2025 Common Reader Course Support Materials

Notes for faculty:

In what follows, we have developed several prompts and reading selections which can be integrated into fall courses to help your students to further engage with our Common Reader text, *Bicycling with Butterflies* by Sara Dykman. While you can (and should!) encourage your students to read the entirety of the book on their own time, these prompts operate under the practical assumption that you will *not* be assigning the entirety of the book to your course reading list. These prompts have been paired with a student-facing introduction and specific textual selections so that students can fully participate *without* completing any prior reading. We hope these prompts hold relevance for a diversity of courses/disciplines, can add value to your existing lesson plans, and encourage your students to further engage with the text and the upcoming common reader events in October.

Introduction for students:

For this academic year, CMC has chosen *Bicycling with Butterflies* by Sara Dykman as our Common Reader text. This book details the dangers human development and habitat destruction pose to the survival of the Monarch butterfly, to other plant and animal species, and to the social and ecological welfare of our future world. To raise awareness about these issues, the author chose to bicycle alongside the entirety of the Monarch butterflies' 10,000-mile migratory route from central Mexico through the U.S. and Canada, and to meet with students, communities, and fellow butterfly enthusiasts along the way.

The goal of our common reader program is to read, engage with, and discuss a single text across our entire CMC educational community. In addition to reading the book itself, there are many more opportunities for engagement: the author will be attending each CMC campus to give a presentation and facilitate further conversation (please register!), we have created an art and creative writing contest, and in responding to the prompt(s) below, you'll have the opportunity to discuss elements of this text within your courses. To access the full text, you can pick up a free physical copy of the book in the main lobby of your home campus location, or you can login to your CMC library account to access the ebook and audiobook formats through Marmot and Libby.

Prompt #1:

From *Bicycling with Butterflies* by Sara Dykman (pp 176-182)

The Crazy Monarch Pepple, as I affectionately called the network of passionate monarch enthusiasts across Southern Ontario, go beyond rearing. Starting in the fall, these citizen scientists are part of the vast volunteer network that tags reared and wild-caught monarchs. Where tagged monarchs are found depends both on where the monarchs go and if the people they pass are looking. In Mexico, the guides at the sanctuaries are on the watch. Each found tag can be traded for a $5 (100 pesos) finder's fee provided by the Monarch Watch representatives that visit the sanctuaries each winter. Any found tags are coveted.

Delicately, the lucky finders fold the tags into pieces of paper that are stored in wallets and purses until an exchange can be made. Again, I must confess to initial skepticism. I worried that even the minimal weight of a sticker could be a hindrance to a small, flying migrant. But such worry is likely unwarranted. If it was too much weight, tagged monarchs wouldn't be showing up in Mexico. I was also concerned about how those tagged monarchs are found. Though I believe most tags are collected ethically, I heard stories in Mexico of people shaking monarchs from branches and trampling fallen butterflies at night in search of tags. The question to me was not whether this was happening, but rather, did the benefits of tagging outweigh the sacrifices? I decided the answer was yes. The better we can understand, the better we can protect. Many monarchs have fallen victim to our pursuit of understanding, but they have left a legacy of knowledge. Perhaps the best we can do is honor the casualties and remember them as scientific pioneers-just as we remember the man who first tagged monarchs.

In 1937, Fred Urquhart, a biologist living in the Toronto area, began tagging monarch butterflies in an effort to understand where the monarchs disappeared to. Just finding a lightweight sticker that didn't wash off in the rain took many years. Eventually he landed on a version similar to a price tag. In 1952, through a magazine article, Fred began seeking volunteers to help with his tagging efforts. At first only twelve people responded, but by 1971 there were 600 volunteers. In 1972, Urquhart's wife and fellow monarch researcher, Norah, placed an ad in a Mexican newspaper, looking for volunteers farther south. Reflecting on this, I see those invitations, for ordinary people to be part of extraordinary science, as one of the most important breakthroughs in monarch research. By including volunteers in the mission, the tagging efforts advanced science and created a culture united around the monarch that still exists today.

I've met several people who tagged monarchs with Urquhart, including John Powers and Don Davis. Don has been tagging monarchs since 1967. On September 10, 1988, he tagged a male monarch near Brighton, Ontario. An estimated 2880 miles and nearly seven months later, that monarch was recovered in Austin, Texas, on April 8, 1989. The tag earned Don and the monarch the Guinness World Record for the longest migration by a tagged butterfly.

John Powers (who died in 2019) was perhaps one of the biggest personalities in the monarch world. The day I met him, he wore a Hawaiianesque monarch-printed shirt. With great ceremony, he presented me with a copy of the August, 1976, issue of National Geographic. On the cover was Catalina Aguado and millions of monarch butterflies. Catalina had married a man named Kenneth Brugger two years into his search for monarchs in rural Mexico. Brugger had gone looking for the

monarchs after reading Urquhart's ad for tagging volunteers. Kenneth and Catalina traveled by foot, motorcycle, horseback, jeep, and motorhome, slowly finding clues: dead monarchs on roads, swarms in the sky, local knowledge-to home in on the location of the overwintering monarchs. On January 9, 1975, Kenneth called Urquhart with good news. "We have found them!" Kenneth reported excitedly. "Millions of monarchs, in evergreens beside a mountain clearing." They had found the colony now known as Cerro Pelón.

