Kieran Hunt— Beyond Butterflies: IVM in Real Life and the Road to Adaptive Management

Winston Bandoh [00:00:12] Hello and welcome to the ISA Conference Rewind video series. My name is Winston Bandoh. I'm the Director of Finance at the International Society of Arboriculture. Today, ISA is proud to bring you a presentation by Kieran Hunt on the practical uses of integrated vegetation management in real life and the road to adaptive management. This presentation was originally given at the 2022 ISA Virtual Conference, so the views seen here are those of the presenters. If you are interested in learning about IVM practices, utility arboriculture, biological controls, or managing biodiversity and ecosystems, I expect you will like this presentation. [00:01:00] So now, I encourage you to sit back, relax, and enjoy the presentation. Thank you.

Kieran Hunt: Hello, my name is Kieran Hunt. I'm Digital Engagement Lead with Asplundh's Digital Innovation Team, and I'm here with you today to talk about going beyond butterflies, integrated vegetation management in real life, and the road to adaptive management.

So, this is a typical American metropolitan area. This landscape looks pretty different from how it did before the Industrial Revolution, simply because of how we've had to alter that landscape to soothe human habitation. Compare this to the Tongass National Forest in Alaska, which is old growth forest. It's never been logged. There's no humans living in this area. There aren't any roads. This is probably what most of our American metropolitan areas—at least in forested landscapes—probably looked like before the Industrial Revolution and before humans moved in and converted that land to suit [00:02:00] human habitat.

So, if you're anything like me, I'm pretty outdoorsy. I like to spend a lot of my free time in areas like what we see on the left. But where I live, I like to be in areas closer to what we see on the right, because I like things like a road to drive my car on, a doctor to go to when I'm sick, a refrigerator, lights. And so, the fact remains, we have these areas that we've altered tremendously to suit our human habitat, and that's had a pretty profound effect on the natural world that we live in. Because the fact remains that no matter what we do, as we alter these landscapes, it's going to affect how they function, and it's going to have downstream effects on the animals and plants that require those natural habitats to exist in their normal state. Because we're currently living in the biggest experiment humanity has ever done: the Industrial Revolution or industrialization. [00:03:00] And broad-scale, human-caused disturbance of natural systems has caused global declines in biodiversity and viable habitat, sort of, across the board for different types of organisms. So, plants for instance, 20% of plant species are threatened with extinction. Insects are profoundly in decline. One in five bird species is under threat of extinction, and 1 in 20, bird species is already functionally extinct. And losses in biodiversity can have pretty significant impact on the viability and functionality of the ecosystems that these organisms rely upon.

So, I'm an arborist, and I tend to look at this like I would look at a tree in decline. When trees start to show outward signs of dieback or loss in vigor or viability, I assume that there's already been a significant amount of failures or compromises to the internal processes that allow that tree to function. So, in other words, by the time I'm seeing [00:04:00] these outward signs of loss of health, there's probably already a significant amount of momentum in that disease or death spiral that a tree grows through as it slowly

goes through that process of death or senescence, because trees tend not to die very swiftly or all at once. It tends to be a bit of a process. And similarly, natural systems, they have these cascading processes that rely upon each other, and if we interrupt enough of them or alter them enough or significantly enough, we can see this spiral where things start to reverse and sort of fall apart. So, while I'm not suggesting that our natural systems that we live in are in a death spiral, what I am suggesting is that we've altered them so dramatically, so profoundly that we can't really know what direction which they're headed. And so, I'm asking everybody listening to this talk to take a good hard look at where we are and where we want to be headed. [00:05:00]

