March Monarch Meeting Q&A

High Level Program & Policy Updates

Eastern Monarch Population Update, Wendy Caldwell, Monarch Joint Venture

Q: You showed the total forest occupied by monarch colonies over time. What has been the size of available forest for the monarch over time?

A: About 56,000 hectares make up the Monarch Butterfly Biosphere Reserve, which was declared a Biosphere Reserve in 1980 and a World Heritage Site in 2008. The butterflies occupy a small area within the reserve.

Research Updates & Discussion

Monarch State of the Science, Wayne Thogmartin, USGS

Q: When you say you have removed corn and soy from monarch habitat, is that because those fields are now only corn or soy whereas they used to also contain milkweed and nectar species?

A: Yes, agricultural technologies have become very effective in eliminating unwanted plants from agricultural fields, so conventional corn and soybean fields are unlikely to be providing habitat.

Q: Can you repeat the estimated probability of extirpating of the western monarch by USGS models? Do your models match the risk estimates of USFWS? I thought at the monarch conference in DC last June that USFW predicted a very high probability of extirpating.

A: There is ~50% probability at 20 years to see the population decline below 0.25 ha of area occupied by wintering monarchs in Mexico. We do not know what level of population is so small as to not be able to recover from, but 0.25 ha is less than half the size of the smallest population we've ever seen. If the population dropped below 0.25 ha coverage, it would mean the entire eastern migratory population was overwintering on 15-50 trees, probably numbering no more than 5 million or so individuals.

Q: I am confused about the number of milkweed plants/stems in the North[ern United States] vs the South. Could you please clarify? More plants where? More stems where? Thanks!

A: To reiterate, milkweed density per suitable land cover category is greater in the North compared to the South. What was perhaps not clear enough in my presentation is that not all land cover categories have milkweed. For instance, we know that at this point in time that row crop agriculture has little milkweed; row crop agriculture is no longer habitat for breeding monarchs like it was two-plus decades ago. The transition of row crop from habitat to non-habitat led to a great diminishment in the available habitat in the North principally because the footprint of agriculture is so much greater in the North

compared to the South. The footprint of agriculture is so great in the North that remaining land cover suitable for monarchs is in the minority. In areas where milkweed remains in the North, however, it occurs more densely than in similar land cover categories in the South. This is not so in the South, where the majority of the landscape remains suitable for monarchs, suitable but at lower density. The lower density sums over all acres to amount to a higher total amount of milkweed in the South compared to the North.

Q: While there is a lot of milkweed on the landscape in Texas, there is very little milkweed south of San Antonio. This means milkweed need to get north of Sam Antonio before finding ample milkweed. While there is no historical data regarding number and/or density of milkweed in Texas (accept the work of Calvert), my guess is the development of the I35 corridor are impacting number of monarch. How much is not known. Thoughts?

A: Yes, I suspect it is very much true that densities of milkweed are relatively lower in south Texas, as it seems likely to also be in northern Mexico. Data is, as suggested, sparse here and more would be helpful. It is pretty impressive monarchs whose lives began as far north as southern Canada have to delay reproduction even further to overcome this sparse environment. As far as I'm aware, it's not known what effect or mechanism is employed to make this 'jump'. Gravid females of later generations faced with such sparsity would likely not find sufficient milkweed to lay their full complement of eggs. Do individuals returning from Mexico suffer the same? I do not know.

As for the effect of the I35 corridor, there is some information to suggest that vehicle collision mortality is not insubstantial. How much of an effect on the population there might be, I do not know. Greater attention to monarchs early in the annual cycle is warranted.

Roadside Habitat Suitability, Laura Lukens, MJV

Q: Is any work being focused on potential pollinator habitat in CA in roadsides? Is there any potential to find common ground between fire risk management and potential habitat opportunities?

A: Caltrans has been engaged as a collaborator with the Monarch CCAA for Energy and Transportation Lands. Yes, safety measures, risks, and other and considerations should be explored when identifying and prioritizing potential roadside habitat areas.

