Urban Biodiversity & Phenology

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How and why does our environment change over the course of a (school) year?

WHAT: I will map the different plants, animals, insects, etc. that are on my school campus over the course of the year, and what state they are in (phenology).

HOW: I'll successfully do this by:

- Learning about urban biodiversity & its importance.
- Learn about phenology and how it applies to different species.
- Taking urban biodiversity surveys of select locations around campus, at least 4 times throughout the school year (but ideally during each of the 5 seasons)
- Create a map, graph, or other data visualization that summarizes the collected data.

WHY: In order to better understand what is living at our school (and how that may change from year to year)

Standards

Science Standards:

- **HS.L2U3.18** Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.
- **HS+B.L4U1.2** Engage in argument from evidence that changes in environmental conditions or human interventions may change species diversity in an ecosystem.
- **HS.L2U1.19** Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.
- **HS+B.L2U1.3** Use mathematics and computational thinking to support claims for the cycling of matter and flow of energy through trophic levels in an ecosystem.

Science and Engineering Practices:

- **Analyzing and Interpreting Data** Scientific investigations produce data that must be analyzed in order to derive meaning. Engineering investigations include analysis of data collected in the tests of designs.
- **Planning and Carrying Out Investigations** Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually.
- **Asking Questions and Defining Problems** A science practice is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and can be empirically tested.

Crosscutting Concepts:

- **Patterns** Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

Unit Hook

1. Take a walk around the campus, making a note of any plants, animals, insects, etc. that you know/see. It is ok if you don't know a lot of their names! Mark the ones you do know down on a campus map.
2. Pick one area and create a detailed map of all of the plants in that area, even if you don't know what they are called. How many different kinds of plants are there? Did you see any animals or insects? How many and what kind (if you know)? Create a key for your map.
3. Come back together as a class and share your area maps. Which areas of campus are the most diverse (in terms of plants, animals, insects)? Why do you think that is?

What is urban biodiversity?

Learning Target: What am I learning today?	I am learning: the definition and importance of biodiversity & urban biodiversity, how to do a bird/plant/animal survey, how to collect data
Success Criteria: How will I know that I have learned it?	I can: define biodiversity and its importance, do a bird/plant/animal survey, determine the best method for collecting data
Why am I learning this?	This is important because having a diverse ecosystem helps to sustain everything on Earth. Biodiversity supports food security, medicines, pollination, water conservation, etc.

What is biodiversity?

Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world.

All species and organisms in an ecosystem work together, like an intricate web, to maintain balance and support life. Everything in nature is connected and plays a role in keeping our ecosystems healthy and functioning. When one part of this web is weakened, changed, or lost, it can have ripple effects across the entire system.


NGScience
What is Biodiversity?

Three levels of diversity: species, genetic, & ecosystem

Species come in all shapes and sizes, from organisms so small they can only be seen with powerful microscopes to huge redwood trees. They include bacteria, protozoa, fungi, flowering plants, ants, beetles, butterflies, birds, fishes, and large animals such as elephants, whales, and bears. Each species is a group of organisms with unique characteristics.

Biodiversity includes the genes that every individual inherits from its parents and passes on to the next generation. Genetic diversity is found everywhere, from the variety of songs and feather colors of birds to the colors, tastes, and textures of apples and other foods. Genetic variation, which determines the extent to which individuals can adapt to their environments, is extremely important to their survival.

Genes determine the traits of individuals that form populations of a species. Individuals from different species interact to form communities. These interact dynamically with non-living environmental components, such as water or minerals, to form an ecosystem. Some ecosystems such as tropical forests and coral reefs are especially complex and host a large number of species. Other ecosystems such as deserts and Arctic regions have less complexity and thus a lower number of species, but all those species are ecologically important and some are endemic to that ecosystem.

Why is biodiversity important?

By enabling the natural processes that keep our ecosystems strong and resilient, biodiversity supports everything in nature that we need to survive. It grows the food we eat, purifies the water we drink and the air we breathe, and provides the natural resources we rely on for medicine, fuel, and shelter.

Biodiversity sustains nature’s contributions essential to our health, safety, and protection. It helps regulate climate, protect us from floods, storms, and other disasters, and support livelihoods and economies around the world.

- Places that contain high biodiversity are able to cope better with changes. They are more resistant to natural or human-related disturbances.
- The diversity of life also has significant economic value. Many industries, like tourism, agriculture, and pharmaceuticals, rely heavily on ecosystem services.
- Biodiversity also has immense cultural, spiritual and aesthetic value. Certain animals and plants hold great significance in many cultures.


biodiversity
TED-Ed

Threats to biodiversity

- farming & livestock grazing
- deforestation
  - for agriculture, illegal logging, mining, building roads & dams
- climate change & global warming
  - using fossil fuels
- habitat loss and fragmentation
- overfishing & exploitation of the seas
  - plastic pollution
- extraction and use of fossil fuels
- pollution of soil, air, and water
- invasive species

How can we protect against biodiversity loss?

- Protecting, managing, and restoring forests
- Preserving and restoring peatlands (wetlands such as marshes and swamps)
- Protecting and preserving mangrove forests and sea grasses
- Conserving and restoring natural spaces, both on land and in the water

What is urban biodiversity?

the variety of living organisms, including their genetic variations, and habitats in and around dense human settlements.

What are ways to protect urban biodiversity?

- protect and build green spaces
- using green infrastructure
- protect and build wildlife corridors
- plant microforests
- encourage native species
- promote pollinator-friendly landscapes
- community engagement
- urban forestry
- ecological design in new developments

Why protect urban biodiversity?

- regulates temperatures
- improves air and water quality
- boosts carbon sequestration
- reduces flooding
- supports local wildlife
- lessens the urban heat island effect

Looking at the definitions, does our campus have a lot of biodiversity? How do you know?

What (do you think) are different ways to track biodiversity?

Here are some tools to help us:

iNaturalist

Merlin Bird ID

How should we track our school’s biodiversity?
What should we track? Why?

Assessment:

Goal: Track our school's biodiversity over the course of the year.

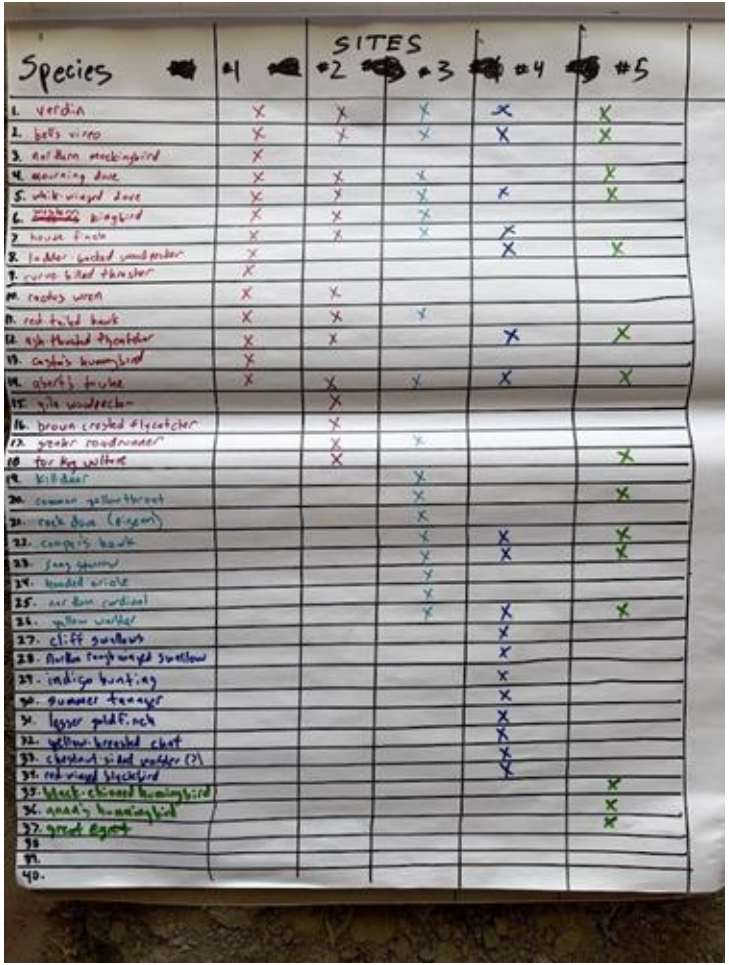
1. Pick 3-5 locations
2. Pick what we want to track
3. Take our surveys
4. Visualize our data
5. Repeat steps 3-4 during Q2, Q3, and Q4
6. Analyze the data, making comparisons & visualizing it for the year.