And one of my calls to action is for us as land managers to set goals for biodiversity and for habitat viability, and mitigating ecosystem loss while managing for robust, compatible, and well-adapted plant communities in the lands which we manage. Because what do we manage for? I'm largely going to be speaking about managing transmission rights-of-way for the transmission of electricity, but this can also be applied to things like Department of Transportation rights-of-way for roads. It can be applied to other areas, such as park lands where we might not need to have a lawn for people to recreate on, if we have areas that we're mowing sort of pointlessly for turf grass, these can be areas that can be converted to habitat. So, if we're talking about transmission corridors for electricity, our primary goal is to safe, reliable, and compliant transmission of electricity—or maybe it's pipeline gas [00:06:00] for line of sight, maybe it's line of sight for roadsides—and so our primary goals cannot be compromised. We need to make sure that that wire is clear of vegetation, because if a tree grows into it, if it's high enough voltage, that tree may explode and may cause a cascading power outage like we saw in 2003 in the Northeastern North America.

But if we shift our focus from pure compliance to integrated vegetation management and managing for compatible vegetation and communities of plants on these rights-of-way, we'll be focused on sustainability. We can offset our costs while also benefiting the environment, because good butterfly habitat is generally very compatible with things like the transmission of electricity. So, if we focus on managing and establishing compatible plant communities, this will accomplish our primary goals while also accomplishing secondary goals that we can [00:07:00] set as land managers who want to take care of the ecosystems in which we reside.

Monarch butterflies may be listed as endangered as soon as next year, and it's very critical that we manage for endangered and threatened pollinators who are very, very critical for allowing our habitats to function. But things like thistle and milkweed and monarchs are really only small pieces of the puzzle. We're talking about ecosystem loss and losses in biodiversity. Pollinators and butterflies are really just a symptom of the problem.

Ecosystem and habitat loss and degradation are the primary causes of these losses in biodiversity. So, if we shift our focus to compatibles-based management, we can treat the problem, not the symptom. And on our rights-of-way, we can do things like improve our cost efficiency and make additional modest investments in goals for habitat establishment that will allow us as right-of-way managers to be leaders in driving the socio-economic changes [00:08:00] that are needed to reverse some of these trends that we're seeing that are causing our loss in biodiversity. The way we do this is by moving, at first, to an integrated vegetation management system. So, this is a system for managing lands that involves a cyclic series of steps. So, these steps repeat, and they form the basis for our vegetation management program. They start with taking an inventory. We identify the compatible and incompatible vegetation, growing on

the lands we're managing. We determine our actions threshold. These are when conditions are bad enough, that we do something about it, so maybe that's: the plants are getting too tall, they're getting too close to our conductors, maybe our stem density is getting too high, and so on. We evaluate our treatment methods.

So, what do we do to correct these incompatible plants or to make things better once they get bad enough? Then we do our treatment. We actually go out and do something, whether it's cut those plants, perform chemical control, [00:09:00] and so on. Then we assess how well our treatments worked. We rinse and we repeat. We do these over and over again. But it always goes back to figuring out what's there, both good and bad. And then going through our series of steps to make sure we control the bad while making the good better. So, this is really a form of adaptive management and as we move into system maturity, as we get better at controlling these plants and managing these lands and forming some sort of momentum for our management style, we get into this cycle where we start to focus less just on taking away the bad stuff and more on improving our conditions and making the good spots better, or expanding the areas of compatible vegetation, so that we have more and more compatible vegetation growing in our rights-of-way. And we continue to establish for efficacy and make sure that we continue to reassess and look at what's good on the right-of-way. [00:10:00] And so, our action thresholds, or those points when things are bad enough to do something, can start to include things like maybe there isn't enough milkweed on the right-of-way, maybe we don't have enough early successional plants that provide habitat for pollinators during the late-summer months, maybe we don't have enough nectar resources at a specific time of year. We start to think about how if we set goals for biodiversity - incompatible, robust, healthy ecosystem, and functional ecosystems - some of those goals can move towards ecosystem health and viability.

