

PowerPoint Script for IPM Presentation

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SLIDE 1

Today's objectives are to teach you what IPM is and to hopefully explain some practical ways you can use it. This can be an intimidating topic, but I promise that many of you are already practicing some IPM concepts, but are not aware of it. That's because IPM makes sense.

Let's start with some true or false questions.

CLICK

SLIDE 2 - True or false? A typical home garden has more pesticide acre for acre in it than a farmer's field. Any guesses?

CLICK

SLIDE 3 - True. Homeowners spend over 11 billion dollars a year on pesticides (this includes Raid and garden pesticides). Actually, most homeowners spend on pesticides about half of what they spend on plants. Farmers are trying to make a living and will not donate that much of their budget to pesticides. Homeowners, in contrast, often overdo it with pesticides. They figure that if a tablespoon of this pesticide is effective, 3 tablespoons will be even better. Not only is that not true, but it's illegal. Next question.

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Slide 4-If a pesticide is natural it cannot harm you? Anyone have a guess?

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Slide 5- FALSE. Remember, many natural products are toxic or even deadly to humans. Castor beans, cocaine, and tobacco are all extremely toxic. This is a good time to mention that using chewing tobacco leaves is a common home pesticide remedy and while this does work well it can be very toxic if the liquid comes in contact with your skin. Some "chemical" pesticides are safer than other pesticides derived from natural sources.

CLICK

Slide 6 - Since most insects are harmful they should be removed from your garden.

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Slide 7 - I hope you realize that this is false. This is one of the reasons for this talk today. Insects have gotten a bad rap in nature. However...

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Slide 8- A majority of insects in the world are not harmful in any way, shape, or form. Less than 1% of insects are pests. In fact, many insects are actually beneficial and are predators of the pests. If you can learn the good insects from the bad insects, than you know when there is a problem and when there isn't.

In the cartoon we have one of the best known predators of the insect world, the praying mantis. Mrs. Mantis has gone to her tax attorney and he replies to her, "I know it doesn't seem fair Mrs. Lake, but you can't use your children as a deduction if you have already eaten them." Actually, praying mantids are a good example of a generalist predator. That means they will eat just about anything, including each other. Sometimes you may see praying mantid egg cases for sale in garden catalogues. These ads tell you that hundreds of baby mantids will hatch from the egg case, and your garden will be full of predators all summer long. This is not quite true. While hundreds of mantids will hatch, by the end of the summer there will only be 1 mantid left. Since praying mantids are very territorial, they will eat any brother or sister mantids they run into.

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Slide 9 - IPM stands for?

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Slide 10 - Integrated Pest Management. So what exactly is IPM?

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Slide 11- IPM is a sustainable approach to managing pests. This means that you can continue to use the garden practices you are already doing without fear of harming your land, your plants, and most importantly yourself or your neighbors. IPM is not opposed to the use of chemicals and in fact includes chemicals as a solution to pest problems. However, the difference with IPM is that chemical control is the last resort since it is often the least sustainable. Integrated Pest Management brings together biological, chemical, cultural, and mechanical controls. We will be talking about these 4 methods of control, but first we must figure out which problems are worth fixing.

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Slide 12 - So what is a pest? Well, a pest is any plant or animal that is out of place. This can be a weed, an insect, a fungus such as a plant disease, a squirrel, or anything else that you don't want in its current location. The definition of a pest is completely in the eye of the beholder.

CLICK

Slide 13 - For example, is this a pest?

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Slide14 - That depends on where the ladybeetle is located. If anyone is from up north you may be familiar with the multi-colored Asian ladybeetle. In the winter, these ladybeetles congregate by the thousands on walls inside people's garages and houses (the beetles are looking for warmth). In these situations, the beetles are definitely a pest. However, if this ladybeetle is in your garden it is actually a beneficial insect. Ladybeetles eat aphids, scales, whiteflies, and many other pest insect species.

CLICK

Slide 15- How about this lawn? Does this person have a pest problem? By the way this is chinch bug.

CLICK

Slide 16- That depends on the level of damage you are willing to deal with. Many people have lawns that look identical to this one and don't give it a second thought. Other people will come running to the extension office at the first sign of a brown patch.

While I am not suggesting that you should live with a lawn that looks THIS bad, one of the most important concepts in integrated pest management is learning to live with some damage. We are often the worst critics of our yards. Studies have shown that when people rate plant problems they always score their own plants worse than anyone else would. In addition, one insect does not make for an infestation. Your yard will never be completely perfect and is even a little healthier if you allow a low level of insects and disease to persist.

