2027

Phenology Calendar

Artwork and Writing by the Class of 2031



Every year students at OWL explore the community around them through our Fall Fieldwork program. Each grade is tasked with digging deeper into one of the many questions that can help to drive and motivate students' curiosity towards their impact on the environment around themselves. For the seventh graders this question is "What makes a community thrive or suffer?" Throughout the year the students investigate this question through a multidisciplinary adventure that follows them through art and science!

In the fall, students spent a night at Osprey Wilds Environmental Learning Center where they learned about the many different plant and animal species that thrive in our state. The students also learned about the systems that maintain the sensitive equilibrium between abiotic and biotic factors. At Belwin Conservancy students continued to explore these systems deeper by exploring the Minnesota prairies, deciduous forests, and coniferous forests equipped with thermometers, photometers, anemometers, sketchbooks, and their curious minds! All of this to discover what makes ecological communities thrive or suffer.

When they returned to OWL, the students in Kent Miller's art class learned how to create scientific drawings of animals where students chose a specific Minnesota species to illustrate and created amazing works included in this calendar!

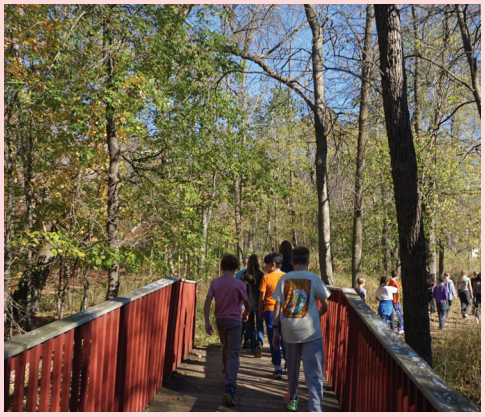
Back in science class, students worked together to research the impact on the seasonal activities, or phenology, of their species. In the end the students synthesized their learning by writing about the impact of climate change on their species' phenology.

This calendar is a showcase of the students' knowledge of the impact of climate change on their local ecological communities that they discovered through outdoor exploration, artistic interpretation, scientific research, and writing.

I feel so grateful to have adopted this amazing project from Megan Hall, and I think the students did a stellar job, both in their work in Kent's art class as well as the research they did in mine.

Akira Mally
7th grade Science Teacher







A Word from Kent Miller (Art Teacher at OWL) on his Experience Teaching the Minnesota Species Project



[To start this project] we practiced [the look, hold, draw method] a few times with our observational sketchbooks and then that allowed the students to have a baseline of skill to draw with accuracy the species of choice.

The main revision process was time. I gave an extreme amount of class time for students to create their drawing. How can time be a revision technique? Well, it is all about creating the mood or tone in the classroom with the students. It is important to give students the space to create and feel unencumbered by external factors, like time. As a teacher I had to trade getting through more content with doing this project with quality. So it was not a specific revision process but rather it was the space for a student to see that they wanted improvements done on the project they were creating and had the space, time, to do it.

I chose to offer different types of mediums as a way to allow for the student to feel more comfortable with their own creating process. Giving the student space to make their own choices about what medium is a way to get students creating at their highest level. When students have the autonomy to make their own choices and it directly influences their own project it increases the quality of the art project. I have seen that numerous times in my teaching career. When I have specific requirements it often reduces student creativity and increases a technical expericene in visual art.

When it all comes down to it, as an art teacher I am often trading one aspect of the project for another. Like a little slider bar, when I increase freedom over here it automatically decreases something else. I just have to be aware of what things are being traded for and be okay with it. Like in the case of the MN Species Project I traded quality of project and time.

I am so very excited about the results of the MN Species Art Project and very proud of the work that students put into it.