If we're tracking birds…

download the app & create an account

- make a list of the birds Merlin hears
- share with the class

did Merlin hear the same birds for everyone? why do you think that is?

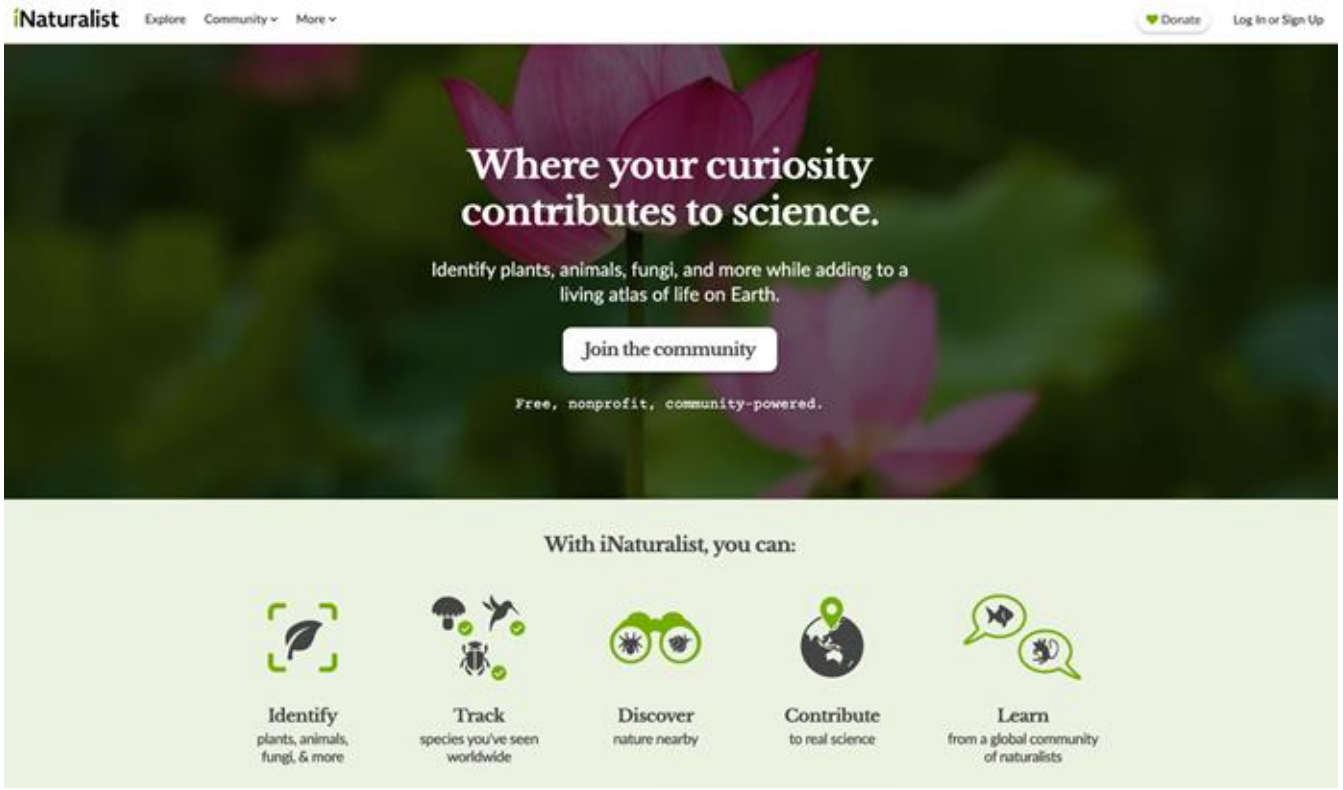


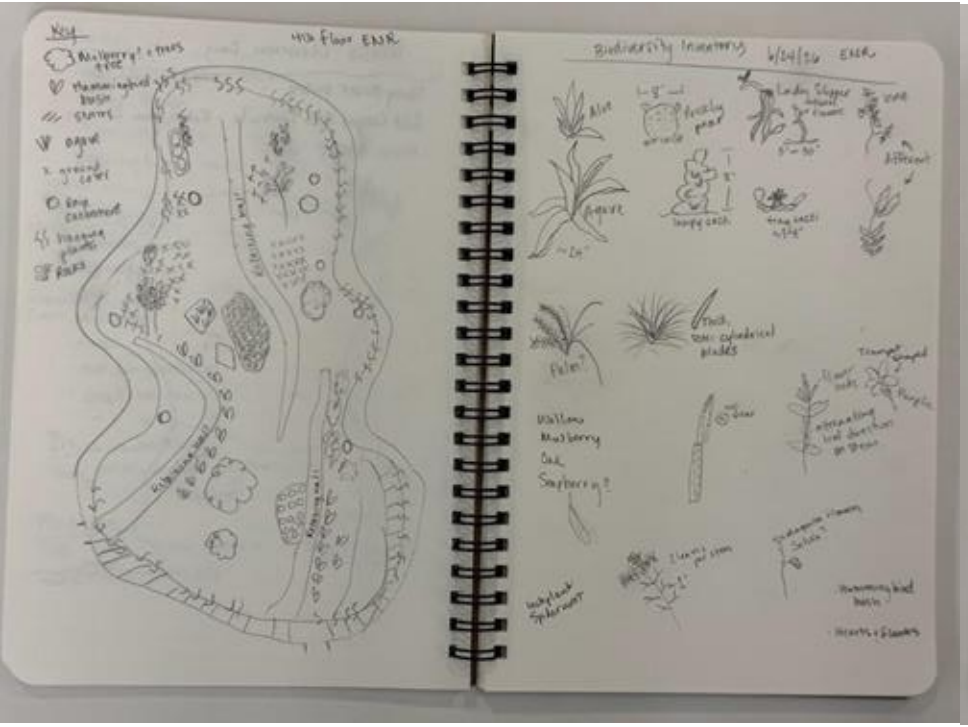
Species	#1	#2	#3	#4	#5
1. verdin	X	X	X	X	X
2. bells vireo	X	X	X	X	X
3. northern mockingbird	X				
4. mourning dove	X	X	X		X
5. white-winged dove	X	X	X	X	X
6. [redacted] phoebe	X	X	X		
7. house finch	X	X	X	X	
8. ladder-backed woodpecker	X			X	X
9. curve-billed thrasher	X				
10. rock wren	X	X			
11. red-tailed hawk	X	X	X		
12. ash-throated flycatcher	X	X		X	X
13. cooper's hummingbird	X				
14. abert's towhee	X	X	X	X	X
15. gila woodpecker		X			
16. brown-crested flycatcher		X			
17. greater roadrunner		X	X		
18. [redacted] warbler		X			X
19. killdeer			X		
20. common yellowthroat			X		X
21. rock dove (pigeon)			X		
22. cooper's hawk			X	X	X
23. [redacted] squirrel			X	X	X
24. hooded oriole			X		
25. northern cardinal			X		
26. yellow warbler			X	X	X
27. cliff swallows				X	
28. northern rough-winged swallow				X	
29. indigo bunting				X	
30. summer tanager				X	
31. lesser goldfinch				X	
32. yellow-breasted chat				X	
33. chestnut-sided warbler (?)				X	
34. red-winged blackbird					
35. black-chinned hummingbird					X
36. anna's hummingbird					X
37. great egret					X
38					
39.					
40.					

If we're tracking plants, insects …

download the app & create an account

- walk around the space & make a note of all of the plants
- if you don't know the plant, look it up!




Key
4th Floor ENR
Biodiversity Inventory 6/24/24 ENR
Aloe
Agave
Palm?
Walnut
Mulberry
Oak
Sassafras?
Hearts + Flowers


COLUMN
DRAINS
ROCKS
STAIRS
GRAVEL
PLANT
23


ENR2 Courtyard
BIODIVERSITY
4th floor
ENR2
Cactus II
Vine II
Plant I
Purple
leaves 10cm


N
3 floors stairs
walking path
concrete
rock gardens
water catchment
benches
agave type
other succulents
cactus
Diff trees
ground cover plants
4 water drip catchment
17 succulents total
2 cacti
7 types trees/shrubs
4 ground cover plants

If we’re tracking animals…

Let’s go collect data!

bring your nature journals!