A year later, Fred and Norah Urquhart trekked up the mountain in Mexico to see the phenomenon with their own eyes. In the National Geographic article, Fred describes the heart-pounding walk with a morbid sense of humor: "Norah and I are no longer young... Suppose the strain proved to be too much? It would be the ultimate irony to have come this far and then never witness what we'd waited so long to see!"

Luckily, their hearts held out and the scientists were rewarded by a storm of wings; their life's work had been realized. From their backyard in Ontario to a Mexican peak, the connection had been forged by forty years of effort, several hundred thousand tagged monarchs, and a team of volunteers tagging and recovering butterflies. They had known where the monarchs spent their summers, and now they knew where the monarchs spent their winters. Understanding the bigger picture put the onus on every North American to protect the monarchs. I thought about those forty years. I wondered if I had the strength to dedicate forty years to something.

The story of the Urquharts' 1976 visit to Mexico continues with poetic surprise. While the Urquharts were at the colony, a three-inch-thick pine branch broke under the weight of so many wings. Fred sifted through the spilled monarchs, and to his amazement, found one adorned with one of his white tags. A science teacher named Jim Gilbert and his class had tagged the monarch in a field of goldenrod in Chaska, Minnesota. It was a gift from nature, validation from Mother Earth.

Word slowly got out about the discovery of the monarchs' overwintering grounds, even though the Urquharts refused to disclose the location to anyone-including renowned monarch researchers such as Lincoln Brower. Though the map in the National Geographic article placed the monarchs several hundred miles north of their true location, there were other clues for Brower and another researcher, Bill Calvert, to go on. They knew the monarchs were 10,000 feet above sea level, in the state of Michoacán. This information landed them in the town of Angangueo, where the mayor, surprised by such interest in a butterfly, helped arrange their passage to the colony now known as Sierra Chincua.

I have been in that same Mexican forest, but can only imagine the joy that filled the scientists. Decades of hard work, dedication, and passion culminated in the hum of billions of monarchs. More monarchs than I have ever seen. More monarchs than the world has seen since humans slowly began erasing their waltzing spectacle. After the winter of 1976, when the western world collided with the colony, the monarchs' refuge began to erode. Knowing enables us to protect, but knowing also enables us to destroy.

I used to wonder how the monarchs would have fared if we had simply left them alone. I've decided that if we hadn't made the discoveries we did, they would have disappeared from our skies with a pain so quiet that only the wind would have wept. Knowledge is the only sword that can cut through harm being done in ignorance. I look to Urquhart and all who have followed his pioneering footsteps with gratitude and admiration. Bruce Parker was continuing Urquhart's mission. He had begun

tagging monarchs in 1998. Though not a biologist by training, Bruce had become a scientist through experience. His efforts and what he'd learned through observation had sculpted him into one. In notebooks, he kept records of the wing length and weight of each monarch he tagged, seeking answers by collecting facts. He was tuned in to the monarchs, and I was inspired by his enterprising methods.

There is contradictory information on whether monarchs born in the fall are morphologically different from monarchs born during the spring and summer. Early research suggested that as daylight decreases, larval development slows, and the result is adults eclosing both heavier and with larger wings. This made sense, as larger wings would be of great benefit to the long-distance travelers that rely on gliding to migrate efficiently. Monarchs have two forms of flight: flapping and gliding. Gliding is the more efficient of the two, and is used extensively by migrating monarchs. They gain elevation in thermal currents (like many birds do), then glide in their desired direction. Their glide ratio is typically between 3:1 and 4:1, or for every three to four feet forward, they lose one foot of elevation. When the wind is favorable, however, they can flap every so often and still maintain their altitude. Larger wings have greater surface area, which increases lift and efficiency. Though it is not clear whether the heavier, larger-winged migrating monarchs born in the fall are born that way in response to the task at hand, it is clear that wing size (and shape) do effect efficiency and thus migratory success.

A more recent study of monarchs reared in summer and fall conditions found that while fall conditions did slow development, adult size did not correlate with those conditions. While bigger monarchs are better suited for migration, they might not be bigger because they have to migrate. Rather, monarchs eclose in a range of sizes every generation, a result of variations in the milkweed they ate as caterpillars. All sizes may start the migration, but the largest winged monarchs are the most capable of surviving the journey. The pressure to have larger, more efficient wings increases for butterflies born farther north (because they have to fly farther), which could explain why the monarchs born at higher latitudes that reach Mexico are larger than the monarchs born at lower latitudes. Only the longest-winged monarchs can survive the longest migration paths, to arrive in Mexico and be measured.

While morphological differences are less understood, the physiological differences are clearer between monarchs of the overwintering generation and the reproductive generations born during the spring and summer. Overwintering monarchs eclose in sexual diapause, likely in response to poorer-quality milkweed, lower fall temperatures, and decreasing daylight. Unlike the reproductive generations that begin mating four to five days after eclosing, overwintering adults lack the necessary hormone responsible for sexual maturity. This delay-which lasts until warm spring temperatures signal reproductive organs to mature just as milkweed in Texas is beginning to re-emerge-is what allows overwintering monarchs to postpone breeding all winter. It also allows them to wait in Mexico for the milkweed in Texas to re-emerge from winter dormancy. A delay in sexual maturity is also what allows overwintering monarchs to outlive winter. While reproductive adults live two to six weeks, the over-wintering generation can live six to nine months. That is enough time to fly to Mexico, endure winter, then return north in the spring to emerging milkweed. As if on pause, overwintering monarchs can wait out winter like prepubescent tweens.

