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Advancing Climate Education in
Illinois: Resources for
Implementing PA 103-0837



Advancing Climate Education in Illinois: Resources for Implementing PA 103-0837

August 10, 2026



Illinois
Environmental
Protection
Agency



ILLINOIS
STATE BOARD OF
EDUCATION

Agenda

1. Review of PA 103-0837
2. Understanding the Meteorology Behind Climate Change
3. What is Phenology and Why is it Important in Climate Change?
4. Illinois EPA-Environmental Education NGSS Units
5. Overview of the Illinois Climate Education Hub
6. Resources and Questions

Advancing Climate Education in
Illinois: Resources for
Implementing PA 103-0837



Who we are



Lorna Shuman, Head of Education
Joe Bauer, Education Specialist



Katie Nahrwold, Illinois State Lead
Illinois Climate Education Hub



Kristi Morris, Environmental
Education Leader (Springfield)
Eli Dollarhide, Environmental
Education Coordinator (Chicago)



Meagan Budke, Science
Content Specialist for
Standards and Instruction

PA 103-0837

Beginning with the 2026-27 school year, every public school shall provide instruction on climate change, which shall include, but not be limited to, **identifying the environmental and ecological impacts of climate change on individuals and communities and evaluating solutions for addressing and mitigating the impact of climate change and shall be in alignment with State learning standards, as appropriate.**

The State Board of Education shall, subject to appropriation, prepare and make available multi-disciplinary instructional resources and professional learning opportunities for educators that may be used to meet the requirements of this subsection (b).



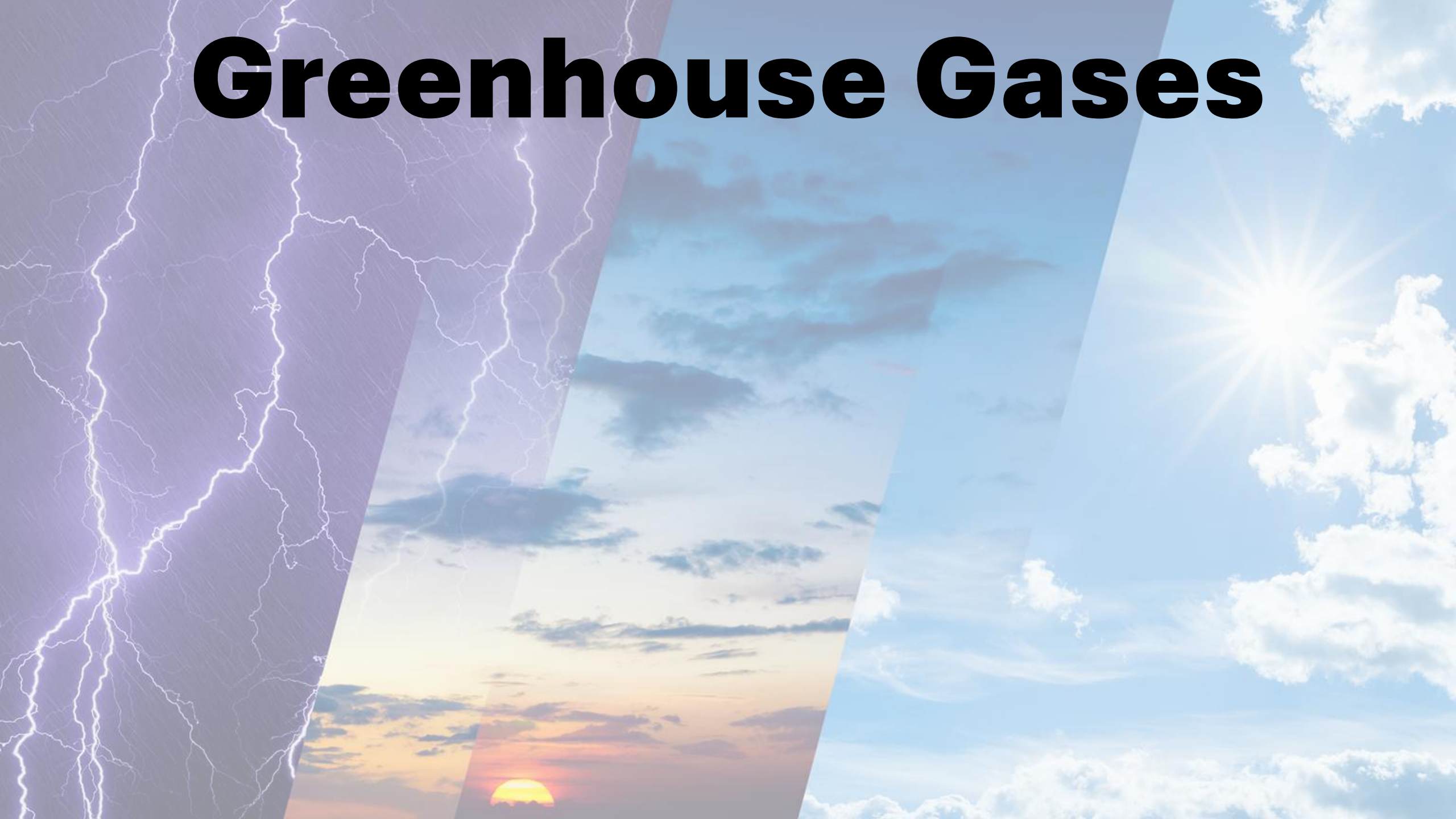
Understanding the Meteorology Behind Climate Change



**You hear a lot about what is
causing climate change.**



Greenhouse Gases



Travel Needs

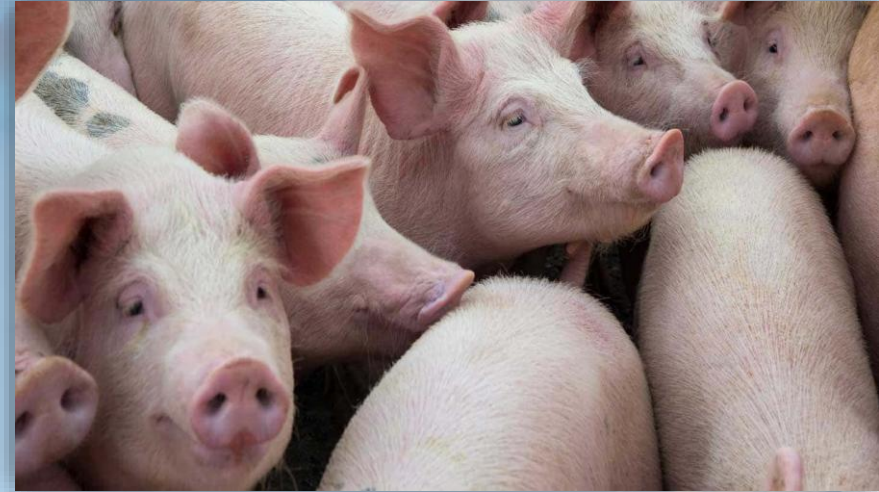


CO₂



Food Needs

CH₄



Water Vapor



H_2O



You hear a lot about what is happening.



Summers are Hotter



Storms are Stronger



Floods more Intense



Droughts more Intense



Winters are Warmer



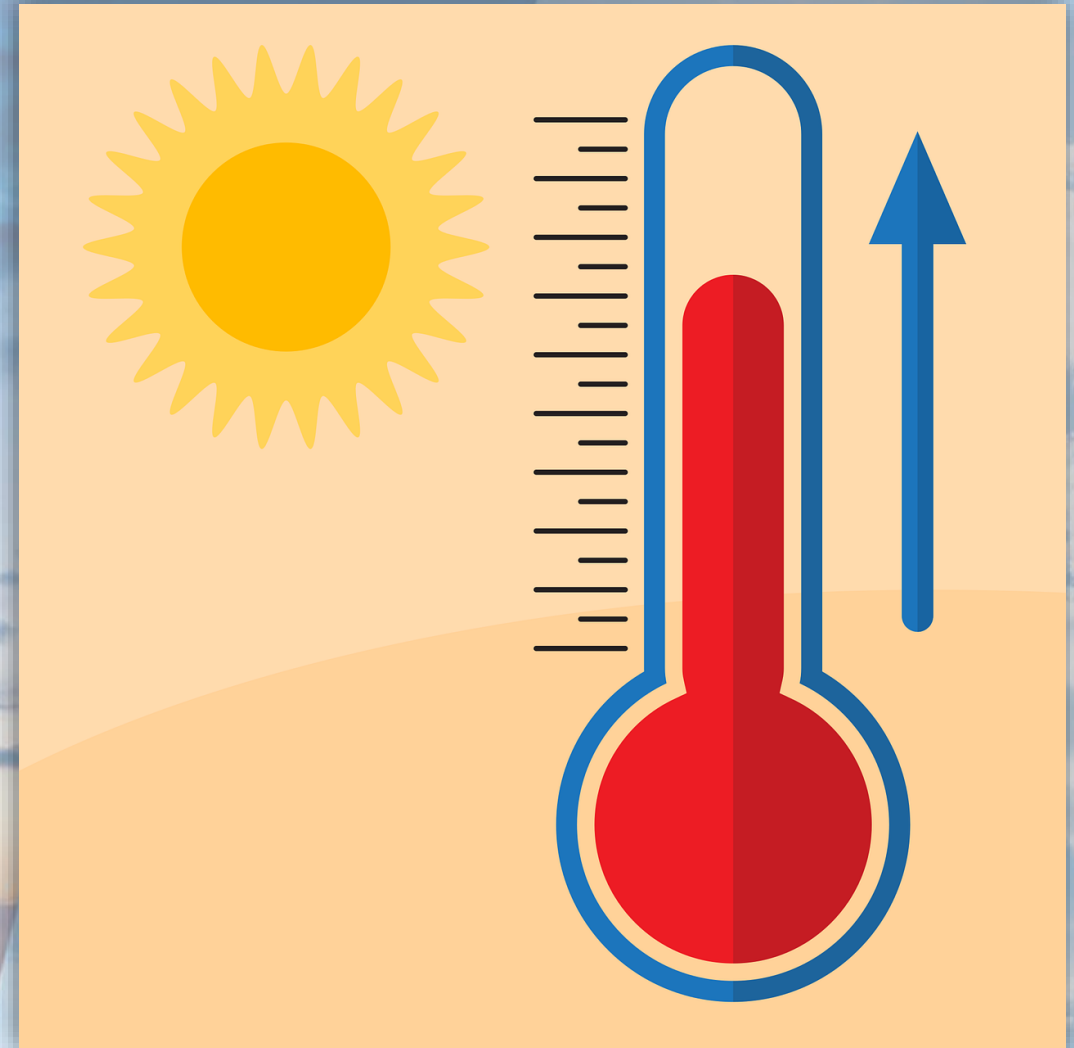
Do you know why?

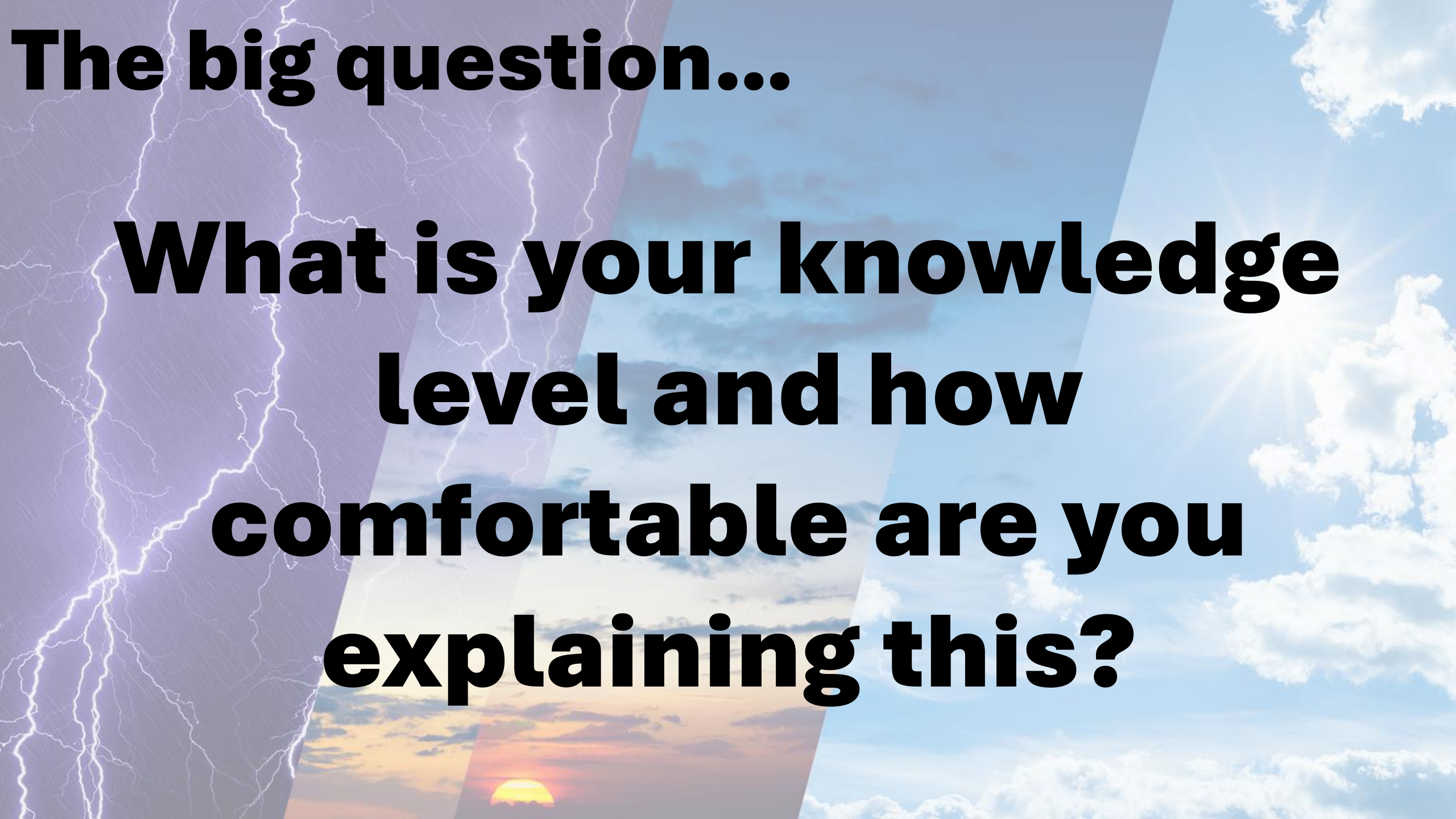
**Why do these
particular gases
cause the Earth to
warm?**



How about this?