Remote Sensing for Monarch Habitat Monitoring, Greg Emerick, Simple Business Automation

Q: Is the imagery gathered in the visual spectrum or hyper-spectral and what resolution is required?

A: When we first got started, we used the visual bands and NIR. Both worked, but the process is a little harder to perfect with RGB imagery. We eventually decided to use RGB because one of the objectives was to use volunteers to capture data. We expect greater participation if the volunteer doesn't need to purchase additional sensors to make this process work.

The ground sample distance is 1.5 inches. We have been using cameras with a global shutter and are transitioning to an additional sensor with an electronic rolling shutter. The newer camera will allow us to fly at higher altitudes and capture the same resolution. Data will be collected and analyzed in 2023.

It should also be noted that we are not restricted to RGB imagery. I prefer using multispectral instead of

hyperspectral because of the file sizes, but we can support both if there's an interest in producing new analytics.

Q: What would it take to adapt the process for different habitats (various milkweed species, nectar plants, habitat types) in the western U.S.?

A: I've built the technology to support multiple species. The workflow is to develop the new object detection algorithm, which can then be included in the workflow.

The key is building the algorithm to support the process. We've created the solution, so we don't need to touch the raw data for the tool to work. In other words, once we are confident in machine learning results, the data can be collected, and the end user decides if they want to process the information. The data is processed without manual intervention and served to their account when the decision is made.

Invasive Species' Impacts on Monarch Butterfly Conservation Initiatives, Adam Baker, Davey Resources Group

Q: Do you have any suggestions for how to manage European paper wasps? What are your thoughts about actions we should take?

A: If you are creating butterfly-centric habitat near man-made structures we should be scouting/managing EPW nests (especially during the outbreak phase). I would not encourage management of native pollinator species. Management can be done by the homeowner by spraying the nest with a contact insecticide. Alternatively, consult a local pest control operator to make the applications for you. Be aware that these wasps get into tight and creative nooks and crannies.

Q: How is management of Japanese knotweed balanced between competition with milkweed and desire of beekeepers for forage from this plant?

A: This is a great question. When does the value (nectar and pollen) invasive species provide outweigh the detriment to biodiversity? Non-natives are okay in my book as long as they don't express invasive qualities. The argument that an invasive plant is valuable because it supports a non-native domesticated insect is very biased toward bee keepers and at the expense of the local ecology. I would suggest bolstering the area with late flowering natives and non-invasive/non-native perennials and woody species to supplement foraging needs. As far as milkweed suppression, knotweed generally creates monocultures and completely stops any milkweed from germinating. We are seeing a similar situation in OH right now with cutleaf teasel. Highly attractive to large aphid bees but becoming increasingly more invasive.

Monarch Population Dynamics, Chip Taylor, Monarch Watch

Q: Based on videos and images from the Mexican overwintering sites, the monarchs have been very active the entire season. Do you think this will impact the stage 2 population?

A: There is no basis for comparing the activity of one season vs another - except indirectly by looking at temperature and incident radiation. If the temperatures are in the high 50s with clear skies (unobstructed sunlight), there will be activity. The higher the temperatures, the greater the activity and

that varies among sites depending on the number of trees per hectare. There is less movement in areas with high tree density with dense canopies. In addition to lots of movement last winter, Estela sent a number of images of masses at which there was little movement. I monitored the temperatures fairly closely last winter, and overall, the temperatures were close to the long-term means.

Q: What role might connectivity between East and West play in determining West population dynamics? (I suspect it is large)

A: There was a recent WaPo article that offered that the increase in monarchs in the West was due, in part, from an influx of monarchs from the East. One of my contacts said he laughed out loud when he saw that suggestion. I wasn't laughing since the suggestion, quite honestly, is embarrassing.