In Mexico, the overwintering generation is called generación Matusalén, or the Methuselah generation in English, after the oldest recorded human in the Bible. Yet, we do not need to use religion to explain such a remarkable feat. Sure, Methuselah supposedly defied time and lived to be

969, but he didn't fly to Mexico without ever having been there before. He didn't settle in the trees of his ancestors, to wait out the winter, and return again in the spring. No, only the overwintering generation of monarch butterflies can do that. In the United States and Canada, the overwintering generation is known as the super-generation.

First we learned where they went. Then how. What will we learn next? Will the migration remain intact, so that more of our questions can be answered? Monarchs are one of the most studied animals in North America, and there are still many questions to be answered. Tagging efforts continue, and the link between us and the monarchs strengthens. The tag is a potential answer, a promise, a declaration of love. So was rearing, and gardening, and rallying as monarch stewards pushed forward. So were the miles I pedaled.

Response Questions:

As students and working professionals, we certainly need to create our own personal goals, and to develop the individual knowledge and expertise required to pursue them. However, it's very often the case that individual learning and exploration takes place within a community, that it requires working with others and for others.

For the author, where and how do you see the importance of "community" at work in this passage?

For you as a student here at CMC, or within your current place of employment, where have you found your individual learning and growth to be connected to be with others? What does 'community' mean and look like to you as a learner?

Prompt #2:

From *Bicycling with Butterflies* by Sara Dykman (pp 106-109)

My experiences at the Driftwood Inn and Kate Rezac's home felt very much the same: two families welcoming me into their lives, graciously providing me more than I deserved, and turning my trip into more than a bike ride.

I spent a few nights in the organized chaos of Kate's house. Juggling jam-packed schedules, Kate, her husband, and their three talented teenage daughters were busy. Only their wandering rabbit seemed to have any free time. Yet, as busy as they were, they somehow made time for me. On my first morning, long after everyone else had left for the day, I came into the kitchen and found a note from Annie, Kate's youngest. "Good morning Sara! We hope you slept well. Choose any food you'd like. I can't wait to see you at school." I read her note with gratitude; her warm words were gold.

At school, I felt that same positive energy and excitement from all the students. It was contagious, and as the kids filed into the gymnasium for my presentation, I watched them try to hold back their eagerness. Smiles spread as I waved, and surprised faces did double takes. In preparation for my visit, they had watched videos I'd been creating on the trip. Now it was clear that the lady they'd watched was not only real-she was in their cafeteria. So was her bike and her tent. Questions abounded. "Why is your tent 'set up?" one first grader questioned "Because I am going to take a nap," I replied, watching him giggle at my
joke. Ice broken.

Once everyone was organized in general rows, my presentation unfolded quickly. The kids knew more about monarchs than many of the adults with whom I spoke. They knew the whole monarch life cycle. They knew monarch caterpillars only eat milkweed In the blur of my rock star reception and the students' enthusiasm, I launched into an unscripted, ridiculous, and totally accidental blunder.

"I say MILK, you say WEED," I prompted. "MILK," I yelled before turning
the microphone to the packed cafeteria.
"WEED," hundreds of kids in school uniforms shouted.
As soon as I heard it, I recognized the unintended alternate interpretation of what we were cheering for. I wanted to stop. Frantically running through options in my head, I decided an abrupt stop would only bring attention to the bizarre moment. I continued.

"Milk!..WEED!. ... Milk!.. WEED!.."

No one looked horrified, and I moved on quickly. Milkweed and the monarchs were not foreign to the students at St. Mary Margaret Elementary because they had been tending a butterfly garden and making real-world connections. I was treated to a tour of their garden by Kate's third grade class. They knew the plants well, and pointed out their discoveries as we walked the mulched paths. The whole school had recently united, class by class, to put down a new layer of mulch, and I felt the pride the children carried in their buoyant footsteps.

Their success had been hard won. The school had only reluctantly allowed Kate to start a garden. They had conceded a slope of grass that edged the parking lot, a plot that was difficult to mow and otherwise unnoticed. But with the help of Kate, her students, shovels, and some native plants, that patch had been transformed. It was now a classroom, a laboratory, and an escape from fluorescent lights and stale air. The garden had become an opportunity for classes to explore, for the community to come together, and for the monarchs to be teachers.

A television crew and reporters joined us to document the garden's success and my visit. I answered a few questions, but what I really wanted to do was explore. At the first chance, I let the students steal me away. Even in the bluster of youthful energy allowed to roam free, I felt something akin to peace as we huddled around a milkweed plant to discover the garden's secrets. The milkweed, poked and prodded, began to ooze tiny bubbles of white latex sap. The tiny drops at first confused the kids.

"Eggs!" they exclaimed, wild with excitement. "Look closer," I countered.

It was not up to me to correct them. The garden was their teacher. "It's sap!" they squealed, delighted to have touched poison. As the group dispersed, shouting erupted. Real monarch eggs had been discovered by the young scientists.

Every day of my trip was an iteration of such learning. I could have studied thick research books on monarchs or read a hundred field guides on milkweed, but crouching in their world, trading carbon dioxide for monoxide, I learned real lessons that I would not forget after a test or a summer break. My senses wrote pages in my mind that could have filled textbooks. My curiosity turned the pages.