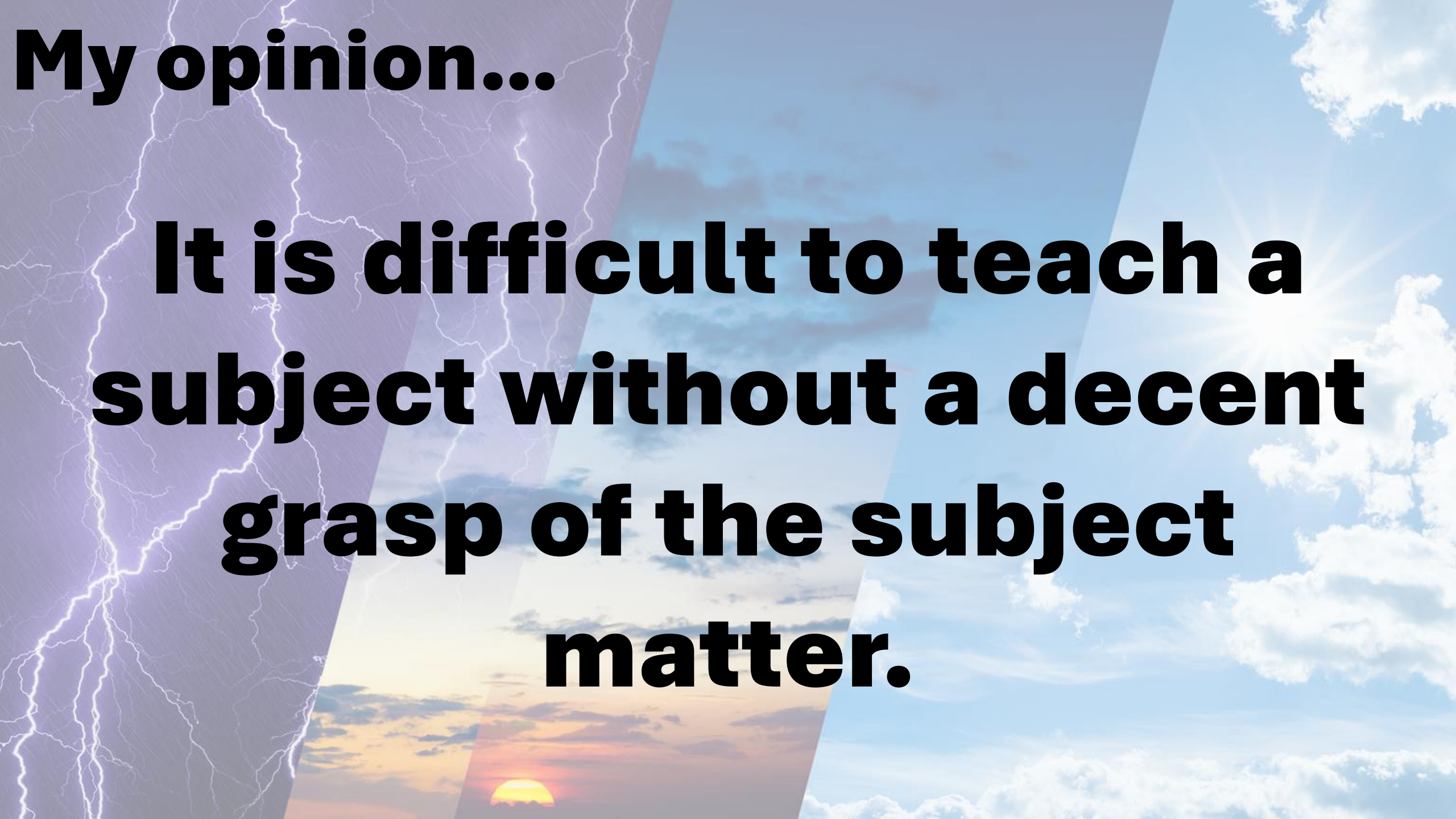
**Why does a
warming
atmosphere cause
the climate to
shift?**





The big question...

**What is your knowledge
level and how
comfortable are you
explaining this?**

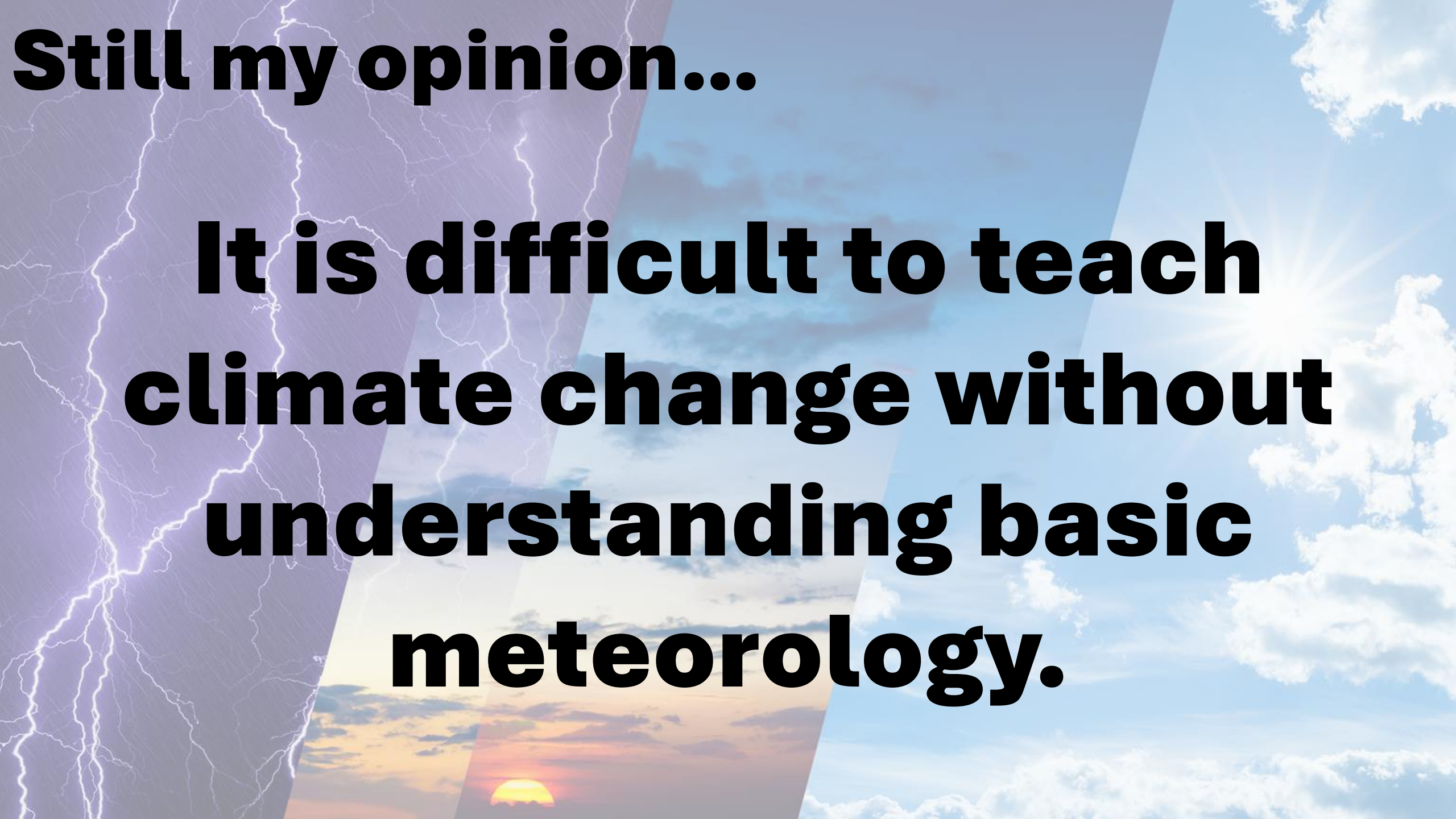


My opinion...

**It is difficult to teach a
subject without a decent
grasp of the subject
matter.**

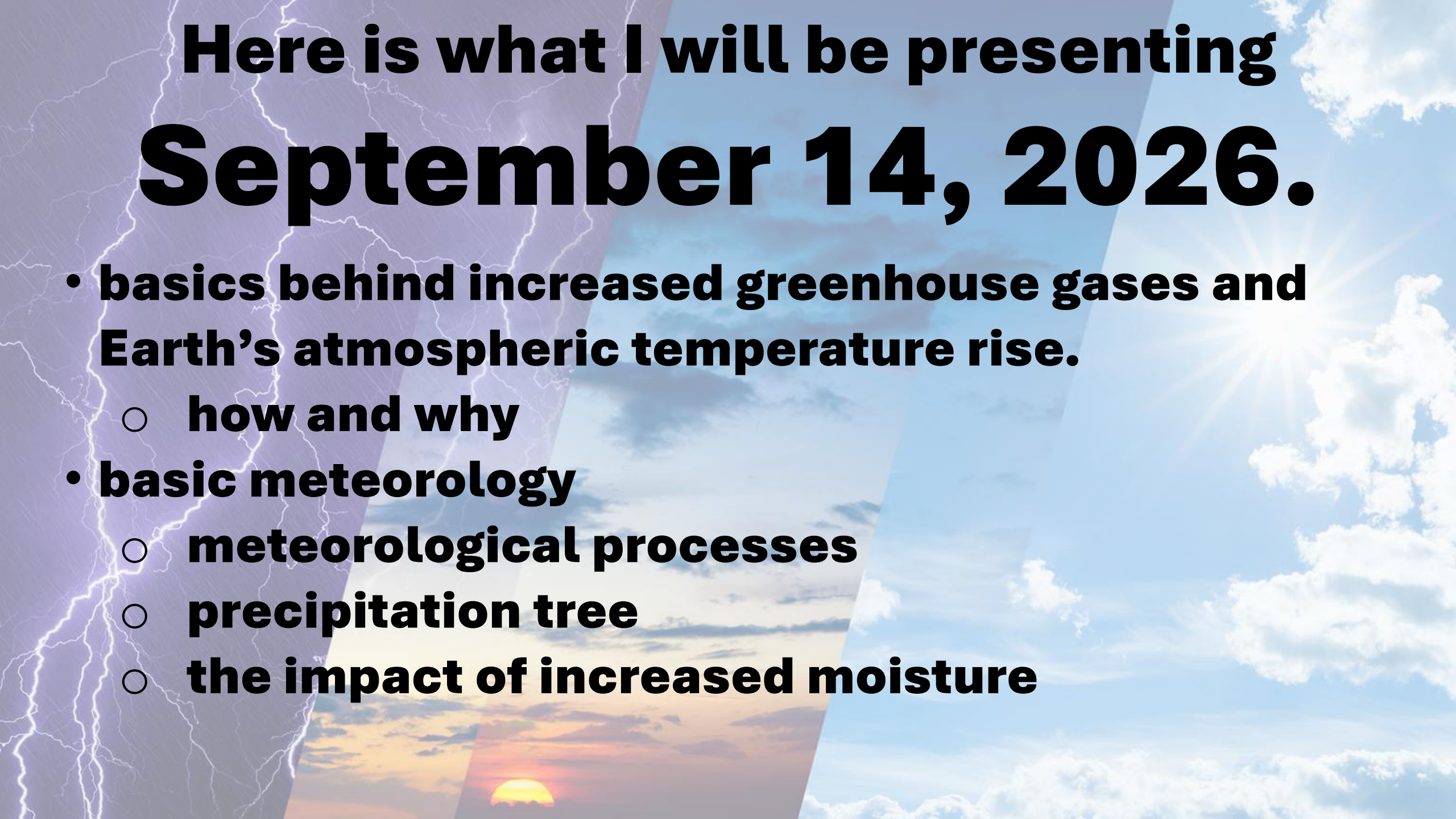


a.k.a.



Still my opinion...

**It is difficult to teach
climate change without
understanding basic
meteorology.**

The background of the slide features a dramatic sky. On the left, several bright white lightning bolts are visible against a dark, stormy purple and blue background. On the right, a bright sun is shining through a blue sky filled with white, fluffy clouds. At the bottom center, a small, bright yellow sun is visible on the horizon, partially obscured by a dark, silhouetted landmass or island.

Here is what I will be presenting

September 14, 2026.

- **basics behind increased greenhouse gases and Earth's atmospheric temperature rise.**
 - **how and why**
- **basic meteorology**
 - **meteorological processes**
 - **precipitation tree**
 - **the impact of increased moisture**

Beyond the Basics

Once we get through the basics, we will begin to connect it all. You will feel more comfortable explaining the impacts of climate change because you will better understand the processes involved.



Anything else?

I will show you where to get a tremendous amount of local climate data for use in the classroom.



This is gonna be a hoot!

What is Phenology & Why is it Important in Climate Change?



