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David Todd [00:00:03] Well, good afternoon. I am David Todd, and I have the great privilege of being here with Barbara Keller-Willy. And with her permission, we plan on recording this interview for research and educational work on behalf of a non-profit group called the Conservation History Association of Texas, and for a book and a web site for Texas A&M University Press, and finally, for an archive at the Briscoe Center for American History, which is at the University of Texas at Austin.

David Todd [00:00:39] And, I want to stress that she would have all rights to use the recording if she sees fit, as well. It is hers.

David Todd [00:00:47] And, I want to make sure that that is okay with you. What do you think? Will that do?

Barbara Keller-Willy [00:00:52] Yes.

David Todd [00:00:54] All right. Well, let's get started, then.

David Todd [00:00:57] It is Tuesday, May 23rd, 2023. It's about 2:45 in the afternoon, Central Time. And my name, as I said, is David Todd, and I am representing the Conservation History Association of Texas. And I am in Austin, and we are conducting a remote audio interview with Barbara Keller-Willey, and she is based in the Sugar Land, Texas area today.

David Todd [00:01:27] Ms. Keller-Willy is a Master Naturalist and is the founder and director of Monarch Gateway, which works to create habitat for monarch butterflies and other pollinators across Texas coastal and central flyways. She has been a particular leader in developing ways to raise and share the native milkweed, and native prairie systems more generally, that are so critical to monarch butterfly survival. One of her strategies has also been to develop partnerships for her work, such as under the Monarch Host Cities Partnership Project.

David Todd [00:02:09] Today, we'll be talking about Ms Keller-Willy's life and career to date, and especially focus on what she has learned and shared about the history of butterfly conservation, particularly focusing on the monarch butterfly and its habitat.

David Todd [00:02:27] So with that little preface, I thought we might start off with a question about your childhood and if there might have been times in your early years where there were people or events in your life that influenced your interest in nature and insects in particular?

Barbara Keller-Willy [00:02:47] Yes, I think in my early childhood I lived in a very rural area and one of my most enjoyable activities that I can recall is walking in the woods or in the

fields with my father, with relatives and other people in the community. And there's a lot when you are, say, three or four years old, there's a lot that you learn without being, without realizing that it's a lesson. And we would walk in the woods and I learned about flowers and insects and just trees and habitat and all the different animals that were in that habitat.

Barbara Keller-Willy [00:03:46] I was very sensitive to bee stings. And so, I was careful to pay attention to pollinators even back then. But I think even that created more of a fascination about them.

Barbara Keller-Willy [00:04:08] And I don't remember where I was taken - I think perhaps it was a Washington, D.C. museum - but I recall very young seeing museum specimens of insects, of butterflies, from all around the world. And I, I just remember being told to move on from that exhibit. And I wanted to stay and observe because I had never had the opportunity to see so many insects up close and still.

Barbara Keller-Willy [00:04:48] And that remains a vivid memory in my head that I sometimes think about when I have opportunity to see, to observe animals today in a still method or, you know, I'm able to observe them from afar with a telescope or a camera or such things. But that, seeing those specimens in a museum, provoked something that made me think, someday, I want to observe things in this way.

Barbara Keller-Willy [00:05:35] And then, I think, I grew up in a time when Disney was on Sunday evenings and, you know, after church Sunday, Disney, the Disney program, on Sunday evening was something that I remember watching regularly. And I especially loved the animal episodes and things like Jacques Cousteau and, you know, nature-related TV shows were something that I gravitated toward even as a very young child.

Barbara Keller-Willy [00:06:22] I didn't really care for cartoons. So we're talking, you know, 3 to 6 years old here. And I didn't care to watch cartoons.

Barbara Keller-Willy [00:06:34] I gravitated toward books that had pictures, real-life pictures of animals and TV shows that did the same. And, you know, museum exhibits, I guess, that were similar, even though those animals weren't live.

David Todd [00:06:53] That's great. So you were soaking up a lot of the natural world, whether it was in these walks with your family members and community and going to museums and watching TV at times and looking through books.

David Todd [00:07:12] Do you, do you remember anybody in particular either guiding you or accompanying you, either, you know, growing up or somebody your own age?

Barbara Keller-Willy [00:07:26] I had a Girl Scout leader that had an interest in nature. And I remember during camping and that kind of thing, that leader would teach us things. And I, I had a science teacher, that I, so I think science teachers all throughout my education were very valuable.

Barbara Keller-Willy [00:08:06] I, when I was in third grade, I was moved to fifth grade math and sixth grade reading and, and each year thereafter, I had classes that were beyond the home room, if you will, that I was in. And science was another class that I was able to move up beyond my grade level. And I think the science teachers that I had were instrumental in helping to create, or helping to channel maybe, that love of animals.

Barbara Keller-Willy [00:08:47] So when you're a child that that people are looking to supplement your learning or give you additional things to keep you interested, they learn that the science was something that interested me and gave me additional opportunities to learn the entire way throughout school.

David Todd [00:09:18] It's great to have adults to take that kind of interest and give you that kind of support and guidance. Boy.

David Todd [00:09:27] So, I think you're telling us mostly about your grade school years. Were there folks in in college, perhaps, that played that same kind of role of encouraging an interest in the outdoors and nature?

Barbara Keller-Willy [00:09:44] Yes. Now, I was a kid who needed grant money to do college. And most of the grant money was, or a lot of the grant money, was geared toward technology. So, you know, I'm a kid that was growing up and, you know, with and we were taught about things that would happen in the future and how we needed to learn technology to be prepared. You know, engineering and those kinds of things were maybe less saturated than wildlife biology.

Barbara Keller-Willy [00:10:30] So, I'm the kid who wanted to live on a farm and instead lived in, you know, a rural few acres and a house and barn. But I wanted the farm, I wanted the land, I wanted the habitat. And I wanted to be probably wildlife biology - I wanted to study.

Barbara Keller-Willy [00:11:00] But that, as they said, was very saturated and there was more money toward, you know, to go into other degrees. And so I kind of followed the money figuring that, "Oh, well, the job will give me the money to do some of these other things that I want to do and that I have an interest in".

Barbara Keller-Willy [00:11:22] And, but in college, I would take. So I had 12 credits that were degree credits toward the degree that I was going for. And then every semester I took a a writing intensive literature class because I also enjoy writing. And then I would take a science class.

Barbara Keller-Willy [00:11:48] And, during the summer, I would take mini master's or six weeks. These six-week intense, you know, eight hour a day, or 4 hours a day in the classroom and 4 hours in the field, where I would do plant biology and herbarium specimens. You know, we went out and collected plants for a herbarium. Soil science is another one that I really enjoyed - plant identification and that, you know, was mostly going out or half the time was going out in the field and identifying plants and trees.

Barbara Keller-Willy [00:12:26] And I think, again, those professors were, in some cases, you know, we had in the soil classes, I remember having lots of soil scientists come in to assist with the class, and they all kind of recognized that, you know, that I wasn't just there to get the credit.

Barbara Keller-Willy [00:13:00] And so, I would say that there were probably, I don't know, maybe ten or so, you know, people that I look to as mentors or guidance - not any one person specifically, but several, several people along the way. And I had some really great people who just appreciated the, you know, the attention to the engineering stuff, too. I don't want to

make it sound like, you know, like I didn't have that in my selected career. But these, in these classes, people recognized that I was there for love of the subject.

David Todd [00:13:59] Yeah, as you said, not just there for the class credit, but because you had a true interest. Well, I think any teacher feels probably very grateful when, you know, you get that connection and that sort of bright light in a student's eye.

David Todd [00:14:21] Well, so, we talked a little bit about this before, but you mentioned that Disney shows and Cousteau programs were appealing to you. Was there anything else kind of in the general culture that you found to be really encouraging or instructive, maybe pushing you towards this sort of natural interest in the outdoors?

Barbara Keller-Willy [00:14:50] You know, I read lots. Silent Spring comes to mind as, you know, especially once I was college age and learning that we as a society do things. I don't think when I was a child I ever really thought so much, so in those early years, you know, when you're watching Disney or whatever, you don't so much think of habitat and what it's going to look like when you're grown or, you know, you don't have the capacity to understand that big picture. But then as you go into college, that's probably where you begin to, what would I say, understand your place in this bigger world and begin to understand that the choices we make and the things we do have an impact on the world around us. And so those kinds of things were instrumental in maybe wanting to make a difference.

