

QUEST #603
Summer: Getting the Bugs Out

(Narration)

Summer in northern New England and the livin' is easy. Or is it? We share this season with at least 16,000 species of insects – and those are just the ones we know about. Insects outnumber all other kinds of animals combined and this is when they're at their peak of activity. They suddenly appear and then multiply right before our eyes. But for many of these bugs, their lives are very short and terribly dangerous.

(Bryan Pfeiffer)

They are exquisite predators in their realm....Their legs have spines on them in order to catch and hold prey. They have very sharp powerful mouthparts for chewing insects.

(Narration)

Figuring out what makes insects so successful is what an entomologist can spend an entire career pursuing.

(Thomas Eisner)

If you pick up insects randomly, chances are if you picked up a dozen of them, that 8 or 9 of them have some chemical form of defense.

(Narration)

There's so much more to learn about the lives these diminutive animals lead. And there's no better time to see that than in the summer. But imagine trying to identify and count all the different species of insects - as well as other forms of life? That's what a BioBlitz is all about. And to make it even tougher, they give themselves just 24 hours to do it. There's a remarkable flush of life in the summer. Could it be that insects are at the center of it all?

(UW voiceover)

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(Open music)

(Music montage)

(Voice of Bryan Pfeiffer)

We're going to demonstrate a tremendous amount of biological diversity here.

(Jim Hedbor)

We'll be attracting moths to fruit bait that's been fermenting for about a week.

(Bryan Pfeiffer)

It's about learning the biodiversity of this site. It's about recognizing that liverworts are as significant as loons.

(Jim Hedbor)

So we hope to get hundreds of species of moths. And tomorrow afternoon I'll be sitting sorting piles of moths and figuring out what's what.

(Bryan Pfeiffer)

And I think we'll be making a statement about Vermont and all places beyond.

(Linda Greenlaw)

Linda Greenlaw, bug hater, here at BioBlitz Central, where over 100 biologists and scientists race against time. It's summer in northern New England and there's an astonishing abundance of life out there. Much of it insects!

(Music title)

(Narration)

This BioBlitz has 120 scientists and naturalists converging on a 500-acre parcel in central Vermont to find as many living things as they can in a 24- hour period.

(Bryan Pfeiffer)

This is the single greatest gathering of biologists and naturalists ever assembled in VT. And they are conducting the most comprehensive biological inventory of any site in the state, ever.

(Narration)

Everything discovered here will be documented and can be used later by municipal officials, planners, conservationists, and scientists.

It's just a snapshot of biological diversity for late June, but it's much more information than ever before gathered at this site.

It was up to Bryan Pfeiffer, a nature guide, to orchestrate this Blitz at the Vermont Institute of Natural Science reserve at Quechee Gorge.

(Bryan Pfeiffer)

I think bioblitzes are a combination of science, discovery, education, public education, and celebration. It's this great coming together of skilled scientists, eager naturalists, and members of the public. To really sort of discover this vast biodiversity at any given site no matter where you are.

(Narration)

These races against time are popular because they make these biological inventories both competitive and fun.

(Bryan Pfeiffer)

I want everyone to have a great time. Tremendous gathering of knowledge here...Enjoy it. And look at people's badges and say, "I don't know about fireflies. Tell me about them." I will play the song of the Bicknell's thrush to signify the beginning of the BioBlitz.

(bird song)

(Pfeiffer)

So with this sound, I'll send you all off and wish you good luck and enjoyment in the field. And thank you all for coming.

(Narration)

It's three in the afternoon and the BioBlitz clock is now running.

(Kent McFarland)

I think people will be astonished when 3 o'clock on Saturday arrives and they look up at the tally board of how many species are out there, from this small area of land in VT. I think they're going to be astonished. And it may cause people that have never thought about biodiversity to stop and pause and think "wow, you know, humans are doing a lot of stuff in this world but we're not the only living organisms here. There's thousands of other things right around me here." And maybe they'll take heed of that.

(Narration)

Bioblitzes have only been around since 1996. We're seeing our first ones now in Northern New England.

This one in Acadia National Park in Maine concentrated on a few species, lepidoptera, or butterflies and moths, instead of all life forms.

But all bioblitzes share a few things in common - getting scientists and naturalists out in the field together, comparing notes, and facing the daunting task of documenting the diversity of a given area.

(Girl)

Arrgh. They're way too fast right now.

(Narration)

There are two kinds of naturalists: professionals and amateurs. Yet even some of those who make natural history a hobby are experts in their own right. BioBlitzes feed right into the zeal they have for the natural world.