Special Thanks to

Leo Bickelhaupt, Akira Mally, Kent Miller, and Claire Ales

Publication Team

Melita Allen and Louden Buetow

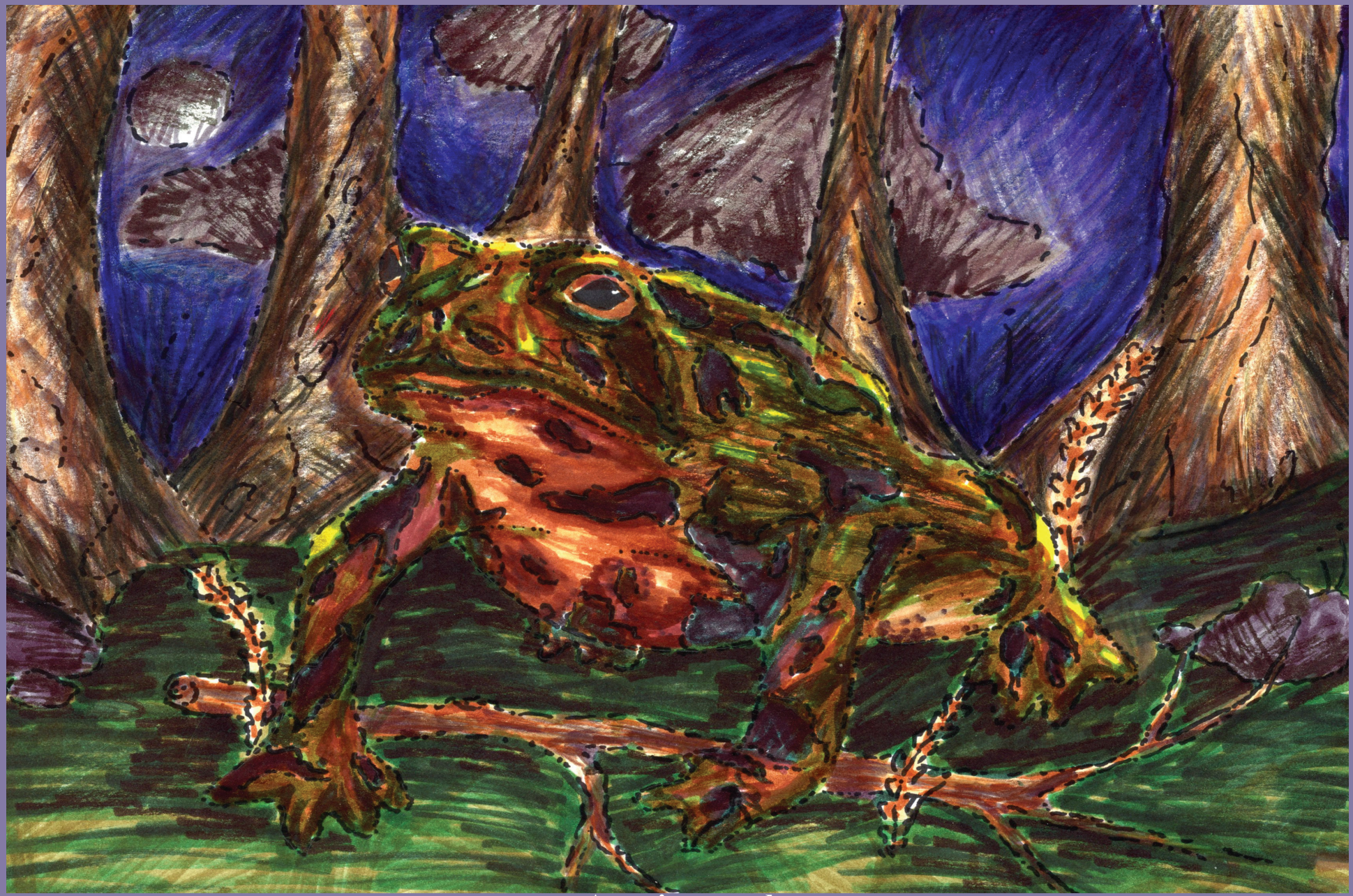
Cover Art

Marina Savolainen-Lee,
Monarch butterfly
(*Danaus plexippus*)



Siri Nathan
Sugar Maple Tree
Acer saccharum

Issy Olson



American toad

Anaxyrus americanus

January

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
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17	18	19	20	21	22	23
24 31	25	26	27	28	29	30