So, we start with converting our program into IVM, and the way we do this at first is generally by resetting. So typically, if we haven't been managing through IVM, we're going to have all sorts of incompatible vegetation growing on those rights-of-way that we need to get rid of before we can establish our compatible vegetation. Often times, the way that we do this [00:11:00] is by converting, by doing a cuts double treatment. So, maybe we'll go through and we'll blow the entire right-of-way, and then we'll perform up a cuts double treatment of an herbicide, or maybe we'll perform a high-volume foliar treatment of an herbicide. This will control the roots of the incompatible plants. It will allow things like grasses as well as anything in the seedbank in the soil to regenerate. So, some compatible plants at this point will naturally regenerate on their own. Then we go through and perform spot treatments of those incompatible plants that reoccur after this initial treatment. So, we're always going to have more stems of trees and other incompatible plants coming back on the right-of-way that we'll need to treat with spot treatments of a low-volume foliar application and so on. Once we do this, we start to see biological controls getting established on these rights-of-way. And these are compatible plant communities that are capable of resisting invasion by trees. And they do this through things like competition, [00:12:00] so naturally just shooting out or occupying space that might otherwise be occupied by incompatible plants.

Allelopathy. So, these are chemical controls that plants have to help suppress the growth of competing vegetation, and then also, there are animals, like deer and rodents, that naturally feed upon woody vegetation and the seeds of those plants on these meadow habitats. So, basically what we're doing here is we're converting a forested area into a meadow, and meadow habitats when they occur in nature, typically occur in early succession. So, if we think about in a forest, maybe during a storm event, trees

may fall down and open up a space in the canopy where sunlight can reach the ground. At that point, any seeds in the seed bank will germinate because of that sun that's hitting that soil, and things like low-growing shrubs, grasses, forbs, and ferns can start to grow up, [00:13:00] simply because they've been resting dormant as seeds in that seed bank. As they start to grow up and occupy the space and forma we'd call a meadow, which is an early successional habitat, sort of a reset, the first stage after that reset. We start to see that these plants as they get established are capable of holding their ground against invasion from other plants. They can't do this indefinitely, and without our intervention, this will eventually convert back into a forested ecosystem.

But meadow habitats, early successional habitats, do have some of these natural adaptations for holding their ground, and these are what we call biological controls. They're basically free to us. They're adaptations that these plants have to hold their ground that can help reduce the amount of management inputs that we need to provide to maintain this early successional, low-growing plant community. And so, we have these biological controls establishing on the right-of-way. [00:14:00] And as they start to establish, we start to focus on compatible space management. As we're performing our inventories, one of the things that we want to focus on is managing for plant communities that are well-adapted to the site. So, plants that are adapted to a site that have naturally evolved to grow in the particular growing conditions on our site – so whether that's based upon soil, aspect, hydrology, anything that affects what natural systems or what communities and cohorts of plants would naturally want to occur on that site - the more that we can focus on managing those sites and converting them towards highly-adapted planting communities, the better those communities are going to be at self-management and proliferation, because they're going to thrive the best or they're going to be the most suitable for that environment, and therefore, going to require the fewest management inputs to maintain that viable, healthy, robust ecosystem.

So, this is a concept that I [00:15:00] like to call ecological momentum. It's the idea that established healthy ecosystems are good at holding their ground against invasion from other plants. And just like healthy trees are more resistant to diseases, insect pests, and other health problems, establishing native early successional habitat that's well-adapted to the site, creates ecological momentum and makes that right-of-way even more resistant to invasion from incompatible plants like trees than if we had just left it in that steady state of IVM and just focusing on the controlled removal of incompatibles. So again, this is about establishing compatible healthy, robust, adapted, native plant communities that are highly adapted to the site on which they are growing. And so, as we set our goals for ecosystem management, our primary goals of compatible plants that don't interfere with our transmission of electricity, [00:16:00] or view sheds, or our DOT rights-of-way, or being able to see down a pipe line corridor. Once we have those primary goals set, we've got this compatible ecosystem, growing on the right-of-way, we focus on our secondary goals of having biodiversity and having robust, healthy, functional ecosystems.