(Richard Hildreth)

We've painted the solution on the tree which will hopefully attract something. This is not an exact science. Everybody has their own idea of what to put in the brew. Sometimes it works in an incredible fashion and you get thousands of insects to come. Well I've been working it for about two weeks and so it's good and fermented. If you just mixed up sugar and water the night before it might be just as good, I don't know. Mythology has it, you have to age it for awhile.

There's orders of insects that I never have given a second thought to. You know, for instance, flies...I don't find them very exciting at all. I know 3 or 4 kinds of common ones, but I have no enthusiasm for flies at all. But, I could get it just like that if I was out there and I saw a new one, something really special. Or a really unusual looking one and thought, gee, I better identify that and then I'd probably go on work and identify it and then I'd read about it and probably, I could...next year, you'd see me and I might be a fly fanatic. You know, it can happen that quick. And, I think that happens to a lot of these people. They all of the sudden get excited about stuff. And, it's easy to... it's very addictive some of this stuff.

(Narration)

The ground rules of bioblitzes are simple. Cause minimal disturbance to areas being blitzed. And whenever possible, identify species in the field by using observation.

(Kent McFarland)

Aphrodite has a yellow eye. Atlantis has a bluish, sort of blue-greenish eye. Which is sort of fitting for its name. It's out of here.

(Woman)

It has sort of curls at the end of each of its antenna. Curls.

(Narration)

Every BioBlitz has to have a central location to break out into teams and come up with game plans. BioBlitz Central is also where a more definitive ID is made, if needed for species that require closer inspection under the microscope.

Even for some large insects, like dragonflies, it can take as long as three hours of painstaking study of colors, vein patterns on wings, even reproductive parts to be sure about one bug's identity.

(Richard Hildreth)

I don't think that people will run out of insects to study because they haven't even identified them all yet... But that's only the beginning, that's only getting a name on them. Trying to figure out how they're vaguely related to one another. But then there's the other things we need to know about them or we might like to know all about their distribution, all about their behavior, all about their life history, all their interactions with other insects and other organisms and what parasites; whether they're parasites, whether parasites attack them, whether they have strange relationships with plants, you know. So, there's endless activity and you never run out of stuff to do.

(Narration)

Summer is the best time to have a blitz since it's when biological diversity is at its peak. And the most noticeable species of all are the insects.

When you're blitzing, it doesn't hurt to have some sharp-eyes and energetic youngsters around.

Back in Vermont, a couple of 13-year old prodigies set a pace veteran entomologists eye with envy.

(Boy)

They go through the holes in the net before you can go under the net and catch them.

(Charlene Donahue)

A lot of times it's that people have never really even thought about insects before. And so, when you start discussing them, that's the first thing you'll get is, I hate insects but I have a question about the lady beetles or I really like butterflies and you say well you know, butterflies are insects, oh yeah and you start breaking down those barriers to even thinking about the insects. There's so much in this world we can't see everything and focus on everything and as we grow up, we start to filter out certain parts of the world and one of those things that often gets filtered out is the insects. And when I talk with students and I'll say, ok we're going to go out and look for insects and that means, you really have to look at the world differently and stop thinking about how you look or talking to your friends or whatever and start looking down and looking smaller and smaller and slowing down and focusing very small. And that's what you need to do is kind of take off those filters that we've put on.

(Thomas Eisner)

I often wondered why it is that what we often like to do when we are very little becomes part of a list of no-no's. A kid doesn't start off by looking at a bug and saying "yuk" or looking at a spider and saying "yuk". We usually start fairly curious.

(Narration)

Thomas Eisner's been chasing and marveling over bugs ever since he could walk...and began photographing them when he was a teen. He has been taking amazingly detailed pictures of them ever since and has introduced this "invisible" world to the rest of us.

(Thomas Eisner)

Well they lend themselves to photography because they are just intrinsically extraordinarily beautiful. If you look at an insect close up, you realize what immense beauty there is in that level of size that we tend to neglect.

(Narration)

Eisner also became fascinated with something else many of us overlook...the way bugs use odors and chemicals.

(Thomas Eisner)

The chemistry came because I grew up very conscious of odors and perfumes. My father was an amateur perfumist who used to manufacture colognes for the family and perfumes and the house always had some very nice smells. Then I realized that insects have smells also. Very often very bad smells, which is their way of surviving...And somehow chemistry and photography came together for me.