Olivia Oseguera



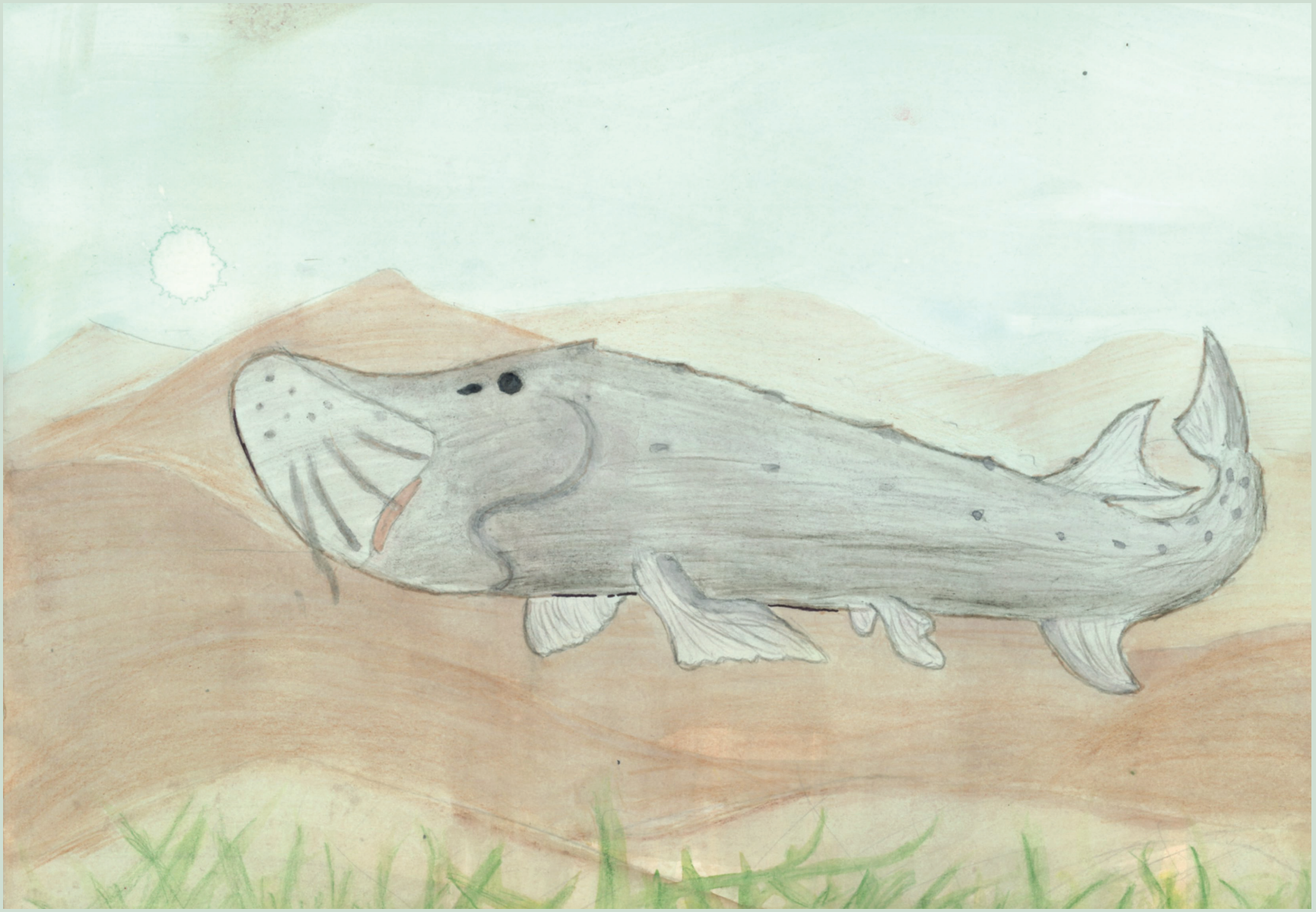
North American river otter

Lontra canadensis

February

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
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28						

Jasper Ewert



Lake sturgeon
Acipenser fulvescens

March

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Elsa Holm



Hognose snake

Heterodon platirhinos

April

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Will Horton



Black bear

Ursus Americanus

May

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23 30	24 31	25	26	27	28	29

Teagan Glasco



Star magnolia

Magnolia Stallata

June

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20	21	22	23	24	25	26
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Elizabeth Bedard