Question:
Data:

How can we represent (this) data in a meaningful way?

Learning Target: What am I learning today?	I am learning: how to visualize data in interesting and unique ways
Success Criteria: How will I know that I have learned it?	I can: analyze data and represent it visually – either graphically or in a unique way.
Why am I learning this?	This is important because learning different ways to present data will aid in comprehension and communication. It also allows us to be creative in the ways that we present our data.

Assessment:

Goal: create a graph or some sort of data visualization that makes sense of the biodiversity data.

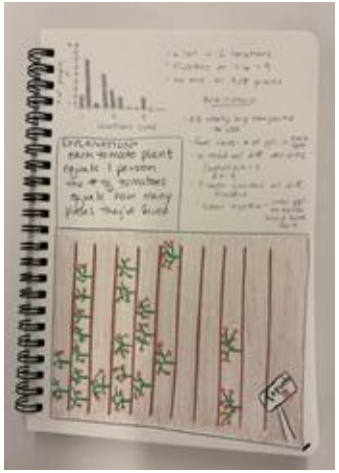
Now that we have our data, we need to make sense of it:

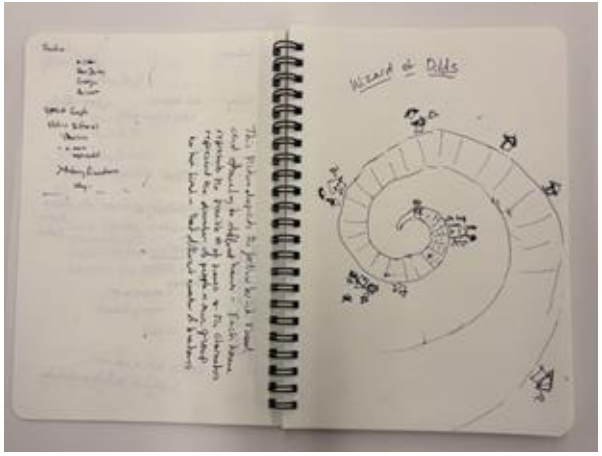
1. data analysis
    a. asking critical questions
    b. creating a “traditional” graph
    c. brainstorm ideas for a unique data visualization
2. visualization
    a. include a title & a key
    b. explain your visualization
3. present in a gallery walk
4. feedback & feed forward

an example:

data: how many places have you lived?

1 place	2 places	3 places	4 places	5 places	6 places	7 places	8 places	9 places
2	7	1	5	3	2			2