(Narration)

So why are there so many bugs in our part of the world? We may not have as many species as in the Tropics, but our region makes up for that with some extraordinary numbers of individual insects. Northern New England is an ideal place for insects in the summertime. We're a mixing bowl for both northern and southern latitude insects to amass. Yet good habitat is just one reason for their success.

(Thomas Eisner)

Insects are the most successful animals on land. It is demonstrated just by their sheer numbers. But there are subtle secrets there. They were the first animals that took to the air and evolved wings. This is part of their remarkable metamorphosis. They grow up as larvae, as caterpillars, feeding on plants, and then as adults they can fly. This gives them the option to disperse. The option to find a mate very effectively. To look for a place to deposit the eggs. I mean flight is just a phenomenal, phenomenal capability. Insects have internal fertilization. They don't spawn, they don't have to return to water to shed the sperm and the eggs into the water and let them find themselves in the water. They insert the sperm into the female, the sperm inside the female finds the eggs, and this is internal fertilization, just like in humans, the insects have hit upon the same solution. If you are little, you are constantly in danger of drying out. So the insect has a skeleton on the outside. One of the major things that that does is prevent it from drying. It also provides places for attachment of muscles, a hard skeleton, that made it possible for them to move

quickly. In other words, very efficient muscular action. And of course the skeleton provides them also with protection. Many of them are literally too hard to chew. So they're wonders.

(Narration)

You can imagine the incredible variety there must be with 16,000 species of insects in our region alone.

Some make music rubbing their wings or wings and legs together.

Others simply sound annoying.

Some look genuinely ferocious, while others are so beautiful and whimsical that it's easy to become infatuated with them.

So what do they have in common?

Six legs, three body sections, and two antennae, for starters.

Many insect larvae eat plants...which they can usually find plenty of during our explosive growing season here.

Caterpillars are often species-specific plant eaters – preferring only one or two kinds of garden plant, wild plant, tree leaf or fruit.

But it's remarkable how universally desirable insects are for other animals.

Nearly every animal eats insects – directly or indirectly - from amphibians to mammals.

Insects also eat each other.

Without a doubt, they're a significant source of food within the natural world.

With so many predators on the prowl for insects, it's no wonder that self-preservation is a constant issue.

For Tom Eisner, a childhood encounter with the bombardier beetle introduced him to the amazing world of how insects defend themselves.

(Thomas Eisner)

I still remember as if it was yesterday the first day I ran in to a bombardier beetle. I was in Lexington MA looking for bugs and I turned over a rock and under the rock there were beetles I hadn't seen before. Beautiful orange color with iridescent blue. I picked one up and "Pssst" came that sound and I felt the heat and I said "Hhmmm, I think I better get some of these." And I collected some, put them in vials and took them back to the laboratory and that was a day that transformed my life. Because I have spent 45 years since then just looking into chemical survival strategies of bugs.

They are wonderful to be able to study. They are among the most interesting animals that we've ever had.

See what I use to attach him to this wire is a little bit of dental wax. So I'm going to do what an ant would do now, which is just gently pinch his leg. And you see that he fires very very directionally.

It turns out to be really quite an extraordinary animal. It is an animal that has a weapon in the form of two glands that open at the tip of the abdomen. The tip of the abdomen can revolve in all directions, and from the tip of the abdomen he shoots out his spray, which he aims accurately, which he shoots out, or she, at the temperature of boiling water, 100 degrees centigrade.

And out shoots this material, scalding hot, well aimed, and ants beware, if you dare bite that beetle in the leg you get a full blast and you are repelled instantly.

There you go beetle. You performed nicely.
If you pick up insects randomly, chances are if you picked up a dozen of them, that 8 or 9 of them have some chemical form of defense.

(Narration)

The more vulnerable insects come up with more passive ways of fending off predators. Some have ingenious ways of camouflaging themselves.

Others make themselves too toxic to eat.

Monarch butterflies and caterpillars prefer to feed on milkweed which is loaded with the poison - cardiac glycosides.

Monarchs can tolerate the toxin. But not their predators. They get very sick when they eat monarchs. So most leave monarchs alone.

Biologists have long thought that another butterfly, the Viceroy, kept predators at bay only because it looks so much like a monarch.

(Kent McFarland)

The thing about Viceroy's, they used to think that, "well they're not poisonous and they look like Monarchs so that they don't get eaten so they copy them". But it turns out that their larva feed on willows. And willows actually have some poisonous qualities to them too, and it turns out that the Viceroy's actually also are poisonous. So they look like, like each other so all the, everybody, all the birds out there that are flying around know "Gee, these big orange butterflies are poisonous".