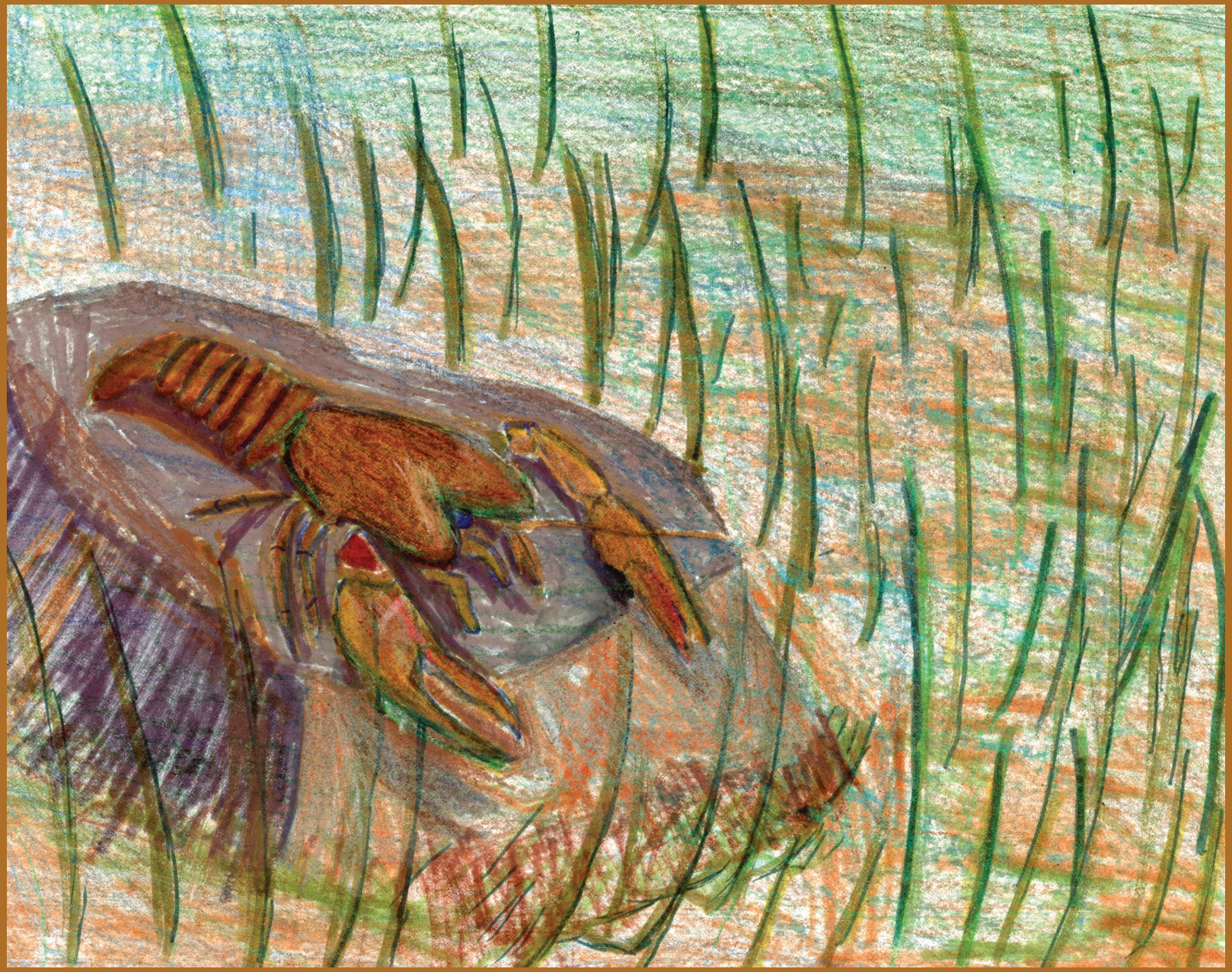


Snapping turtle
Chelydra serpentina

July

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Graeme Burt



Northern clearwater crayfish

Faxonius propinquus

August

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Emmett Hannert-Dawson



Eastern meadow vole
Microtus pennsylvanicus

September

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Anastasia Race



Evening bat

Nycticeius humeralis

October

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
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Rosie Whitten



Swainsons hawk

Buteo swainsoni

November

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21	22	23	24	25	26	27
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Clara Rufi



Northern cardinal

Cardinalis cardinalis

December

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26	27	28	29	30	31	



Abir Daali
Snow bunting



Cecilia Solis Monter
Wood duck



Alice Mounes
Ruby throated hummingbird



Gabreille Beauregard
Grouse



Maxwell Nowiki
Piping plover



Isaac Ladoucer
Loon



Nova Weston
Great blue heron



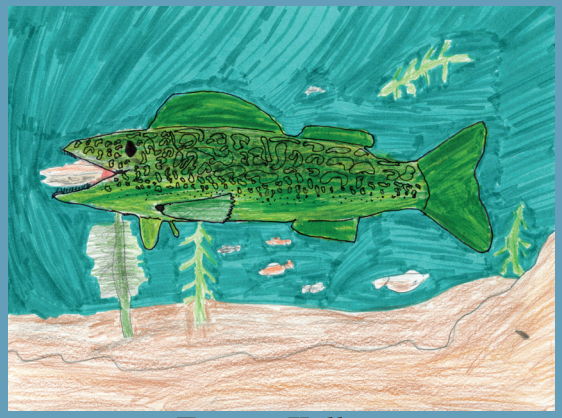
Soren Sommervile
Double-crested cormorant