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Slide 17- Now that you have an idea of what makes a pest, how can you combat that pest? Well, your IPM toolbox is equipped with 4 tactics. You can use biological control, which is using other living organisms like insects to control pest problems. You can also use chemical controls. You can use cultural controls. Cultural controls are the things you do before the plant even goes in the ground. It involves some pre-thinking such as choosing disease resistant varieties and planting the right plant in the correct moisture and sun requirements. The fourth tool available is physical control. This involves satisfying activities such as squashing bugs. The first tool we will discuss is biological control.

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Slide 18- Biological control is the use of living organisms to control pests. There are three types of biological control; predators, parasites and pathogens. The cartoon on the left is an example of a great predator. Despite people's ill feelings towards spiders, they

are a great predator of the garden. In this cartoon, one spider turns to the other and says, "If we pull this off we'll eat like kings."

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Slide 19- A predator is anything that consumes other living organisms. Birds, snakes, and lizards are important predators of insects, but there are also many insects that eat other insects. Now I could make this a taxonomy lesson and go through slide after slide of insects, but instead we will talk about some of the characteristics of predators. You already know many natural enemies.

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For example, we already talked about this predator, the praying mantis. But what if you did not know this was a praying mantis? What are some clues that would tell you he is a predator?

What physical characteristics does he have that make you think he is a carnivore instead of an herbivore??

Grabbing arms - Yes, look at his arms. They are called raptorial arms, like a Tyrannosaurus Rex. He uses those arms to grab prey, not leaves.

Big teeth - He wouldn't need those big teeth if he was a plant eater.

Big forward facing eyes - He has to go out in search of prey.

Last, the praying mantis is just a scary looking insect. If an insect looks mean, it is usually a predator.

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Slide 20- This is a ladybeetle eating an aphid (that's right, not all ladybeetles are the characteristic red and black). If you saw this happening on a leaf, what would help to clue you towards who is the good guy and who is the pest?

Clue number one is that there are 3 aphids and only 1 ladybeetle. Pests tend to occur in high numbers while there are only a few predators. It's the law of the jungle. There are only a few lions but hundreds of antelopes. It is very rare to see an "outbreak" of predators.

Another clue is that the ladybeetle is EATING the aphid. Observing the insects in your yard can teach you a lot. Take some time to observe what is going on.

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Slide 21- This is a predaceous spider mite feeding on a pest species of spider mite. As you notice, the predator is bigger than his prey. But it is important to remember that small insects can also be predators; they are just predators of even smaller bugs.

Some strawberry growers release predatory mites instead of spraying chemicals to control their mite problems. Many pesticides kill more predatory spider mites than pest

species. In addition, the pest spider mites build up resistance over time. You are left in a worse situation than you started with.

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Slide 22 - This is a predaceous stinkbug sucking the juices out of a caterpillar. Predators don't only attack the adult stage; they can attack any life stage of an insect. In fact, there is often a predator for each stage of life an insect goes through. Stinkbugs can be tricky. Some stinkbugs are bad and some are good. While there is no hard and fast rule for telling the difference, good stinkbugs usually have spines and are dark in color. In contrast, harmful stinkbugs are usually green; however, there are exceptions to these rules. Remember you can always tell whether a stinkbug is good or bad by observing its behavior.

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Slide 23 - So would anyone like to guess - is the wasp good or bad?

Wasps and other social insects are all predators, but they are a mixed blessing. Even fire ants are predators. Have you ever seen a group of fire ants attack a caterpillar? This gets back to the whole definition of what a pest is. A wasp outside your front door may be a pest, but you may decide to leave a wasp's nest that is in an obsolete area of your yard.

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Slide 24 - Earwigs are an example of an insect that eats both insects and plants. Sometimes earwigs hurt the roots of young plants, but most of the time they are considered more beneficial than harmful. Unless insects are eating wood, big teeth or pinchers indicates a meat eaters

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Slide 25 - Last, is the infamous spiders all of which are predators.

CLICK

Slide 26 - Some general rules about predators: they are bigger. For example, this fly larva on the right is much bigger than the little aphids it is consuming. They are "badder" meaning that they are mean-looking. There are fewer of them. There is one fly larva and many aphids. And last, predators are faster. This adult long-legged fly on the left can quickly dart around to catch its prey.

If this green blob on the right is a syrphid fly larva, why doesn't it look anything like an adult syrphid fly (the insect pictured in the corner)? That's because of...

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Slide 27- complete metamorphosis. Years ago you learned that many insects go through 4 life stages: egg, larva, pupa, and adult. Insects such as butterflies, beetles, and flies all go through these 4 stages of life. With this type of metamorphosis, the larva and adult often look nothing alike. Sometimes it is more important to identify the larva since it may cause more damage (think of caterpillars which are the larvae of moths and butterflies). Pictured above is a C-shaped white grub, which many people have problems with in turf. Did you know this grub grows up to be a June beetle?