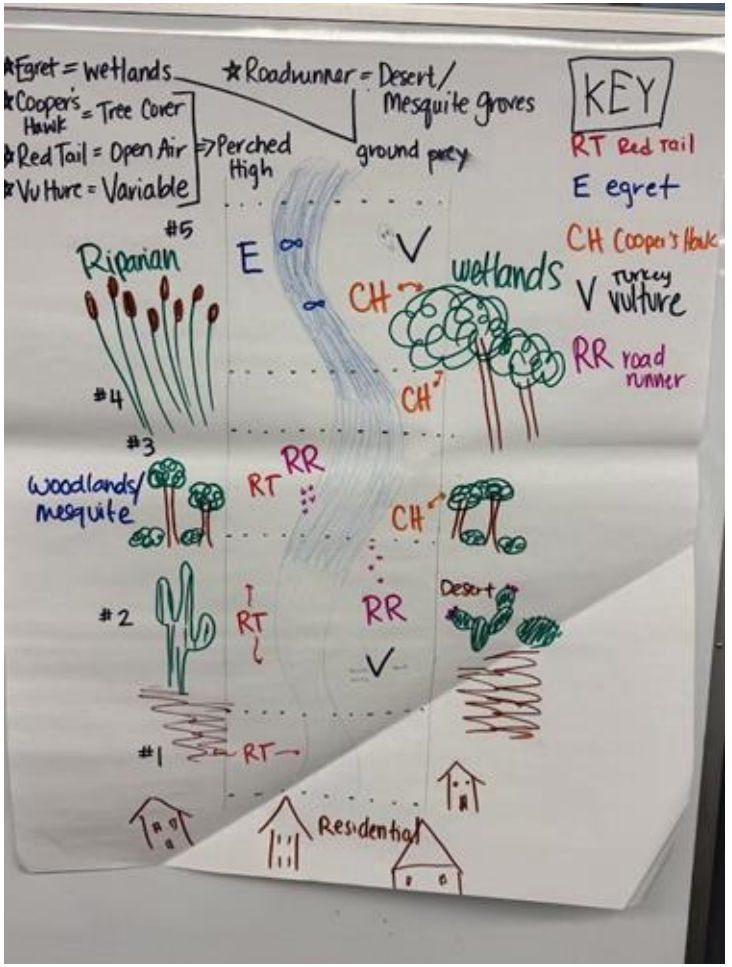


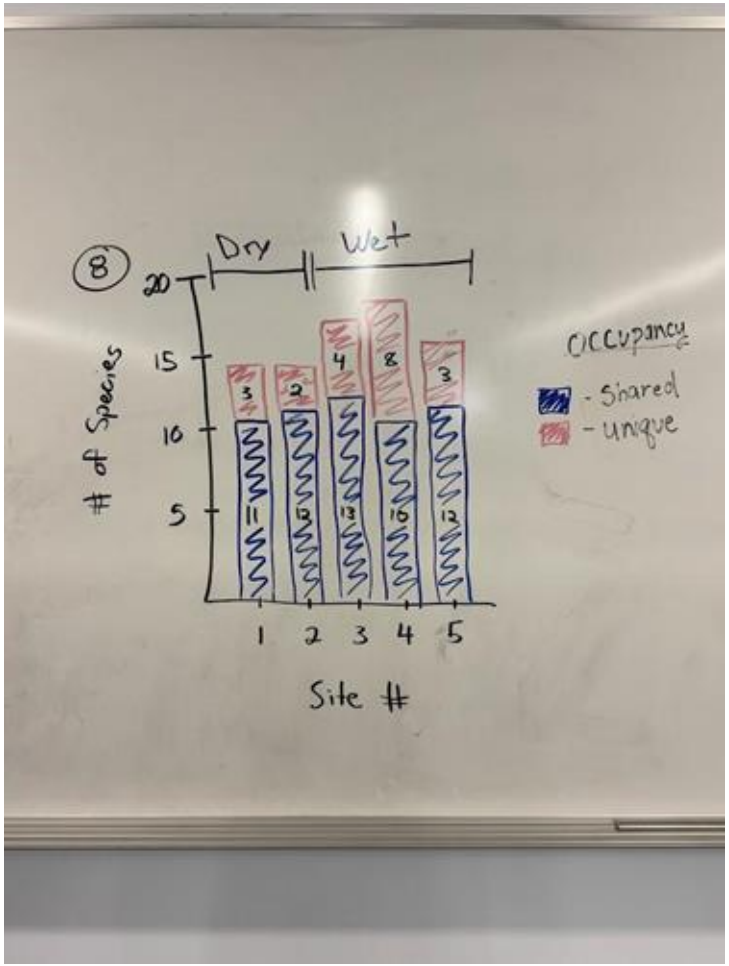


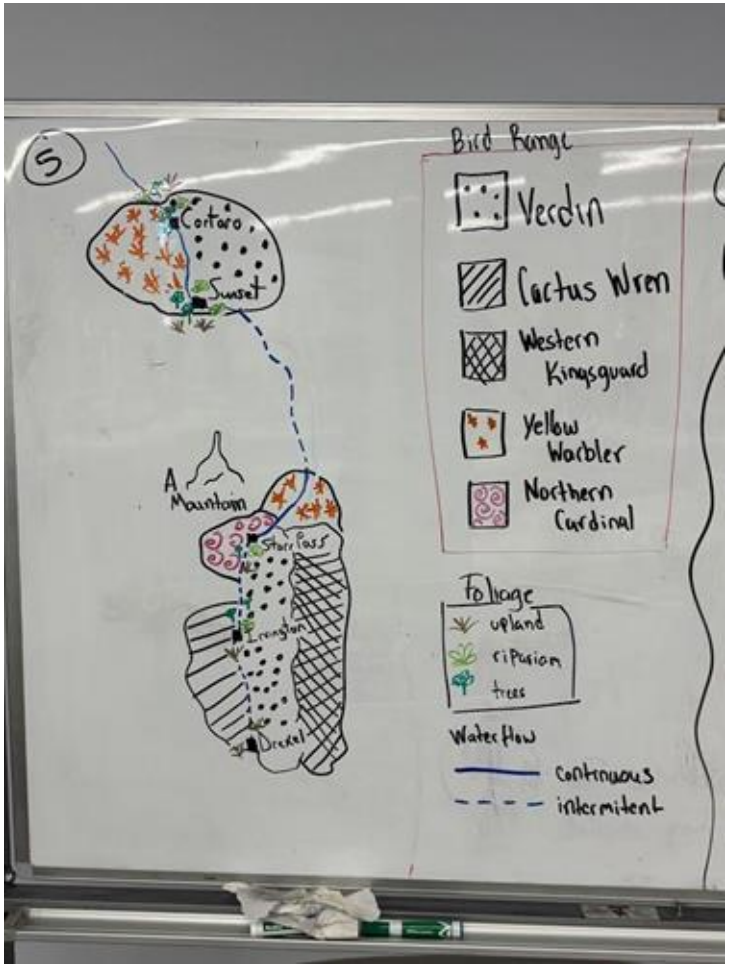
another example:

we visited 5 sites and listened for birds


June 10, 2026
on the Santa Cruz River
KEY
time stamp
upland
tree cover
riparian/wetland
Birds
none
water
deep
11:30 AM
10 AM
9:15 AM
8:15 AM
7:30 AM
Orchard
Sunset
Rectory
Sunset Irvington
Dorsel


Egret = wetlands
Cooper's Hawk = Tree Cover
Red Tail = Open Air
Vulture = Variable
=> Perched High
Roadrunner = Desert/ Mesquite groves
ground prey
KEY
RT Red Tail
E egret
CH Cooper's Hawk
V Turkey Vulture
RR road runner
#5
Riparian
E
CH
wetlands
V
#4
#3
Woodlands/ mesquite
RT
RR
CH
#2
RT
RR
Desert
#1
RT
Residential


8
Dry
Wet
20
15
10
5
# of Species
3
2
4
8
3
11
13
13
10
12
1 2 3 4 5
Site #
Occupancy
- Shared
- unique


5
Bird Range
Verdin
Cactus Wren
Western Kingsguard
Yellow Warbler
Northern Cardinal
Cortaro
Sunset
A
Mountain
Starr Pass
Irvington
Drexel
Foliage
upland
riparian
trees
Water flow
continuous
intermitent

Now that we have our data, we need to make sense of it:

What do you see in the data?

Any patterns? Explain.

create a “traditional” graph with the data

brainstorm ideas for a unique data visualization

create your visualization!

include a title & a key

explain your visualization!

present! & feedback/feed forward

- put out your visualization
- walk around, looking at others' visualizations
- leave sticky notes with "feed forward" –
  - what did they do well?
  - what questions do you still have?
  - are there any suggestions you have on how to make their visualization clearer or easier to read?
- give yourself feedback: reflect on your visualization
  - What would make the data easier to read?
  - Which part of the representation is the most effective?
  - How could you use what you have seen from others in your own visualization?

additional resources:

Days 1 & 2: Exploring the Data

- ✗ **Activity:** Review the survey data.
- ✗ **Discussion Prompts:**
  - ✗ What do you notice?
  - ✗ What do you wonder?

Day 3: Class Discussion on Visualization

- ✗ **Activity:** Discuss as a class how to visualize the data.
- ✗ **Group Discussion:** Write down all ideas for visualizing the data.

Reminder: There is no right or wrong way to display this data.

Day 4: Planning and Starting Visualizations

- ✗ **Group Activity:** With your group decide how you might visualize the data.
- ✗ **Task:** Begin working on creating a visualization of the data.

Day 1: Continue Visualizing Data

Activity: Continue working your data visualizations with your group.

Day 2: Gallery Walk

Activity: With your group, look at the different visualizations that each group created.

Reflection Prompts:

What do you notice or wonder about the visualizations?

What questions arise from viewing the data in different ways?

Day 4: Class Discussion

Activity: Discuss the observations and questions from the gallery walk.

Day 5: Second Gallery Walk with Feedback

Activity: Conduct another gallery walk.

Feedback Prompts:

What would make the data easier to read?

Which part of the representation is the most effective?

How could you use what you have seen in your own visualizations?

after you've done it once:

Day 1: Exploring the Data

- ✗ **Task:** Complete the survey about campus biodiversity

Day 2: Brainstorming Visualization

- ✗ **Group Discussion:** WIth your group, dig through the data. What patterns do you notice?
- ✗ **Activity:** Begin creating a visualization with on your own based on the data.

Day 4: Finalizing Visualizations

- ✗ **Activity:** Finish your visualization of the data.

Day 5: Gallery Walk

- ✗ **Activity:** Walk around the room and observe the different data visualizations created by another class.
- ✗ **Reflection:**
  - ✗ What do you notice or wonder about the visualizations?
  - ✗ What questions arise from viewing the data in different ways

What is phenology?

Learning Target: What am I learning today?	I am learning: the definition of phenology, about the different phenological stages of animals, plants, and insects of the Sonoran Desert
Success Criteria: How will I know that I have learned it?	I can: define phenology, identify examples of different phenological stages of common plants and animals
Why am I learning this?	This is important because phenology helps us track climate change and its effect on the plants and animals in our environment. Phenology also helps us with agriculture; knowing when things are happening in our environment will help determine which plants to plant, harvest, etc.

note: this lesson can occur after all biodiversity lessons throughout the year have occurred. then students can choose from organisms that they have observed & nature journaled about over the year.

What is phenology?

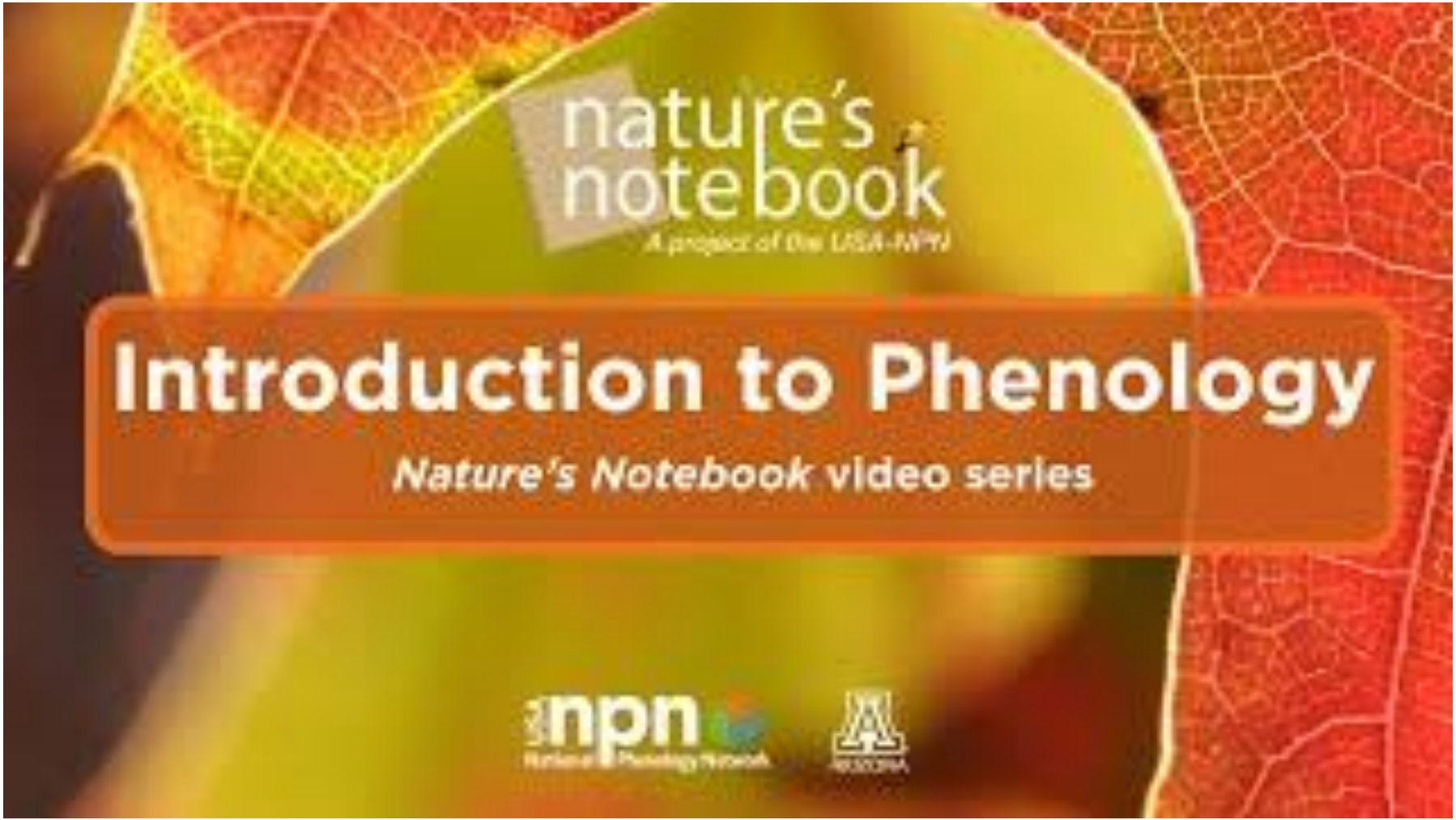
"nature's calendar"