"A monarch!" a group of third graders exclaimed, their fingers and eyes tracking the sky. Like an echo, the whole class joined to watch the monarch float over our heads. Their pure delight and his delicate orange wings filled my heart with hope. Human beings were not made to fight nature. Human beings are made of nature. When we are released to waltz among gardens unburdened by the appetite of power, we can see our home in nature-and see that we share our home with monarch butterflies.

That monarch was a messenger. It christened the air with wing beats and ordained each student as a scientist, conservationist, and member of our shared planet. That monarch connected the students to Mexico, Canada, and New York City, not just an unnamed patch of schoolyard in Nebraska. He had navigated an unwelcoming ecosystem of grass, pavement, cement, brick, tile, plastic, shingle, and wood, and found refuge in the class's small garden. That monarch was proof that when we give nature room, it will thank us with color and so much more.

I stood, as stunned as the students. Until a monarch finds you, until your paths cross, the astonishment you will feel can only be a word on a page. Until every kid feels that connection, we are failing them.

I began to envision a garden at every school, providing every student with a living laboratory and real-life connection with nature. The monarch could become a symbol of our shared responsibility, shared planet, and the power of our combined efforts. With a native butterfly garden at each school, it wouldn't matter where the kids lived, how their state representatives voted, what they

looked like, how they talked, or how much money their families made. The monarchs could connect us all, reminding us that we are all creatures that deserve to be seen as amazing.

Kate's determination and courage to start a garden that had first been met with rejection was inspiring. I needed her garden as much as the monarchs did. I needed to see that there were people doing their part, helping steer the future toward something better. Her dedication to making sure the garden remained a success was welcome fortification for me.

Response Questions:

Aldo Leopold's *A Sand County Almanac* (1949) is a commonly read and cited text within the Sustainability Studies within the Environmental Science disciplines. In this text, Leopold creates a distinction between the "scientist" – someone with specific job training credentials, formal research methodologies, and replicable results – and the "naturalist" – someone who carefully observes and engages with the land, ecosystems, plants, and animal species.

The writer of this passage is *not* lepidopterist (an expert on moths and butterflies) or a scientist holding an advanced degree, but where and how do you see her perspective as a *naturalist* to be unique and effective? What might the naturalist be able to see which the scientist cannot?

More broadly speaking, why might it be important for us to "raise awareness" about the key issues we care about long before we become professionals or experts in a given field, trade, or skill?

Prompt #3:

From *Bicycling with Butterflies* by Sara Dykman (pp 118-121)

I stopped to watch them twirl in the air like synchronized acrobats. Though I had first stopped, thinking they were monarchs, at second glance l identified them to be copycats. It was my first sighting of the famous viceroy butterflies (Limenitis archippus). Except for the viceroys' arc of black that divided each orange hind wing and their more organized, white-dotted wing edging, I understood why animals, including humans, might confuse them with monarchs.

For some predators, the mere fact that a potential target is orange is enough to keep the predator at bay-what's known technically as aposematic coloration. Predators are wary of orange, a caution owed to experience and evolution. When the warning colors of monarchs are not heeded, all but a handful of vertebrate predators will learn at first bite that the orange butterflies are toxic. This defense is a result of monarch caterpillars eating milkweed and sequestering the plant's cardenolide toxins in their bodies. The cardenolides are carried into adulthood, making adult monarchs a bitter emetic. A clueless predator will often release a monarch after one bite, the only damage a chunk of missing wing. Once the lesson is learned, anything resembling the cause of such discomfort is usually safe, just as humans often avoid a food associated with a time when they were sick.

The viceroy is a mimic. With a wing color and design similar to the monarch's, it can piggyback on the monarch's poisonous protection. Predators can't tell them apart, and so both are avoided. There are several classifications of mimicry. The viceroy was for a long time considered a Batesian mimic, in which the monarch was the unpalatable model and the viceroy was palatable. In this system, if a predator first eats a viceroy and suffers no ill consequences, then the monarchs are actually more vulnerable because predators will think they are safe to eat as well. In the early 1990s, though, the Batesian classification was called into question. It seems that viceroy butterflies are also unpalatable. Viceroy caterpillars eat Carolina willow (Salix caroliniana) and, like monarchs, sequester the plant's defensive compounds. As adults, viceroy butterflies secrete these defensive compounds when disturbed, deterring predation. Mullerian co-mimicry, in which the viceroy and the monarch are both unpalatable models, is now deemed a more appropriate classification.

A couple walking through the viceroys' neighborhood watched me as I ran from one plant to the next, my camera trained on details invisible to them. Until we learn to see, we may never be able to distinguish between orange wings, green leaves, and blue skies. We may continue to be lost even in the places we call home.

Under the spotlight of attention, the viceroys steered into the sky. I left on my bike, following forty miles of flower-framed bike path. I witnessed several pairs of monarchs breeding. The cottonwoods celebrated summer with confetti of seedy fluff. As the day wore on, I began to catch glimpses of Minneapolis and Saint Paul, which hovered like distant clouds. The cities were still too far to reach before dark, so I began to look for a place to stay the night.