David Todd [00:16:22] Right. Right.

David Todd [00:16:24] And, well, so, you mentioned Silent Spring: were there other books or movies, TV shows, you know, that whole sort of, I guess, cultural bath that we're sitting in all the time - anything sort of touch you and maybe encourage your interest in the outdoor world.

Barbara Keller-Willy [00:16:57] I would just say that it was my entire childhood into adulthood. It was, you know, if it wasn't... Most everything that I would say influenced me today was animal-related. And I can't I, I don't, a specific thing is not coming to mind beyond, you know, those books and TV shows that I mentioned.

David Todd [00:17:35] Okay. Well, so I know you've had a long, illustrious career, but I thought it was it was interesting that you had signed up to join the Master Naturalists and had been trained and participated in the Fort Bend Coastal Prairie chapter. And I was curious how you learned about the group and then what sort of impact that might have had on your education about nature and the creatures to make up.

Barbara Keller-Willy [00:18:17] So, I think, you know, there are certain seasons of life. And for me as an engineer, I was very busy. I traveled nearly 100% of the time when I was working, you know, so meaning every week I traveled somewhere. And then with your family life and whatever, you know, when you have younger children and they're in school, that all takes a lot of time. And interests and hobbies, I think, naturally take a backseat during that time. And, at different points in my career, I don't know that there was time for anything but, you know, career and coming home and doing the things that you have to do, and want to do, with your family and, you know, your own personal interests kind of take a backseat.

Barbara Keller-Willy [00:19:22] And so, there came a point in time where I decided to leave that job with a huge amount of travel and look for something with a little less travel. I do love the travel and I enjoyed, I loved my job. So I was simply looking for something that was a little

less intensive, maybe. And, but I did this in 2009. And, I became that person who left their current job without a future job. And it also happened to be a year when there were lots of other people job-hunting. And I remember I applied for a job and I was one of the top several applicants. I don't know how many. And in the interview process, they told me that there were 303 suitable applicants for that one position. And it made me realize that, that I had left during a time when many others were job-seeking and I decided that I was going, that it might take a little longer than I had expected to move on to the next thing.

Barbara Keller-Willy [00:20:54] And so, I decided that I was going to volunteer and get involved in some other things. And that is how I learned about the Master Naturalists. And I decided, "Well, this is a perfect opportunity." The Master Naturalist program requires a series of classes over several weeks - we're talking like six weeks. And it requires that you go visit certain sites to learn from experts that are brought in for those classes. And when I was working, I knew of the Master Naturalist program, but I didn't feel like I had the time to devote to it.

Barbara Keller-Willy [00:21:43] And so, now, you know, in 2009, with my job, having given up my job, I just decided, well, I'm going to volunteer and I'm going to finally take my Master Naturalist certification. And so, it wasn't exactly in 2009, but in the next couple of years, I finally signed up for that program.

Barbara Keller-Willy [00:22:15] And I loved it. It was all the things that interest me, you know, all the nature-related things. And, it was, it actually became, I would say, part of the catalyst for later growing milkweed even.

David Todd [00:22:38] Yeah. Now, that is something that we really should get into. I'm so curious about your role with milkweed, and so let's talk about that soon.

David Todd [00:22:49] Maybe this is a good time to just talk about the monarch. And how were you first introduced to monarch butterflies?

Barbara Keller-Willy [00:23:01] My first memory of monarch butterflies was following a monarch butterfly. I had a butterfly net as a kid. Remember, I'm wanting to observe things as closely as I could in those museum specimens. I didn't want to pin everything to a board, but I definitely wanted to see it. And so I followed a monarch butterfly, and it landed on milkweed. And there was this seed pod on the milkweed as well. And I remember taking, gathering these seed pods, which weren't ripe at the time. And I took them home and I turned the seed pods into a Thumbelina doll in bed. So that is my very first memory of milkweed. And I wasn't in school yet when that happened.

David Todd [00:24:09] Boy, that is an early start.

Barbara Keller-Willy [00:24:11] That's my first memory. And then over the years, I was also interested in photography in my, especially in my teenage and young adult years. And, you know, in the days of 35-millimeter film, you would put a roll of film in your camera and do your best to adjust everything to get the perfect shot of things that were flying and moving. And, so, I had, I would have envelopes of not-clear pictures. I think I probably took roll after roll of film to get the perfect shots of moving insects that, to get the few that I have.

Barbara Keller-Willy [00:25:09] But then as I, when I had a digital camera, I, just like everybody else who has a digital camera, you know, you end up taking hundreds of pictures,

trying to get that one perfect shot. And I just remember my entire life having either lots of blurry 35-millimeter pictures of butterflies and pollinators - insects, hummingbird moths were another, and hummingbirds. You know, it's difficult to adjust a camera when you're doing everything manually to get that perfect shot. And so I always had what seemed to be many more pictures of insects than the other things that I would take, because, of course, things that were standing still for you or, you know, were stationary were much easier to take pictures of.

David Todd [00:26:10] They understood the challenges that faced a photographer. Yes! Well, good.

David Todd [00:26:18] Well, while we're talking about butterflies, and monarchs in particular, maybe you can introduce us to the life history and the ecological niche that the monarch butterfly might have.

Barbara Keller-Willy [00:26:33] Sure. This is particularly important for Texas. We serve an important role in the monarch's lifecycle, and their needed habitat.

Barbara Keller-Willy [00:26:52] I would say the monarch is considered a multi-generational migratory insect. And what that means is, it has two distinctly different habitats that it uses over the course of a lifetime. And so, it over-winters in the mountains of Mexico, above Michoacan. And in the spring, that butterfly that has over-wintered in the mountains, hanging on the trees together to create warmth, is going to come down off the mountain and begin a migration toward Texas, where it's going to lay eggs.

Barbara Keller-Willy [00:27:52] And then, that butterfly that has lived in Mexico over winter is going to die. And those eggs will produce a caterpillar that grows to become the next, or the first, generation of monarch butterfly. That generation is going to use, the caterpillar will use, our milkweed and the butterfly is going to use our nectar plants as its energy or fuel to move to migrate to its next location.

Barbara Keller-Willy [00:28:34] So, once the butterflies reach Texas, they're going to begin to fan out across the Midwestern and Eastern United States. And the first generation is going to be, take place in Texas, and then those will move on to other locations.

Barbara Keller-Willy [00:29:00] So the second, that butterfly that's going to produce the second generation may move on to, let's say, Oklahoma and, you know, and do that same process again. It's going to lay eggs, then it's going to die. Those eggs become the second generation and that butterfly is going to move northward.

Barbara Keller-Willy [00:29:25] And, until they produce the fourth generation, which is called a super generation. And this is going to be located in, say, southern Canada and the northern United States. This generation is born with immature sexual organs. It's not going to reproduce. Its goal is to return to Mexico, where its ancestor over-wintered last year. It's going to return there to over-winter this next winter.

Barbara Keller-Willy [00:30:08] And so, those different generations of butterflies require a breeding habitat, and then they require this over-wintering habitat. So two different types of niche habitat, if you will.

David Todd [00:30:33] Okay. All right. And many generations, you know, to take advantage of all those habitats, I guess.

Barbara Keller-Willy [00:30:41] At least four: occasionally, there's some discussion that there is a fifth, but there's at least four generations of that monarch butterfly.

David Todd [00:30:55] Okay. And what do you think is the ecological niche for the monarch? What role does it play in the larger natural world?

Barbara Keller-Willy [00:31:07] Well, it performs as a pollinator. So, especially it's going to pollinate our flowers. It's going to help pollinate vegetables as it moves along through its journey.

Barbara Keller-Willy [00:31:33] The other thing that I think we don't always understand is the role that the monarch plays as a food source for other species. And when we're thinking about saving a monarch, sometimes that's alarming to people to talk about how many of them are expected to be a food source for other animals. But scientists estimate that less than 5%, so they say 3 to 5% of the eggs that are produced and each monarch butterfly has about 300 eggs that she can lay. And it's expected that 3 to 5% of those will reach adulthood.