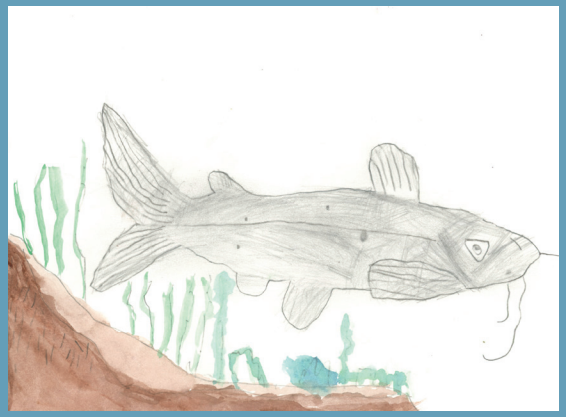
Amelia Wilkins
Eastern hemlock



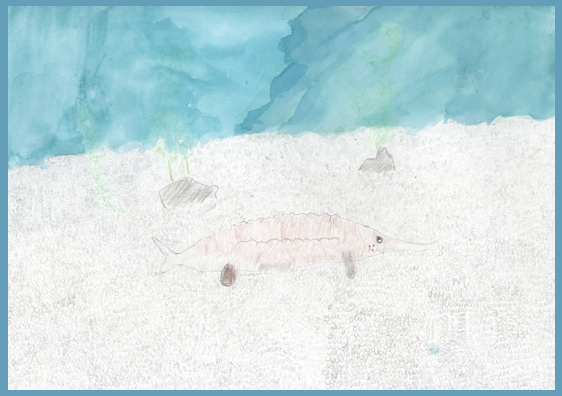
Asher Crocker
Small mouth bass



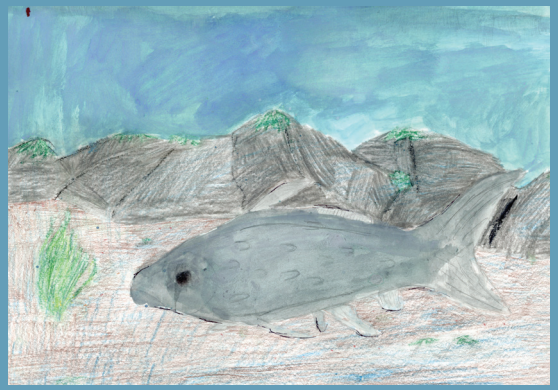
Everett Keller
Walleye



Ellot Street
Channel catfish



Gus Osborn
Longnose gar



Simon Guffy
Blue sucker



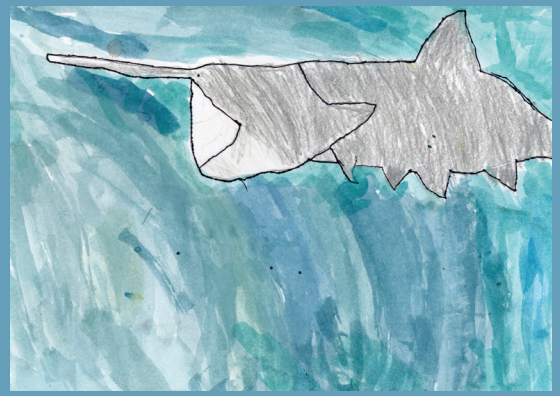
Wyatt Jedlicki
Large mouth bass



Sebastian Halland
Shovelnose sturgeon



Patrick Wonders
Topeka shiner



Arcadio Harty-Agbo
Paddle fish



Ava Wright
Bobcat



Braxton Jenniges
Red fox



Charley Sil
Raccoon



Coral Cosgrove
Ermine



Evelyn Connor
Moose



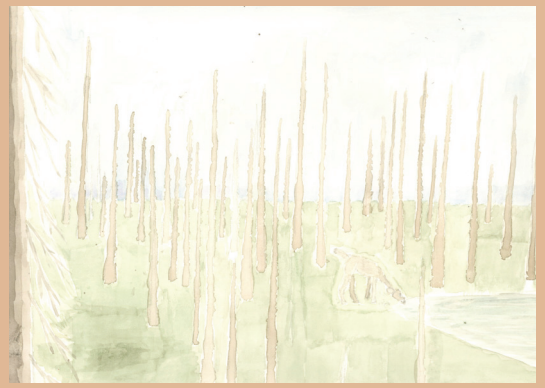
Henry Kain
Canadian lynx



James Garrett
Grey fox



Julian Dantas-Kemp
Grey wolf



Julio Yang
White-tailed deer



Liam Torres
Fox squirrel



Lourdes Maldonado Gamez
Bison



Margo Nathan
Beaver



Nikki Chrz
Mink



Piper Squire
Northwestern moose



Rosie Van Genderen
Badger



Simon Simmers
Fisher



Raelynn Hamblin
Painted turtle



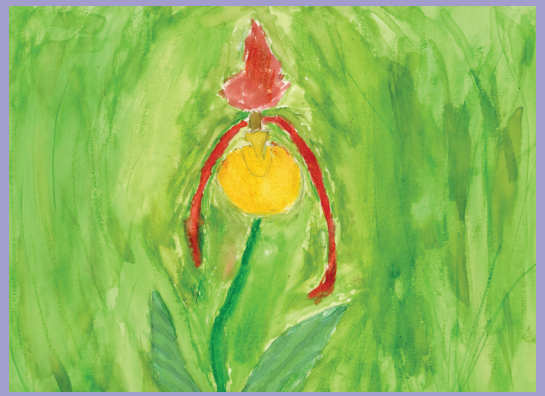
Cristian Bravo Mendez
Morning dove



Grayson Allen
Wood frog



Hattie Davis
Bull frog



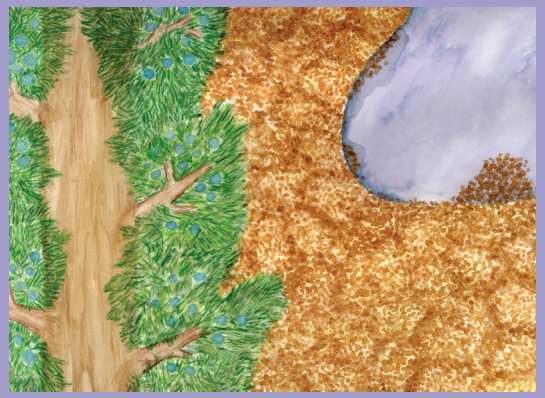
Lydia Harris