On a scouting mission, I followed the long driveway of a Baptist church and found exactly what I sought. Beyond the grass, behind the brick wall, alongside the air conditioning unit, was a spot

nearly hidden from the view of passing cars. To the west, shrubs stood guard. To the east lay a naked, unplowed field. I set my bike down and stretched with satisfaction. Another nearly forgotten space had just become my home.

As the day awoke, so did I—my alarm clock, the low rumble of a tractor sauntering through the field that butted up against the church. After adjusting to the light of a new day, I waved to the man in the driver's seat. I figured a friendly wave would lower suspicion. Assuming he was too busy to do anything about the random lady in the tent behind the church, I went back to sleep.

The next time I opened my eyes, a few hours later, it was to a lawnmower cutting the grass literally around my tent. The guy atop the riding lawn mower treated me like the playground equipment, and I treated him like a more adamant alarm clock. I packed up without pause, waved yet again, and biked back to the highway. I wondered as I biked how that interaction would have gone if I had been a black man. Would the police have been called? Would I have been able to bike away?

This question of privilege surfaced again some fifty miles north of the Twin Cities, as cops shook my tent and yelled commands to wake up. I had chosen the camping spot in a park with access to a forested hiking trail, even though there was a No Camping sign. Normally the sign would have deterred me, but I had been caught on a highway constricted by construction. Continuing in darkness could have been deadly. Instead of slinking guiltily into the woods and potentially scaring an early morning visitor, I camped in plain sight, my bike propped up to explain my traveler's dilemma. This did not stop the cops.

"Get up!" they shouted as they pounded on my tent. "Police!" Jolted awake, I was in fight mode before my brain could catch up. I answered with a startled string of cuss words. Then, completely awake, I unzipped my tent and handed over my driver's license. They hovered over me and grilled me with questions. The degree of their anger did not seem to match the degree of my crime. Luckily it was 7 a.m., so I was happy to get the heck out of there when they told me go. I understood it was their job to enforce the rules, even arbitrary ones, but did it need to be done with such venom and lack of curiosity? I had pitched my tent out of the way, I had picked up the nearby litter, and all I was doing was sleeping. My blood boiled as I packed up, and I wondered how it would feel to live in a world where it was deadly to demand dignity.

Only months earlier, not far from where I'd camped, Philando Castile had been shot in his car by a police officer. His girlfriend, Diamond Reynolds, had sat in the driver's seat with a calmness that I have never been forced to muster. Her baby was in the back seat, Philando was dying at her side, and she called the murderer of her boyfriend "sir," while he pointed a gun at her.

I had broken a law. Philando Castile had a broken taillight. I had been allowed the space to be indignant. Diamond Reynolds couldn't afford that. What if the police had found her in my tent? What if her boyfriend had awakened surprised and cussed in alarm? It was difficult to accept that my skin color was in part what made my trip feasible. I questioned how I could prioritize monarchs when injustice was swinging its deadly sword at my human brothers and sisters of color.

I began to see the monarch as a symbol of compassion. No one blames the monarchs for their population plummet. No one says it is the monarchs' fault when caterpillars die from herbicide and pesticide use. No one thinks that monarchs are lazy because they can't find milkweed anymore, or

that they deserve getting hit by a car because their migration passes over Interstate 35. Instead, we recognize the monarchs' struggle. We rally, fight, cry, get angry, and do something.

We are capable of seeing that the world is an equation, tweaked for some so that the result is best for those making the rules and moving the pieces. The monarchs were helping me to see many worlds.

Response Questions:

Even though this book primarily focuses on butterflies and environmental conservation topics, this passage demonstrates how the author also attempts to grapple with issues about power and privilege. On the one hand, the author is a woman who must confront barriers caused by misogyny, social perceptions, and personal safety, but on the other hand, she acknowledges that her ability to gain acceptance from hosts/audiences, traverse international borders, and informally (often illegally) camp each night without begin subjected to arrest/violence depend in large part on her presentation as a white, English-speaking American citizen.

First, how do you understand the connections the author is making between her ecological investigations of butterflies and her awareness of social inequity? How does one inform the other?

For you personally, have you been able to form these kinds of connections? That is, how have the content/conversations in your college classes, the experiences in your job or profession, the expertise in a personal passion or hobby helped you to better understand or describe larger social issues?

Prompt #4:

From *Bicycling with Butterflies* by Sara Dykman (pp 65-73)

If Mexico and its mountain spine are geologic shepherds guiding their flock of monarchs through a relatively narrow area, then Texas is the open pasture into which the flock is freed. When they hit Texas, the monarchs spread out with the wind and claim every road heading north as part of their path of
migration. No longer racing toward spring, the next chapter for the females is to disperse and find milkweed plants on which to lay their eggs. As the monarchs' range expanded on this migration, so too did my route options. Moving north, I wove my way into Texas on a route I had spent the previous year charting.

The bulk of my pre-trip route planning had come from studying the trends and patterns of the monarchs uncovered by Journey North, a migration tracking website. Since 1994, students, teachers, nature centers,
citizens, and scientists across the monarchs' range have been submitting monarch sightings to Journey North, which then compiles the data on maps. By plotting the mountain of collected times and locations, the big picture is revealed. In general, the monarchs spread north though the Central Flyway, while slowly being pushed northeast by prevailing winds (some are pushed far enough east to generate a smaller Eastern Flyway).