Barbara Keller-Willy [00:32:29] And, in doing so, they are most likely the strongest, fittest, best eggs that that female produced. And so maybe the strongest monarchs survive, whereas the others, especially in the caterpillar stage, become food for all kinds of things. You know, chickadees, it's estimated that it takes thousands of insects and caterpillars for a mama chickadee to produce one clutch of eggs to fledgling. So. You know, those caterpillars are expected to feed frogs and lizards and other insects. And in that way they are also they perform an important function within the food chain as well.

David Todd [00:33:33] So that's really something. We think about is the vividly colored butterflies and caterpillars and how they're just esthetically delightful and yet for a lot of creatures it's food, it's a meal.

Barbara Keller-Willy [00:33:52] Mm hmm.

David Todd [00:33:53] Well now, I think you mentioned this earlier but, but maybe we can go on a little more depth. One of the things that's really remarkable I guess about the monarch is this, this amazing migration that they undertake. And it just seems extraordinary to me that they can cover so many miles over so many generations and navigate, you know, the winds and all the landmarks that they must use to try to get from Canada to Mexico and back again. How do you think they do it? What have you learned?

Speaker 2 [00:34:36] Well, I think most scientists believe that they know their place in the sun and as the days, as the amount of daylight changes, it gives cues to the monarch about migration. Temperature is another: so, as temperatures begin to cool, the butterflies recognize that it's their time to migrate. So, cues in nature mostly related to length of daytime length, temperature, sunlight and that kind of thing, I believe, give them the cues that they need to know that it's time to migrate.

Barbara Keller-Willy [00:35:32] Now, you know, they are also going to use wind patterns and such things as, you know, to help them glide along, so they're not constantly, you know,

beating those wings to fly the whole way to Mexico. And so perhaps there are seasonal winds and things that they also recognize.

David Todd [00:36:03] It's, I guess, amazing that they have all these different cues and clues that may help them not just make the distance, but also navigate the route.

David Todd [00:36:18] And I gather, one of the key parts of that route goes through Texas and that Texas acts sort of like a funnel for much of the migration. Is that right?

Barbara Keller-Willy [00:36:31] It's true. So, the, while there is a California population and scientists do occasionally see some of those as part of the overwintering population. The majority of the overwintering population comes from east of the Rockies, and all of those only enter the rest of the United States by going through Texas on their northward journey and coming back through Texas on their southward journey.

Barbara Keller-Willy [00:37:17] So, in Alabama, for instance, there are East Coast monarchs that congregate at the Gulf of Mexico and await certain wind patterns to cross the Gulf of Mexico into Texas, where they replenish their nourishment and move on into Mexico.

Barbara Keller-Willy [00:37:45] But it's really fascinating the role that Texas plays. And I would go so far as to say that without Texas milkweed and nectar flowers, the remainder of the United States may not have monarch butterflies.

David Todd [00:38:09] Boy. It's, I guess it's important as part of the whole chain of their life.

David Todd [00:38:18] Well, let's talk a little bit about the status of these monarchs. Can you tell us a little bit about the historical trends in the population, how that might have changed over recent years?

Barbara Keller-Willy [00:38:33] Mm hmm. So the, there are lots of different things happening that impact the monarch butterfly and their migration. And in the 2014, 2015 range, scientists petitioned the U.S. Fish and Wildlife to have the monarch butterfly declared an endangered species. In 2016, U.S. Fish and Wildlife began actively investigating what the monarch needed and whether they should, in fact, declare the species endangered.

Barbara Keller-Willy [00:39:30] And so, there are in the area where the monarch overwinter there is logging. There were people who used the oyamel trees, where the monarch overwinter, for heat, wood-burning, for instance. There are people living in that area that use that resource from the habitat to survive.

Barbara Keller-Willy [00:40:04] And then, as you move out into areas where they expect to find milkweed, they sometimes no longer do, because what was previously habitat has now been converted to some other land use. It's suggested that GMO, genetically modified seeds, contribute to the decline in monarchs because it prevents the milkweed from growing in like corn fields in places where the monarch used to find the milkweed.

Barbara Keller-Willy [00:40:52] There are things such as if you've ever, if you're in Texas and you have come down through Dallas or across San Antonio, during migration and you see the number of butterflies that hit your car as they're migrating across highways, you would understand what a detriment that can be to a migratory population.

Barbara Keller-Willy [00:41:26] So all of these things combined and I'm sure there are some others, you know, during our some of our weather events that happen, that take place, during migration can also play a role.

Barbara Keller-Willy [00:41:45] But, all of these things have reduced the number of monarch butterflies. And it was suggested that at one point that across the United States, I think it was 4.1 billion, we needed to produce or plant 4.1 billion additional milkweed plants to bring the monarch butterfly population back to what it was, not at its highest population, but there is a number that scientists have selected, as you know, that they think this should be the goal that we strive and to reach that number of monarch butterflies, we would need 4.1 billion additional milkweed plants across the United States.

David Todd [00:42:49] Boy, that is flabbergasting. That's a huge number.

David Todd [00:42:55] Well, maybe this is a good opportunity to just talk about what some of the promising conservation or restoration efforts might be for the monarch butterfly. It sounds like one would be to try to reintroduce milkweed on a really big scale. Are there other ideas that you've heard of?

Barbara Keller-Willy [00:43:17] Well, I think nectar plants are as important, if not more so important, than milkweed, which is their host plant. So all of these migrating butterflies - I like to say that the butterfly works 9 to 5. So the butterflies use winds to, when winds reach a certain temperature in the sky, so just like the turkey buzzards or hawks and those kinds of birds that glide on the wind, you know, the monarch uses those same winds. And the temperatures have to be a certain degree of warmth for the butterfly to be able to reach that height in the sky.

Barbara Keller-Willy [00:44:13] And so, you know, 9:00 in the morning, they're probably up in the sky now. Temperatures have reached an optimal temperature for the wind patterns to take place and for the monarch to be able to survive up there in those heights. And they're going to glide on the wind, fly until it's about 4:30, 5:00. And none of this is an exact science. You know, it's really about temperature. I just used those hours kind of to say that these are the hours that the monarch is moving and, you know, at beginning of day and end of day, when temperatures reach a certain point that allows for them to travel on the winds, they're going to do so.

Barbara Keller-Willy [00:45:06] And when they "fall out" is the term that we use, when they leave the sky in the evening, they are going to need nectar plants and water in mass. And so butterflies that are migrating often migrate in large numbers. And here in Texas, there are many, many pictures and occurrences of the monarch landing in areas where they're seeking flowers and for nectar and water.

Barbara Keller-Willy [00:45:48] So, you know, they've flown all day and so they're now looking for, to replenish their moisture. So, sometimes, you know, sprinklers go on at the end of the day and people have reported butterflies landing near their sprinkler systems and things such as that.

Barbara Keller-Willy [00:46:16] I mean, there are some questions, you know, do they look for, do they somehow know, that they are going to land in an area that has enough nectar resources for them? Do they typically land at common places year after year? People do tend to see them on natural lands and places, fall-out points, along the way year over year.

Barbara Keller-Willy [00:46:53] So, you know, if it's a large number of monarch butterflies traveling, you know, just a handful of nectar plants aren't going to sustain all of those. So they're looking for places where there's enough nectar for the group.

David Todd [00:47:14] Hmm.

David Todd [00:47:16] Well, so, you've had a special role in propagating milkweed. And I gather that this was not a simple, straightforward kind of challenge. And I was hoping that you could, first of all, explain the importance of milkweed. And you've explained the role that the nectar plants have, but maybe you can just focus in a little bit on, on the character of milkweed that makes it so important to monarchs.

Barbara Keller-Willy [00:47:54] Sure. When the monarch butterflies come from, come down off the mountains in Mexico and they migrate here to Texas, that monarch, that female monarch butterfly, has approximately 300 eggs in her body. And she is going to be seeking enough milkweed to lay those eggs. Hopefully, ideally, she can lay one egg per plant and she will meander, trying to find milkweed, enough milkweed, to lay those eggs. If they find themselves in a situation where there's not enough milkweed, or maybe they feel that they're not going to make it any further, then they may lay more than one egg per plant. But most years, when we see them migrating, you will find about one egg per plant.