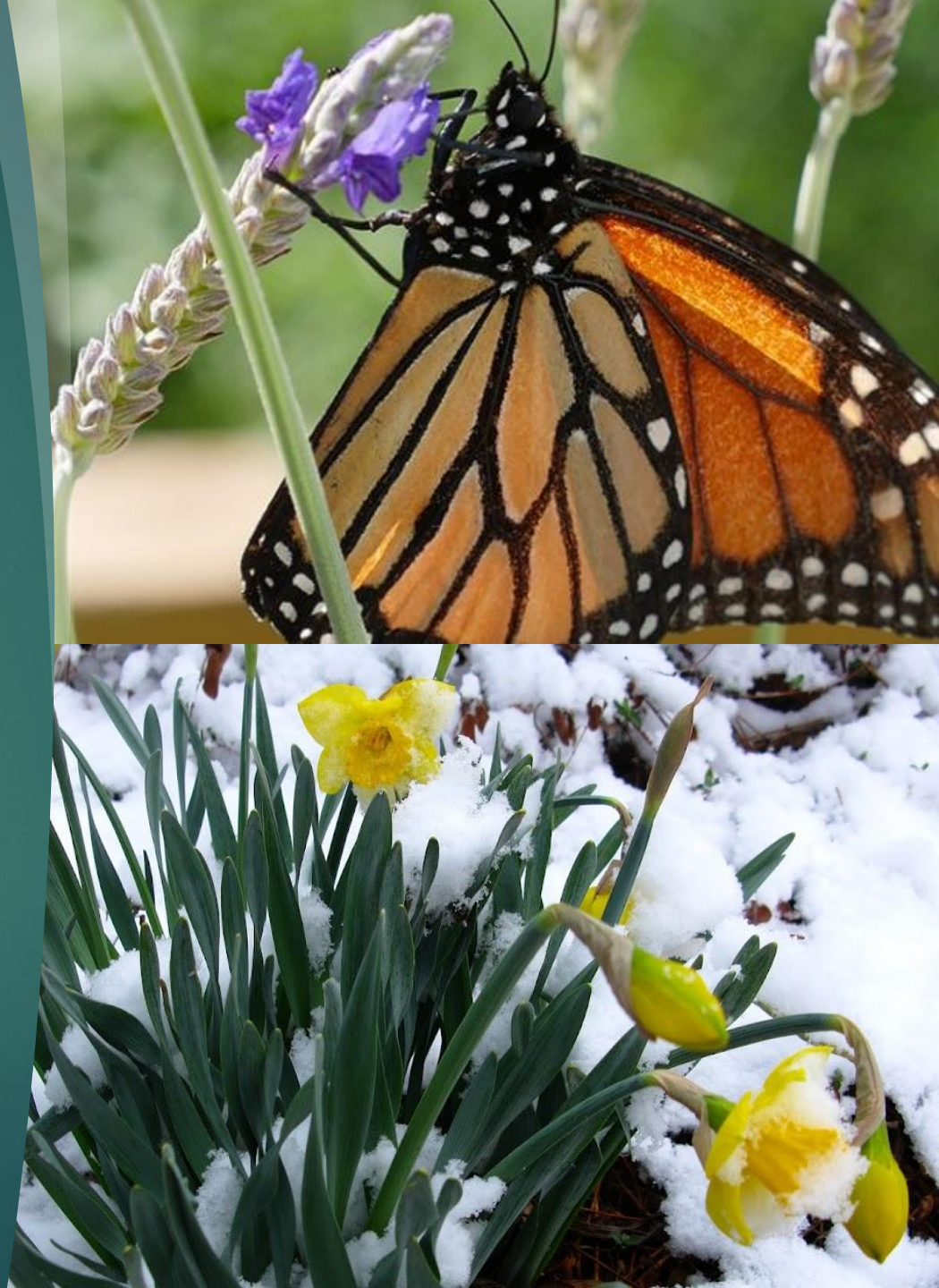
What is Phenology

- ▶ Science of appearance – its observable
- ▶ Study of timing of life-cycle events in plants & animals
 - ▶ Flowering
 - ▶ Leafing
 - ▶ Hibernation
 - ▶ Reproduction
 - ▶ Migration
- ▶ Comes from Greek words
 - ▶ Phaino – to show
 - ▶ Logos – to study



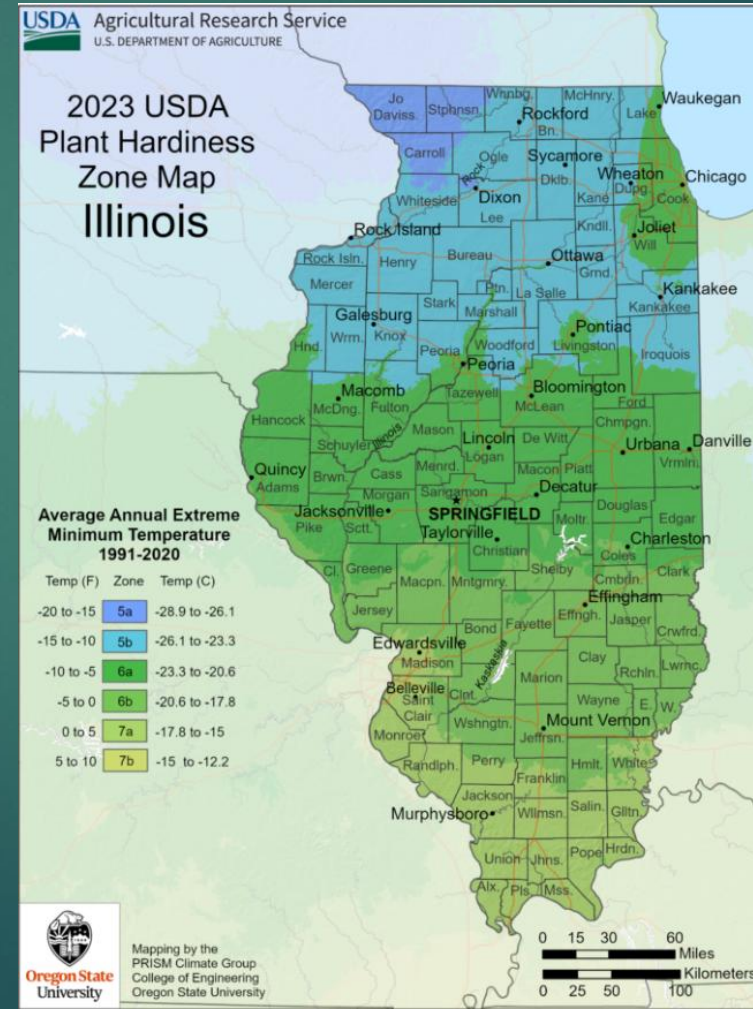
Phenology = Nature's Calendar

- ▶ How living things respond to environmental cues?
- ▶ Sensitive to alterations/changes in climate (long term)
- ▶ Uses traditional knowledge (known by people for generations)
- ▶ Vital field of ecological research
 - ▶ Ecological mismatches
 - ▶ Predictor of biological events



Using Maps to look at changes

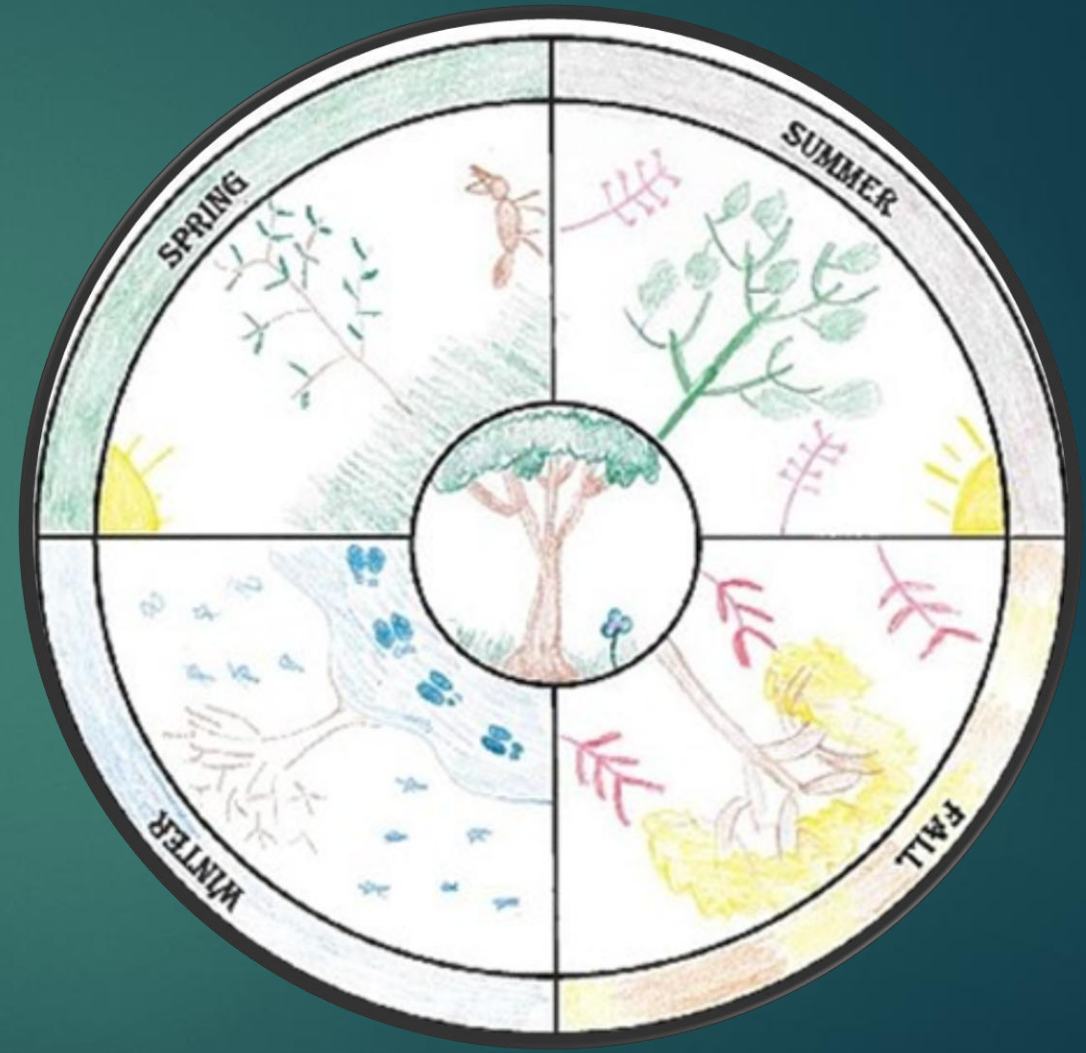
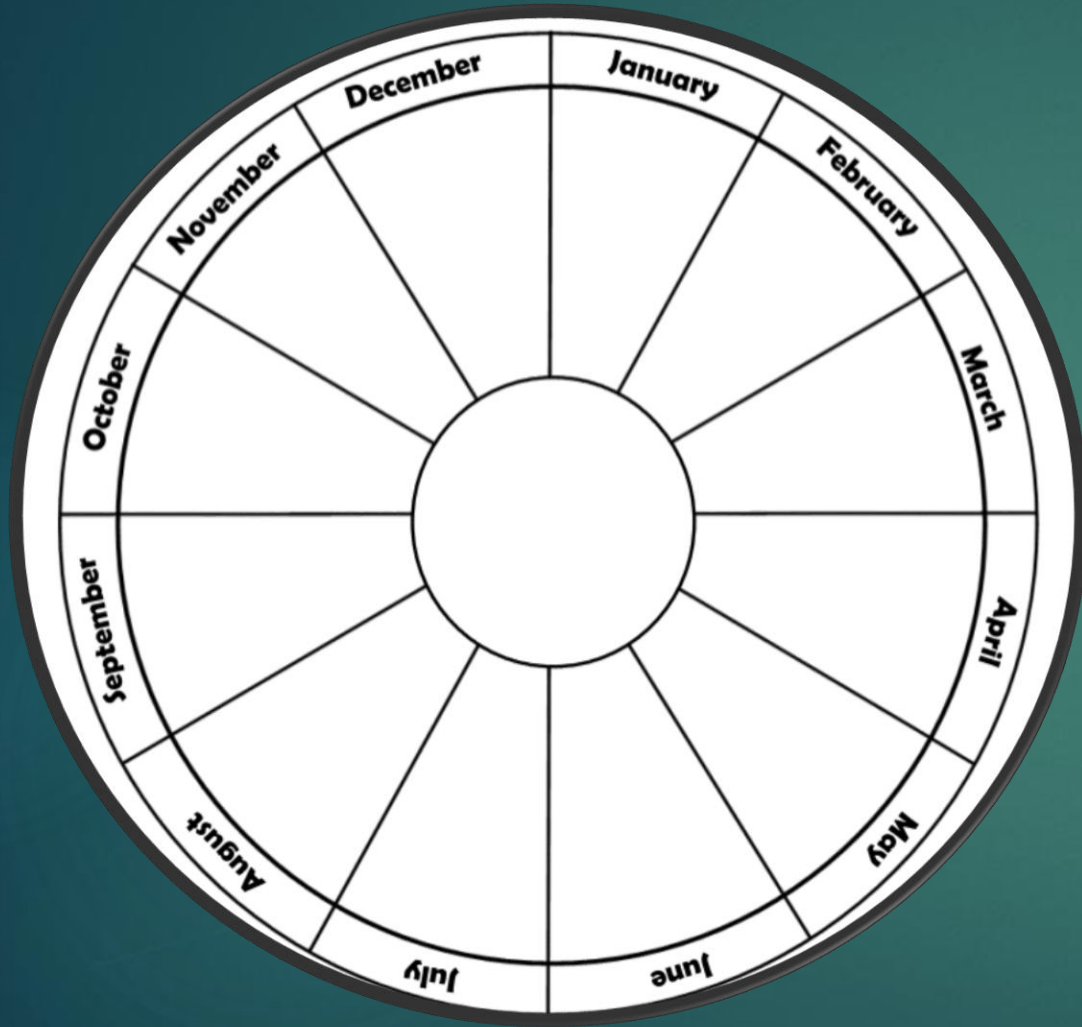
- ▶ Seasonal timings have been consistent, until recently
- ▶ Every 1°C rise in temperature, bud burst happens 5 days earlier than usual, generally 20 years ago
- ▶ Causes ripple effect in food webs
 - ▶ A plant leafing out and blooming earlier
 - ▶ Insects that feed on plant, hatch earlier to meet this
 - ▶ Birds that feed young on insect larva not hatching earlier



USDA Plant Hardiness Zone Map, Illinois

<https://stateclimatologist.isws.illinois.edu/climate-of-illinois/illinois-plant-hardiness-zones/>