Here is a short list of the reasons:
The monarch population along the Front Range in CO, NM is small in the fall.
No monarchs tagged along the FR have been collected W of the FR.
There is a big gap - hundreds of miles between the small FR population and the relatively small monarch population that moves south through W KS.
Most of the eastern population passes S across a line from Salina, KS to St Louis. For these monarchs to move W they would have a traverse of about 500-600 miles to cross the Rockies and then would have travel from the W slopes to Calif. There are no indications monarchs are capable of conducting such flights. Monarchs E of the Rockies deal with SW winds that tend to push them to the SE. In many areas W of the Rockies, winds from the E tend to aid westerly flight.
In the last 30 years, our participants have tagged over 2 million monarchs in the E and not one has been collected W of the Rockies.
The idea of monarchs moving W from the E, doesn't fit with all that has been learned about monarch orientation and navigation over the last 30 years. Monarchs have fixed responses to environment cues that have the effect of enabling them to get to Mex or if emerged W of the Rockies then to the W.

A companion idea is that monarchs enter AZ and NM from MX in the spring to colonize the SW. Again there is no evidence supporting this conjecture. No one seems to have looked into this proposition. There are several things to consider.
First, most of the route to the N experiences high temperatures in the spring that would limit flight and survival. Much of the traverse is desert with limited floral resources in March. The distance is at least 300 miles further from the colonies in MX to the milkweed areas in the SW. All of which indicates that the possibility of a MX recharge to the SW is small. If such events occur, they would be rare and would be the result of unusual weather conditions.

There is some suggestion that mid-summer monarchs from the E cross the northern Rockies to the W. Those numbers might allow for some mixing but wouldn't be sufficient to increase the W population.

Lightning Talks

Monarch Wings across America, Kelly Bills, Pollinator Partnership

Q: How do you ID and decide on properties to enhance? Are they private, public, etc.?

A: In most cases we have an online application form where sites submit to be considered to receive plant material. We then vet the submissions based on our project criteria making sure that there is staff, commitment, and relative technical experience to establish and maintain the habitat. In some cases for more specific grant funded projects we work through our network to recruit landowners directly. Monarch Wings across America sites are a combination of private and public lands.

Nothing Changes until It Changes in the Dirt, Elsa Gallagher, Bee and Butterfly Habitat Fund

Q: Solar Synergy, Key Benefit - Carbon Sequestration, you're looking into carbon sequestration ecosystem services but are you also looking into the carbon storage benefits as they're separate ecosystem services?

A: Yes, we'll be looking at both.

How the Monarch CCAA supports NiSource's ESG Reporting and Biodiversity Commitment, Steve Barker, NiSource

Q: For GRI reporting, do you consider CCAA adopted acres as "areas of high biodiversity?" What about pollinator plantings?

A: Adopted acres don't always translate to high quality so do not include total adopted total acres as part of ESG reporting. Might be something to highlight however, noting that even lower quality, naturalized ROWs can provide some sort of benefit or ecosystem service. We are developing a tracker to better document high quality, biodiverse areas, areas with nexus to manage lands, restoration or pollinator habitat acres etc… We are reporting both voluntary acres, e.g., pollinator habitat creation, and mandatory acres such as compensatory mitigation.
We are attempting to develop a rapid assessment form to better document and track overtime. Hoping this will align with CCAA/Survey123 as well.

National Monarch Habitat Suitability Modeling for Corporate Decision Making, Jessica Fox, EPRI

Q: Do you use MaxEnt for your analysis? Or something different?

A: No, we don't use MaxEnt. The "model" is not mechanistic or dynamic. It is really just using veg class types to drive suitability predictions. It is a vegetation driven model. Each veg class type is associated with a specific suitability type, which is then coded and displayed. We know it isn't perfect, but it is what is currently possibly to run at such a large scale (all of the U.S.). Happy to discuss/collaborate to improve this!! Our full report is here: Monarch Habitat Model: Landscape-scale Approach to Identifying Monarch Habitat in the United States (epri.com)

Integrated Vegetation Management to Restore and Manage Landscapes & Improve Pollinator Habitat, Rick Johnstone, IVM Partners

Q: How did you engage with tribes on some of your pollinator projects? I am interested in learning more. I am with the Department of Defense.