One of the things that we can focus on early is establishing key stone plants. So, keystone, plants are those that have a disproportionately high support of trophic energy transfer. So, basically, in a food web, plants are the primary producers. So, these are the only organisms in an ecosystem, generally, that are capable of creating their own food. And our plants, as we know through photosynthesis, take sunlight, carbon dioxide, and water and convert those into sugar, and that sugar when consumed by primary producers, or those organisms that consume plants, those sugars then move up the food web. [00:17:00] So, now we have something like a caterpillar that eats the leaf of a plant and gets sugar out of that leaf. So, they've consumed that plant as a primary consumer, and now something – like say a bird - consumes

that insect and that sugar moves up and up and up the food web. And this can get pretty complicated. But essentially what we need are plants that are producing that sugar, that are bringing that energy into the ecosystem. And if we have plants that are what we call key stone plants, these are the ones that are going to be most readily available to the most organisms up that food web. So, maybe things like blueberry is capable of producing a lot of energy, that's capable of moving its way up into a lot of different organisms in a food web. This is what we call key stone plants. So maybe blueberry or rubus, you know raspberry and other native rubus species, [00:18:00] are capable of supporting a disproportionately high number of organisms of that food web. And so these key stone plants will be focused on establishing them early. It can help to kick-start our ecosystem functionality, and then as we go and move forward into this ecological momentum, we assess we enhance we reassess, we can start to continue to focus on areas of maybe rarer plants that have popped up, or maybe even planting these plants that we know were critical for certain organisms that occur in these areas. We can start focusing on managing for more compatibles that are filling specific niches. Because generally, compatible native plants support pretty specific native animals. Some insects are adapted to consuming one particular plant to complete their life cycle. Monarchs are an excellent example of this. In order for their larvae to be successful, they need milkweed to reproduce. Now, they need all sorts of other [00:19:00] nectar resources as adults to be able to support their long journey on their migration, but they're pretty reliant upon milkweed to complete their life cycle because of reproduction. Similarly, many other animals and many other insects and birds require specific plants to complete their life cycle. So, as we're getting into this ecological momentum, let me focus on managing for biodiversity. We really need to focus on what's working on the right-of-way, what could be expanded. So, maybe we're moving through the right-of-way.

We see that there's a patch of plants that are rare or that are highly functional in our ecosystem, and then we focus our management on expanding that area of highly compatible or highly beneficial plants. Maybe we know that if we mow them at a certain time of year, they will come back with a higher step count. Maybe we know that if we go through and mow the areas around them while the seeds are germinating, we can help to get that plant to expand its [00:20:00] footprint on the right-of-way. Whatever the case is, sometimes we're just mowing while the seed pods are out, because it'll scatter them while also scarifying the soil. So, conservation mowing is one of the key ways that we can proliferate certain desirable plants while suppressing the surrounding, maybe desirable but less desirable plants, because again, we're trying to convert to that highly well-adapted, robust, native compatible plant community. And so, we're fostering plant communities for things like habitat, forage, nesting sites. And then also, one of the other things I like to suggest is right-of-way managers and areas where bats are prolific since bats are so highly threatened and since a lot of these low-growing, early successional plant communities support a high number of insects.

If we put bat boxes next to our rights-of-way, we can help to support bat communities in our areas simply by giving them a place to rest and then feed. Because we have a whole lot of food for them with all these insects [00:21:00] that are occupying our lands. And letting the bats can go back into their bat boxes, and hopefully they'll fatten themselves up enough that in the wintertime, if they do get white nose syndrome, they won't succumb to it, because they'll have enough energy resources from feeding on our rights-of-way. There is a pretty significant link between native plant abundance and the abundance of birds. And this is related to things like nesting habitat, baiting habitat, but the primary link between these two is believed to be food sources. So, the idea here is that the larvae of many insects serve as the primary food source for baby birds. So, even though many adult birds might feed on things