Phenology Wheel



USA NPN (National Phenology Network)



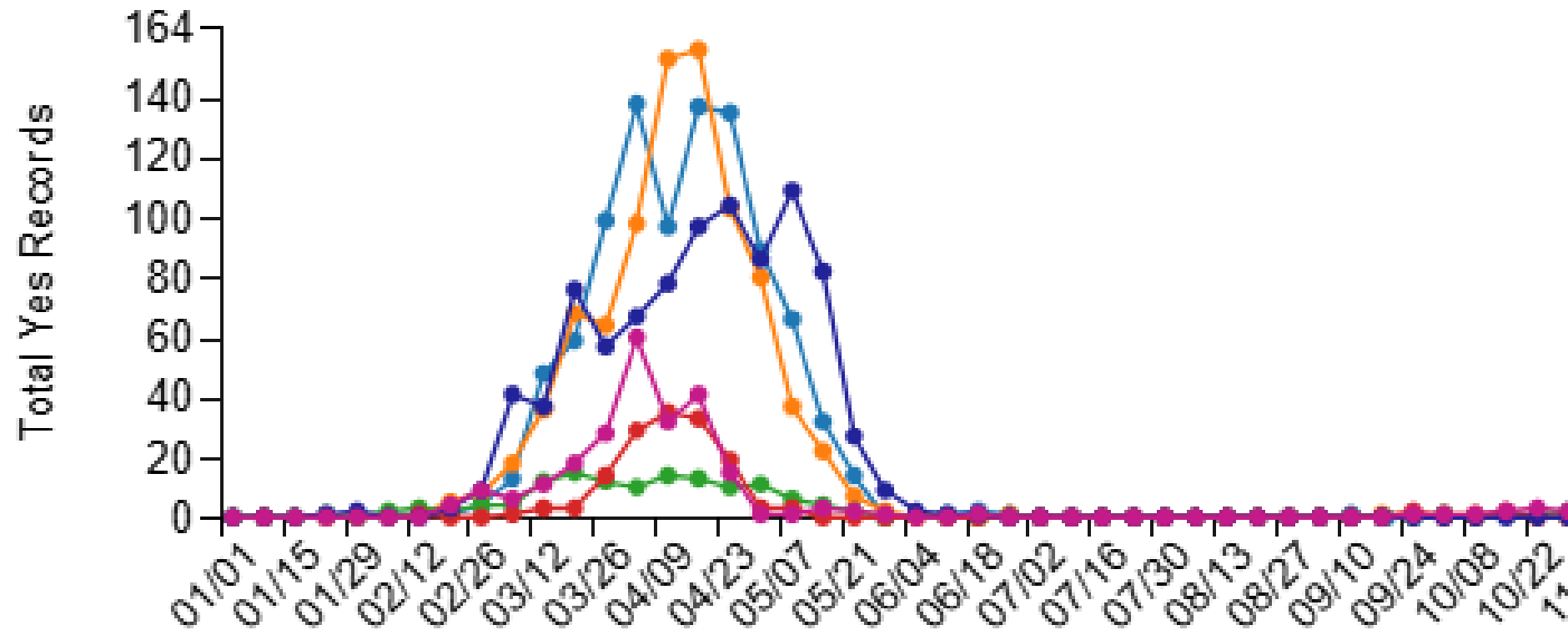
- ▶ <https://www.usanpn.org/>
- ▶ Visualization
<https://www.usanpn.org/data/visualizations>
- ▶ National-scale monitoring & research initiative
 - ▶ Focus on collecting, organizing & delivering phenological data, information & forecast
 - ▶ Natural resources management & decision-making



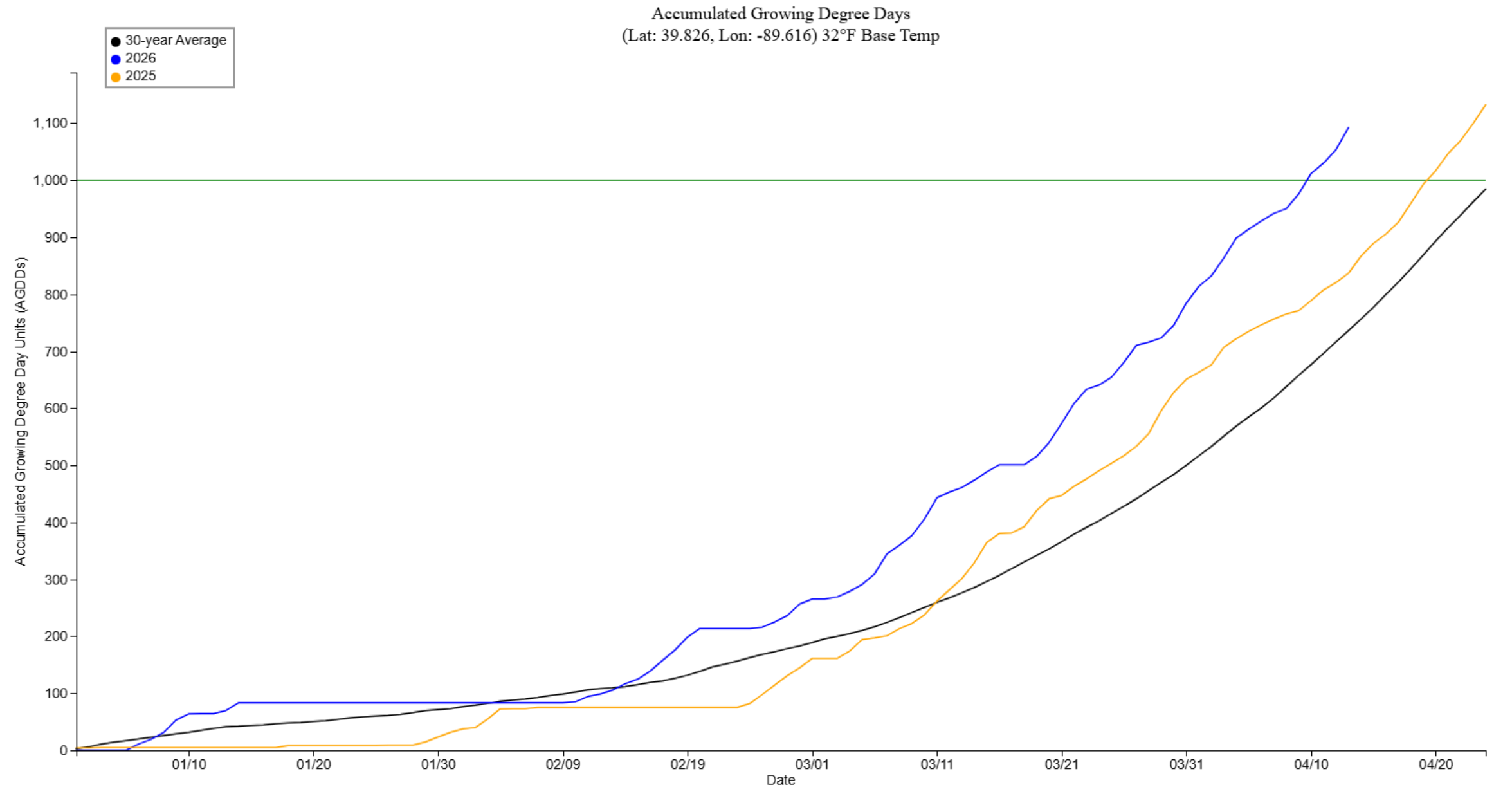
Eastern Redbud

Activity Curves

- 2025: Eastern redbud - Open flowers or pollen cones
- 2024: Eastern redbud - Open flowers or pollen cones
- 2018: Eastern redbud - Open flowers or pollen cones
- 2010: Eastern redbud - Open flowers or pollen cones
- 2022: Eastern redbud - Open flowers or pollen cones
- 2016: Eastern redbud - Open flowers or pollen cones



Differences in Accumulated Growing Degree Days





BASE LAYER

Daily Spring Index Leaf Anomaly
April 13, 2026



BOUNDARY



YEAR

2026



SPECIES/PHENOPHASE



FEATURES

Data precision filter: 30 days



RESET VISUALIZATION

[Reset visualization](#)



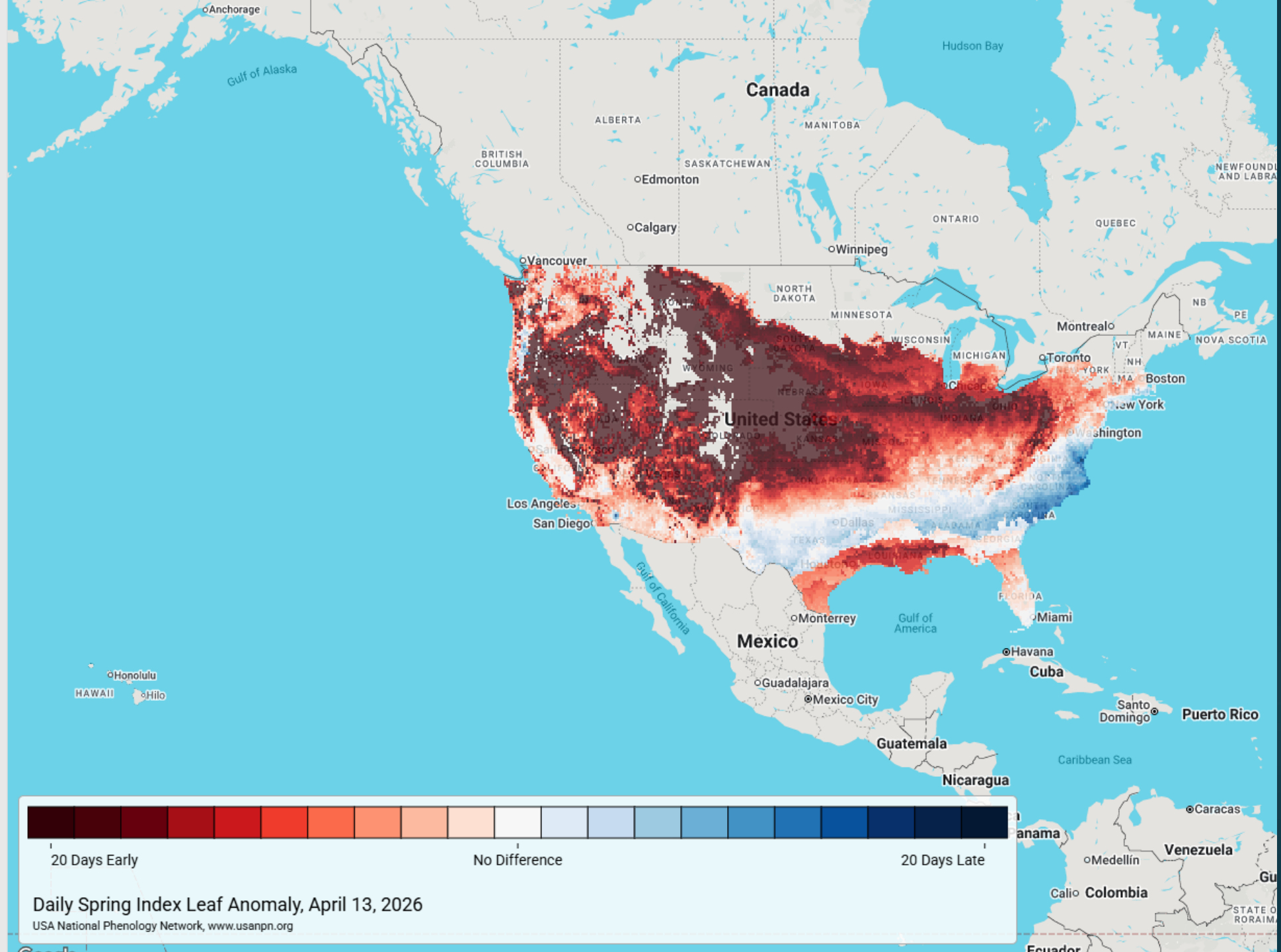
SHARE VISUALIZATION

[Copy link to clipboard](#)



EXPORT VISUALIZATION DATA

[Export data](#)



Daily Spring Index Leaf Anomaly, April 13, 2026

USA National Phenology Network, www.usanpn.org

Project Budburst

- ▶ <https://budburst.org/phenology>
- ▶ Chicago Botanic Garden
- ▶ Started on 2007, moved to CBG in 2017



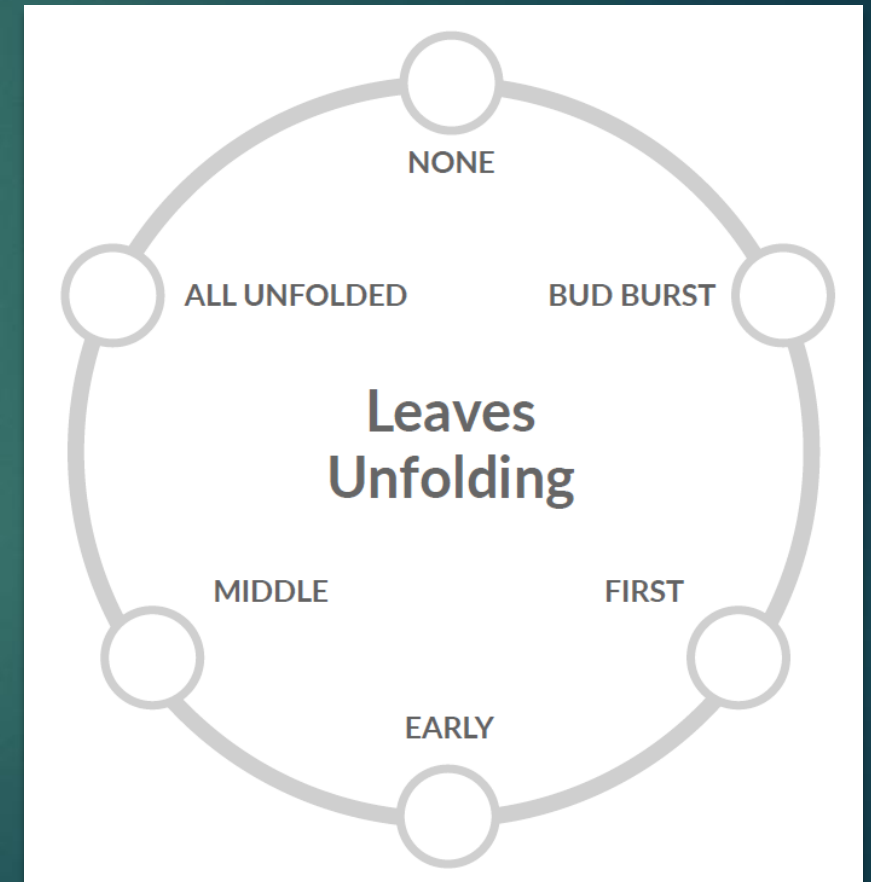
chicago botanic
garden
REGENSTEIN SCHOOL