Barbara Keller-Willy [00:49:06] So she is seeking 300, just one butterfly, is seeking about 300 different milkweed plants where she could lay one of her eggs and that milkweed is said to be a host plant. It is the only plant that the monarch butterfly caterpillar can eat to survive and become a butterfly. There is no alternate plant that will feed a monarch caterpillar.

Barbara Keller-Willy [00:49:41] Those caterpillars go through five stages or instars, five stages of growth. At the very tiniest, you know, they're not eating a lot. But as they begin to grow, and, as when they reach that fifth instar stage, they are just an eating machine. And in certain kinds of milkweed, it's said that that to get one caterpillar to chrysalis stage would take about 42 milkweed leaves. Some of our native plants, some of our native milkweeds are a little thicker. You know, they have a little thicker leaves that may be fewer than 42, but on average, it takes a lot of milkweed to grow monarch caterpillars.

David Todd [00:50:49] And my understanding is that the milkweed not only provides them with nutrition, but that it provides them with a kind of chemical that makes them resistant and maybe toxic to predators. Is that right?

Barbara Keller-Willy [00:51:04] That's true. So different kinds of milkweed have something called cardenolides. And those cardenolides produce the toxicity in the monarch butterfly. And the reason this is important is because the, the, for instance, if a bird kills a monarch or eats a monarch butterfly, they will often vomit when after they've eaten it due to this cardenolide or toxicity in the butterfly. And as a result of that, birds and other predators learn to recognize that you don't eat that orange and black butterfly because that will make you sick. And in that way, they are protected from predators.

Barbara Keller-Willy [00:52:06] And the queen butterfly does that as well. The queen butterfly mimics the orange and black of the monarch butterfly and also hosts on the milkweed plant. But they both are able to be, they gain a certain protection as predators learn not to eat them because they will be ill.

David Todd [00:52:36] It's interesting: a little bit of chemical warfare, I guess.

David Todd [00:52:41] So, tell me about how you rose to the challenge of figuring out how to understand how these milkweed were actually grown from seed. And I understand that you had to figure out some issues with mycorrhizae and phosphorous and other aspects of of cultivating these plants.

Barbara Keller-Willy [00:53:13] Yes. So, I was volunteering to grow plants for restoration. And it was one of those activities after I had given up my job, or left my job, that I just used to fill my time. I'd gardened with my grandparents since I was three or four years old. And I love it. But I, while I was working and traveling didn't have, didn't do as much of it as I liked. And so I knew that when I, once I had more time at home, I wanted to become involved in gardening in some way again.

Barbara Keller-Willy [00:54:00] And so, I was growing some native plants for restoration purposes and I happened to be part of a group that was planting seed in a prairie restoration. And I, I remember the group saying, and they would occasionally buy a few plants and then plant lots of seed. And this was an ongoing, you know, years' worth of labor of love kind of thing kind of project where they eventually wanted to have a pocket prairie.

Barbara Keller-Willy [00:54:42] And so they said, "Gee whiz, I wish we, it's a shame we can't have native milkweed. You know, this site would really be beautiful with native milkweed." And I said, "Well, why can't we? Why can't we just grow some?" And I remember every head, and there might have been, I don't know, eight or ten people with me. I don't remember how many exactly. But I do remember that every single one of them turned to look at me with a look that said, "Oh, she doesn't understand."

Barbara Keller-Willy [00:55:16] And they said, "You can't grow native milkweed. Nobody has, none of us have figured out how to how to grow it and then make it survive when you planted in the ground." And I thought, "Nobody?" Like really, that can't be true. And I kind of, you know, wrote off what they were saying and thought that isn't true.

Barbara Keller-Willy [00:55:43] And so, I, my particular kind of engineering, was continuous improvement engineering. And, what that is, is any kind of... You're taught that you can facilitate problem-solving of any kind, that you can basically solve anything, if you get the process experts and the right people in the room. You're taught that you can facilitate problem-solving. And, you know, having had a lot of success over the years of solving various problems, using a problem-solving process or a specific, methodical set of steps, I thought, well, we'll just do you know, we'll just do that. We'll use this problem-solving method to solve whatever the issue is with growing these plants.

Barbara Keller-Willy [00:56:54] And so, you know, without really committing to them that I was doing it, I collected some seed, and I think about 300 seed, and planted them. And maybe three grew. And, you know, so of those 300, I ended up with about three plants. And those plants didn't survive very long.

Barbara Keller-Willy [00:57:33] And so, I realized at that point that this was going to be a little more complicated than I thought. And so, I took that problem-solving process, and I set up an experiment, if you will. And I just started systematically looking at every plant that had failed. I created a database. I gave each plant a number. I put each plant that died under a

microscope and tried to do failure-mode analysis to, you know, I kept at that time referring back to my work training. And, you know, I was going to do failure mode analysis. I was going to figure out why this plant died and I was going to put some corrective action in place to make sure that didn't happen next time.

Barbara Keller-Willy [00:58:34] And, I was working with a group of Girl Scouts at the time, and they were kind of trying to do what I was doing. I mean, for the growing part, they were trying to grow milkweed along at the same time as I was, and they were not doing very well with it. A lot of their plants were dying and the girls were discouraged.

Barbara Keller-Willy [00:59:05] And, you know, so I realized the, that I don't want to say that I created new gardening or new propagation techniques or things that had never been used before in propagation. It wasn't that kind of work that I was doing, but rather it was for your average gardener, who isn't a scientist, and doesn't have a horticulture degree, and doesn't have access to lots of specialty greenhouse products, how do we, what process would allow them to be most successful? That's what I was trying to create.

Barbara Keller-Willy [00:59:56] And what process would allow kids who have this affinity with this monarch butterfly that almost all of them recognize want to do something? How do we help them do something to feel like they're helping the monarch butterfly? You know, if we give them milkweed seed and it dies, well, then that isn't the message that we want to leave our children with, I don't think. And so I wanted to be sure that whatever method I created, kids would be able to do in school as well.

Barbara Keller-Willy [01:00:35] And so, as I put them under the microscope, I just started noting the reasons why this failed. And consistent moisture, you know, was probably the number one thing that I found. So, seedlings need consistent moisture, but consistent moisture lends itself to dampening off and, you know, mold and other types of things.

Barbara Keller-Willy [01:01:11] So, I started messing with, or experimenting with, different types of soil and additives. And, at some point, I began putting not only the failed milkweed under a microscope, but I began digging up living milkweed species so that I could understand and recognize in their root structure maybe things that were different that the root structure in the ones that were dying did not have, so I could compare and maybe make some kind of, draw some kind of, conclusion from that.

Barbara Keller-Willy [01:01:59] And so, part of understanding, part of being able to, analyze a tiny little root structure meant that I sometimes injected dye into the roots. And when I did that, I was able to see the mycorrhizae. Now, there are some places in Texas where if you, where certain plant communities, you're able to see mycorrhizae, you know, with the eye.

Barbara Keller-Willy [01:02:34] But, there's few of those. And it's more likely that when you look at your plants, you see roots, but you don't necessarily see the mycorrhizae.

Barbara Keller-Willy [01:02:44] And so, I realized that at a certain age all the successful milkweed plants had mycorrhizae. And there is, scientists believe about 80% of the plants are mycorrhizae-obligate, meaning they require some species of mycorrhizal to survive. And mycorrhizae is a fungi that pierces the roots and then it grows beyond your root system. And it, in return for taking some of the sugar or carbohydrate out of the plant to feed itself underground, it in turn gives the plant moisture and nutrients from its extended reach. So its roots, or it reaches further than the plant's roots do.

Barbara Keller-Willy [01:03:51] And so then, I began looking at adding mycorrhizae to the soil. And, you know, at first I didn't understand that the plants were mycorrhizae- obligate. That came a little later. But anyway, as I worked through, I learned different bacterium and fungi that needed to be in the soil for that milkweed plant to survive. I learned that dampening off was caused by certain bacteria or fungi. And if you had other bacteria and fungi in the soil that could counter that, then that wouldn't happen.