"In general" needs emphasis. By studying Journey North's maps, I was able to discern the infinite, subtle changes of each year's migration. I began to see the monarchs as one organism, growing, moving, and transforming abdominal claspers to get ahold and copulate. Males, during this coupling phase, are often met with resistance from females, and it is likely that most attempts don't result in copulation. When a male does find success, he flies with the female hanging below. Silhouetted, the female looks like
a reflection of her male escort, an upside-down, tandem paraglider. This conjoined configuration can last as long as sixteen hours, during which the male transfers his sperm to the female in a protein-rich spermatophore (a sort of packet filled with sperm).

As temperatures rise at the overwintering grounds, both males and females begin instinctually analyzing the cost and benefits of breeding. For males, the cost of mating is energy expenditure. The spermatophore
can be up to 10 percent of a monarch's mass, and both fighting and flying with females uses lipid reserves. However, the benefit, though unlikely, could lead to the male passing on its DNA. While monarchs are particularly promiscuous, and females can store sperm from multiple males, mating in Mexico is likely less effective than breeding farther north. Most successful copulations are those performed close to the time of egg laying (in other words, in Texas, not Mexico).

While mating close to the time of egg laying leads to more success, some males find the benefits of breeding at the sanctuaries to outweigh the costs. These males are typically in the poorest condition. They often have diminished wing state and small abdomens (which mean less fat reserve). They are least likely to survive the migration to Texas. Males in better condition and more capable of surviving the migration will likely choose differently. For male monarchs, breeding in Mexico is a sort of Hail Mary. Early studies (conducted by male scientists, it should be noted) assumed females were passive, so their behavior was not scrutinized. Now, scientists are less

sure. It seems that females, too, have their own game theory. Females are seen resisting male mating attempts at different levels (and in different ways than observed in their summer range). At least in Mexico, the size of the males, with the smallest males being the most maneuverable and thus hardest from which to escape, may be a factor. Another factor could have to do with the receiving of the spermatophore. Regardless of such equations, when monarchs arrive in Texas, both males and females limp with tattered and faded wings-worn-out warriors scarred from the battles of life. Using visual and chemical clues, the females hone in on milkweed plants. Using their legs, which are covered in chemoreceptors, they drum on the milkweed's leaves to taste the plant's chemical composition, and, reading it like a nutritional label, understand its suitability. Sharp, spinelike tarsal claws on the tips of every female's brushfeet (the first pair of legs which, unlike the other two pairs, are typically tucked beneath the body and are difficult to see) cut the milkweed and trigger the release of more plant chemicals, much like cutting grass does. Drumming affords females extra-strong whiffs, to determine the best milkweed for their babies.

When satisfied, the female tips her body, curls her abdomen, and deposits, with a tiny bit of glue, a small egg on the underside of a milkweed leaf. Like tucking children into beds, monarchs choose the milkweed plants that will become the best possible nurseries and buffets. Though an average female will lay 300 to 500 eggs, she will typically lay only one egg per plant, to ensure enough food for each hatched caterpillar. For the overwintering females, this is their final act: to bestow the next generation a feast-sustenance that will feed the following leg of the migration relay-because even though the overwintering monarchs live longer than those born in the spring and summer, they can't live forever. By the time the females (and the strongest males that took advantage of late breeding) have arrived in the southern United States, they are old creatures. It is their turn to float down to Earth, return to the soil, and bide their time before blooming as flower petals. I was to follow many generations and to learn from them all.

I crouched on hands and knees to accommodate my curiosity. Each leaf appeared uneaten; no eggs in sight. Undeterred, I ripped a tiny edge of a single leaf, to watch its milky latex sap emerge. Testing the sap between my fingers I understood how it could gum shut the mouths of young caterpillars. With a deep breath, I tried to smell its bitter, heart-stopping poison (I couldn't). The gluey, toxic sap deters many herbivores, but not monarch caterpillars. On a neighboring milkweed I caught sight of a horseshoe-shaped hole in a leaf, a trench made by a caterpillar to drain the glue from its meal. In this way, the caterpillar is able to eat the milkweed and sequester the leaf's steroidal poison, cardenolides, in its body. The plant's toxins then become the caterpillar's own powerful defense. A matter of evolution, the relationship of milkweed and monarch continued to play out in that roadside ditch, complicated yet perfect. I felt dizzy. In love. It was early in my journey, and already, I loved the monarchs because I loved the milkweed. I loved the milkweed because I loved the monarchs.

Satisfied with my search, I carried on, keeping my eyes glued to the shoulder of the road. Like a female monarch absorbed in her task, I hunted for milkweed and stopped often to inspect the shaded bellies of their leaves. Mile after mile, the orbs of milkweed flowers, sitting like eggs in leafy nests, stole my attention, until all the hunting paid off. At the first sight of those white, black, and yellow stripes on a caterpillar, I jumped off my bike like it was on fire and dove into the shoulder of the road. Chomping corn-on-the-cob style on a quickly disappearing leaf was my first monarch caterpillar of the trip.

Fifth instar, I figured.

Three to five days (depending on weather) after an egg is laid, a caterpillar hatches, nearly unrecognizable. This first size, or first instar, with its black head and translucent, cream-colored body, looks more like a wormy grain of rice than a monarch. It looks so unlike its larger counterparts that people will sometimes pluck one off their backyard milkweed, thinking it a pest. For the tiny caterpillar that survives, its life as an eating machine begins, starting with an appetizer of its chorion egg casing. Then it spins a pad of silk on which to perch (or possibly to dangle from, if disturbed), and the main feast begins.