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Slide 28 - While most of you know that this is a ladybeetle (and by the way those yellow things are ladybeetle eggs), can anyone identify this next insect?

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This is a ladybeetle larva and in fact this is the stage of the insect that is most beneficial. Next time you notice aphids on your plants, turn them over to see if any of these small orange and black insects are dining on the aphids. In fact, if anyone has ever purchased ladybeetles from a garden store they have probably been less than pleased with the results. The problem is that adult ladybeetle congregate on mountains out west to hibernate in the winter. People then go out to the mountains to collect the ladybeetles, store them in the fridge for the rest of the winter, and distribute them to garden stores for sale that spring. When these ladybeetles awaken in the spring, they want to migrate back out west and don't particularly care about sticking around your yard to eat pests. In addition, the ladybeetles may be carrying parasites and other diseases. If you are going to purchase ladybeetles, it is better to buy them in the larval stage and from a laboratory. Not only are they hungrier as teenage larvae, but they can't fly and will stick around your garden for at least a few weeks until they pupate. When you purchase insects grown in a lab, you can be assured that they are parasite and disease free and will not infect your native ladybeetles.

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This is a lady beetle pupa.

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Slide 29 - This is another insect that has complete metamorphosis. Have you ever seen these stalked eggs on the undersides of a leaf? They are lacewing eggs and will grow to be an important beneficial insect. As a larva, it consumes vast amounts of soft-bodied insects, and is commonly sold by many insectaries. If you are going to purchase beneficial insects, this is one of the best for your money.

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Slide 30 - In incomplete metamorphosis, the young insect looks very similar to the adult except that it does not have wings. Think of cockroaches or grasshoppers.

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Slide 31 - Now that you have a handle on predators, we will move onto parasites.

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Slide 32 - Can anyone guess what is going on here? A hint: it is NOT interspecies mating.

In fact, this is a wasp that is laying her eggs inside a caterpillar. As the eggs grow and mature, they will hatch and feed off of the caterpillar. This eventually results in the death of the caterpillar.

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Slide 33 - This is a step-by-step look at parasitism. A parasitic fly is parasitising a house fly pupa. First she locates her host (the house fly pupa). Then she lays her eggs. Parasitism is a completely female thing since they are the only ones who lay eggs.

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She inserts her ovipositor into the pupa. While it may look like a stinger, an ovipositor is only used for laying eggs since it does not have the venom or muscles to sting. Her eggs develop and hatch, devouring the house fly pupa.

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Here we see the wasp's young emerging from the pupa case.

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Slide 34 - There is a parasite out there for every stage of every insect's life. If you ever see a caterpillar or other insect in your yard that looks like it has small eggs attached to its back, you should leave it alone. These are parasites doing their work.

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Slide 35 - These are parasitized aphids. Healthy milkweed aphids are yellow; however, these red, off-colored aphids have been parasitized. A color change is often a clue that an insect has been a victim of a parasite.

As mentioned earlier, parasites are very specialized. Also, unlike predators, which eat their prey and don't leave much evidence behind, parasites leave a trail of bodies. While you may never see the parasite doing its work, you often see the signs of carnage left behind.

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Slide 36 - For example, these are aphid mummies. They are left behind after a wasp emerges from the off-colored aphids. You can see the female wasp laying her eggs inside an aphid. When her young hatch, they leave an escape hole (which is visible if you look carefully). If you see these mummies in your yard, it is a sign of natural enemies in your yard.

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Slide 37 - Most parasites are either flies (right picture) or wasps (left picture). They are both very small. If there is nothing dead or decomposing around and the fly isn't a house fly, then it is probably a beneficial fly.

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Slide 38 - No talk about parasites would be complete without mentioning the Phorid fly. Who knows about the phorid fly?

This is a fly being released by the University of Florida to control fire ants. When the ants are out foraging, the fly lays her eggs inside the head of the ant. This paralyses the ant and the developing fly larva eventually causes the ant's head to fall off (of course the ant dies), and the fly emerges.

So is the fly working?

Yes, it is. The fly is changing the habits of fire ants by making them less bold in foraging for food, thus causing stress upon the colony. This parasite was never introduced as the silver bullet control to end fire ants. It may be causing a 1-2% reduction in fire ants, but when only 2,000 of the 100,000 fire ants in your yard die, most people aren't very impressed. The phorid fly is only a small part of the strategy.

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Slide 39 - The last type of biocontrol is pathogens.