(Narration)

Another defensive strategy of some insects is to startle predators with "extra eyes."

(Thomas Eisner)

Caterpillars of swallowtails have a lot of neat tricks. They have fake eyes on them which give you the impression that they are looking in all directions so no matter from where you approach the caterpillar, you have the feeling he's staring back at you. Well that can be discouraging we think, to birds who may be programmed not to attack a prey item that stares defiantly at you because that might be an indication that the animal is protected.

The use of fake eyes to confront a predator is a use that is fairly widely used by insects. The moths that have fake eyes on the back wings, the diurnal butterflies that have fake eyes on them, and predators, birds in particular, are warned by these to hesitate about attacking.

They have innumerable defensive strategies and you can spend your lifetime working on that and that is basically what I have done. For some reason I have become interested in insect defenses and I have uncovered story after story about a bug doing something interesting to protect themselves. And there's a lot of them out there left for others to work on.

(Narration)

During the first afternoon of the Vermont BioBlitz, a number of participants are hard at it collecting insects.

(Man)

Well there's three spiders in here and one harvestling. What many people call daddy longlegs. I have no idea of what species we have here. One is probably crab spider. But we won't know for sure until we key them out and get them under the microscope and examine them closely and then we'll know what species we're talking about here.

(Woman)

And a pitfall trap is a way to passively trap things that wander along the ground surface. Dig a hole in the ground deep enough to sink a cup in there and backfill around it so that things that wander along, drop in. You can bait it if you want. I didn't with this, I just put some water and some soap to break the surface tension in there.

Looks like we have at least one good-sized spider. I think it's a juvenile. Which makes it tricky to identify. Sometimes it makes it impossible to identify because you need the genitalia of the mature adult to tell species apart. But we'll be able to get it hopefully at least at the genus level.

(Narration)

Of all the formidable predators lurking in the insect's world, spiders are perhaps the best known stalkers and ambushers.

If their elastic-like silken webs are not enough to entangle unsuspecting victims, spiders also leave tiny droplets of glue on some of the strands.

The beauty of these webs belies how effective they are as traps.

The spider waits for an insect to get stuck and then liquefies its prey with venom before sucking it up.

(Thomas Eisner)

One of the major enemies for insects in the night are spiders with their webs. If you look around how many webs there are at night, you realize the hazards that the insect faces that is flying around in darkness. So a vast number get eaten by spiders.

(Narration)

Another feared predator does its hunting on the wing.

Dragonflies and damselflies – of the odonate order - are aerial hunters so good at what they do, that no other insects have ever successfully challenged them in their habitats.

They're also among the most ancient living animals on Earth.

(Bryan Pfeiffer)

Yes. They are exquisite predators in their realm. They are essentially at the top of the insect food chain. They like to eat the bugs that we hate. So they are out there catching mosquitoes and black flies and deer flies. And their bodies are designed as very effective predators, which is really what they are. Their legs have spines on them in order to catch and hold prey. They have very sharp powerful mouth parts for chewing insects.

There are some dragonflies that will pursue, catch, kill and eat other dragonflies. Even dragonflies their own size.

(Narration)

Yet there's a certain elegance and splendor to these insects. It's no wonder that our region's 170 species of "odes" are attracting a growing number of admirers, many of them bird and butterfly enthusiasts.

(Bryan Pfeiffer)

This is a little thing called sedge sprite. It's a damselfly. One of our smallest and diminutive. Name a color and you'll find it on the body or the wing of a dragonfly. Some of them are marked like butterflies on the wings, patterns. Others have clear wings. Most of them have multi-colored, well most of them have amazing colors on their bodies. Either metallic green or glowing red or pastel blues and yellows and greens, or just day glow orange and neon blue. You name it, it's out there. It's really a delight to watch. It's like watching the colors on a bird.

(Narration)

What we generally refer to as dragonflies are actually two major groups of insects.

(Bryan Pfeiffer)

Well the first thing is that damsel flies are not female dragonflies. Dragonflies are the robust, and there are certainly exceptions to this, but they are the robust, large, to some people scary looking – I think because they fly so well – insects, that when they land they hold their wings out flat. Damsel flies tend to be more diminutive. More dainty. More slender bodied. More elegant in some ways, if you will allow me to use that word, and often bright glowing neon colors - blues, greens, reds, metallic greens. When they land, they fold their wings above the thorax or spread at a slight angle, a 45 degree angle. But they, for the most part land and hold their wings folded above their back and their abdomen.