As the caterpillars eat, they grow to the limits of their exoskeletons, and are forced to molt. From first instar to fifth instar, monarch caterpillars molt four times. During each transition, monarchs spin a new pad of silk and use the hooks on their rear prolegs (the fleshy pads on caterpillars that function like legs but are not true legs) to secure themselves to the silk. At this point, they stop eating for several hours while their outer cuticle skin separates from the new inner cuticle. As the old skin splits, a helmet-like head capsule falls away. Nearly liberated, the caterpillars must walk out of their old exoskeleton constraints. Watching the process, it is impossible not to root for the fresh-faced caterpillars contracting with effort. With great labor, they emerge. Triumphantly, they turn around and eat their own discarded skin. Nature wastes not.

With each molt, the monarchs get makeovers. Their front and back tentacles (antenna-like appendages) start as small bumps and stretch to elegant flairs. Their black, white, and yellow bands grow more pronounced and vibrant. Their six true legs see subtle changes in position, and their ten prolegs gain white-dot embellishments. They grow in size, too, but size alone cannot indicate age, as the condition of the milkweed also influences how much the caterpillars grow.

The fifth molt is perhaps the most dramatic. A larval finale, if you will, from fifth instar larva to pupa. The graduating caterpillar hangs from the silky pedestal of its silk button, and curls until it forms the letter]. The fifth molt begins as the exoskeleton splits to reveal the soft, neon-green of a young chrysalis. Its larval skin-an homage to its caterpillar life-bunches and falls away. Pulsing, the cremaster (the black post it dangles from) is driven into the silk so the chrysalis doesn't fall.

Most of us learn the basics of this transformation in grade school, but as adults, we stop truly looking, assuming there is nothing new to see. It is when I really look, with all my senses, at the feat of an egg becoming a butterfly, that I find God….A spring migrant.

The monarchs and I were not the only migrants. Feathered, scaled, and hairy wings towed warmth and color from distant lands in their contrails. Yet migrants were not the only actors. Wildflowers-firewheels, winecups, and lupines-stood captivated by the sun and invited even the most timid pollinators to waltz among their petals. The hibernators, letting out long sighs as they stretched in the spring sun's rays, shook off the last grasp of winter and returned to work. I was surprised to find such drama along a Texas road.

Response Questions:

When we talk about natural conservation efforts, we often think about the “beautiful” and the “charismatic” – for Colorado, that might be a wildflower-specked mountain, an iconic

trout-filled river, a moose in a snowy field, an especially patriotic Bald Eagle perched on an American flag pole. And that's perfectly fine – we value these especially striking places and creatures, so we should work to protect them.

However, whenever the author is crawling roadside culverts looking for Monarch caterpillars or trapsing through stagnant swamps looking for milkweed, this practicing what Lawrence Buell refers to as the "dignification of the overlooked": carefully attending to the less celebrated but equally important species and processes of ecological systems.

In this passage, how do you understand the writer's developed ability to appreciate and closely commonly overlooked plant and animal species like caterpillars? What does her knowledge of and passion for Monarch butterflies have to do with this?

Thinking about the 'dignification of the overlooked' concept more broadly, what kinds of interests, passions, or areas of expertise do you have which aren't commonly held by others? Why is this 'less popular' interest so important to you, and how do you remain engaged without support, interest or acknowledgment from others?

Prompt #5:

From *Bicycling with Butterflies* by Sara Dykman (pp 109-112)

Crossing the Missouri River again, I moved north. I crossed corn fields and a state line into Iowa. At Desoto National Wildlife Refuge, layers of native grass hid speckled fawns, and marshlands were flooded with pipping kingbirds. A view of a raccoon, noble in its wildness, buoyed me. I crossed more corn to arrive in Mondamin, Iowa (population: 379; named after a Native American goddess of, you guessed it, corn). Near the playground of the local school, middle schoolers walked me through a corner dedicated to native prairie. Next up was Sioux City, Iowa. On a meadow-topped hill overlooking town, a ringed-neck snake said hello. Yet, between the hopeful moments were miles of corn. I could not isolate myself from the truth.

"We used to see loads of monarchs," a man at a grocery store mused. "Now I hardly see any." I'd heard this almost daily. It was a story told without malice, but it stung all the same. Some of the stories I was hearing, I enjoyed. Such as how, in World War II, the government paid children to collect the fluffy seed heads of milkweed (called floss, or coma) in onion bags. The floss went into making life jackets for soldiers. It took two onions sacks to fill a life jacket, and 1.2 million jackets were needed. Milkweed gave us over a million life jackets, and our thanks was to spray it with weed killer.

Mostly, the stories just hurt. The older generation had lived with milkweed when it was still abundant (and unappreciated) enough to be called a weed. The people sharing their stories would talk about how, as kids, their jobs had been to pluck milkweed from the fields, but their stories mostly ended there. They didn't usually continue with how, as they became adults, their family farms were bought out and mega-industrial agricultural conglomerates began to rule the land. They didn't share the fact that, by the 2000s, genetically modified crops and broad-spectrum herbicides had been unleashed. Their childhood farms were replaced by fields of modified corn, which became the only plant capable of withstanding the poison doused on every acre. Even milkweed, once prolific, largely succumbed. The last holdouts of the prairie didn't stand a chance.