Barbara Keller-Willy [01:04:35] And so, I just took these failures one by one and either added something to the soil or adjusted the process in some way, so that I could make recommendations that if you use this soil with these things added, then I can guarantee that if your seed is viable, you are likely to produce a plant.

Barbara Keller-Willy [01:05:04] And so, I was able to produce hundreds of thousands of milkweed plants. I have pictures of driving around with a 16-foot trailer, you know, full of these little tiny milkweed plants on the back and delivering them to schools and different locations.

Barbara Keller-Willy [01:05:29] And then, after several years, I would go back with the hope of collecting seeds from that site to grow more milkweed. And what I was finding was that a lot of them did not survive long-term. And so, for me, successfully growing milkweed means from seed to a plant that survives five years in the ground, in its habitat.

Barbara Keller-Willy [01:06:05] And so, I began then analyzing the soil in these locations where we were going to put the milkweed and in some cases adjusting the content of that soil, and maybe companion plants and other things, to allow the milkweed to be successful in that habitat, long-term.

David Todd [01:06:38] That's so interesting. And I guess of all these native prairie plants grew in a whole context of bacteria and fungi and mycorrhizae. And it's not as simple as just putting it in, you know, a pot and putting some water on it. So it needs a lot more inputs.

David Todd [01:07:08] Well, now, you know, one thing that struck me was that not only were you learning how to grow these plants and growing them, that you were distributing them to students and others that would actually put them in the ground and create these habitats that you were trying to promote for the monarch.

Barbara Keller-Willy [01:07:31] Yes. That was true.

David Todd [01:07:33] Could you please tell us about that work?

Barbara Keller-Willy [01:07:34] Yes. So I took ... well, one year my husband gifted me with a non-profit. He said to me, "Why are we paying retail for all this stuff that you are buying and just giving away?" And he said, "At a minimum, you know, you need to be buying wholesale. And, you know, so let's create this non-profit where we can begin to just not pay premium prices for some of the stuff that you're doing.".

Barbara Keller-Willy [01:08:16] And that was really how Monarch Gateway was born.

Barbara Keller-Willy [01:08:22] But, once I had a non-profit, that wasn't something that was in my mind back when I was just trying to grow these milkweed. I was trying to, you know, get

them to survive in their habitat. And I was more focused on that problem-solving process than, you know, how much I was spending. And we would have dump truck loads of dirt delivered to our cul de sac in Sugar Land. And, you know, so there was a cost associated with it, certainly.

Barbara Keller-Willy [01:08:57] And I'd take it by wheelbarrow full back to the back because, you know, in Sugar Land, I live in a suburban community and all the yards are fenced, so there's not a way for a dump truck to, you know, dump it in your backyard.

Barbara Keller-Willy [01:09:17] And then, I eventually started using a soil blend and had that delivered. And so, you know, I ordered pots, and I ordered plant trays and labels and just all kinds of things to make this all work. And I was giving it all, you know, I was paying for all of it and then giving it away, to the tune of hundreds of thousands per year for those first probably four or five years.

Barbara Keller-Willy [01:10:03] And so then, I realized that once I had a non-profit that I could begin to look at this on a bigger scale. And then, you know, sat down and took a step back and decided that I would look at what do we want to do with the non-profit and how do I want to maybe categorize or focus on particular areas. You know, where do I want this milkweed to go?

Barbara Keller-Willy [01:10:41] And the milkweed that I was selecting, to complicate it even further, at that time, I was, as I learned how to grow this, I was going all over the state of Texas and I was teaching others how to grow milkweed, and or teaching them what I knew at that point in time. And there were some people who would follow me several places across a year. You know, I might see them in San Antonio and in Austin and in Lubbock or some, you know, I couldn't believe people would travel.

Barbara Keller-Willy [01:11:19] And, when I'd asked them why, they'd say, "Well, do you realize that you tell us what you've learned since the last time we saw you in each new presentation." And I did realize I was doing that. You know, as I ... I didn't hold anything back. I just taught everybody everything I knew at that point in time because my goal was not to create, my goal wasn't to make money with it.

Barbara Keller-Willy [01:11:50] My goal was, you know, if if the butterfly has to wait for somebody to come up with the money to pay for enough milkweed to be planted, then that's not going to work. So what I thought needed to happen was as many people, feet on the ground, as were willing to put milkweed in the ground needed to do so.

Barbara Keller-Willy [01:12:18] And, for that to happen, they needed to know how to do it.

Barbara Keller-Willy [01:12:22] And then, if they were a school, if they were a certain kind of organization, if they had a community garden, if they had a school garden, if, you know, whatever, I would give them milkweed that I grew.

Barbara Keller-Willy [01:12:43] And then, I just wanted to monitor it. So, I didn't want anything in return. I didn't charge them for any of it. I just wanted to be able to come back and monitor whether the milkweed survived.

Barbara Keller-Willy [01:12:58] And so, that required... So, as I sat back and then I began thinking in terms of, well, if I do, if I take one load of milkweed to Lubbock, and I take one to

Dallas and I take one, you know, south of Sugar Land somewhere, is that really going to help the monarch butterfly? Probably not. It may help the handful of butterflies that happen to be in that area.

Barbara Keller-Willy [01:13:30] So, I began looking at Texas in a way to figure out was there some, was there some way to divide the state into sections and then begin to observe or monitor or document what habitat was there and maybe grow out from that habitat to fill in an area.

Barbara Keller-Willy [01:14:06] During the same time frame that all this was happening, I sat through a presentation with the Jha Bee Lab from U.T. and she presented that some of our native bees, if they have to travel two miles to obtain nectar, they would die. So their nectar sources have to be within a mile of their nest or their hive or their home, depending upon the kind of bee they were.

Barbara Keller-Willy [01:14:47] And so, early on, I began campaigning not just for the monarch butterfly, but I would talk about all of these other species of pollinators that also needed habitat.

Barbara Keller-Willy [01:15:03] And so, all of that led me to the Texas Council of Government Regions. So, Texas is divided into 24 different government regions. And I worked with, or talked with, Dr. Fred Smeins with Texas A&M, who, I won't say I was working under him or even with him, but he certainly sat down with me and listened to my ideas and advised me on whether he thought what I was doing sounded good or if I was on a reasonable track or not.

Barbara Keller-Willy [01:15:49] And so, I laid out Texas in these government regions, and then I began looking at state parks and I looked at, I began mapping in ArcGIS, I mapped, I took layers of mapping that already exists - so right of ways, train tracks, gas lines, state parks. I just began creating these layers after layers of habitat, or potential habitat, and then identified places where I had groups of people who wanted to create habitat and furthermore, where there were groups of people that might take over some kind of leadership or feet on the ground.

Barbara Keller-Willy [01:16:52] You know, because one person can't do it all. Nor did I want to do it all. I just wanted to kind of be a catalyst to say this is possible. That milkweed that you thought wouldn't grow, it does grow. You can do it.

Barbara Keller-Willy [01:17:09] And, I had to prove that to people by giving, I'd carry dirt, I'd carry bags of dirt into presentations. I'd carry seed. You know, I brought hand trucks full of stuff. And I'd do these presentations and I'd send people home with bags of soil and pots and seed and, you know, I'd give them nectar seed and all kinds of stuff to change that mindset from "No, we can't grow Texas milkweed", to "Oh, yes, I was successful in growing that.".

Barbara Keller-Willy [01:17:47] And then, creating the, and documenting the, larger goal, which was, you know, habitat in each of these 24 government regions.

David Todd [01:18:02] Well, that's really clever. So you were trying to, I guess, prioritize planting by using these corridors, I guess, where there's a railroad.

Barbara Keller-Willy [01:18:11] Yes.

David Todd [01:18:11] Right of way, or road or a gas pipeline or whatever. And then finding folks to adopt each of those areas to really take some leadership in those regions.

Barbara Keller-Willy [01:18:24] Yeah. And initially it was where there was activity already going on, you know, getting them to include milkweed as part of their activity.