like berries and seeds and nuts, when they're chicks, they need a high protein high fat diet to grow up into adults. And so many birds will feed their chicks the larvae of insects, and many of the native larvae of the insects that occur in our ecosystems require native plants to grow. So, just like we were talking about Monarch, [00:22:00] which isn't the best example, right, because when Monarch feeds upon milkweed, that makes it inedible to birds. That's one of the reasons why it's adapted to grow on milkweed. But most other insects are specialized for one or a few species or genera plants. And if we have more native plants, growing on the right-of-way, we're going to have more abundant insects and insects larvae which is going to create a higher abundance of birds, because it's going to improve the success rate of the bird clutches so that those baby birds are trying to grow up on our rights-of-way. But importantly, native insects tend not to feed on invasive plants - with a few exceptions. So, if we want to have robust, healthy, functional ecosystems, driving out invasive or non-native plants is one key way to approve the biodiversity and the success of a lot of those higher trophic level animals, like birds. And since about 35% of the world's crop require [00:23:00] animal pollinators to produce the crops that we want to eat, and about 40% of insect populations are declining globally, if we improve insect habitat order on our rights-of-way, these are going to serve as important reservoirs of insect biodiversity, which can ultimately improve our own crop production. So, not only are these insects feeding the birds, they're also feeding humans. Sort of downstream. Utility Arborist Association's Environmental Stewardship Committee has put together some really awesome tools for managing for biodiversity. I highly recommend going onto the UAA's website and this biodiversity tools page, and looking through some of these ways that we can set goals for biodiversity, and put together scope of work for biodiversity. One of the key takeaways from these tools are these types of goals. So, protection-based goals, enhancement-, and integrity-based goals. And the way that these work in a nutshell, [00:24:00] our protection-based goals are just trying to not damage or reduce the number of good plants that we have on that right-of-way, on that land that we're managing. So, we don't want to kill or harm any of the plants that we like on that right-of-way. But if we move into things like, enhancement-based goals, now we're looking at, okay, what do we have that's good, and how can we make them better?

So, if we have an area of good plants that we want to proliferate or expand the footprint of, what can we do to enhance those plants? Maybe it's just planting more, but it could be targeted conservation mowing at times that we know will help proliferate that plant. Maybe it's going through and spreading the seed pods or suppressing incompatible or less desirable plants nearby to create more space for these higher desirability plants to expand into. And then we move into integrity-based goals, which are really more along the lines of that ecological momentum that I mentioned earlier, the idea that as we make, as [00:25:00] we guide succession of these plant communities into highly adapted native plant communities, we can help to improve the integrity of these ecosystems, make them more functional, more robust, and more resistant to damaging agents. One of the key ways that we're going to be able to manage in this way is by bringing in ecologists. Local ecologists, people who know how the natural systems in these areas work, are going to be fundamental in establishing the goals that we need to improve the functionality and viability of the ecosystems that we're managing. These people are going to be capable of looking at the natural systems that are occurring on our rights of way They're going to be able to make - they're going to be able to perform our assessments more effectively and make prescriptions for how we can improve the viability and functionality of these habitats.

So, responsible program managers looking to manage for diversity and function will consult ecologists for [00:26:00] their inventories and to prescribe treatment methods on their rights-of-why, and perhaps

also to assess their advocacy afterwards. Part of the way that we prescribe treatments on these rights-of-way is by looking at the ecotype. So, just like I was talking earlier about how certain plants are going to be specially adapted to certain growing conditions - and these can be microclimate, it can be based upon the slope or the aspect, it can be based upon hydrology and more broadly on the climate, which is probably going to affect the whole area that you're working in - but as we get into these microclimates and focusing on managing for ecotypes to get those highly adapted native plant communities to grow and to establish, to form those very robust ecosystems with the highest ecological momentum. These are going to be the ones that are going to out-compete invaders the best and reduce our management inputs the most, which again, I want to reiterate we're never going to be free of managing these lands. We're always going to have to go [00:27:00] through and target the removal of incompatible vegetation, and at those times were also going to have the opportunity to improve the compatible vegetation on the right-of-way, expand it, and help guide succession.