A: I engaged with The Navajo Nation as a consultant for Arizona Public Service when I accompanied their Arborists when meeting at The Navajo Nation headquarters in Window Rock, AZ. We needed the

approval of the Navajo Forest Service to remove hazardous trees from APS high voltage transmission rights-of-way on the Chuska Mountains and to selectively apply herbicides as part of their new IVM program. I explained that I had a slide presentation that outlined IVM and they brought together all of their Navajo departments; Forest Service, Fish & Wildlife, and EPA, as well as the US Bureau of Indian Affairs (BIA). We then conducted a field tour on the mountain ROW as well as lower high desert and discussed treatments together. The Forest Service approved of the IVM program with the caveat that we only walk and backpack treat any archaeological areas and prohibit wheeled vehicles, and BIA asked for advice on improving their invasive plant control of salt cedar (tamarisk) and Russian olive. The Navajo Nation EPA awarded us grant dollars to conduct rangeland restoration research on a cooperative ranch to improve grazing habitat for cattle, sheep and horses. Pollinator habitat improvements were an offshoot of this work for specific land uses and not the determining factor.

I similarly engaged with the Santa Ana Pueblo Tribe as a consultant for Public Service New Mexico on high voltage transmission ROW crossing tribal land near Bernalillo, NM. We met in the field to discuss planned removal of incompatible juniper trees on high desert habitat and selective removal and herbicide treatment of incompatible salt cedar, Russian olive and black willow in the bosque floodplain of the Rio Grande, while retaining Coyote willow. The Pueblo Tribe was wary of cooperating with the electric utility but when I explained that we were removing One-seeded Juniper and invasive plants to allow other rangeland plants to proliferate, the same as their own management plan across Tribal Lands, and that we would document plant community changes with a botanist and share the results with their botanical team, they accepted our IVM plan. Again, pollinator habitat was a beneficial result of our IVM work, but it was not the driving factor at that time.

In all cases, especially Tribal Nations, I find it to be more acceptable to landowners to first engage in dialogue to learn of their concerns and management needs and then wrap their needs into our overall IVM program.

I hope this is helpful since I used the same philosophy when meeting with the US Army Corps of Engineers as a consultant for Columbia Gas in Tennessee to adopt IVM at J. Percy Priest Lake. I have also conducted training for the Department of Defense Pesticide Board at Linthicum, MD and Jacksonville Naval Air Station, FL and I have been a judge of DOD Environmental projects at military bases for annual awards at the Pentagon.

Divergent Monarch Migration, Gail Morris, Southwest Monarch Study

Q: What locations in the California desert are proposed to be studied? Do you have any data on monarch populations within the California desert?

A: We are actually looking at data throughout the state of California to build upon when we were tagging in the deserts of California. We applied for a permit to tag, test for O.e. and train people to complete MLMP Activity 3. This way people could monitor with MLMP, tag and test for O.e. since there

are data gaps across the region. However, while our protocols have been approved, our permit is not yet active, and so there have been delays in this research getting underway.

Other Questions

Q: Will presentations be made public after the meeting?

A: Presentations will be available on the on the Rights-of-Way as Habitat Working Group website and Monarch Joint Venture partner sharefile.

Q: Do we receive or can you provide any Continuing Education Credits, acknowledgement, certificate, email, or other for attending this conference?

A: We are happy to provide a letter or acknowledgement of your attendance for the duration of the meeting if that would be helpful. Please send us a request for your specific needs.

Q: Is there a list of quality nectar plants for NY that we should look for on our ROWs that will most benefit monarchs?

A: Check out this resource from the Xerces Society: https://xerces.org/monarchs/monarch-nectar-plant-guides?field_state_target_id=89