Barbara Keller-Willy [01:18:38] But later, yes, it was taking on some of these corridors and in talking with Dr. Smeins, you know, beyond just the monarch butterfly - a prairie, for instance, has a life span of a couple hundred years if it's landlocked. So unless, you know, back when Texas was predominantly prairie, we had bison that migrated from across the United States that would bring seed that they were carrying on their hide, you know, and then they got down here and it was warm. And so, they'd shed some of that hide and those seeds would drop and that would introduce new DNA, introduced into our prairie systems.

Barbara Keller-Willy [01:19:36] But as our prairies are becoming more and more isolated or landlocked, if you will. The opportunity for seed to come into them, so for new DNA to come in to them, is fewer than used to happen.

Barbara Keller-Willy [01:19:57] And so, these corridors can play an important role. And so these movement corridors, I would say, can play an especially important role in even the preservation of the prairies that exist today.

Barbara Keller-Willy [01:20:19] And, it's said that less than 1% of what used to be exists today. So our prairies have diminished to less than 1% of what used to exist.

David Todd [01:20:34] Boy, it's a sobering thought.

David Todd [01:20:36] Well, so I think that while you've certainly done a lot with nectar plants and with milkweed, it sounds like you've also been active in in trying to restore a prairie. I think you've been active in Milam County, like a 90-acre tract up there that's a blackland prairie that you've been trying to restore. And maybe you talk to us a little bit about what that's involved.

Barbara Keller-Willy [01:21:03] Sure. So, I have to say that, before I start that, I have to say that, for me, if you could imagine the something, some gift that you think or something that you dream of obtaining, like if you won the lottery, what would you buy? Would you buy a Maserati? Would you buy a, you know, I don't know, something. If you imagine something like that, that is how I feel about the, about this prairie that I am restoring.

Barbara Keller-Willy [01:21:47] When I pull up, I am giddy almost every time, still. It is fascinating to me, the kind of the hold that ... I don't know whether it's just the land or whether it's the investment of, you know, all the things that I've done with this land. But it is my, for me, that land is like winning the lottery. Like, I can imagine that must be for somebody else.

Barbara Keller-Willy [01:22:31] And so, I approach this with a lot of love. And this land was a family property. And we purchased it. And we set aside 92 acres as a blackland prairie pollinator habitat. And what that means is that every land management decision that we make, or practice that we implement, has to be pollinator-friendly.

Barbara Keller-Willy [01:23:07] And there are lots and lots of different practices that you implement if you're a land manager. You know, there's invasive control. So deciding what is an invasive species versus not. Some of this land was farmed in the past and some of it was never farmed. So there are some patches of native habitat there, and it consists of a small wooded patch and land along a stream. So you have wetland. You have typical blackland prairie soil, wetland and some wooded area.

Barbara Keller-Willy [01:24:01] And the first thing that I did there was began restoring what was farmed to match the native blackland prairie habitat. And along the way, somewhere along the way, you know, we took video as we were doing this and we had mesquite trees that had been, that had taken over some of the land because nothing, you know, the grassland was not preserved. The land had previously just been allowed to grow as it would.

Barbara Keller-Willy [01:24:45] And so, I removed the trees that were preventing the prairie from remaining a prairie. And, you know, because we had mesquite trees there, that will probably be something that I will be continuing to do the rest of my life, because some of those seeds are, you know, in the seed bank. And so that continues to be one of our maintenance projects.

Barbara Keller-Willy [01:25:15] And, we've done everything from putting live stakes in the side of a soft bed stream bank, to tree removal, to invasive grass removal. We don't have a huge amount of invasive grasses or invasive species that are there, but we do have some.

Barbara Keller-Willy [01:25:43] And so, every year we make decisions about how to remove those invasive species without impacting the soil. Lots of herbicides that you could use remain in the soil for a long period of time and would prevent some of the grasses and other plants that I've worked to grow would prevent them from growing.

Barbara Keller-Willy [01:26:09] So, I'm very careful and I get lots of expert input from different organizations or people on how to maintain this going forward.

Barbara Keller-Willy [01:26:25] We have an abundant bird population.

Barbara Keller-Willy [01:26:30] We have, we monitor the host plants we have.

Barbara Keller-Willy [01:26:35] We do counts of butterflies across that whole 92 acres. We have some rare butterflies that frequent the property.

Barbara Keller-Willy [01:26:51] So I think my goal, my end goal, would be that I would someday be able to bring people there, other landowners, and say, "This is how we achieved a pollinator-friendly habitat, while doing all of the ordinary land maintenance things that every landowner is faced with doing every year."

David Todd [01:27:23] That's great. So it could be a real teaching tool. Well, so that would be a project sort of focused on, I guess, mostly on other landowners.

David Todd [01:27:33] But I think that you had worked on something at another stage called, or near Meadow Place, and I think that you said that it was a real opportunity to learn about the role that municipalities, governments in general, play in preserving habitat and helping monarchs and other species. And can you talk a little bit about that and those partnerships that you learned?

Barbara Keller-Willy [01:28:02] Sure. So one of the phrases that we came up with after looking at the government regions, those 24 government regions, we decided that if we did this partnership, host city partnerships. So lots of cities have signed up to be monarch host cities, and a lot of those cities have activities that they have planned. And some that didn't sign up, maybe didn't because they couldn't commit to the number of years that they had to maintain the habitat and such.

Barbara Keller-Willy [01:28:58] So, we worked with both. We've worked with cities that have signed up to create monarch habitat and cities that didn't sign up, but had citizens who were interested in creating habitat within their city.

Barbara Keller-Willy [01:29:16] So, every city has parks. They have various right-of-ways. They have gas lines. They have water lines. They have various infrastructure. They have power lines that come to their cities.

Barbara Keller-Willy [01:29:33] They have, often have, flood control projects. And especially as we think of all the huge 500-year storms that Texas has had in recent years, we are aware of how much maybe flood reimbursement moneys that come in as part of disaster, national disaster programs that come into our area to refurbish land that was impacted by these storms and things.

Barbara Keller-Willy [01:30:11] So, municipalities or cities all have some of these little slivers, or, and in some cases, maybe big slivers, but they have these slivers of land that are otherwise often unused. So they may be mowed and they sit there and often were just plain greenery.

Barbara Keller-Willy [01:30:38] And I worked with cities early on to create pollinator habitat. We provided, we often provided, seed. We've paid or have done ourselves seeded properties.

Barbara Keller-Willy [01:30:57] For me, one of my other, you know, if, so I currently look out at people who think of cars as a big goal for the future. I think of tractors. I look out across the world and have tractor envy and seed drill envy. Those are pieces of equipment that are necessary for creating, for seeding grasses where, and flowers where, there currently are none.

Barbara Keller-Willy [01:31:32] And, but those kinds of equipment are not readily available in either municipal, you know, in their host of equipment that they own or that they're planning to purchase. And so, sometimes the cities want to create habitat but can't because they don't have the equipment to do so.

Barbara Keller-Willy [01:32:02] And so, by creating partnerships that bring together the city land, the appropriate equipment to do the project, the seed and other resources, we are able to create habitat, especially in areas. I just have a special affinity for the, what used to be, prairies. And so, in a lot of the areas like Meadows Place and other areas that I've worked, there used to be prairies there. And so, by, we've, at this point provided hundreds and hundreds of pounds of seed to various groups to grow native grasses and the nectar sources or the native forbs.

Speaker 1 [01:33:06] Well, you mentioned native forbs, and I think that we might just get your view about, you know, well-meaning people who have sometimes tried to support monarchs by planting non-native tropical milkweeds. And I've heard there are some drawbacks about that. And I was hoping that you might be able to sort of explain the nuances of tropical versus the more native species of milkweed.

Barbara Keller-Willy [01:33:37] Sure. You know, when I began thinking about monarch and milkweed, it was probably 2010 for me. And at that point in time, there was not a place where I could go to buy native milkweed that I knew of, heard of, could find on the internet.

Barbara Keller-Willy [01:34:04] I remember a gardening friend ... and I didn't really tell people that I was, that I was thinking about trying to grow native milkweed back then. But I remember a gardener asking me, "Do you have milkweed at your house?" And she said, "I have a lot. Would you like to come see my milkweed and I'll give you some?" She said, "You just pull it out of the ground and you plant it.".

