in the shade who really miss growing bright yellow plants, here's a goldenrod you might like. The stem may become blue-gray with age, but the real claim to fame is the string of bright yellow flowers along most of the stem, not just at the end like with most goldenrods. It's also smaller and less aggressive than most goldenrods, more easy to blend into a garden and keep under control. And remember that goldenrod was the number one plant on the list of herbaceous plants for larval food!

(slide 50 – New England Aster)

Asters are a staple of garden centers in fall, but some of the less cultivated native species are also worth growing. This New England aster is the basis for a number of the cultivars. Notice how the centers of the flowers are brown in some cases and yellow in others? The yellow centers indicate flowers that haven't been pollinated yet; the color serves as a signal to pollinators that pollen is still available.

(slide 51 – Witch Hazel)

Like other witch hazels, this shrub or small tree blooms when very little else is blooming. On warm days, the flowers unfurl. When it gets colder, they knot back up like a tiny ball of yarn. The flowers smell good and last a long time on the plant, maybe in part because pollination is so sketchy this time of year – most of the bees are hibernating.

Unlike the more common Japanese witch hazel, this one blooms in late fall. The foliage turns a bright yellow in fall, and when it drops, there are the flowers. They last into the middle of winter and serve as a food source for the last remaining pollinating insects. If you get one of these and a Japanese witch-hazel, you can literally have flowers all winter long!

(slide 52 – Big Bluestem)

Big Bluestem is primarily a prairie grass, but its range extended across the continental United States to near Canada. There are several cultivars that are taller or shorter or a different color. The seed heads are fairly rigid and the leaves are gently arched, which can be a nice contrast.

Quite a few insects feed on the foliage and a few birds will eat the seeds. The foliage is eaten by voles, which might turn some people off to it – no one wants voles in their gardens – but there's increasing evidence that bumblebees nest in abandoned vole and mouse holes underground – you can't have bumblebees without the rodents. This is a pretty, and tough way to tolerate the voles in your yard.

(slide 53 – Little Bluestem)

Little Bluestem is, of course, not related to Big Bluestem. It forms a tidy clump of bluish foliage. While the seed heads make less of a display than other grasses, they are sought after by several species of birds. Little Bluestem is a well-behaved addition to a dry sunny garden, and the fact that so many things nibble on it doesn't generally affect its appearance.

(slide 54 – cultivars)

So now you're probably thinking about what natives you might want to add to your garden. There's one complication, which is cultivars. Cultivars are cultivated varieties – it's what happens when people breed plants to change some aspect of them. Sometimes the changes are massive. Most changes are a lot subtler than that, but when we change a flower from single to double, we may be removing nectaries or anthers. Many of the modern cultivars are hybrids or clones, which means they don't need the ability to reproduce. Hybrids are created every time from the parent stock, and clones are cloned.

(slide 56 – Not all cultivars ...)

And even when the changes are even more subtle than making a flower double, it can affect how the pollinator views the plant. There is increasing suspicion that cultivars don't play the same role as the species in the environment, though there's not much hard data on this yet. Annie White did her PhD thesis on topic; part of her research was analyzing several pairs of natives / cultivars to see which pollinators they attracted and in which numbers. The most typical pairings showed the species being more attractive than the cultivar, but not always and not always by a lot. For example, all the pollinators much preferred the native New England aster over its cultivar 'Alma Potschke'. When she looked at the Black Eyed Susan (*Rudbeckia fulgida*) versus its cultivar "Goldsturm", it was almost a dead draw. And when she compared Culver's Root (*Veronicastrum*) to its cultivar 'Lavendelturm', there were more pollinators on the cultivar. It's a great start, but it's only about a few cultivars, and only about pollinators. What about the cultivars' effects on insects' larval stage and overwintering? And all those other cultivars?

Research continues, so meanwhile the best suggestion I can make is to go to a large garden center or trial garden that has many cultivars side by side, and just look at the flowers. If the pollinators prefer one cultivar over another, it will quickly become obvious.

(slide 56 – Sources)

The best local source for information is the Native Plant Trust, formerly known as the New England Wild Flower Society. They are headquartered in Framingham Mass; their garden is absolutely worth visiting, especially in late spring. They teach courses and also have a significant web presence. The Lady Bird Johnson Wildflower Center is located in Texas, but their database includes the whole country. The Native Plant Finder site I mentioned earlier – it's a great source for natives as larval host plants. The Missouri Botanical Garden Plant Finder is not restricted to native plants, but they do have very thorough information on many plants, including cultivars. The next two are more wild-flower sources, not specifically for New England though – but many natives grow in multiple areas across the country. The final reference here is the study comparing species to cultivar for pollinator preferences.

Garden in the Woods sells native plants, though often cultivars of native plants. I've had some luck finding natives at Golden Skep, and I've heard Blue Stem Natives only sells species, not cultivars. The Native Plant Finder site with all the information about host plants also has a list of sources for native plants. If you still can't find what you're looking for, I'd suggest googling the plant by botanical name. Many plants have the same common name so a search on that might yield a result that's not even close to what you were looking for.

(slide 57 – questions?)

Any questions?