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Slide 40 - The insect diseases we are talking about cannot become human diseases. Insect diseases are very specific, affecting only certain types of insect such as caterpillars or beetles. Like parasites, pathogens leave behind a trail of bodies. One thing you have to consider when using pathogens is that they do not offer instant control. They may take a few days to kill an insect, just as it takes you a few days to catch a cold.

This caterpillar is infected with the *Beauveria* fungus, which is a naturally occurring fungus here in Florida. This fungus freezes the caterpillar in place, sometimes leaving it in a standing position.

You can make a tea from fungi such as *Beauveria*. In South America, a Brazilian farmer collected infested caterpillars and crushed them up making a tea. He then sprayed this on his plants, infecting all the caterpillars on his plants. He passed this tea on to his friends, and the disease spread through his community.

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Slide 41 - While it is understandable if you are not excited about making caterpillar teas, there are still ways in which you can use pathogens. Many “chemicals” that you buy on the garden store shelf are actually insect pathogens. These products are marked as bacteria, fungi, nematodes, or protozoa.

BT only kills caterpillars and is active for short periods of time. The caterpillar must ingest the BT, so it does not harm beneficial insects since they do not consume leaves. There are other varieties of BT that kill beetles and grubs. You typically want to use BT within a year of purchase since heat and time break down the pathogen.

Nosema is used for grasshopper control. Grasshopper control is sometimes a losing battle. Even if you kill all the grasshoppers in your yard, your neighbor's will easily migrate in. With both Nosema and BT it is important to remember that size does matter. While they may work well on smaller insects, the only thing that will kill a 3-inch grasshopper is your truck tire.

You can also purchase beneficial nematodes to control mole crickets, grubs, and other soil-borne pests. These nematodes are completely different than root knot nematodes and will not harm your plants.

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Slide 42 - Now we will move on to chemical control. As I mentioned earlier, integrated pest management is not opposed to using chemicals, you just want to minimize chemical use. Remember, you are spraying where you live. In this cartoon, Popeye is reading the paper, and the new report says, “A study found the highest levels of pesticides in peaches, apples, pears, and *spinach*.”

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Slide 43 - Prior to WWII, pest control still relied on all four control methods used in IPM: physical, cultural, biological, and chemical control.

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Slide 44 - Around the 30's and 40's nerve agents were found to have insecticidal properties.

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In addition, DDT came into popularity as a form of mosquito control (think malaria). The discovery of other synthetic organic insecticides such as Parathion and Carbamate also increased pesticide use.

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Slide 45 - The chemical industry grew from being relatively nonexistent in the 20's to having more than 900 registered insecticides by 1980.

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Insecticides were a popular choice because they were cheap, could be used in small quantities, lasted a long time, killed everything in sight, were easy to use with existing equipment, and could fit into a calendar spray.

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Slide 46 - And as Martha would say,

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“That’s a good thing”
But was it such a good thing?

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Slide 47 - Let’s imagine that this is your yard. These small and black insects are aphids. There are also a few ladybeetles in the yard. You decide to spray with a broad-spectrum (meaning it kills everything), persistent (meaning it lasts a long time) insecticide all over your yard. What would happen?

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Slide 48- What an excellent job you did at killing everything! Dead bugs are all over the yard. While you did kill a few ladybugs, you killed tons of aphids. Sounds pretty good, or is it? What would happen in the next few weeks?

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Slide 49 - The aphids are beginning to come back. It looks like the few that have survived are resistant to your insecticide. The ladybeetles are having a hard time, but let’s give them a few more weeks.

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Slide 50 - The aphids are beginning to come back pretty strongly, but the ladybeetles are yet to reproduce. This is one of the problems that occurs when you spray chemicals that harm beneficials. Beneficials often reproduce at a much slower rate than their pest counterparts. A broad-spectrum insecticide often does more harm than good.

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Slide 51- Now, the aphid population has returned to its original level, but the aphids are all progeny of the resistant parents, and you don't have anywhere near the number of ladybeetles you started with.

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Slide 52- So what sort of pesticides should you spray? Not all pesticides are created equal. Some pesticides are not compatible with integrated pest management such as: Organochlorides like DDT, Organophosphates like Orthene and Diazanon, Carbonates like Sevin and Dilox, and Pyrethriods. Compatible chemicals have certain characteristics.

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Slide 53- First, you should choose selective pesticides. The more selective a pesticide, the more likely it will target your pest and not harm beneficial insects. You also want to choose a pesticide with short residual activity. This means it doesn't last a long time. You have a pest problem now, and once your pests are dead there is no reason to have residue on your plants. In addition, where you spray is very important. If one holly is infested with scale, you don't need to spray every holly in the yard. You can spot spray only where you have a problem.