Barbara Keller-Willy [01:34:31] And so, I remember visiting with her, and it was, of course, tropical milkweed.

Barbara Keller-Willy [01:34:37] And so that was readily available in the nursery business, you know, all along. So, when people began thinking about helping monarch butterflies, tropical milkweed may have been the only milkweed that was available to them.

Barbara Keller-Willy [01:34:57] So, I don't want, I don't want to be too critical about if you had it, okay, I understand how that came to be.

Barbara Keller-Willy [01:35:08] But, as we've gone along here, scientists have learned a lot about the tropical milkweed. Some scientists believe that the tropical milkweed being available during the fall migration causes monarch butterflies to fall out of the migration and begin to lay eggs here in Texas, and which creates an overwintering population of monarch that are almost always 100% OE-infected.

Barbara Keller-Willy [01:35:51] So OE is Ophyrocystis elektroscirrha. OE is a protozoan that.

Barbara Keller-Willy [01:36:07] [Could we stop for a moment?

David Todd [01:36:08] Sure, of course.]

Barbara Keller-Willy [01:36:12] So the. Ophyrocystis elektroscirrha is the scientific term for the OE that is a protozoan that is contracted by butterflies on the tropical milkweed.

David Todd [01:36:41] I see. Okay. Yeah, Go ahead, please.

Barbara Keller-Willy [01:36:45] Yes. So, other scientists have proven that tropical milkweed is a very high cardenolide milkweed, and that higher cardenolide milkweed is detrimental to monarch butterflies being able to survive the trip to Mexico to overwinter.

Barbara Keller-Willy [01:37:19] So, scientists think that each different kind of milkweed has a cardenolide value or an amount of cardenolide that it carries, some of them such tuberosa. So Asclepius tuberosa has almost 0% cardenolide. Others have very high rates. Some of our

native Texas milkweed have cardenolide values that range in the 3 to 5 hundreds, which would be considered a medium value cardenolide.

Barbara Keller-Willy [01:38:09] And that makes sense because many of the overwintering butterflies in Mexico, when they do DNA analysis, they are able to determine that they were fed or that they, as caterpillars, they ate some of our native Texas milkweed.

Barbara Keller-Willy [01:38:31] And so those medium-value milkweeds are said to be healthiest for the monarch butterfly. The higher cardenolide value is very hard on the body of the monarch butterfly, and many of them that consume tropical milkweed will not end up making it to Mexico to overwinter with the migratory population.

Barbara Keller-Willy [01:39:09] So, it is recommended that, if you have tropical milkweed, that you, that you cut it back to six inches or less before the fall migration, or that you pull it out all together and treat it as an annual if you are going to have tropical milkweed.

Barbara Keller-Willy [01:39:39] But, we've also discovered that tropical milkweed poses problems in the spring for the migratory population. In that tropical milkweed in many areas of Texas will grow all year round. It does not die back.

Barbara Keller-Willy [01:39:59] And so, OE is a protozoan that is going to reside on the abdomen or the wings of a monarch butterfly. And as the monarch butterfly flits around a plant seeking a place to lay eggs, those protozoan will be dropped on to the leaves of the milkweed plant. Or, when she lays an egg with a sticky egg sac, some of the protozoan will fall off of her onto the egg sac.

Barbara Keller-Willy [01:40:35] When the caterpillar emerges, chews its way out of that egg sac, it is going to chew those dormant protozoan, which will then become active once they're in the gut of the caterpillar. And then, that caterpillar becomes an OE-infected butterfly for the rest of its life.

Barbara Keller-Willy [01:40:57] In some cases, depending upon the level of infection, they may not be able to become a butterfly. They may not be able to form a J to begin to go into a chrysalis. They may emerge looking normal, but be missing toe pads which they use to detect nectar and milkweed.

Barbara Keller-Willy [01:41:25] Or, their proboscis is in two pieces when a butterfly emerges. And they need to put that together, kind of like a straw. If you could imagine putting two pieces of a drinking straw together and OE sometimes causes malformations in that proboscis. So, you may have a butterfly that looks normal but can never really eat or seek nectar because its proboscis is malformed.

Barbara Keller-Willy [01:41:58] We also know that because the tropical milkweed does not die back in the winter, that when spring comes along and the migratory butterflies come, our native milkweed is just beginning to peek above ground. The butterfly probably knows that there's milkweed there before you have noticed that it's above ground. And they will often lay an egg on just a little tiny shoot that's coming up out of the ground. And then, as that plant grows and the caterpillar grows, of course, there's enough milkweed there for that caterpillar to continue growing.

Barbara Keller-Willy [01:42:41] But in the case of tropical milkweed, there's this big, bushy plant and they lay eggs on it. But, a lot of the milkweed leaves have that dormant protozoan just laying there in wait for a butterfly or for a caterpillar to eat those leaves. And so in that way, having tropical available for the spring migration can infect the migratory population with the OE protozoan in ways that they weren't previously.

Barbara Keller-Willy [01:43:24] So, the mother migrates here, does not have OE, but lays eggs on tropical milkweed, which has these dormant protozoan from other infected butterflies. And the caterpillar eats it and then becomes infected. So, in that way, tropical milkweed can negatively impact our migratory population, as well as those who fall out and remain in the area in the winter.

David Todd [01:43:58] Well, that's a very persuasive argument against these tropical milkweeds and of course, the OE and the impacts on breeding timing and migration and and the, you know, toxicity problems that they engender.

David Todd [01:44:17] Well, let's talk about some of the educational efforts that you've been involved with, and some that you may be aware of and can tell about. I was really curious to learn more about the Monarch Madness Festival that I think happens not too far from you in Sugar Land at Brazos Bend State Park. Can you tell us much about that?

Barbara Keller-Willy [01:44:40] So Monarch Madness was an effort, or was a program, I guess, where we created many different exercises and activities that were butterfly-related. So, I worked with a group of scouts and their families for the very first one, and we created this fall festival where people could come to visit and participate in all kinds of free activities. So, they could paint a butterfly. They could create an insect mask. They could see different kinds of monarch butterfly. They could see monarch butterflies, but also other species. They could buy plants. They could see the life cycle. They could play games that use the life cycle. We had plush monarch wings and kids participate in a mock monarch migration wearing these plush monarch butterfly wings. That is very beautiful to see.

Barbara Keller-Willy [01:46:08] And so, it is a family-friendly festival where people can learn all about not only the monarch butterfly, but other pollinators as well. And together with that activity or with that festival, we give a scholarship as well. So, it can be, depending upon where it's held, so, it's been, there's been Monarch Madness festivals in different places and different places continue to do them. But the goal here was to create this notebook, if you will, of activities that can take place anywhere.

Barbara Keller-Willy [01:47:10] So, any community in Texas that has people who are interested ... well, any community anywhere, I guess, but, you know, those that have happened have been here in Texas. They can take all of these activities that have been created and documented and written up and telling you what supplies are needed and that kind of thing. They can create these festivals in their community. And the goal was to kind of create a plug-and-play, here, we can give you all of these materials so you know how to replicate these activities.

Barbara Keller-Willy [01:47:55] And a lot of the time I will load up a trailer and, you know, I have screens that have butterflies painted on them that kids stand behind and put their face in the hole to take their picture with butterflies, you know, and different things like that. So I'll load up a trailer and travel to where these festivals take place.

Barbara Keller-Willy [01:48:19] But, in general, the goal is to create a festival around pollinators with there's more than 100 activities in the books that could be done anywhere in Texas. And it predominantly deals with Texas butterfly species. So, some of the other additional activities may center around butterflies that would be in your area of Texas. So, you know, some of it can be specialized to a particular area in Texas as well.

David Todd [01:49:06] Well, that's great. And I love the way of having this sort of template that you can, as you said, plug and play in different communities. I think that I had heard about it occurring in Brazos Bend State Park. But can you mention the other locations that some of these festivals have occurred?

Barbara Keller-Willy [01:49:25] Mm hmm. So it has taken place in Meadows Place. It has taken place in my Milam County. It has taken place in, ooh, it has taken place in West Texas, near Midland. And we had a few places, not in Dallas, but in surrounding communities around that area as well. We had a few places.