Budburst



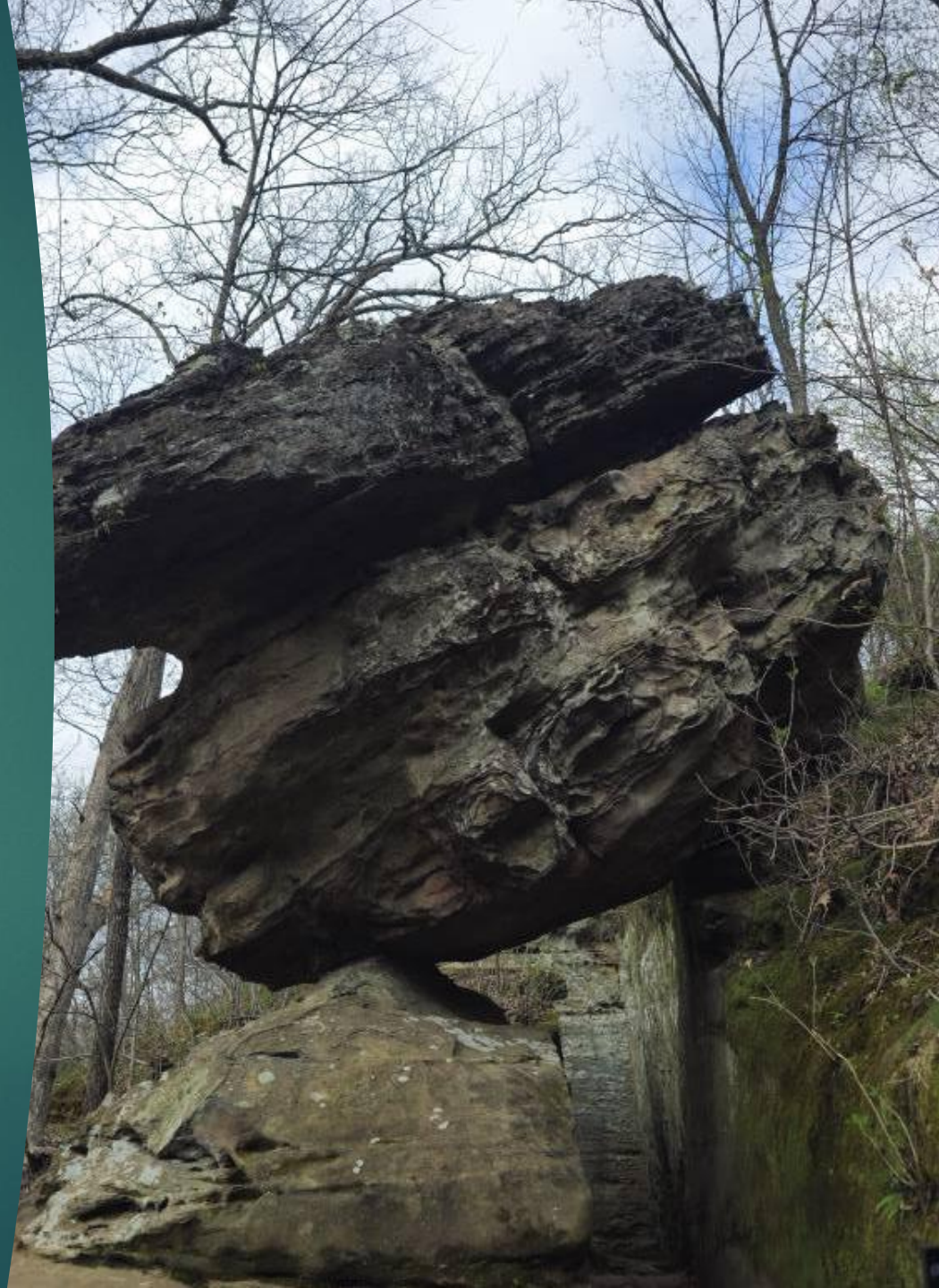
Leave Unfolding – Project Budburst

- ▶ Leaves Unfolding
 - ▶ **None** - No new leaves visible.
 - ▶ **Bud Burst** - Protective scale coating is shed from the bud, exposing tender new growth of one or more leaves.
 - ▶ **First** - First leaves are completely unfolded from the bud on at least three branches. Leaves need to be opened completely (flat) and the leaf stem or base must be visible (you might need to bend the leaf backwards to see those).
 - ▶ **Early** - Only a few leaves have unfolded from the buds (less than 5%).
 - ▶ **Middle** - Half or more leaves have unfolded from the buds.
 - ▶ **All Unfolded** - All or most leaves are fully unfolded.



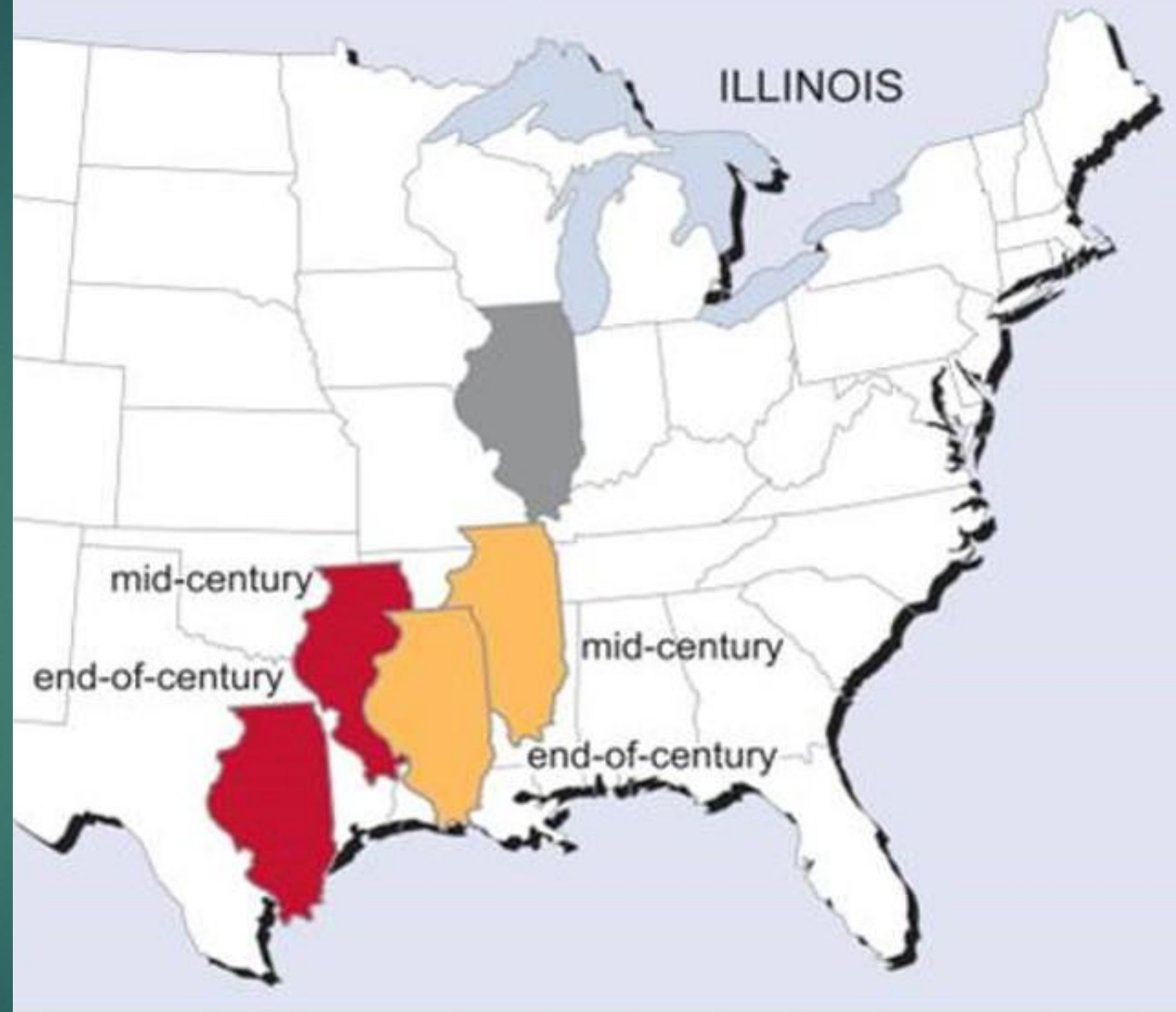
Climate Change is another stressor to an already stressed system

- ▶ Not all species are declining



What do
scientists think
it will look like
here?

Union of Concerned Scientist
www.ucsusa.org/mwclimate



Lower Emissions
Scenario⁹¹

Higher Emissions
Scenario⁹¹

Hayhoe *et al.*²⁸³

Questions?



Lorna Shuman
Head, Division of Education
lorna.shuman@illinois.gov
DNR Division of Education, One Natural
Resources Way, Springfield, Illinois 62706



Illinois Environmental Protection Agency

Environmental Education

NGSS Curriculum Units

A partnership with the University of Illinois Urbana-Champaign's Office for Mathematics, Science, and Technology Education

- Each unit is aligned to the Next Generation Science Standards (NGSS) for formal classroom use.
- Geared towards upper elementary and middle school educators (Grades 5-8)
- Designed to encourage critical thinking and observation skills
- All units are freely available online to download and adapt accordingly, or to use only what is needed



Scan to access
units on UIUC site

Or click on IEPA's web site:
<https://epa.illinois.gov/topics/education/pathways.html>



Environmental Education

NGSS Curriculum Units

- Each unit:
 - Student driven by investigating a phenomenon
 - Follows a storyline
 - Discusses environmental and ecological importance
 - Anthropogenic caused impacts
 - What can be done to help mitigate effects
 - Contains:
 - Teacher Guide
 - Hands-on activities
 - Culminates in a community action plan



Research Article

THE JOURNAL OF ENVIRONMENTAL EDUCATION
2021, VOL. 52, NO. 4, 239–255
<https://doi.org/10.1080/00958964.2021.1949569>

 **Routledge**
Taylor & Francis Group

RESEARCH ARTICLE

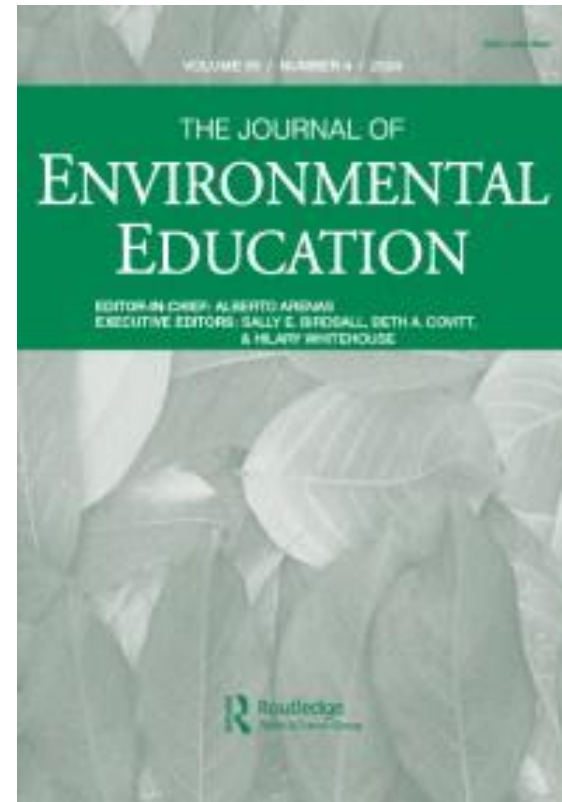


Designing environmental storylines to achieve the complementary aims of environmental and science education through science and engineering practices

Samantha Lindgren^a, Kristi Morris^b and Amanda Price^c

^aUniversity of Illinois at Urbana-Champaign, Champaign, Illinois, USA; ^bIllinois Environmental Protection Agency, Springfield, Illinois, USA; ^cUniversity of Illinois at Springfield, Springfield, Illinois, USA

- Key findings:
 - Student-driven storylines empower discussion through observation
 - Incorporating Env Ed into the classroom helps teach *for* the environment
 - Significantly elevated student nature-relatedness scores



Why is the Pond Green?

- Students investigate algal blooms and their environmental impact.
- Activity: Lab grown algae
- Discuss runoff and impacts of nonpoint source pollution, including nutrients
- Ecosystem imbalances
- The interconnectedness of the environment, accumulation of nutrients down to the Dead Zone.

Surface Water (Algae)
Why is the pond green?



Surface Water (Algae)

Activity 2: Drawing Out Pollution

On the picture below, circle any items that you think might add extra nutrients or other substances to the environment.



Why is the pond green?

- Activities include worksheets to identify pollution sources
- Great for interdisciplinary discussions: connections to urban planning; agriculture; biology



Where Does My Food Go?