Only gene-altered corn survived, creating naked and poisoned monoscapes. That older generation had witnessed something spectacular, then they had bequeathed me a shadow. Most never asked themselves why or said sorry. What are you doing to fix it? I wanted to ask, but my diplomacy usually won out. "Current farming practices don't leave room for native plants like they once did," I explained. "Monarchs require milkweed. Without milkweed, there can be no monarchs. We have to change how we farm." After such conversations, I hoped, as I biked away, that my words would leave them unsettled, and they would look around and begin to tell a different story.

There were once billions of monarchs, now there are millions. There had been millions of Eskimo curlews, billions of passenger pigeons, and trillions of Rocky Mountain locusts—now there are zero.

These animals are trying to warn us. The milkweed and the monarchs are canaries in the coal mine. Humans, numbering nearly 8 billion, are also threatened. The broken planet that is killing insects and birds and frogs is killing us, too. We are under attack. Watch the news. Go outside. A report by an Australian think tank ran the numbers: if nothing changes, human civilization as we know it today will likely collapse by 2050. I'll be 65. I hope I die before the monarch migration does. I am aware

how dramatic that sounds, but my heart can't stand the pain of telling a generation not yet born that when I was young, there were still monarch migrations.

I am also aware that we must eat. That we must balance farmland and protected lands. It is a matter of priorities. It is about remembering how to share. There was a time when plowed farmland actually invited common milkweed (Asclepias syriaca).

Prior to European settlement, common milkweed had been a species with a limited range. As a disturbance species, it was likely confined to excavated soil, mostly found around animal burrows. Plowing opened up millions of acres of opportunity. Common milkweed thrived between corn rows and on field edges, and was actually preferred by egg-laying female monarchs over adjacent nonagricultural habitat. This preference may have been because such milkweed was easier to find, occurred in isolated patches which limited predators, had more edible leaves (due to lower sun exposure), or had higher nitrogen levels. Whatever the reason, it is good to know that sharing is possible. Today we don't often share, even accidently.

Herbicide use began in the 1940s and was historically applied before the corn emerged; otherwise the corn also would have been killed. Glyphosate (Roundup, as marketed by Monsanto) was introduced to control "weeds," but again, it could not be applied once crops had emerged. Spraying before emergence allowed monarchs to safely utilize agricultural habitat.

In 1996, genetically modified (GM) soybeans were introduced; GM corn followed in 1998. These seeds were tolerant to glyphosate applications, and being "Roundup ready" meant that farmers could spray after the crops had emerged. By 2012, 73 percent of corn and 93 percent of soy were Roundup ready. Any plant that was not tolerant quickly starved, as their mechanisms of photosynthesis broke down. Milkweed didn't stand a chance.

In 2019, the United States Department of Agriculture reported that more than 91.7 million acres (about 69 million football fields) of corn were planted in the nation, and 89 percent sprouted from herbicide-tolerant, genetically modified seeds. Our water, air, milkweed plants, and monarchs continue to be collateral damage.

As I watched the miles of corn come and go, the most infuriating part of the puzzle was that most of that corn wasn't even being grown for human consumption. Depending on markets, about a third of it goes to animal feed, another third to ethanol production. Ethanol is a fuel source that uses more energy to make than it can produce, yet the government supports it with subsidies. We call government support to farmers "subsidies." Support for poor people is instead referred to as "welfare." Regulations are basically subsidies for wildlife and wildlands. I yelled at the clouds, because they listened. I wished they could tell me what they remembered of that place once called a prairie.

Response Questions:

As much as the author makes clear that the North America's human development – roads, bridges, forestry, industrial agriculture, subdivision-style housing developments, the

creation of international boarders – is *not* designed for bicyclists or butterflies, she also suggests in this passage that our modern world is not very well designed for *us* as human species either.

Thinking locally about Colorado and the American Southwest, where and how have you felt, somewhat like a migrating butterfly, that you don't have access to a home and healthy habitat? What would you change about human development practices here in Colorado?

As the examples in this passage illustrate, our world necessarily changes from one generation to the next, sometimes radically. There have been no lack of negative changes in the past century – climate change, species loss, increased toxicity in our land and water – but in using milkweed as an example, changes are not always 'bad' in a simple sense: as much as human development threatens Monarch butterflies, it has also facilitated habitat expansion since milkweed didn't previously exist outside of America's central prairies. **Thinking either ecologically *or* socially/politically, what's another example of a significant change you've witnessed in your lifetime which has a complex or unsettled impact on our lives?**

Spanish-language and Other Resources from Sara Dykman

Noticias:

El Tiempo Recorre ruta de la Mariposa Monarca

CBS News Inside the monarch butterfly migration mystery: flying to Mexico from Canada, the U.S. - CBS News

Podcast:

Linguocast: Sara Defensora de las Mariposas Monarcas

Spanish Videos: Sara made videos for young kids in English and Spanish.

Scroll to bottom for Spanish videos:

Spanish and English Videos for Kids

School Resources:

Start on page 23.

Worksheet on Monarch Trip

Magazine Article:

Ciclosfero El cielo y la tierra: el viaje de 5.000 kilómetros de las mariposas monarca

National Geographic: Saving the Monarchs