the study of the timing and cyclical patterns of events in the natural world, particularly those related to the annual life cycles of plants, animals, and other living things.

helps us understand how living organisms respond to environmental cues such as day length, temperature, and rainfall, and how climate change can impact these seasonal changes.

can include:

- the budding of leaves in spring
- the arrival of migratory birds
- the flowering of plants
- the onset of fruit ripening


nature's notebook
A project of the USA-NPN
Introduction to Phenology
Nature's Notebook video series
npn
National Phenology Network

Why is studying phenology important?

- informs crucial decisions about
  - when to plant and harvest crops
  - when to conduct rituals or ceremonies
  - when to expect the arrival of specific animals for hunting or gathering
- offers a window into the impacts of climate change and the consequences for ecosystems and human societies
  - can gain valuable insights into how global warming is altering the timing of key biological events
  - shifts can have cascading effects on ecosystems, disrupting the delicate balance between species and affecting agricultural practices and food security
- aid in the development of more effective conservation strategies, enabling us to better anticipate and mitigate the challenges posed by changing environmental conditions

provides essential data for understanding, adapting to, and mitigating the ecological and societal consequences of a changing climate.

Examples of phenological stages:

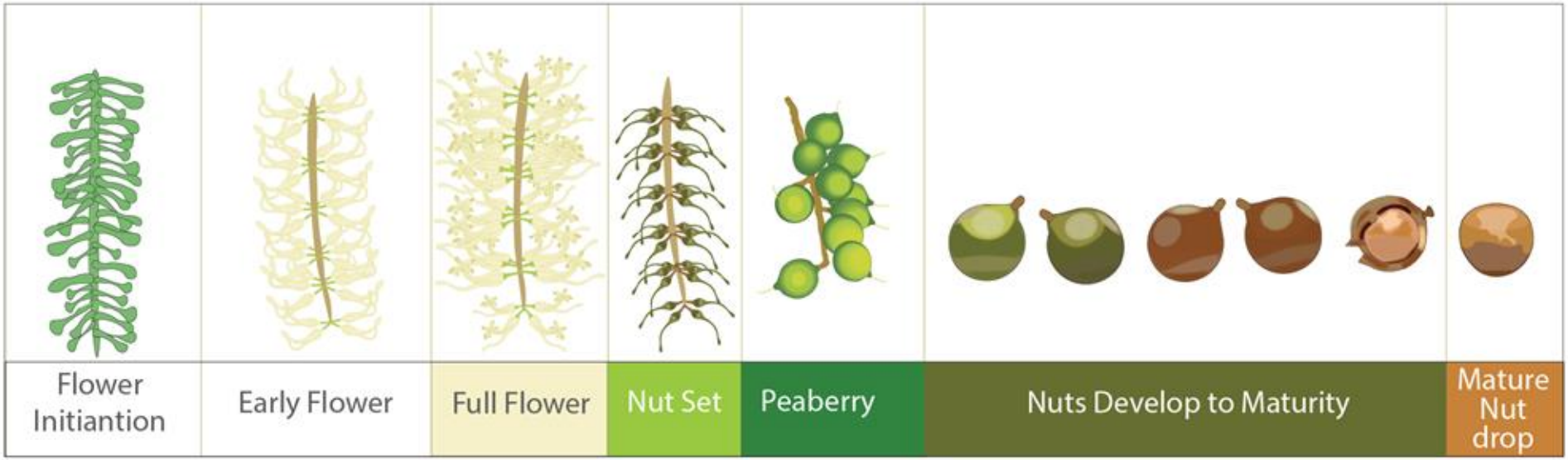
Creosote


Saguaro cycle of life
cactus kelly


SAGUARO CACTUS LIFE CYCLE:
a step-by-step guide!
Life Cycle
Cactus

PHENOLOGICAL STAGES OF THE MACADAMIA PLANT

Macadamia integrifolia



Assessment:

Goal: to create an infographic of a desert dweller that focuses on the phenological stages.

Your infographic should include:

- Research information about your desert dweller.
- Draw a picture of your desert dweller.
  - FOCUS ON **3+ PHENOLOGICAL STAGES**
- Include their predators and prey.
- Include important adaptations.
- Features it has to survive.
- Unique traits or features.
- Their location and typical shelter
- As much information you can about your dweller.

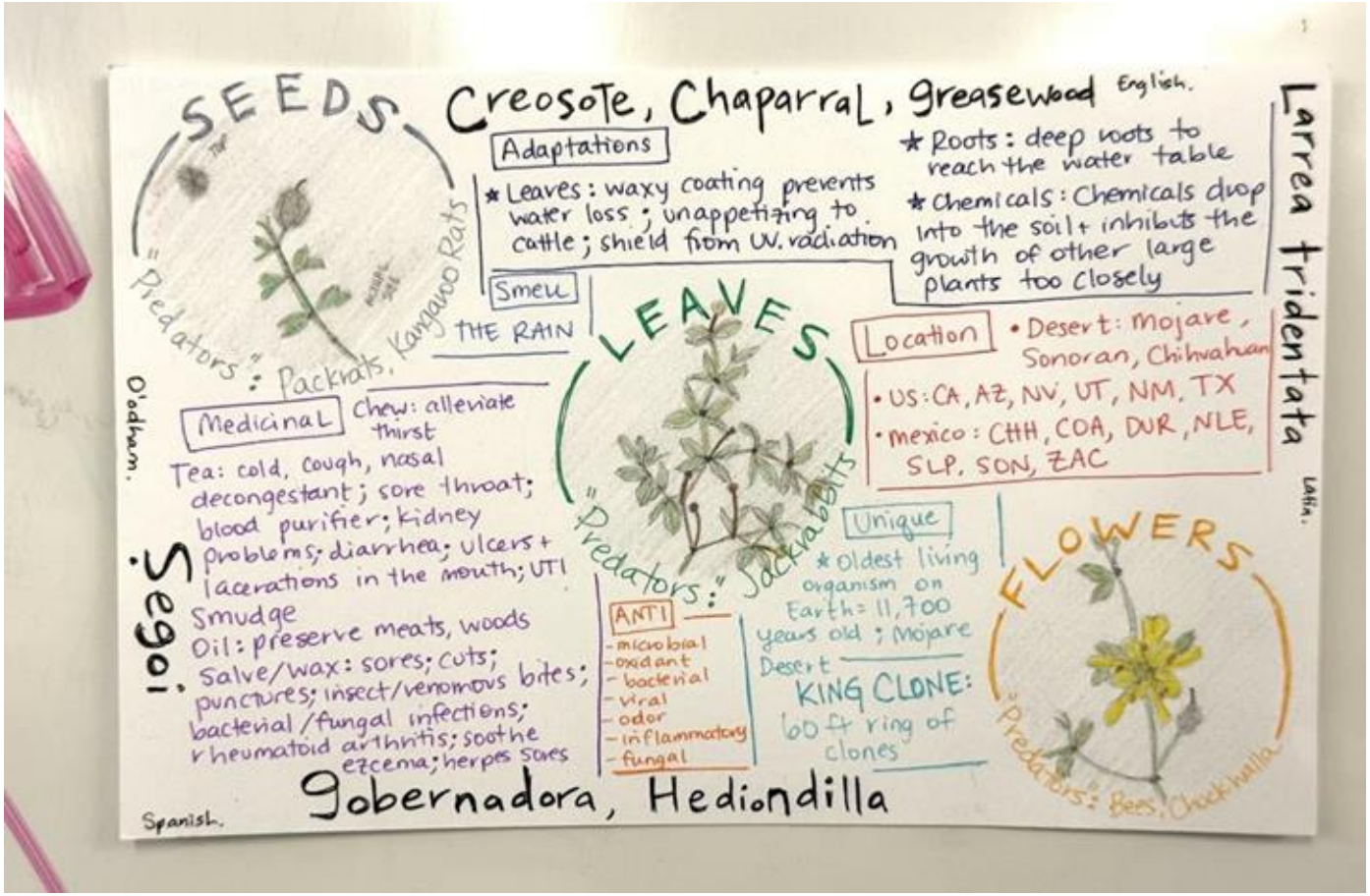
a template for information gathering (does not include phenological cycles)