But if we're focusing on managing for the most adapted, most robust ecosystems with that highest ecological momentum, one of the things that we're going to need to focus on is the soil and the land on which that vegetation is growing. And so GIS is critical for managing those lands for habitat delineation. So, we can do things like take layers in our geographic information systems or GIS. We can map out our rights of way or whatever lands were managing, and then we can look at things like soil type.

So, what, what is the parent bedrock? What is the soil on which these plants are growing? We can combine that with things like slope. So, what soil is growing on a higher percent slope; [00:28:00] what soil is on more flat land. And then we can look at things like aspect. Which ones are getting the morning site, which ones are getting the afternoon- morning light, which ones are getting the afternoon light. And as we start to layer these different layers on top of each other, we can pick out specific polygons or zones where we have a very specific set of circumstances that will guide which plant communities are best adapted to those sites. And again, the way that we make the ultimate determination of what should be growing there is by bringing in local ecologists who know the natural systems and how these different components of an ecosystem interact to form different plant communities or to guide which ones are best adapted to those sites.

Another thing that's good to keep in mind is our cycle length is going to affect how robust or how mature our program can get. So, if we have a longer cycle length, so 10- or 15-year cycles, we're always going to be in [00:29:00] that resetting state. We're never going to be able to get it to this maturity level where we're really managing for robust compatible ecosystems, because by the time we get back every time, we're always going to be resetting that right-of-way to get back to that early successional stage, because we're always going to have stuff moving back in and growing back up. Those trees are going to get back in, because we're not spending enough time frequently enough on our rights-of-way to get to this ecosystem maturity. If we're managing on a much shorter cycle length - so, as we get down to 5-, 4-, 3-, 2-, 1-year cycle lengths, depending on how much we want to invest into our rights-of-way, we can get more and more into this maturity level where we're starting to look at really guiding succession and honing in on very specific ecosystem types and getting into this real level of ecosystem maturity and momentum that we're [00:30:00] seeking to improve the habitat on our rights-of-way. So, this is really a financial decision. It's a balance here, and as we're moving through and determining on our different spans or in our different management zones in our system, we can determine our cycle length based upon areas that we think are most beneficial to our local habitats to target. So, we may not do a shorter cycle length everywhere, but we can pick areas that have the most potential for success or maybe the

highest functioning, and we can go drive our management towards those areas and shorten our cycle length in a targeted way so that we're focusing in places that we're going to get the best bang for our buck. Finally, I think it's important that we bring in our local communities, including our local academic entities.

So, if we have a local university, especially if they have a natural resource management or similar type of program. We have ecologist who are studying at our local universities or are working with our local students. We can bring them onto our rights-of-way. So, maybe we just [00:31:00] invite them in and say, hey, you can use this area as a laboratory if you want. We can carve out some zones for you to practice some of your own management. This is going to help bring more eyes of ecologists at local interested parties onto our right-of-way. It's going to give us more insight into what's going on these lands that were managing, and some utilities are even going so far as to fund some of this research. So, they're supporting those researchers in the students that are that are looking at these research problems on their rights-of-way. And so we're getting these collaborative partnerships where we have people out there who are actively working to figure out what works best to improve these habitats.

And we're also getting more eyes on the ground out there. So, we're supporting the research, we're furthering that change, that robust ecosystem management that we're all trying to accomplish here, and we're also getting that type of management on our rights-of-way by bringing these people in. Other community groups like local audubon societies, [00:32

:00] people who are looking at birds, plants, the more people we can bring onto these sites to help with our management, to help get eyes on the ground, looking at what's there, the more we're going to know about what's going on these rights-of-way.

And the more we're going to be able to drive our management towards success in ecological productivity. That's all I have. Thank you so much to ISA for having me, and I'm here if you have any questions.