Barbara Keller-Willy [01:50:06] And, I would say that the other thing that can happen is, depending upon the number of people that are participating, you could have a large fair-type activity. At Brazos Bend, at the very first one, I would say that we had about 50 volunteers working the festival and then we had invited other groups to participate. So we had somebody selling plants. We had, you know, we had invited other groups to come and set up their own booth for which they would be responsible. And, but we had, I know we had over 1200 people come through the festival in one day.

Barbara Keller-Willy [01:51:01] And then, there have been others where there was one put on in Sugar Land that was more of an HOA activity. So a little smaller scale, fewer people, you know, but a butterfly festival just the same. So, with these activities and the way the template is set up, you could be a small group that has a festival and then continues to grow it. Or, you could be a large group that wants to put on a festival that has a wild factor, you know, right from the beginning. It just depends on the number of people that you have participating.

David Todd [01:51:55] Well, that's great. It sounds very flexible and adjustable to whatever the venue or the group might be.

David Todd [01:52:05] Well, and something else that I've heard you talk, you know, through the last bit, has been the monarchs are part of a whole group of pollinators. And I was wondering if you could sort of talk about the relationship between the monarch and the other butterflies and moths or hummingbirds, for that matter, that might be also involved in pollination.

David Todd [01:52:32] On the one hand, I've heard that monarchs are accused of distracting from attention that might go to these other species. They're sort of the star, you know, the diva. And then other people say, "No, no, these monarchs are sort of a wonderful door, an opening, to get people interested in the whole phenomenon of pollination and all the species that are involved in that.".

David Todd [01:53:00] What do you think about that, you know, the role of monarchs versus other pollinators?

Barbara Keller-Willy [01:53:08] So, I do believe that, I would understand why somebody might think that the butterfly, that the monarch butterfly, gets all of the attention. Certainly

when there's a determination, a Fish and Wildlife endangered species determination being made, there is a lot of effort and focus and a lot of press around the species that's being considered.

Barbara Keller-Willy [01:53:41] And I do think that it's fair to say that the monarch takes some of the money and attention away from species that maybe people should be working on saving as well.

Barbara Keller-Willy [01:53:59] But, you know, not every ordinary citizen out there is going to recognize a native bee species or feel as maybe emotionally tied to that bee species as they do the monarch. Almost every child in grade school that I have encountered knows what a monarch butterfly is. I don't think I've ever walked into a classroom or a small group of kids and had to explain what a monarch butterfly is.

Barbara Keller-Willy [01:54:44] And, just as that's true of today's kids, that's probably true of previous generations of people as well. So the, a mayor here in Sugar Land talked about going dove hunting in south Texas, and he had to stop because he couldn't see to aim during dove hunting because this cloud, or kaleidoscope as a group of butterflies is called, or a group of monarch butterflies, this kaleidoscope of butterflies came across the field where he was dove hunting. And he, you know, he relayed that story to me probably 15 or 20 years after it happened. And he could remember it fondly as though it happened yesterday.

Barbara Keller-Willy [01:55:40] So, I think many of us, for many of us, that image of the monarch butterfly holds a place that maybe an endangered bee, or some other species that we've never seen, isn't going to hold in our hearts and our memories and our emotions. So while that other species may be deserving of money and efforts, you know, there's not as many people know about it.

Barbara Keller-Willy [01:56:16] And so, when you are trying to get people to participate in a conservation action, there has to be a certain momentum on their side. You know, it can't all be forcing the message out into the community and trying to make something happen. You know, there has to be a place where the message meets with people who also want to participate.

Barbara Keller-Willy [01:56:51] And so, I think that by, I think the monarch does feel the role of an ambassador for all pollinators.

Barbara Keller-Willy [01:57:04] And especially if we're talking about creating habitat, it's easy to teach people who want to see monarch caterpillars on milkweed that they also need the nectar plants for the adult butterfly. And oh, by the way, if you're going to create this habitat for this monarch butterfly, do you know that if you add prairie parsley and you add pipe vine and you add Joe Pye weed over here, or a sassafras tree that you're going to attract these other species.

Barbara Keller-Willy [01:57:51] You know, so it's easy to create a nectar bed or a nectar garden or a field of nectar plants that will support many, many different pollinators as well as the monarch butterfly. But it's often that monarch butterfly that they reach out to you and say, "Hey, I want to create some monarch habitat. What are your recommendations for planting?" You know, and then once they're interested in that, they will often learn that many other species will come to visit.

Barbara Keller-Willy [01:58:29] It's been said that diversity begets diversity. And so, if you want the monarch butterfly, you would be more successful in attracting the monarch butterfly by having a diverse set of nectar plants and other species so that the monarch butterfly sees other species flying around. It seems that lack of other species in your habitat denotes maybe not enough food or not enough resources of some kind. But if there are lots of different insects and lots of different plants, then you will collect all kinds of other visitors to your habitat.

David Todd [01:59:24] That's a wonderful insight. I love that, that it's sort of like a form of advertising.

Barbara Keller-Willy [01:59:31] Yes.

David Todd [01:59:32] Well, so, let me just ask you one more question. You've been so patient with us.

David Todd [01:59:38] You know, most of the conversation has been about monarch butterflies, although you mentioned, you know, other creatures as well. But I was wondering if there's anything that we may have skipped over that you'd like to add about monarch butterflies or more generally about wildlife conservation in the state?

Barbara Keller-Willy [01:59:59] You know, I think that, I think that it takes very little effort on the part of all of us all across Texas to create, or to leave, to just allow there to be, maybe these undeveloped little slivers of habitat for the various animals across Texas. And that, to me, seems such a small thing that if each of us were just willing to allow a small garden, a small bed, a, you know, if you're a huge property and you're part of a movement corridor or some right away that serves as a movement corridor for migratory mammals, well then maybe do it at that scale. But at a minimum, I think that just allowing there to be these slivers of wild native plant habitat growing in our communities is probably one of the easiest things that all of us could do for the various species in Texas.

Barbara Keller-Willy [02:01:43] And, once we do that, that often grows into something more as time goes on. And I could say that we ought to do this because, you know, pollinators pollinate our food sources, are plants that produce our fruits and vegetables and all kinds of things. But as we create these little slivers, different people will see different things in them, and they grow to become different things to different people. And, they often grow into something more of a movement or something. You know, they reflect on something bigger.

Barbara Keller-Willy [02:02:30] And, in closing, I would just say that I once heard somebody say that if we can't figure out how to allow these insects and other species to survive among us. We won't eventually save ourselves because they're really a metaphor for our own society, you know, and leaving them a small place to coexist with us is the right thing to do.

Barbara Keller-Willy [02:03:09] And I just, you know, I just would encourage you, if you're a landowner or if you're a gardener, if you're a suburban or even in an apartment, you know, you can have a pot out on your patio. You can have a garden bed of, you know, some native plants that are important to species for your area. If you're a landowner, again, you can leave those unmanaged or unmowed slivers of land available to whatever native species need them. And in that way we contribute to habitat for both the monarch butterfly and all the other native species that may need that habitat in our areas.

David Todd [02:04:06] Well put. I love the idea of these sort of cascading impacts, whether it's from monarchs to other insects to other creatures to, you know, just what it teaches each of us to see these, you know, viable habitats. Great point.

David Todd [02:04:23] Well and thank you so much, Barbara, for your time today. I really enjoyed listening and engaging with you, so thank you for your time and I hope our paths cross. Maybe we will be butterflying somewhere and bump into each other. I hope so.

Barbara Keller-Willy [02:04:41] I would like that very much. And you can always come visit our 92 acres. We're not that far from you.

David Todd [02:04:49] Well, I'd love to see it. I bet it's a beautiful thing, especially this spring. We've had a wonderful show of flowers?

Barbara Keller-Willy [02:04:56] Yes, it is beautiful.

David Todd [02:04:59] Well, enjoy it. And it sounds like it, as you said, it makes you giddy. And I can understand why.

Barbara Keller-Willy [02:05:04] It does.

Barbara Keller-Willy [02:05:05] Thank you so much.

David Todd [02:05:07] All right. You take care. Thank you so much. Bye now.

Barbara Keller-Willy [02:05:09] Bye bye.