- Students learn about food waste reduction and landfill diversion
- Explores what happens to wasted food, environmental consequences, and solutions
- Activity: Cafeteria food waste audit
- Activity: Designs a landfill and classroom composting
- Food waste video (9 minutes)

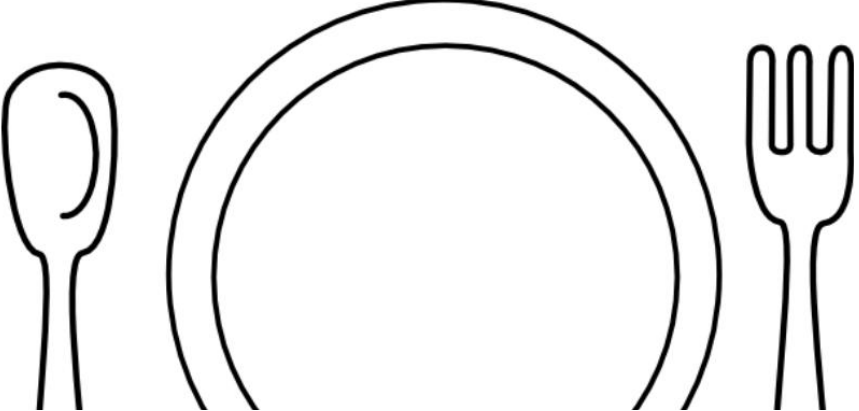
Food Waste Activities

Environmental Pathways

Name:

Where does my food waste go?
WHAT'S ON MY PLATE?

On the plate below, draw and label 4 of your favorite foods that you eat about once a week. For each food item, use the Food Calculator to see how much water your food requires to grow, and how much greenhouse gas is produced as a result. Record your values in the data table below.



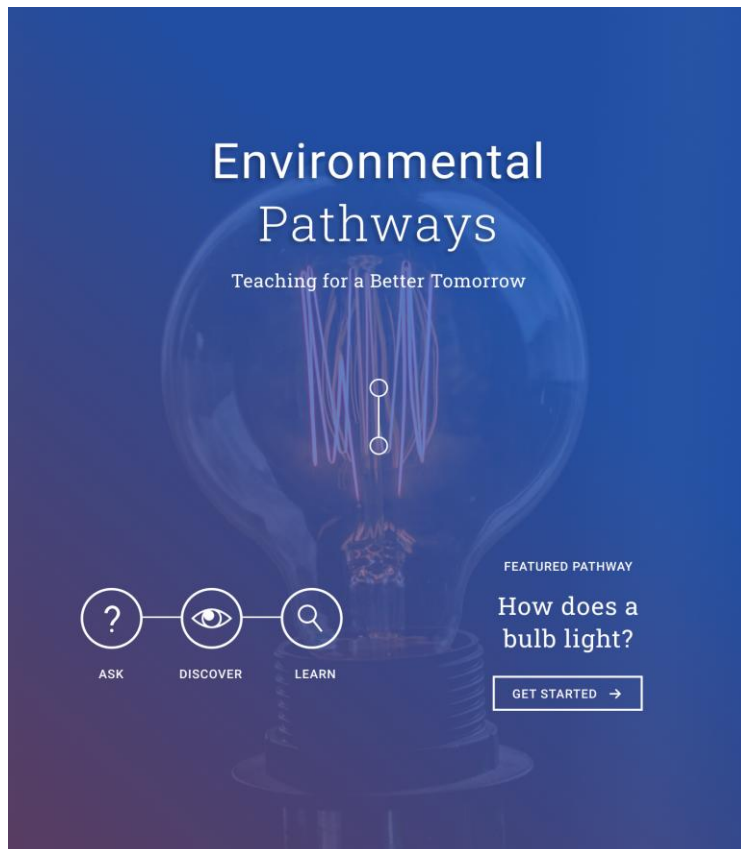
Food Waste

Where does my food go?

- Key activity includes a “What’s on my plate” exercise; connecting to food waste to energy loss and climate change
- Unit ends with advocacy and action
- Ads, policies, school food share tables and on-site composting

How Does a Bulb Light?

Energy



- Students explore electricity production and delivery, conservation, and changes in the energy system including transportation.
- Students investigate current power systems and future changes
- The advantages and disadvantages of different power sources and how they affect the environment are also examined

Loanable Activity Kits

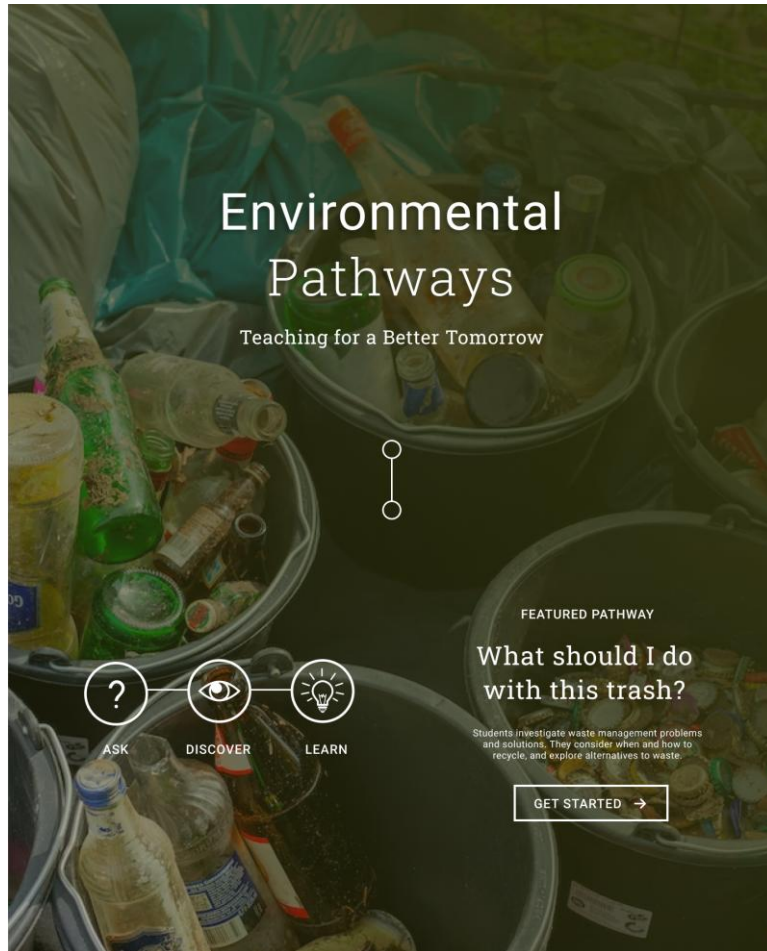
How does a bulb light?



- Hydropower Kit
 - PowerWheel kit, tubing, and submersible water pump
- Circuit Kit
 - 7 hand crank generators, 7 5V and 100mA solar panels, 7 5.5V and 170mA solar panels, 56 alligator clip leads, and wire strippers

Available free for loan through the Illinois Library System or by contacting us

What Should I Do With This Trash?



Waste Management

- Anchor: Trash choices and consequences
- Students investigate how much trash they produce and what their choices with it are
- Composting, recycling responsibly, and plastic use/reduction
- Unit concludes by discussing community action plans

Waste Management



What should I do with this trash?

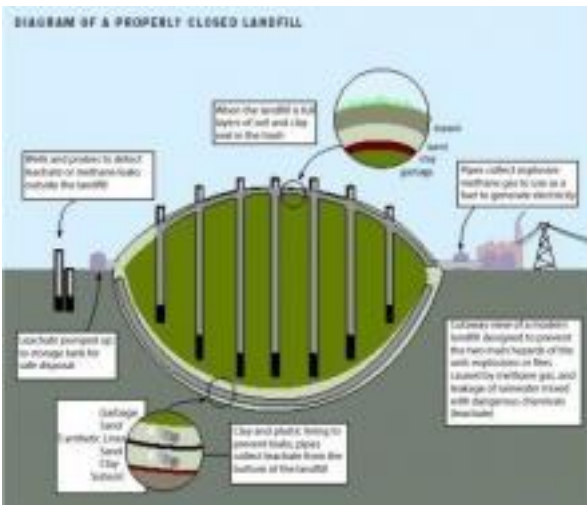
- Emphasis on circular economy and environmental impacts of
- Illinois' limited landfill capacity
- Disposal of hazardous waste and hard to recycle items

► Hands-on activities:

- Recycle your own paper
- Investigating packaging (over 1/3rd of all waste)
- Create your own biodegradable forks with gelatin, agar, and cornstarch

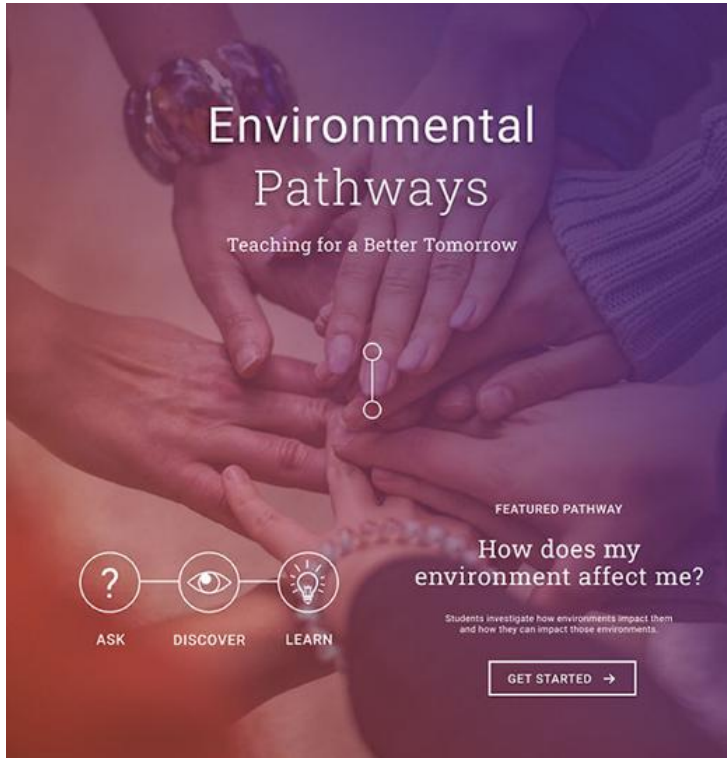
Let's make new paper out of paper in the recycle bin. We need scrap paper, a window screen, a plastic tub, a blender, water, and a cloth.

1. Tear the scrap paper into tiny strips.
2. Fill at least half of the blender with water and add a handful of paper strips. Then, run the blender on medium speed to shred the paper strips into a pulp. If the blender is not blending well, add more water. Keep blending until the paper pulp mixture is smooth.
3. Place the window screen on top of the plastic tub.
4. Pour the paper pulp mixture across the screen into a thin and uniform layer.
5. Cover the paper pulp with a cloth and press down to absorb water, push water through the screen into the tub, and make the new paper more uniform and thin.
6. Once most of the water has been removed, place a hand over the cloth and then flip the screen upside-down onto a waterproof table.
7. Remove the screen and move the cloth with the paper pulp to a place where it can dry.



How Does My Environment Affect Me?

Environmental Justice



- Students explore the definition of EJ through a series of Illinois case studies
- Utilize participatory science methods to collect environmental quality data; examine intersection of scientific methods and social context
- Unit concludes with opportunity to impact local conditions through planning, inclusion, and advocacy

Loanable Activity Kit!



Illinois Environmental Protection Agency Environmental Education

We are always looking for new ways to collaborate and support educators across Illinois.

Please reach out and connect with us!

Kristi Morris (Springfield)
Kristi.Morris@illinois.gov; 217/558-7198

Eli Dollarhide (Chicago)
Eli.Dollarhide@illinois.gov; 312/832-2183



Questions?





Why climate change may NOT be taught in the classroom

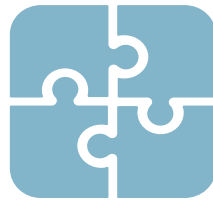
Low Teacher
Confidence



Lack of Time &
Resources



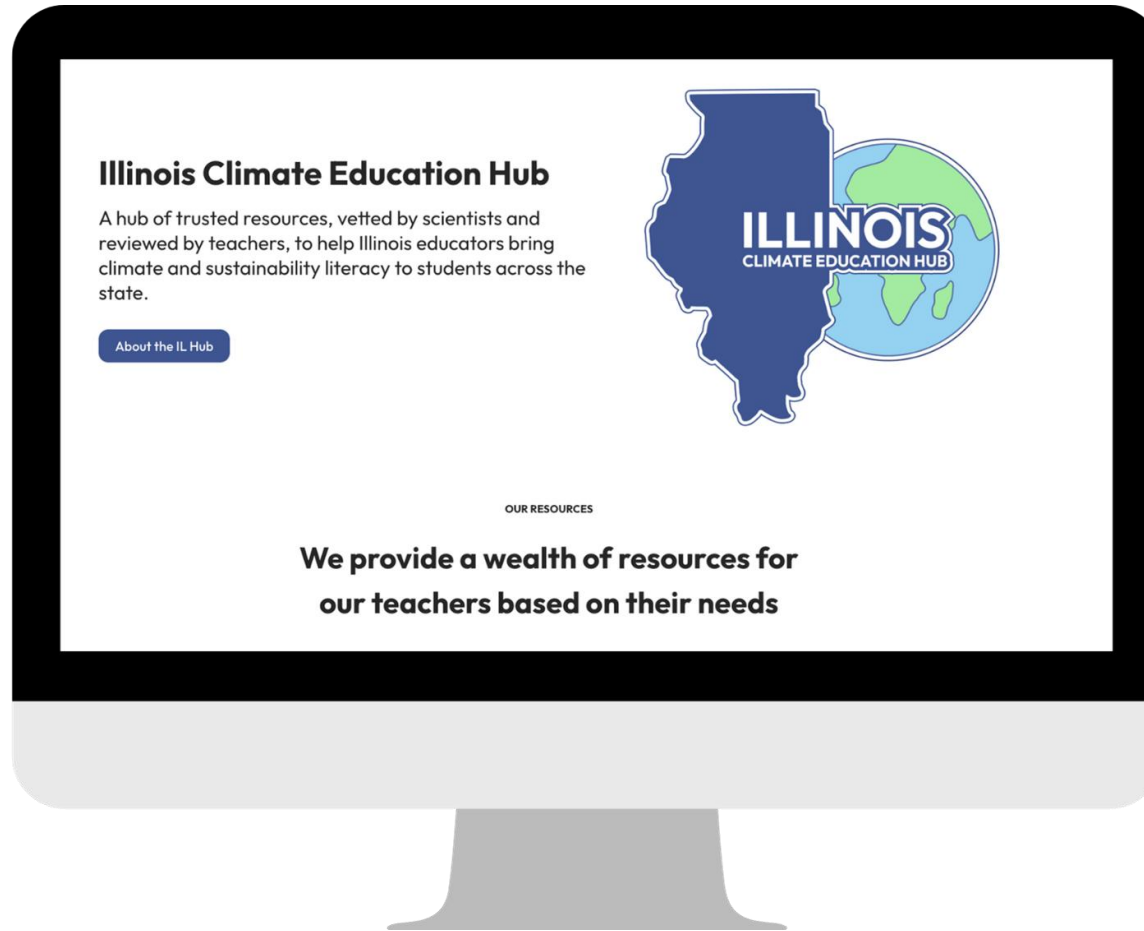
Doesn't Fit into
Curriculum



Controversial
Subject



What is the Illinois Climate Education Hub?