desert dwellers to make an infographic on:

- anna's hummingbird
- greater roadrunner
- great horned owl
- gila woodpecker
- vermillion flycatcher
- verdin
- yellow warbler
- less goldfinch
- cooper's Hawk
- butterfly weed
- saguaro
- palo verde
- velvet mesquite
- quail bush
- desert willow
- desert prickly pear
- ocotillo
- soaptree yucca
- gila monster
- gila topminnow
- chuckwalla
- western diamondback
- packrat
- honry toad
- black widow spider
- ground squirrel
- bark scorpion
- tarantula hawk
- desert termites
- pinacate beetles
- desert blonde tarantula
- flameskimmer
- cochineal
- apache cicada
- crane fly
- valley carpenter bee

or anything we've seen on campus
or some other organism (pending approval)

an example:


SEEDS
"Predators": Packrats, Kangaroo Rats
LEAVES
"Predators": Jackrabbits
FLOWERS
"Predators": Bees, Checkerspot
Creosote, Chaparral, Greasewood
English.
Adaptations
* Leaves: waxy coating prevents water loss; unappetizing to cattle; shield from UV. radiation
* Roots: deep roots to reach the water table
* Chemicals: Chemicals drop into the soil + inhibits the growth of other large plants too closely
Smell
THE RAIN
Location
• Desert: Mojave, Sonoran, Chihuahuan
• US: CA, AZ, NV, UT, NM, TX
• Mexico: CHH, COA, DUR, NLE, SLP, SON, ZAC
Medicinal
Chew: alleviate thirst
Tea: cold, cough, nasal decongestant; sore throat; blood purifier; kidney problems; diarrhea; ulcers + lacerations in the mouth; UTI
Smudge
Oil: preserve meats, woods
Salve/wax: sores; cuts; punctures; insect/venomous bites; bacterial/fungal infections; rheumatoid arthritis; soothe eczema; herpes sores
ANTI
- microbial
- oxidant
- bacterial
- viral
- odor
- inflammatory
- fungal
Unique
* Oldest living organism on Earth = 11,700 years old; Mojave Desert
KING CLONE: 60 ft ring of clones
Larrea tridentata
Latin.
Gobernadora, Hediondilla
Spanish.
Seguo.
O'odham.

another example:

How and why does our environment change over the course of a (school) year?

Learning Target: What am I learning today?	I am learning: about urban biodiversity, phenology, and data visualization.
Success Criteria: How will I know that I have learned it?	I can: show the progression (phenological stages) of the different plants, animals, and birds on my school's campus; determine biodiversity data trends from one quarter/season to the next & visually represent it.
Why am I learning this?	This is important because having a better understanding of the plants, animals, and birds that are on our campus will allow us to identify ways to increase biodiversity. And understanding the phenological stages will help us be better gardeners as well as be better stewards of the land since climate change is slowly affecting the timing of the phenological stages.

Assessment

Option 1: Create a map of the campus for each season, noting the biodiversity and phenology. Be sure to include drawings, words, and numbers – this map should be an extension of your Nature Journal. What stage should different plants and animals be in during each season?

Option 2: Create a calendar for the school year that denotes when different plants should be blooming, dropping fruit, animals and insects should be being born/hatching/mating, etc. Make a note of where on campus someone may find these plants, animals, etc.

Long term goal:

To continue doing this activity from year to year and study the shifts in phenological stages, shifts in biodiversity, etc.

option 1: create a map

1. get 4 campus maps, 1 for each quarter
2. for each of the 5 locations where biodiversity data was taken, choose 3-5 organisms to highlight
3. for each organism, include:
    - elements from your nature journal: drawings, numbers, words
    - phenological stages
    - information from your infographic
4. what stage should different plants and animals be in during each season/quarter? show the shift in biodiversity and phenology over the course of the school year

option 2: create a calendar

1. decide which kind of calendar you are going to make
    - the time period
    - the shape
2. choose 3-5 organisms to highlight
3. for each organism, include:
    - elements from your nature journal: drawings, numbers, words
    - phenological stages
    - information from your infographic
    - where it can be found on campus (its location)
4. what stage should different plants and animals be in during each season/quarter/month? show the shift in biodiversity and phenology over the course of the year

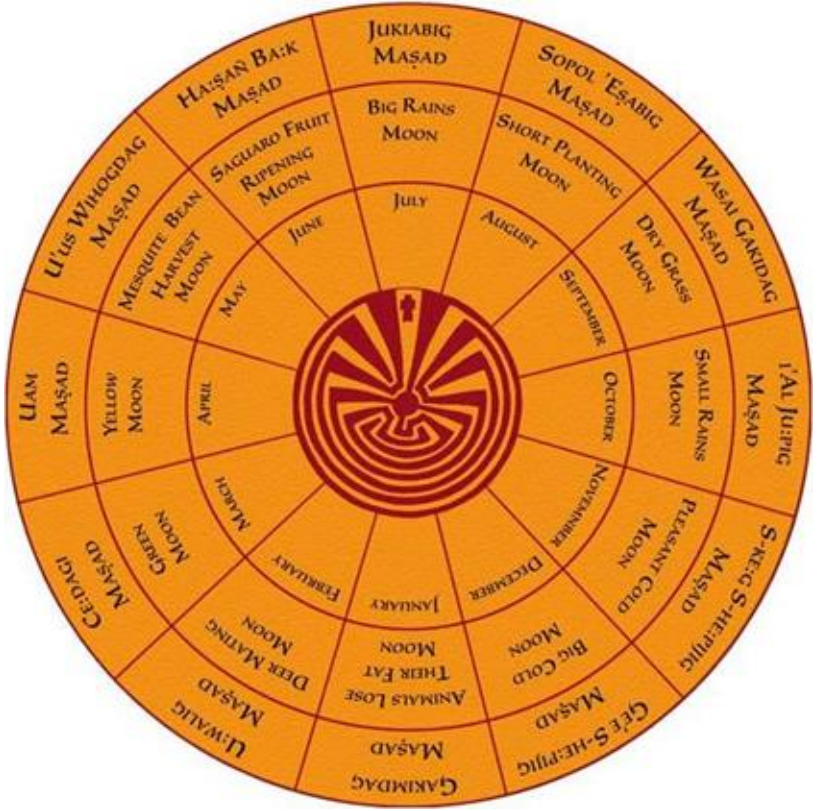
options for time period:

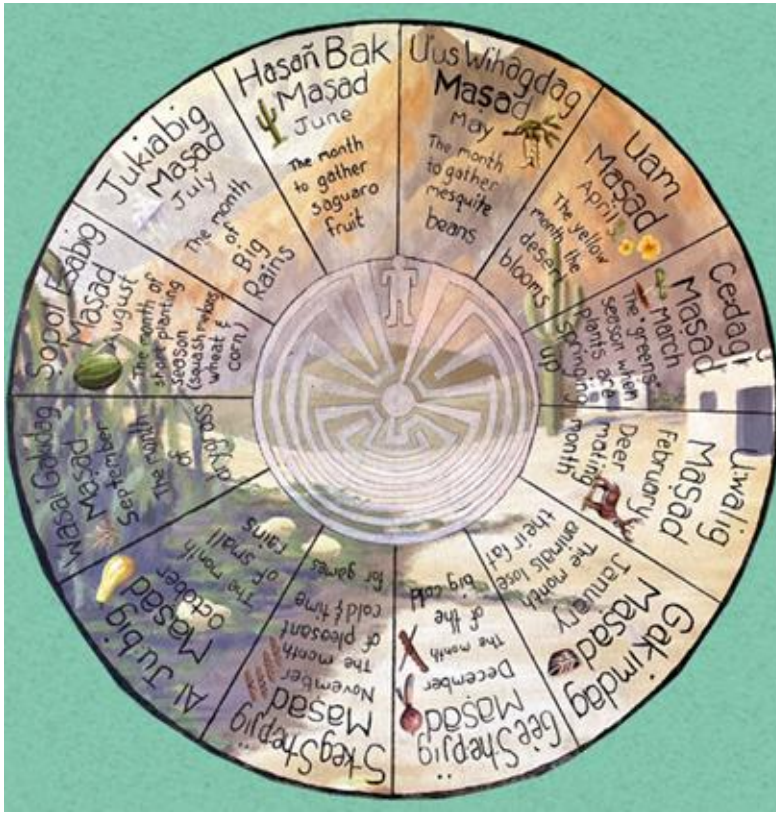
- by quarters (4)
- by months of the school year (10)
- by months of the year (12)
- by seasons (5)

options for shape:

- circle
- traditional calendar
- something else?

examples of phenological calendars:





Onaabani-Giizis (March)
Hard Crust on the Snow Moon

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				grouse drumming sandhill cranes arrive	1 ravens nesting	2 first crusty snow gull sighting
3 first snow fleas purple finch turning water	4 Canada geese spotted pair of eagles on the ice	5 first robin	6 bald eagles on breeding grounds and mourning	7 daffodil plants emerging through the snow	8 first red-winged blackbirds song sparrows sterlings arrive chipmunk out	9 ticks look for deer hides as soon as the snow melts
10 New Moon first thunderstorm	11 eagle building nest male dove calling	12	13 bat out feeding during day sandhill cranes return willow catkins	14 snow buntings moving north	15 maple sap begins to flow	16 maple sap flowing
17 first mourning dove first red-winged blackbirds first night above freezing	18 snowshoe hare coats begin to turn brown	19 Spring Equinox common mullein leaves emerging first goldfinches at feeder	20	21 eagles mating first juncos	22 early leek growth	23 wolf pups born
24 woodcocks peenting	25 Full Moon male red-winged blackbirds return	26 woodpeckers drumming first grouse drumming first common redpolls	27 hail	28	29 northern white cedar flowering	30 buds on large red maple Chequamegon Bay free of ice
31 first whipping sparrow						

Iskigamizige-Giizis (April)
Maple Sugar Moon

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
ice out dates	1 turkeys gobbeling first mosquito			first tick first peepers silver maple leaf buds breaking painted lady butterflies	5 sandhill cranes, woodcock, wood ducks, & pine warblers spotted first chipmunk	6 sandhill cranes calling
7 wood frogs heard calling kingfisher calling first thunderstorm	8 New Moon sturgeon spawning starts first bear spotted	9 end of maple sap season northern flicker pecking at something under snow	10 first woodcock mating call	11 skunks cabbage flowers	12 Canada bufflehoberry leaves emerging marlins calling	13 red maple buds swelling
14 dragonflies out	15 62 inches of snow! snowshoe hare change from white to brown first spring peepers	16 first bluebirds last snow of season	17 first loon Junkee bark	18	19 marsh marigold blooming	20 first butterfly first dragonfly last snow of season
21 first spider outside first red-winged blackbird	22 first colored-winged dragonflies	23 Full Moon first painted turtle basking	24 sugar/maple flowering maidenhead emerge	25 wood frogs calling	26 leaves emerge	27 yellow-rumped warblers return
28 first bumblebee	29 first canoe first flowers on trees red maple hermit thrush singing	30 first spring peepers				

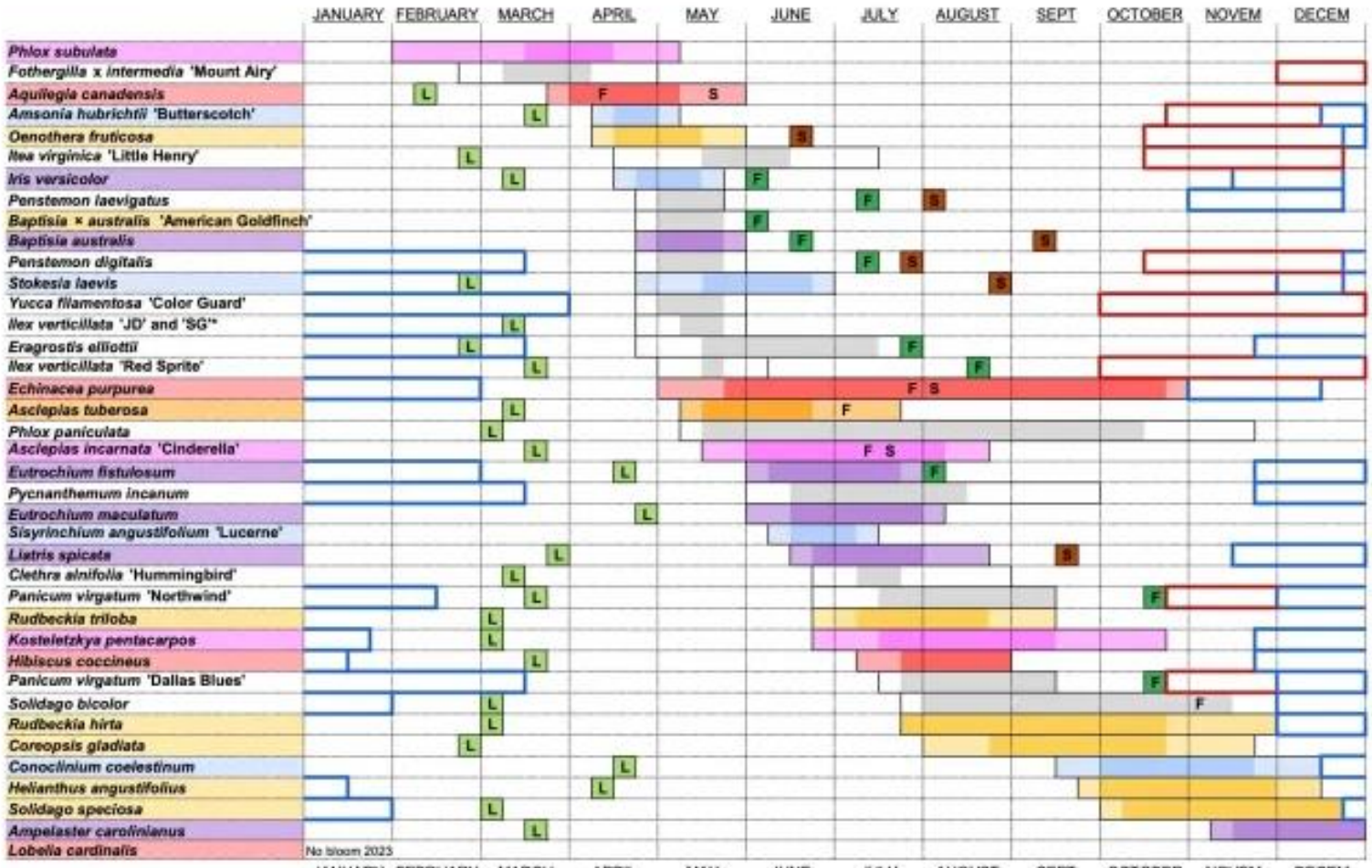
Waabigwanii-Giizis (May)
Flower Moon

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 end of maple sap season first leeks harvested mosquito hatch			4 house wrens back first woodcock mating call male running in circles in backyard
5 end of maple sap season	6 leaves out on apple, birch, serviceberry, plum silver maple flowering ice out on Silver Basin Lake	7 New Moon	8 snowsnake and songbirds singing	9 shadbush flowering	10 first hummingbird	11 first oriole eastern meadowlark first thunderstorm
12 first grouse drumming first trout lily flowering first snapping turtle laying eggs	13 trillium blooming starflower blooming	14 first suckers running	15 first fiddleheads harvested redbud, lady, & bracken fern fiddleheads	16 bumblebee on leatherleaf flowers		18 first new needle growth on trees first apple blossom
19	20 box elder flowers flowers on raspberry plants red osier dogwood leafing out	21	22	23 Full Moon first dragonfly late frost	24 spring azure butterfly	25 first monarch of the year
26 yellow swallowtail sighting pin cherries blooming staghorn sumac leafing out	27 last frost before summer	28 first bear	29 first hay cutting first white-tailed deer fawn	30	31 wood duck swimming with her ducklings	deer fawns spotted