Yellow lady slipper



Tahlia Guerrero
Jacob's ladder



Saanii Beavers
Arnica lonchophylla



Abby Macleod
Eastern red cedar



Willow Turbak
Pink lady slipper



Josie Brown
Red cap mushroom



Tim Berquist
Bull frog



Ellie Dent
Minnesota ladybird beetle



Everly Jones
Poweshiek skipperling butterfly



Jack Sullivan
St. Croix snaketail dragonfly



Olive Rodriguez
Asian lady beetle



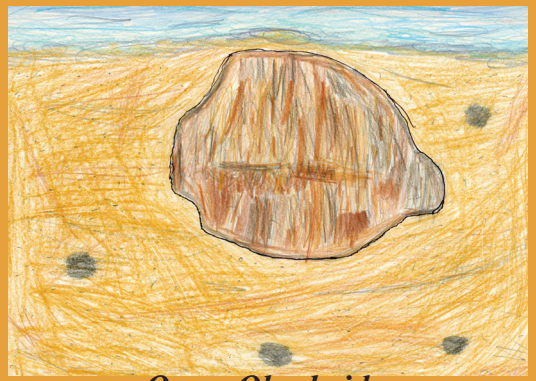
Sam Dell
Bumble bee



Vincent Swayne
Plains gardner snake



Lyric Jenkins
Zebra mussel



Owen Oberheide
Bullhead clam



Infinite Allah
Chicken of the forest

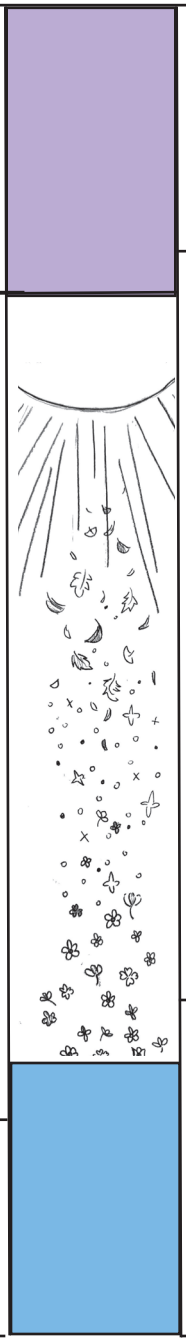
How MN species are affected by climate change

Black spruce – *Clara Brady*
Climate change is positively affecting the Black Spruce population. Their growth is responsive to warmer, spring-like temperatures. The reason they are more responsive to warmer climates is because it promotes faster growth. The rise of temperatures in the months of April through October gives the trees more time to grow. This rise in temperature extends the growing period by 8-11 days. If the temperatures continue to rise during those months, the species will thrive even more.