Mission

To empower all educators to easily and effectively teach about climate change, justice, and action.

Vision

A future where every child learns about climate change and becomes a steward of our planet.





Why State Leads?



Our focus on collaboration and making climate education meaningful in the local context while connecting communities of climate educators across the nation is key! Our State Leads are the connectors who support the specialized collaboration state by state.

State Hubs

Connecticut

Illinois

Maine

Michigan

New Jersey

New York

Oregon

Wisconsin

Let's Explore

Illinois Climate Education Hub

A hub of trusted resources, vetted by scientists and reviewed by teachers, to help Illinois educators bring climate and sustainability literacy to students across the state.

About the IL Hub

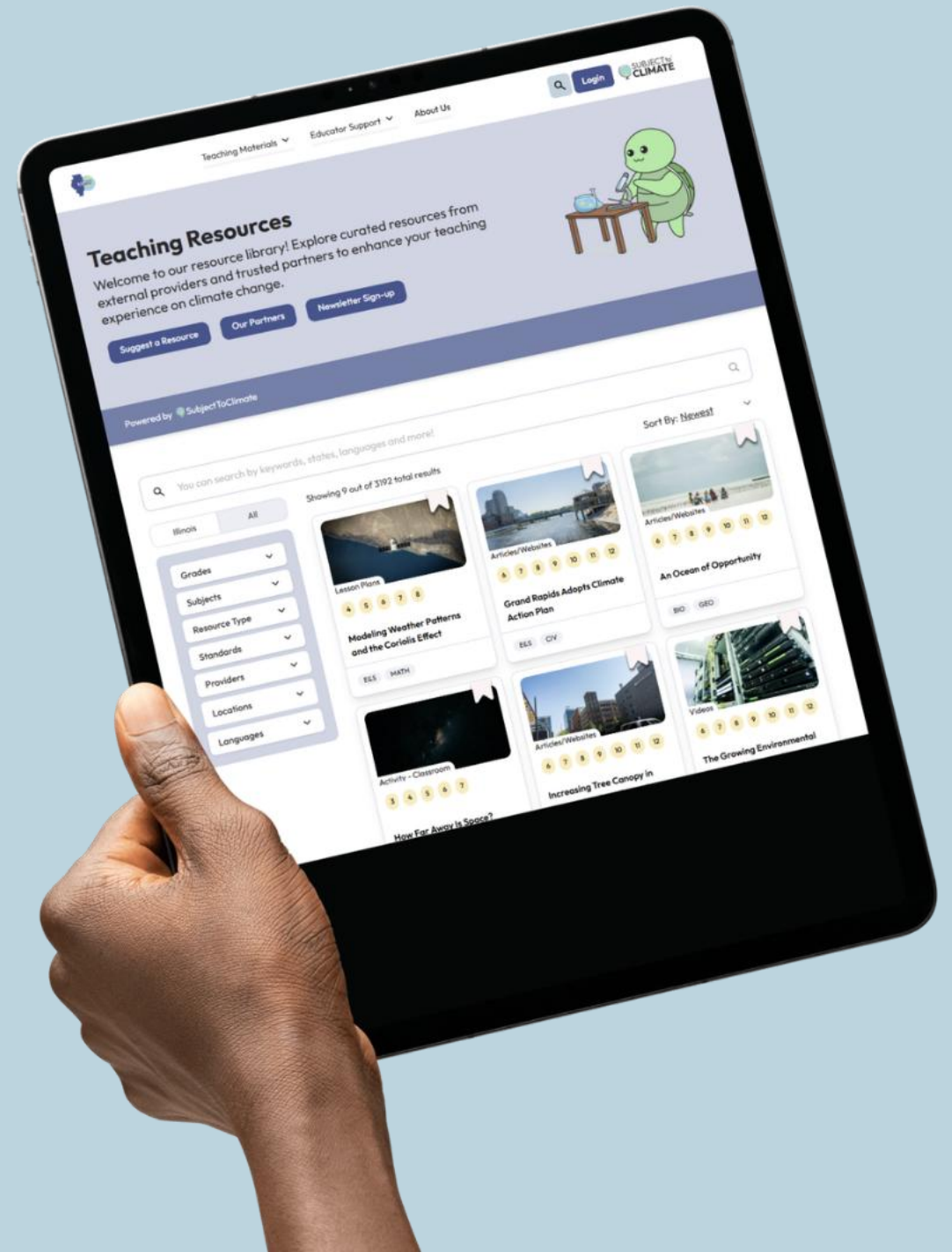


OUR RESOURCES

**We provide a wealth of resources for
our teachers based on their needs**

Resource Database

- ➔ Over 3,000 resources for all grade levels and subjects!
- ➔ Reviewed and vetted by a team of climate scientists and educators.
- ➔ Content provided by a wide variety of leaders and innovators in climate change education.



IL Place-Based Resources

ELA, Science, Grades K-2



A Little Help From Their Friends

Provided by: IL Department of Natural Resources | Published on: May 1, 2025

Lesson Plans K 1 2

ELA & Science, Grades 6-12



What Climate Change Means for Illinois

Provided by: EPA | Published on: June 13, 2025

Articles/Webistes 6 7 8 9 10 11 12

ELA, Math, Science, Grades 9-12



Plotting Trends – Environmental Justice in Chicago

Provided by: ACE | Published on: March 30, 2021

Lesson Plans 9 10 11 12

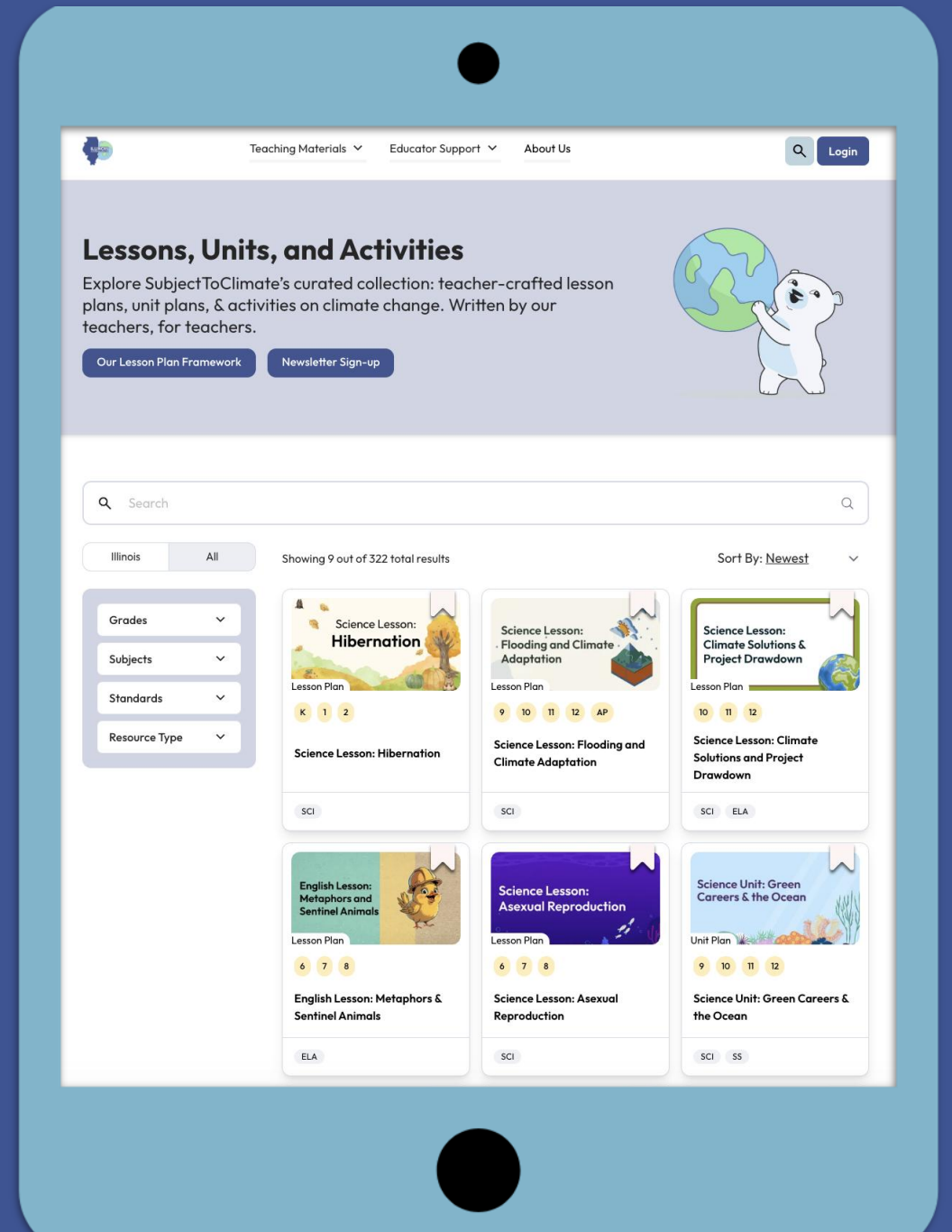


Lessons by Teachers

➡ Created by teachers, for teachers

➡ Standards-aligned

➡ Lessons, units, stand-alone activities



Science & ELA, 3-5

Lesson: Monarch Challenges

Students analyze a graph to learn about the decline of monarch butterflies, play a game to identify challenges faced by the insect and make an action plan to help the species in their local context.



INQUIRE



INVESTIGATE



INSPIRE

Inquire: Students interact with a slow reveal graph showing Monarch Butterfly decline and discuss.

Investigate: Students examine and identify the challenges monarchs face during migration.

Inspire:
Students take action to increase the monarch population.

Monarch Challenges: Science Lesson

Choose a way to help the Monarchs

Option 1:

Read a story about Monarchs.
Brainstorm ideas for your own story to spread awareness.

Option 2:

Make a plan to participate in a Citizen Science Project.

Option 3:

Use an idea from your class' brainstorm. Make a plan.

How can we take action?

Record student ideas here.

Name _____ Date _____

Monarch Graphic Organizer
Play the Monarch Movement Game. Then fill in a Monarch's Needs, Next, talk about Challenges and Solutions.

Needs	Challenges	Solutions
What do Monarchs need to survive?	What is the problem?	What can be done to help the Monarch population?
Monarchs need...	But the problem is...	So we can...
Milkweed	People think it is a weed	Plant it in our gardens

Science & ELA, 10-12

Lesson: Flooding and Climate Adaptation

Students explore midwest scenarios as they explore climate change and placed based impacts associated with climate change.

02 Farming Community

A farming community in the Midwest is experiencing a severe, prolonged drought. Water supplies are scarce, affecting irrigation systems. The community is facing reduced crop yields and economic instability.



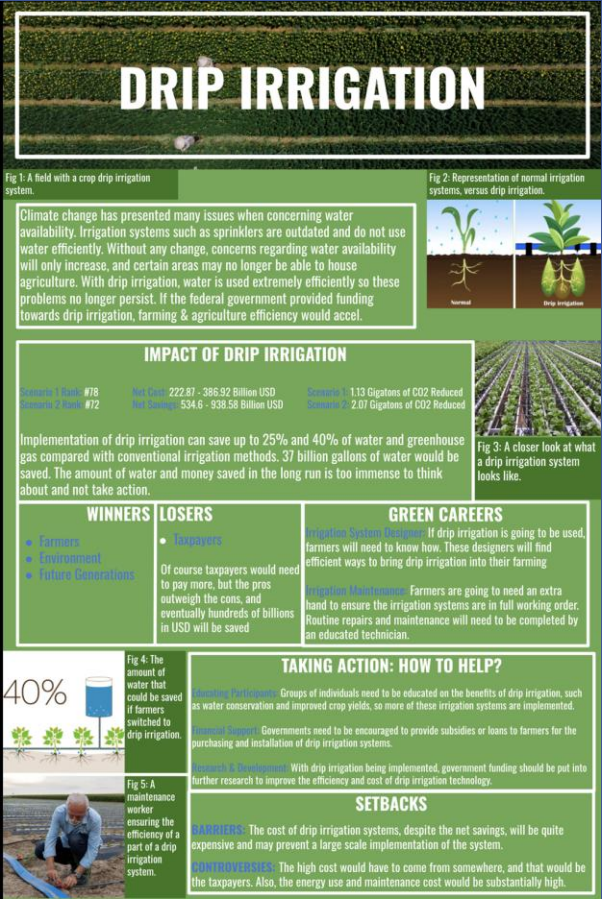
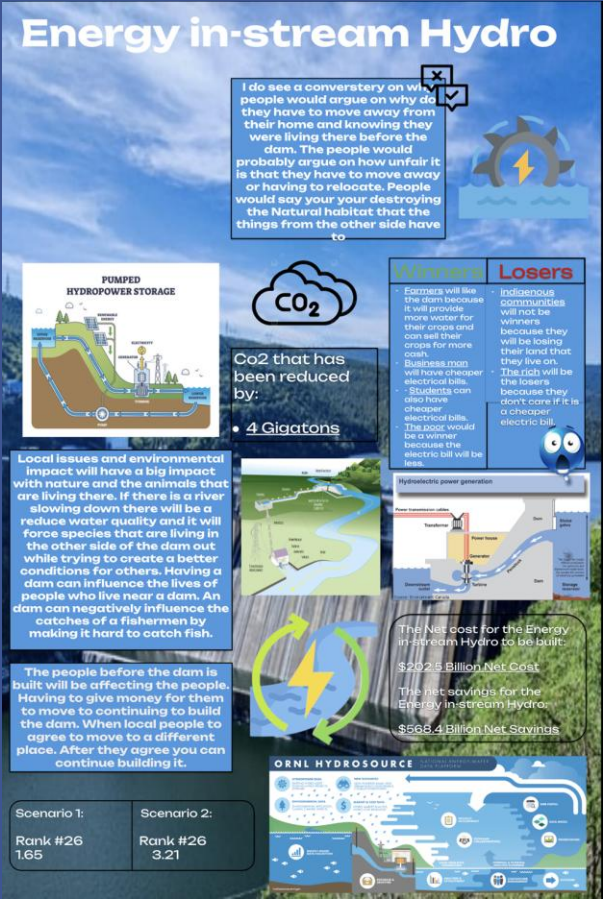
Investigate: Students research two solutions to climate change using Project Drawdown resources.