(Narration)

Unlike most other insects, their legs are right behind their heads to make it easier for them to hold their prey while they're devouring it. Like some other insects, they have huge compound eyes.

(Bryan Pfeiffer)

Dragonflies, when you look at them, most of the head is occupied by the compound eyes. Sometimes those compound eyes are so large that they meet in a large seam on the head.

They detect movement quite well. They actually have five eyes. They have two compound eyes and three other eyes that are very sort of reduced and have limited functions, some function, but certainly not as much as their compound eyes.

(Narration)

Compound eyes are a collection of facets – up to thousands of them – each facing a slightly different direction.

The compound eye gives the insect a general impression, a mosaic, but not a complete image nor one in focus.

But these sphere-like eyes are excellent for detecting motion.

Insects can process images much faster than we can with our eyes.

That allows an insect to fly at high speeds through dense woods and marshes chasing other insects without hitting anything.

Then there are the insects that make us feel like prey. Here in northern New England, there are about 50 species each of our two most notorious bugs - mosquitoes and black flies.

Not all of them will seek out what scientists call “blood meals” from us.

Many of them prefer birds.

But when mosquitoes bite us, there are some real dangers. Their saliva can spread diseases, parasites, bacteria, and viruses.

Mosquitoes kill more humans than any other animal on Earth.

They’re much more dangerous than black flies.

So why is it that black flies tend to hurt more when they bite?

This University of New Hampshire entomologist has studied both.

(John Burger)

The mouth parts of black flies and things like deer flies and horse flies are very different from mosquitoes because the mouth parts in black flies are much more broader and blade like in appearance, where the mosquito has a stylet, something you slip under the skin.

In the case of black flies, they’re called pool feeders because they feed on a pool of blood that leaks out of a capillary. And basically, what they do is they cut a hole in your skin, which is why it hurts often when they bite. And they will actually, when they encounter a blood vessel, a capillary, they’ll actually punch right through the capillary and as the blood begins to ooze out under the skin, they will use the other mouth parts to lap up the blood and feed on blood. Which is often why, after you’ve been bitten by a black fly, if you look at the spot where the bite was, you’ll see a little tiny spot of blood there that’s leaking out before it coagulates.

It’s almost like knives really, where you’re chopping something rather than just slipping something in a capillary.

Now mosquitoes on the other hand have very fine needle-like mouthparts. And, they’re often referred to as vessel feeders because they actually... these little stylets actually penetrate the capillary under the skin and take in blood directly from the capillary. Very elegant really.

So, they’re fundamentally different in the types of mouthparts they have. Both, however, of course, serve pretty much the same function, that is to feed on blood.

(Narration)

It’s true that only female mosquitoes and black flies bite.

Nutrients from our “blood meals” are essential for eggs to develop in their ovaries.

Both mosquitoes and black flies have an underwater phase with their larvae and pupae. For black flies, it's always in swift-moving clean water.

(John Burger)

Basically they have fans, very, very fine what are called head fans, one on each side. And the funny thing is these things are in the current is sweeping by, and these fans, when the black fly is right side up, look like this and of course they wouldn't be very effective in filter feeding if they stayed like that. So, what happens is a black fly anchors itself, let's say to a rock, and then it twists the body around so the head is actually facing up. And then, it uses these fans to filter stuff through the water. And so, there's stuff coming through the water and they're simply using these fans to collect. And then, eventually, the fans will close up. And they bring the fans, they have a sticky surface things will cling to and they'll simply take that in and rake it through the mouthparts and clean off the fans and put them right back out again. And you can actually see them do this; it's absolutely fascinating.

(Narration)

As they're eating, black flies are in survival mode, even in the larval stage. These tiny black flies are fighting with one another to protect their underwater turf. In this case, a blade of grass. Mosquito larvae, on the other hand, need standing water. Burger has a backyard lab for his mosquito research - in a stack of old tires.

(John Burger)

They'll take about a month or so to develop and then they'll form... the tumblers, they're, as my kids used to call them, wrigglers because they wiggle around in the water, you'll see that out there in the habitat. And they'll take some, maybe, 3 or 4 weeks to develop into the pupae. Pupae last 4 or 5 days, and then the adults emerge, the males and females.

(Narration)

As irritating as these insects are, their primary role is to be food for other animals.

(John Burger)

Probably the majority of adults get eaten by birds, they get eaten by bats, they get eaten by dragonflies, they get eaten by just about anything that's a predator.

There are all sorts of predators in the water, you know, like water beetles and, and giant water bugs. It's very dangerous out there. And, so a lot of these things are gonna get, or fish for that matter, are going to get chomped on and they are actually providing a living for many many other animals that they live with. Very, very important.