Ode'imini-Giizis (June)
Time for Picking Strawberry Moon

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 first fish caught
2 chokecherry blooming wild black currant blooming first bear sighting	3	4	5	6 New Moon watch for turtles laying eggs watch for nesting songbirds	7 first firefly	8
9 pear trees start blooming	10 first dragonfly	11 beach heather blooming purple rock cress blooming	12 first strawberry	13	14 wild rice floating leaf stage	15
16 meadowsweet blooming	17	18	19	20 Summer Solstice bunchberry blooming heavy rains	21 blue flag iris blooming	22 leaves with silvery undersides
23 smooth honeysuckle blooming	24	25	26 flowers on berry plants pitcher plants in bloom	27	28	29
30						

Piedmont Prairie Garden at Rotary Plaza - Phenology Calendar 2023

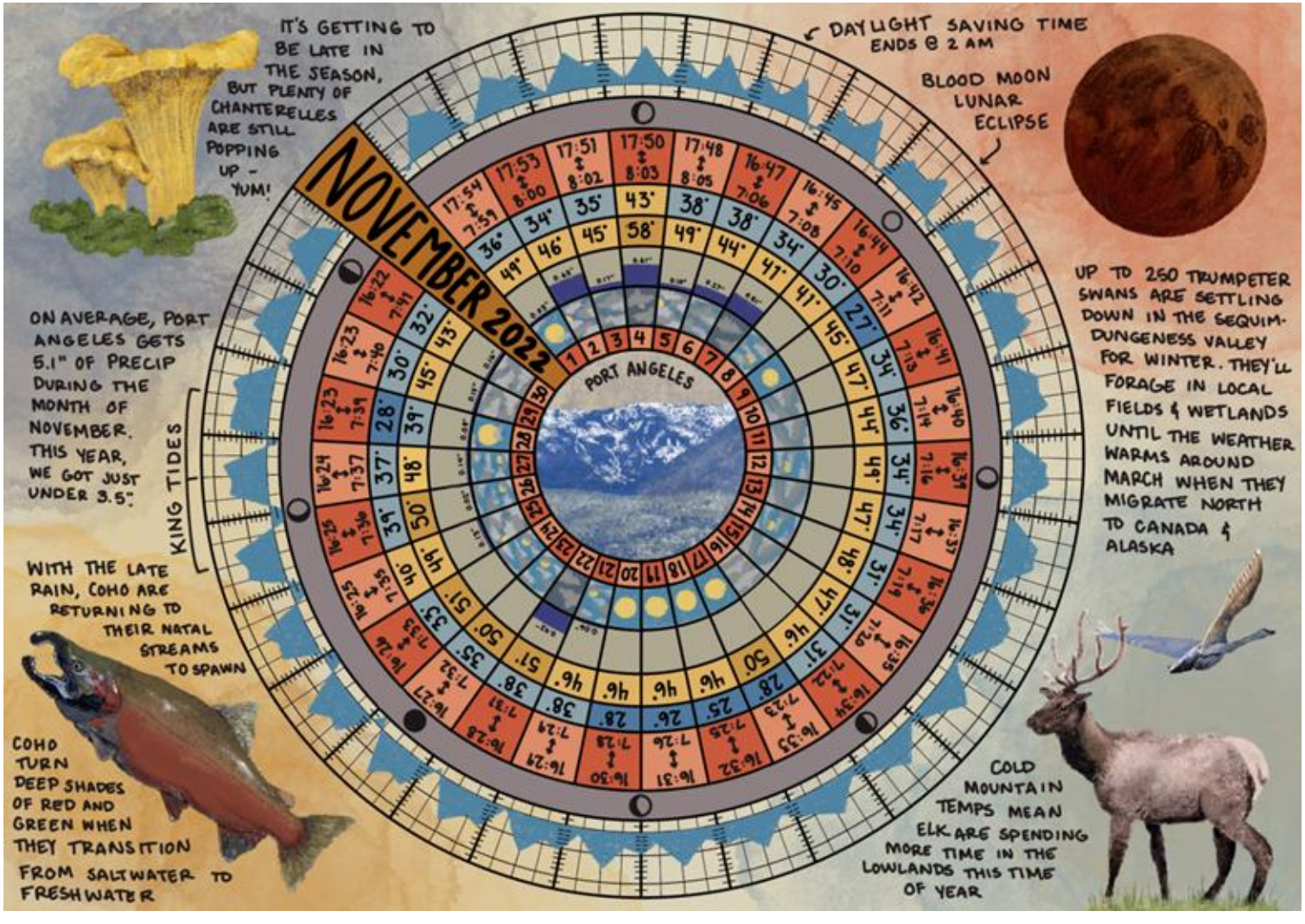


* 'Jim Dandy' and 'Southern Gentleman', nearly synchronous 2023


WINTER
SPRING
SUMMER
AUTUMN
December
January
February
March
April
May
June
July
August
September
October
November


WINTER.
SPRING.
SUMMER.
AUTUMN.
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER


EARTH
Rest
Stir Earth into Air
AIR
Grow
Flower
FIRE
Fullness
Fruit
WATER
Harvest
Let Go Water into Earth
WINTER
JANUARY
WOLF MOON
COLD MOON
DECEMBER
NOVEMBER
BEAVER MOON
OCTOBER
SEPTEMBER
2/1-2/22 IMBOLC
2/1/22 Look for Mercury
MIDWAY IMBOLC TO EQUINOX
3/2/22 Mercury to east in morning
Also watch for Saturn, Venus, & Mars
3/20/22 VERNAL EQUINOX (OSTARA)
3/20/22 Venus in morning
3/23-4/5/22 - Mars, Venus, Saturn visible to SE in early morning
4/5/22 - Mars & Saturn visible in morning
MIDWAY EQUINOX TO BELTANE
4/22-23/22 - Lyrids Meteor shower
4/29/22 - Mercury to west after sunset; Jupiter & Venus close
4/30-5/1 BELTANE also partial solar eclipse
5/6-7/22 Eta Aquarids Meteor shower
5/16/22 TOTAL LUNAR ECLIPSE
WINTER SOLSTICE
SUMMER SOLSTICE
LAMMAS
AUTUMNAL EQUINOX
SAMHAIN


NOVEMBER 2022
PORT ANGELES
IT'S GETTING TO BE LATE IN THE SEASON, BUT PLENTY OF CHANTERELLES ARE STILL POPPING UP - YUM!
DAYLIGHT SAVING TIME ENDS @ 2 AM
BLOOD MOON LUNAR ECLIPSE
UP TO 250 TRUMPETER SWANS ARE SETTLING DOWN IN THE SEQUIM-DUNGENESS VALLEY FOR WINTER. THEY'LL FORAGE IN LOCAL FIELDS & WETLANDS UNTIL THE WEATHER WARMS AROUND MARCH WHEN THEY MIGRATE NORTH TO CANADA & ALASKA
ON AVERAGE, PORT ANGELES GETS 5.1" OF PRECIP DURING THE MONTH OF NOVEMBER. THIS YEAR, WE GOT JUST UNDER 3.5".
KING TIDES
WITH THE LATE RAIN, COHO ARE RETURNING TO THEIR NATAL STREAMS TO SPAWN
COHO TURN DEEP SHADES OF RED AND GREEN WHEN THEY TRANSITION FROM SALTWATER TO FRESHWATER
COLD MOUNTAIN TEMPS MEAN ELK ARE SPENDING MORE TIME IN THE LOWLANDS THIS TIME OF YEAR