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Slide 54- Some examples of chemicals compatible with integrated pest management are IGRs (insect growth regulators). These chemicals stop insects from molting. They are specific and affect only a certain stage of insect.

Repellants can be used to deter insects, mammals, and other pests.

Oils and soaps have almost no residual activity. When you spray aphids with soap, the aphids die, but the next day the beneficials are free to come and clean up the carcass aftermath. You can make a soap and oil spray at home by combining 2T oil ,2 T soap, and 1 gallon water; however, you should never spray oil on plants in the heat of the day.

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Slide 55-You can also refer to the compatibility chart, which lists common pesticides and how they work within IPM and their affect on beneficials (*direct group to handout*).

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Slide 56-Now let's discuss cultural controls. A good phrase for cultural control is "right plant right place." Does anyone have azalea plants that look like this (stippled leaves with small black dots on the underside)?

This problem is due to an insect called lacebug. While azaleas are shade plants, people do not always place them in the shade. Studies have found that azaleas in the sun have more lacebug problems than those put in the shade.

Besides placement, the variety of plant you choose is equally important. In Florida, there are certain varieties of tomato that will always get diseases. This is why most people plant disease resistant tomatoes. Florida has a tough climate. Diseases run rampant. If you have a plant that has always caused you problem, sometimes the best thing to do is dig it up and move on.

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Slide 57- You always want to make sure to start with pest-free plants. Don't be tempted by the discounted diseased plants at your local store. Also, make sure to destroy plant refuse. It is often better to throw away diseased plant parts than to take a chance by putting them in the compost pile. If you don't get the temperatures hot enough, you will wind up with a contaminated pile of compost.

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Slide 58- In addition, make sure you have healthy plants. They are less stressed and less susceptible to disease. Use the correct amounts of fertilizer and water. Turf disease especially can be aggravated by over-fertilizing.

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Slide 59- The next control method is physical control. Physical control is physically excluding insects. Remember to remove insects as well as weeds. Weeds are not only competition for water and nutrients, but can also serve as an alternative host for diseases and insects. Not all unwanted plants are weeds. Some attract beneficial insects; other plants such as clover in your lawn may provide additional Nitrogen.

This is a picture of a floating row cover. It serves as an insect fence to keeps out flying insects.

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Slide 60- Mulch is another example of physical control. Mulch can offer the additional benefits of conserving water or increasing organic matter. Some colored mulches may warm or cool the soil. Reflective mulches are used by tomato growers to repel whiteflies and thrips.

Last, don't forget about the environmentally friendly physical control of squashing your insects.

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Slide 61- Now that you know some IPM methods, what if you would like to use biological control in your yard? You can either purchase beneficials or preserve what you have.

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Slide 62- If you decide to purchase insects, make sure to buy from a reputable supplier. The more a company knows about an insect, the more likely you are to have success with it. You should figure out what insect you are trying to combat and maybe even what species. Remember if you want to purchase parasites that they are very specific. A good reputable supplier should be able to help you out with this. In addition, if you ever have an insect identification problem you can always bring it in to the extension office.

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Slide 63- Here is a list of suppliers. Many of the companies will send you a free catalog if you request one from their website. Florikan is the biggest dealer, controlling a majority of the market.

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Slide 64- Besides purchasing natural enemies, you can also encourage the natural biocontrol already in your yard. This can be done by:

1. Reducing the rate/frequency of pesticide application. Try spot treating or simply removing infested plants. Stop treating minor problems and use selective pesticides such as pathogens.
2. Learn to identify the signs and symptoms of diseases and insect problems. Try keeping a garden diary.
3. Plant beneficial insect attracting flowers within 10 yards of your plants, and remember that polycultures are better than monocultures. Experiment within your own yard to find out what works best. Most beneficials utilize small flowers as additional pollen and nectar sources when their pest food supply runs low.

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Slide 65- This is a list of flowers that attract beneficial insects. Think about the problems that arise in your yard and try to plant flowers that will be blooming during or right before that problem arises.

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Slide 66- Scouting cannot be overemphasized. Scouting is looking around your yard for diseases, insects, and other problems. Learn to anticipate problems in your yard so that

you can take preventative action. Controlling one plant with a pest problem is easier than controlling a whole hedge.

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SLIDE 67- When scouting, look for conditions that favor a pest. If it has been hot and humid you might anticipate fungus. In addition, look for signs of insect damage or frass (caterpillar poop). Also, watch for natural enemies as they may already have a situation under control, and there maybe no need for your intervention.

CLICK

Slide 68- THE END