(Narration)

We know so little about insects even though they're so vital to the natural world in the summertime.

(Thomas Eisner)

You know the great thing about insects is that there are so many of them and they are so diverse. So you can just get a tremendous amount of entertainment out of studying them. Insects are just wonderful beasts. And you can take any insect and find something interesting about them.

(Narration)

Yet we tend to associate insects with pests – especially those that destroy crops and trees.

(Richard Hildreth)

You know, the only insects anyone knows about are the bad ones, the so called bad ones, the ones that are pest; the ones that eat the crops or carry horrible diseases or something. So, it's either medical entomology or you know, economic entomology, agricultural entomology, they've done all the work.

(Charlene Donahue)

My job is protecting the forest of Maine and a lot of times that's looking at pest species that feed of the trees. And there are lots of really interesting stuff out there but there aren't enough hours in the day to look at all that. And what I have to focus on are the problem insects as a part of my job.

(Narration)

Only a small fraction of insects are pests.
Try as we might, we have not been able to exterminate any New England insect pest species! And that's a good thing.

(Music)

There wouldn't be many plants without insects. In a sense, they both use each other. It's virtually impossible to overstate how important insects are to the health of our plants. Eighty percent of all flowering plants are insect-pollinated. Many of our agricultural crops would be non-productive without insects helping to pollinate them. It's not just bees. Butterflies, moths, wasps, flies, beetles, even mosquitoes are pollinators too. In return, plants provide a concentrated source of nutrition for many insects.

(Kent McFarland)

For some plants they are major pollinators. That's their main job I guess you could say. You know for some plants it's good and bad. For some plants, they actually feed on the plant as the larva but then as adults they end up pollinating the plants. So it's sort of a little give and take.

(Narration)

Some insects, particularly butterflies, are almost entirely dependent on nectar for their nutritional needs.

Nectar provides insects with sugars, amino acids, and fats.

Butterflies are among the most interesting to watch as they “sip” nectar.

(Kent McFarland)

The adults are feeding on nectar. That’s why you see them at flowers and you’ll often see their long tongue sticking down into the tube of the flower, to sort of suck up the nectar through their straw-like tongue.

For the most part, they’re generalists when they are nectaring.

(Narration)

It can be said that plants have evolved to compete with one another for pollinators. It’s a competition that has resulted in specialized flower anatomies to attract specific insects... seasonal spacing of flowering to spread out the competition...and fluctuating nectar production.

Individual flowers may be nectar-rich on one day and nectar-poor the next.

This “nectar lottery” forces insects to keep trying flowers until they hit a “winner.”

In turn, the chances of all flowers getting pollinated are higher.

(Music)

(Narration)

The Vermont bioblitzers have a lot of ground to cover.

The habitats are diverse and it’s not easy scouring a steep river gorge, two reservoirs, wooded trails, meadows, and wetlands.

(Man)

It would be nice to...

(Man)

There’s really no access to that.

(Woman)

So the American has one wart per spot?

This is American then.

(Narration)

Before evening of the first day, traps for the nocturnal animals are put into place. These are catch and release-type traps.

(Woman)

There’s this wedge that keeps the door down that a trigger when they press on it, it snaps shuts. In larger traps in the woods we can find chipmunks, squirrels, flying squirrels. But here in the field, we’re just expecting mice.

(Narration)

Back at BioBlitz Central, the afternoon's haul of specimens stacks up and fatigue begins to take its toll on those assigned evening microscope duty.

(Music)

(Bryan Pfeiffer)

I don't know many.

(Woman)

What is it? He thinks he knows it. Come on.

(Pfeiffer)

It's not izania (sp). That's the only one I know. I want to know the easy ones.

(Woman)

Tree moss.

(Pfeiffer)

Right. No, it's not.

(Woman)

That's about the right size range. Climacium.

(Woman)

Everything about a moss is designed around water because it's a non-vascular plant. It's fascinating. You know they all kind of look the same. I'm going to take off some leaves and put them under the compound scope next. Because I'm not going to bed until I know what species this is.

(Narration)

Out in the woods, the bat crew, led by state biologist Scott Darling, is still going strong.

(Scott Darling)

This is a mist net which is what we use to catch bats during in the summer season for the most part. We tend to locate these nets along bat foraging areas or travel areas. Forest roads are some of the best places to put up a net like that because they move through the forests to get to areas where they can feed. And when they are having young like they are this time of year, they will go right back to their roost and nurse their young. So you see these patterns of activity. They are very active, from dusk on, for two to three hours. Then there is this lull.