Inspire: The summative activity in this lesson involves students creating a climate solution poster.

Science Lesson: Climate Solutions and Project Drawdown

Created by Teacher(s): Michael Aprill | Published on: August 27, 2025

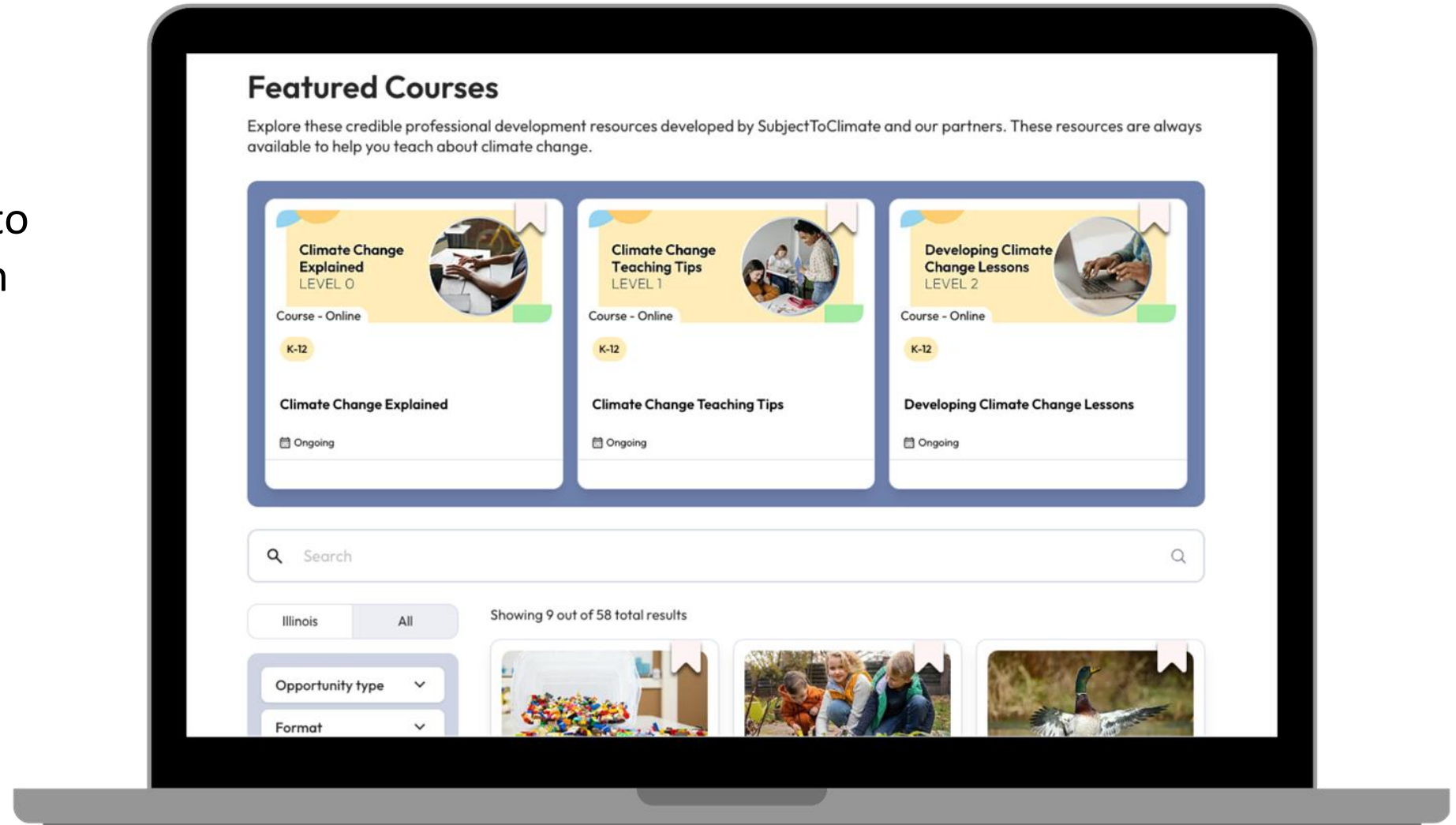
Lesson Plan101112Created by Wisconsin Climate Education Hub teachers



Sample student posters.

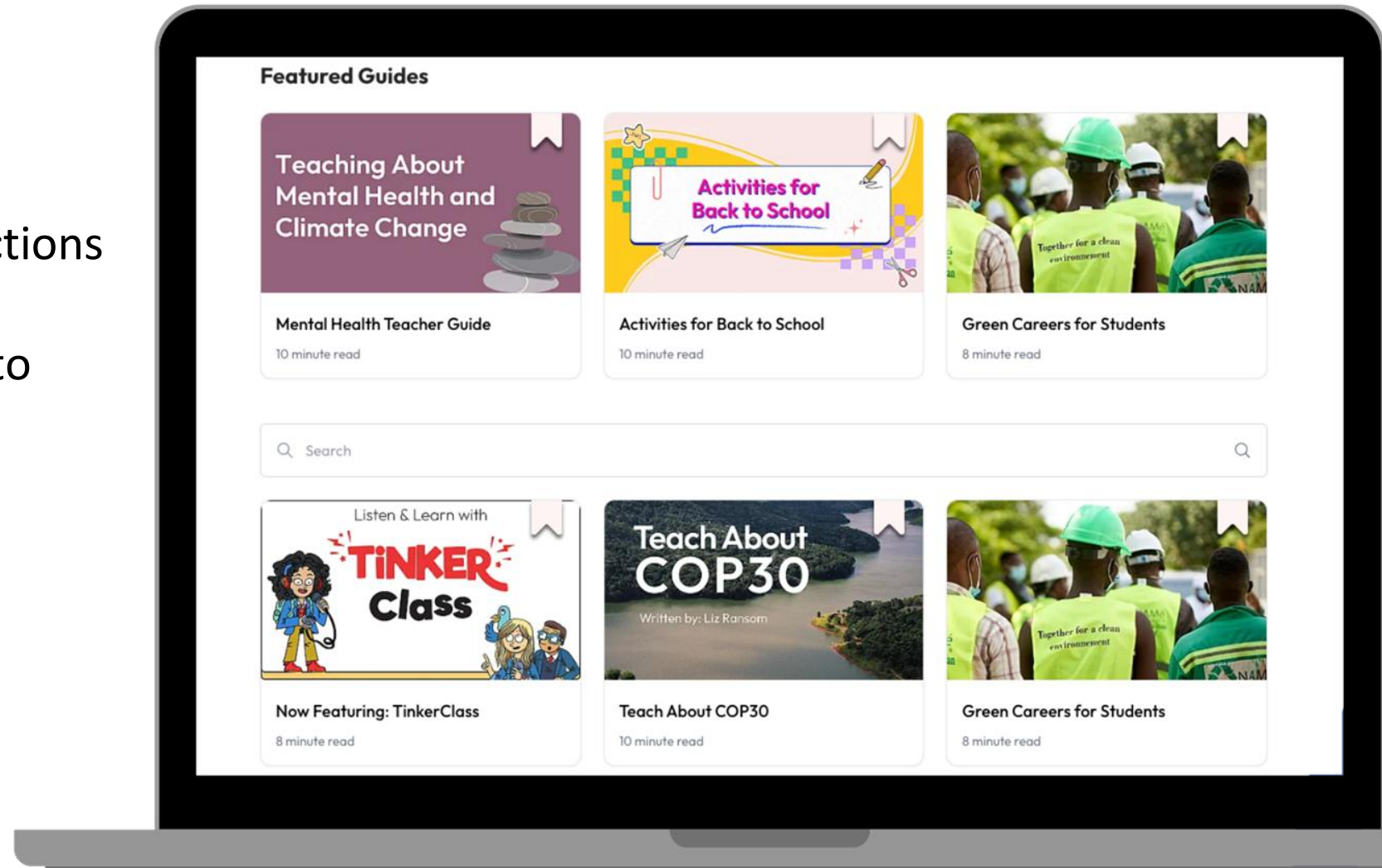
Professional Development

Learn more about integrating climate change education into your classrooms with these high-quality Professional Development Opportunities.

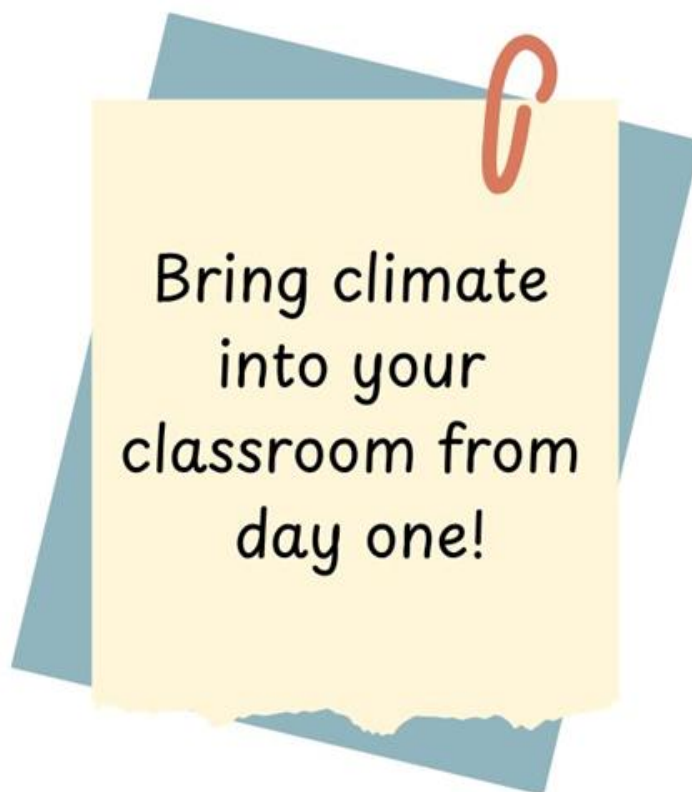


Teacher Guides

Explore curated collections of resources based on topics teachers want to teach!



BACK-TO-SCHOOL
2026 TEACHER
GUIDES



Bring climate
into your
classroom from
day one!



News for Students

Effortlessly assign daily news articles tailored to your students' reading levels for enhanced comprehension.



Search by topic.



Select your grade band to scaffold the text.



Assign to students by adding to Google Classroom.



Your turn!

Create an account.

This will allow you to save favorites.

Register

Login

Go to Resource Database or Lessons by Teachers.

Set your filters and search by keyword.

Explore the results and save your favorites!



Stay Connected!

Sign-up to our free newsletter and
stay up-to-date on new resources
& PD opportunities.



Be sure to select Illinois as your hub!

Share your journey with us!



**SUBJECT^{to}
CLIMATE**

@subjecttoclimate



● Navigating the Illinois Climate Education Hub: Ready-to-Use Science Resources and Lessons

November 9, 2026, 4:00-5:30pm

Join us for an interactive **90-minute exploration** of SubjectToClimate's Illinois Climate Education Hub, a free collection of science-vetted, state-aligned lessons and instructional resources designed to support climate literacy across grade levels. As Illinois prepares to implement new climate education requirements under PA 103-0837, the Hub offers educators ready-to-use resources that can help meet those expectations.

During this interactive session, participants will explore exemplary climate science lessons for **every grade band (K–2, 3–5, 6–8, and 9–12)**, learn how to navigate the Hub efficiently, and discover resources that can be implemented immediately. Educators will also participate in **grade-level breakout discussions** to collaborate with peers, explore the Hub, and curate resources tailored to their instructional needs.





Thank you!

Katie Nahrwold

katie.nahrwold@subjecttoclimate.org

Illinois State Lead,
Illinois Climate Education Hub

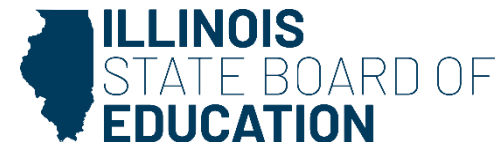


What is next?

1. Be sure you have signed in
2. Look for an email from Meagan Budke for materials and slide deck
3. By the end of the week, log in to PD+ to complete the evaluation form and redeem PD hours



Advancing Climate Education in
Illinois: Resources for
Implementing PA 103-0837



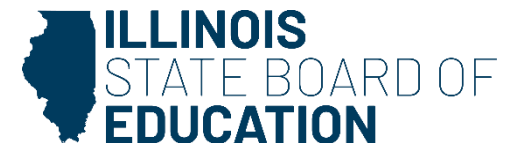
Resources

[ISBE Science Webpage](#)

[IDNR Education Website](#)
[IDNR ENTICE Workshop Webpage](#)

[Illinois EPA's Environmental Pathways Curriculum](#)
[Illinois EPA's Environmental Education Resources](#)

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Thank you--Stay Connected

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