Ruffed grouse – *Gabrielle Beaureguard*
As winters get warmer and the snow melts sooner, ruffed grouse find themselves pushed farther north, closer to, and even beyond, the Canadian border. Warmer springs may cause insects to emerge earlier, potentially leading to a mismatch between insect availability and grouse chick hatching timing. Chicks rely on this food source for survival, and without deep snow, they lose their usual ways to survive, such as burrowing into snowbanks to stay warm and hidden from predators. These changes do not just make life harder; they also result in fewer chicks being born and food becoming more scarce. Scientific studies indicate that the ruffed grouse populations are particularly vulnerable to the effects of climate change on snow cover and food resources. Because of climate change, it is even harder for them to survive in the wild, and it remains uncertain how their populations will adapt.

St. Croix snaketail dragonfly – *Jack Sullivan*
Climate change is negatively affecting the St. Croix snaketail dragonfly. One example of this is that wildfires can reduce food, which constrains mating behaviors in some dragonfly species. Another example is the rise in temperatures. Since dragonflies are exothermic, if they get too cold, they can't warm up; if they get too hot, they can get sick. If they are too hot, chemical reactions can take place in their bodies, resulting in death. Since dragonflies are highly temperature-dependent, even a few degrees higher can be harmful. As temperatures rise and wildfires become more likely to happen, dragonflies are affected. Climate change is the primary factor of the declining dragonfly population.

Swainson hawk – *Rosie Van Genderen*
The Swainson's hawk is being negativly affected by climate. Rising temperatures mean their main food sources come and go before the hawk can eat them. When the rodents that are eaten by these hawks eat insects that gain energy from trees, they have to start earlier in the spring so they can eat the trees. So the hawks have less and less each year.



Canadian lynx – *Henry Kain*
The Canadian Lynx, which lives in Canada and upper parts of the United States, is struggling due to global warming. The warmer, shorter winters in Canada and Minnesota make it harder for the Lynx to traverse the already melted snow. They cross the border to hunt the Snowshoe Hare which lives in the young forests of Minnesota and Canada. Global warming is bad for the Canadian Lynx

River otter – *Madelynn Vang*
Climate change is negativly affecting River Otters. River Otters are indicator species, so their presence is a sign of good water quality. Freshwater ecosystem health is of particular concern to humans. Think about it, most cities are built on rivers; all people need water. Otters exhibit resilience to climate disruption events like strong storms, drought, sedimentation, and temperature shifts. However, the otter's food is more sensitive to the impacts of climate change and other factors like pollution. Otters are at the top of the food chain, which means impacts to their food can impact otter populations. Other climate-related threats to River Otters and their food include sea-level rise and salt water intrusion into freshwater habitat. Climate change could alter environmental conditions with irregular temperatures and precipitation, which would have a trickle-down effect on other parts of their ecosystem, such as disease, parasites, and other predators. Some otters may be more sensitive to these changes than others and may not be able to tolerate the new conditions. Climate change may also physically shift suitable habitat to a new location, forcing otters to stay, adapt, and move to where environmental conditions are more favorable. Lastly, human pollution and development could taint the water quality and food sources, destroy their large, pristine freshwater habitats, and stress otters even further. So overall, if climate change continues, it will really affect Sea Otters and their ecosystems; which can affect food chains, how they act, and sea-level rise.

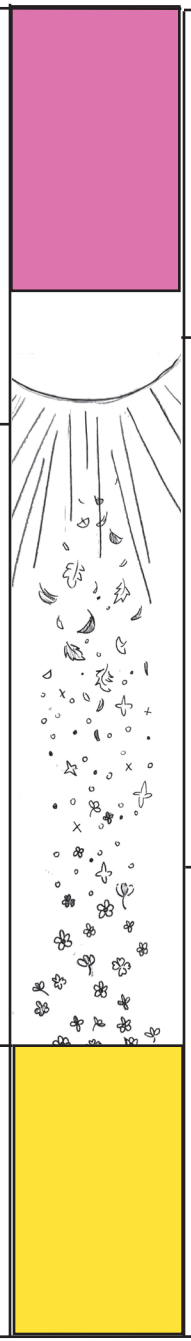
Piping plover – *Maxwell Nowicki*
Climate change is negatively impacting the piping plover in Minnesota. According to ocean.si.edu, when the temperature rises because of climate change, spring comes earlier, and there is less ice which means less suitable nesting spots for the birds. If the Piping Plover decides to put their nests on melting ice, their eggs could float away in the water. Also due to climate change, the Piping Plover migrates further north which exposes them to predators. In conclusion, due to climate change, the population is going down due to lower nesting spots and that's why I think climate change has a negative impact on the piping plover.