(Narration)

Twenty bats are caught and identified in the makeshift lab on a truck tailgate.
The bats' foods of choice – mosquitoes and other insects.

Which is exactly what most birds are looking for in the summer too.
Is it a coincidence that the number of birds and insects peak at the same time in northern New England? Absolutely not.
Birds wait for insects to emerge before they migrate north.
They then take full advantage of the flush of insects to get the protein needed for their nestlings' growth.
Some even manage 2 to 3 broods in one summer.
By mid-summer, reproduction is complete and our “transient” birds are getting ready to leave.

(Woman)

Oh, there's a glossy ibis. Look at that long curved beak. Now that's an insect-eater that probes in the mud. He eats worms and bugs and different things. That beak is just so adapted to dig right down in the mud.

(Narration)

Maine Audubon naturalist Linda Woodard starts looking for migrating birds by the second week of July.

(Linda Woodard)

Migration has already started. Fall migration, it's sad to say, but yes, it has started and we're seeing some shore birds coming back through. We're seeing whole family groups of red-winged blackbirds flying around. And the shore birds, they have to really fatten up. They fatten up more than any other kind of bird. And they will actually, some of them will actually double their weight getting ready for migration. So they have to eat a lot when they're here. And you just see them constantly going up and down, up and down trying to eat and trying to get as much food as possible.

(Narration)

Even birds that eat mostly fish, indirectly rely on insects.

(Linda Woodard)

The fish eat the insects. And you'll see a lot of insects right atop, on the top of the water and so the fish will just come right up and eat the insects. So, we have, you know, a whole food chain effect here.

The egrets are so important and to come in here, they need this marsh for the fish and the fish eat the bugs. So it's all...the bugs actually go, you know, right up the food chain. The fish need the bugs, and the egrets need the fish.

(Narration)

Songbirds add high fat fruits to their diet just before migrating.

Plants have evolved so that much of their fruiting happens just as waves of fall migrant birds are coming through to spread the seeds.

There's probably no better animal to disperse seeds than migrating birds.

(Music)

(Narration)

Before dawn, even before the early birders are up, Jim Hedbor is at BioBlitz Central still getting caught up on all the moths brought in the day before.

(Jim Hedbor)

When you're collecting specimens, there's no point in collecting specimens if you don't have data with them. And just for speed, I'm just indicating that these are from site number one.

Those kept in the collection will end up with exact data of where and when they were caught, so 50 to 100 years from now, maybe can make patterns and sense of this somehow.

That's probably 25-30 species in there in that little tin.

(Music)

(Narration)

Hedbor's anxious to see how his overnight traps fared in the overnight rain. These traps use light to lure insects.

(Jim Hedbor)

Oh yeah. Look at this. Polyphemus moth. What a wonderful thing to get.

(Music)

(Narration)

By the time the other blitzers get organized, their final push has been delayed by fog and rain.

(Bryan Pfeiffer)

Does anyone want to get their feet wet and thrash in, you know, to go pick up a few....

(Narration)

That doesn't stop Pfeiffer from issuing a challenge to his dragonfly group: get a higher species count than the butterfly group led by his colleague, Kent McFarland.

(Bryan Pfeiffer)

They don't know it but I'm hoping we can beat them... Well, they have the same handicap we do. They've got the same handicap we do.

(Narration)

For the time being, his “rival” has given up on butterflies and has gone snorkeling.

(Kent McFarland)

I’ve got a huge snail here. Huge snail. Want me to put a little water in there for you. The clarity isn’t bad out there either.

Right here is a beaver dam going way under the bank. The bank over here. I stuck my head a good this far up the tunnel. Pitch black.

I’m going to go swim over to those cattails and see what’s over there.

(Woman)

OK.

(Narration)

This kind of weather’s also conducive to locating fish, aquatic insects and amphibians. A group of biologists wades into the Ottawaquechee River with nets and a 300 volt generator to electro-shock fish for a few seconds, just long enough to be identified.

(Man)

That’s a decent sized trout.

(Man)

Yeah, for a brook like this.

(Man)

It looks kind of perplexed. His wings are still drying out.

(Man)

It just hatched, huh?

(Man)

It’s newly emerged.

(Man)

What?

(Woman)

Dobson’s fly.

(Man)

It’s a beauty. It’s about as big as they get.

(Man)

That is a big one.

(Man)

And they have nasty dispositions as larvae. They'll really get ahold of your finger.
Energetic.

(Pfeiffer)

We're just wandering aimlessly, waiting for the sun to come out.
Well, not exactly dragonfly weather. What we're looking at now just kind of hunkers
down. I'm going to go back to the car and have a muffin.

(Rick Van de Poll)

What I'm really doing is panning for gold because I thought I could make a little side
money on this adventure. Looking for mylantid caddis flies which build cases of sand.
No, it's pretty sparse.

(Man)

Holy cow.

(Man)

It's just a fantastically big spider.

(Man)

What?

(Man)

I figured that would be good for one of the live boxes back at the bioblitz. One of the
spider people can say what it is.

(Narration)

By mid-day, there's a last minute push to get specimens into the right hands at BioBlitz
Central.

(Jim Hedbor)

A lot of these smaller moths if they were bigger, they would be famous. They're just so
beautiful.

The thing about these, these here, there's actually about five species. So there's a reason
to collect so many, although we didn't do it intentionally.

(Narration)

Then when the weather finally clears, the 24-hour marathon becomes a mad dash to
beat the clock.

(Bryan Pfeiffer)

Got a silvery blue here. We may be getting butterflies for the butterfly group and I
want to beat them. I want to have more dragonflies than butterflies. We may have to
bargain for these.

(Kent McFarland)

It's probably my favorite butterfly. It's beautiful. It doesn't look like much on the outside. It's called Milbert's Tortoiseshell. I don't know if you can get a look at it, but do you see those cats-eyes? Some people call it the fire rim tortoiseshell too. Aghh...

(Bryan Pfeiffer)

Libellula pulchella. They're posers. They like to sit for you.

(Music)

(Kent McFarland)

Oop. I think we're running out of time. I think that's it.

(Woman)

It's three.

(Kent McFarland)

It's three. We're done. Nothing like one hour of sunlight to get everything done. You take 24 hours and cut it down to one hour. That's all you get. One hour and find all the butterflies you can!

(Music)

(Narration)

It takes another couple of hours to get everything tallied. Once that's done, it's time to celebrate.

(Boy)

That's a lot of bugs.

(Bryan Pfeiffer)

Not long after three o'clock, I saw Doug Greene, who was our lichenologist, sitting down with Lisa, the very first taxon to report. They were entering lichen data. And suddenly, this great feeling came over me. I said, "Man, this is actually happening. We're getting species. We're getting data."

At two o'clock when the sun came out, we went on a one hour blitz. And our goal today was to beat the butterfly group. Now, the butterfly group was sort of being run by Kent. We may not have beat them, I don't think this is not their real total.

(Laughter)

(Bryan Pfeiffer)

Significant? Kent led the butterfly group.

(Kent McFarland)

We had 63. Thirty five.

(Bryan Pfeiffer)

Moths. Jim Hedbor is here. Many of us got out, got to walk around with Jim Hedbor last night. Those folks are now sleeping. Jim went non-stop.

(Jim Hedbor)

We gave them lists, like 42 noctuids. And we'll get around to it later. But my tally was about 170 moths, and there may be more.

(Rick Van de Poll)

The coolest thing was not even in the water. But it emerged, it was a heldermite (sp.) emerging. It was this long. Dobson fly. The prongs on it were about an inch long. The tendrils, the wings were still soft. When you picked it up, it was about half the size of your hand.

(Bryan Pfeiffer)

This is the total number of species reported. We did our best to avoid duplicates. But this is a pretty good haul, I think. I think we all should be proud of ourselves. Thank you very much.

(applause)

(Bryan Pfeiffer)

I think that too many of us are disconnected from what's living around us. And this is an opportunity to connect people or to reconnect people who lost that connection in their adulthood. They might have had it when they were kids running around with their butterfly net or catching grasshoppers or fireflies, or chasing after birds, but here's an opportunity for it to all come together and for this great sort of rediscovery to happen.

(Thomas Eisner)

Insects are a success story. You know more insects have been described than all organisms put together. Something like 2 million organisms have been given names. Really described. More than half are bugs. And that more than half amounts to something over a million by now. And that's far from the total, there's probably another 8 to 10 million insects out there that have never been described. And that's something really worth pondering. That so much of what is living is still unknown to us. Makes you sort of think about what it means to destroy nature, what you're losing when you destroy nature. You're burning books before you've read them.

(Linda Greenlaw)

Although not a complete inventory, this is an amazing starting point. Insects may not be my favorite part of summer, but they sure play a huge and critical role. I'm Linda Greenlaw, thanks for watching.