How MN species are affected by climate change

Beaver – *Margo Nathan*
Beavers are critical creatures in fighting climate change in Minnesota and around the world. Unfortunately, climate is negatively impacting them faster than they can fight it. In autumn, when beavers build their dams, they engineer them specifically to slow water flow, creating lakes and ponds. Climate change has caused the winters to come earlier, before beavers can properly brumate. According to the World Wildlife fund, If the winter comes before the beavers are done building dams, carbon that would normally get stored in wetlands will get into the atmosphere, destroying our ozone layer. According to studies done by the World Wildlife Fund, areas with beavers tend to better survive wildfires. Without Beavers, areas would be drier, more prone to wildfires and more carbon

Sugar maple – *Siri Nathan*
Can you imagine Minnesota without our iconic maple syrup? the sugar maples in Minnesota are dying. These trees need very specific temperatures. Due to climate change, but they aren't getting these temperatures. Sugar maples grow in clumps and groups, so when one tree gets hurt, the others can help or send messages through their roots, Which is good, until the lack of snow harms the roots and they stop doing their job. The soil also needs the tree leaves to be healthy and habitable in the spring and summer, but the leaves aren't ready to fall when they need to and delay the process in the fall. The strong freeze-thaw cycles have driven leaves to fall earlier and sap flow to start earlier. Scientists believe that by 2090, sap flow and collection will start 2-4 weeks earlier, causing the other plants, animals, and people who need that sap as food or a money maker to start the process earlier before the sap or tree is ready. Studies from 2018 show that the rising temperatures are affecting the insects and animals that rely on the trees for a habitat. They are suffering because many of the insects live on or near the roots; and in winter, the snow acts as insulation to protect the insects and roots from freezing. Without the snow, many more roots have frozen, killing or harming the trees.

Fox squirrel – *Liam Torres*
My research shows that Global warming is actually good for fox squirrels. The results of how they are impacted by climate change are actually quite interesting because they actually benefit from climate change because they will be able to live in more suitable land with more food which would result in a population increase. But there is a bad part about this. If fox squirrels migrate farther north, they will make smaller squirrels (like the flying squirrels) population massively decrease due to too much competition with bigger squirrels.



Snow bunting – *Abir Daali*
Due to global warming, the Snowbuntings in Minnesota are decreasing rapidly. Why is the population of Snowbunting birds decreasing? Warmer springs make early breeding behavior. But since the babies are hatching early, the ecosystem isn't equal. Because their food source is lower, the Snowbunting species is closer to extinction. Between 40 years ago and today, the Snowbunting population is decreasing rapidly. These birds are really important, because they help with soil. And that is how global warming is affecting the population of the bird Snowbunting.

Badgers – *Rosie Van Genderen*
Climate Change affects badgers negatively in many ways. First, their food source. Earthworms, a main source of food for badgers, do not like dry soil, so as land gets dryer in the summer due to climate change, worms dig deeper into the ground to find cooler and wetter soil. This makes it very difficult for badgers to get to the worms underground because of the deeper soil being too firm for their claws—especially during droughts.These conditions make it very difficult for cubs to get their food. In 1995, 65% of baby cubs died in October due to a drought in the summertime. Secondly, their habitat. Badgers mostly live in Prairies, prairies that are being affected severely from climate change. Due to rising temperatures in the summer, wildfires are more likely to happen which destroys badger's homes and environment. In conclusion badgershave mostly been affected in the summertime by its dry and very hot temperatures. Even though there hasn't been much of a change in their life cycle, it is still important and needs to be fixed.

Moose – *Evelyn Connor*
The poweshiek skipperling butterfly is native to the Midwest. Due to climate change, they are being driven to extinction by the rising temperatures and extreme dry weather. The drought has also decreased their ability to find food sources, which ultimately means they cannot eat and they end up hungry. The poweshiek butterflies are highly sensitive and fragile so any of these changes make a big impact. As temperatures are rising there is less winter to spend as caterpillars. These unpredictable changes mismatch the timing for when they emerge into butterflies: they emerge before food is available and it reduces survival chances. So in conclusion, the poweshiek skipperling butterflies are being killed by climate change and we need to do something about it.



January



February



March



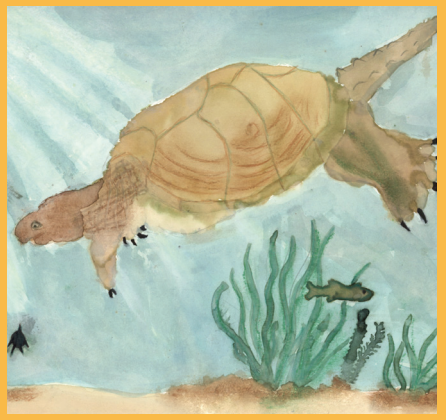
April



May



June



July



August



September



October



November



December