Illinois NLRS Explorer

Illinois Environmental Protection Agency

Illinois Department of Agriculture

ILLINOIS Extension
COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES

Photo: Layne Knoche

Current Situation

- Partners have engaged in many successful outreach campaigns for the Illinois NLRS
- Despite outreach efforts, many kids, teens, and adults in Illinois aren't aware of the Illinois NLRS or Gulf Hypoxia
- Simultaneously, Illinois needs to increase BMP adoption to reach our nutrient loss reduction goals

The Idea

- **Teach students about the Illinois NLRS** during a time when they are considering career choices and/or college majors
- By getting them interested early on, they can **help implement the strategy** and **share information** with their parents
- **Develop an Illinois NLRS curriculum** for teachers and other educators

ILLINOIS
NUTRIENT LOSS
REDUCTION STRATEGY

Bump in the Road

- Shared the curriculum idea with Terri Hallesy and Joan Cox, education specialists at Illinois-Indiana Sea Grant
- They shared with us the process and timeline for putting together a full curriculum, which can take up to **TWO YEARS** to complete
  - More in-depth and complicated than we thought
  - Teachers prefer individual lessons and activities over a full curriculum

Solution

- Prefer something to share during this school year
  - Helps with remote learning
- Rather than develop a full curriculum, we decided to put together an **educational toolkit** with resources for teachers and other educators to learn about and teach this material
  - Structured, but self-guided
  - Provide basic information and links to resources
  - Can always develop a full curriculum later on

Audience

Illinois K-12 students and their families. Students may be interested in exploring NLRS components and careers and can share that information with their families.

Photo: 4H Website

Photo: MWRD Website

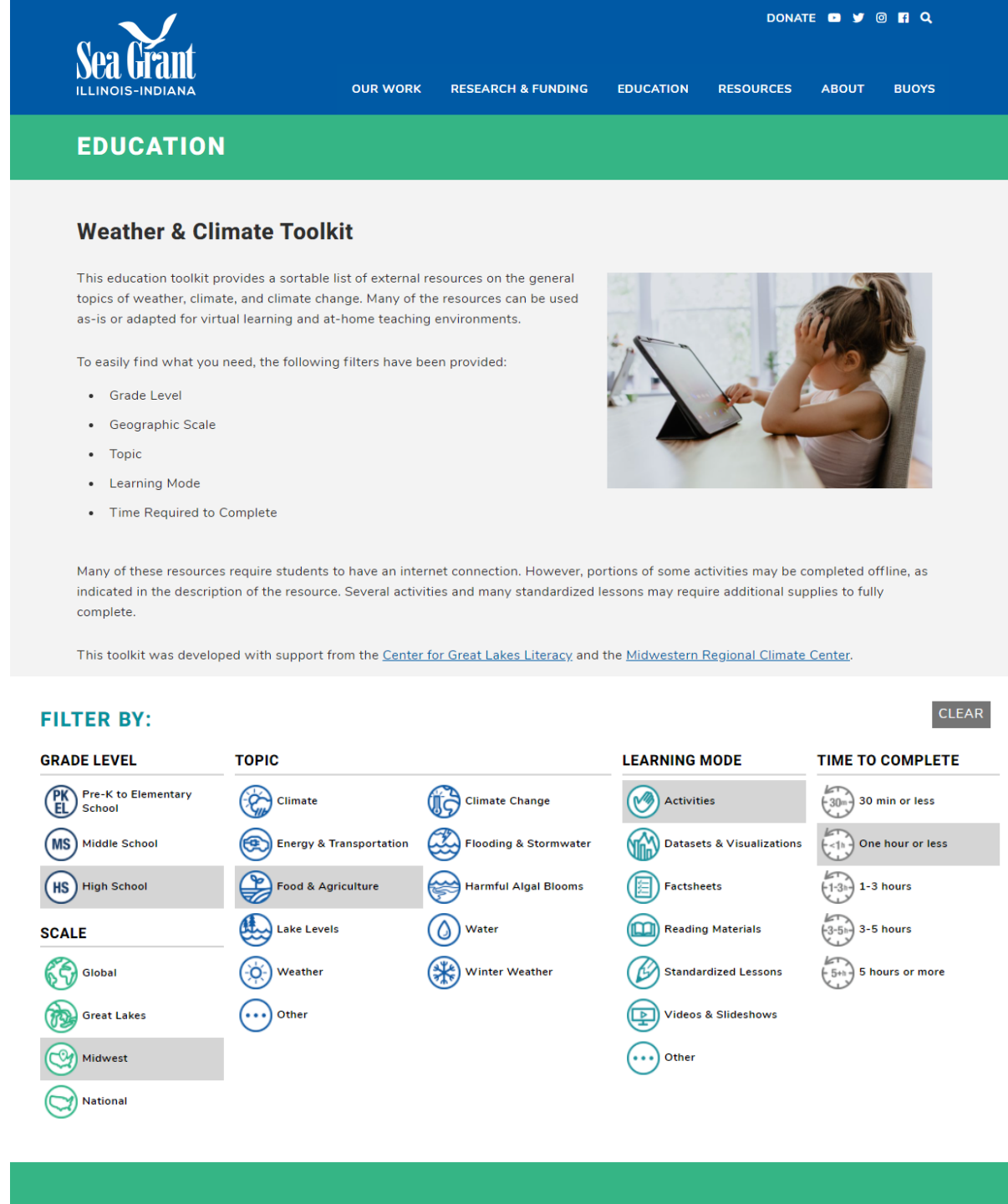
Key Topics

- Gulf of Mexico Hypoxic Zone
- Connection between Illinois and Gulf of Mexico
- Nitrogen and Phosphorus
- Illinois Nutrient Loss Reduction Strategy
- Careers

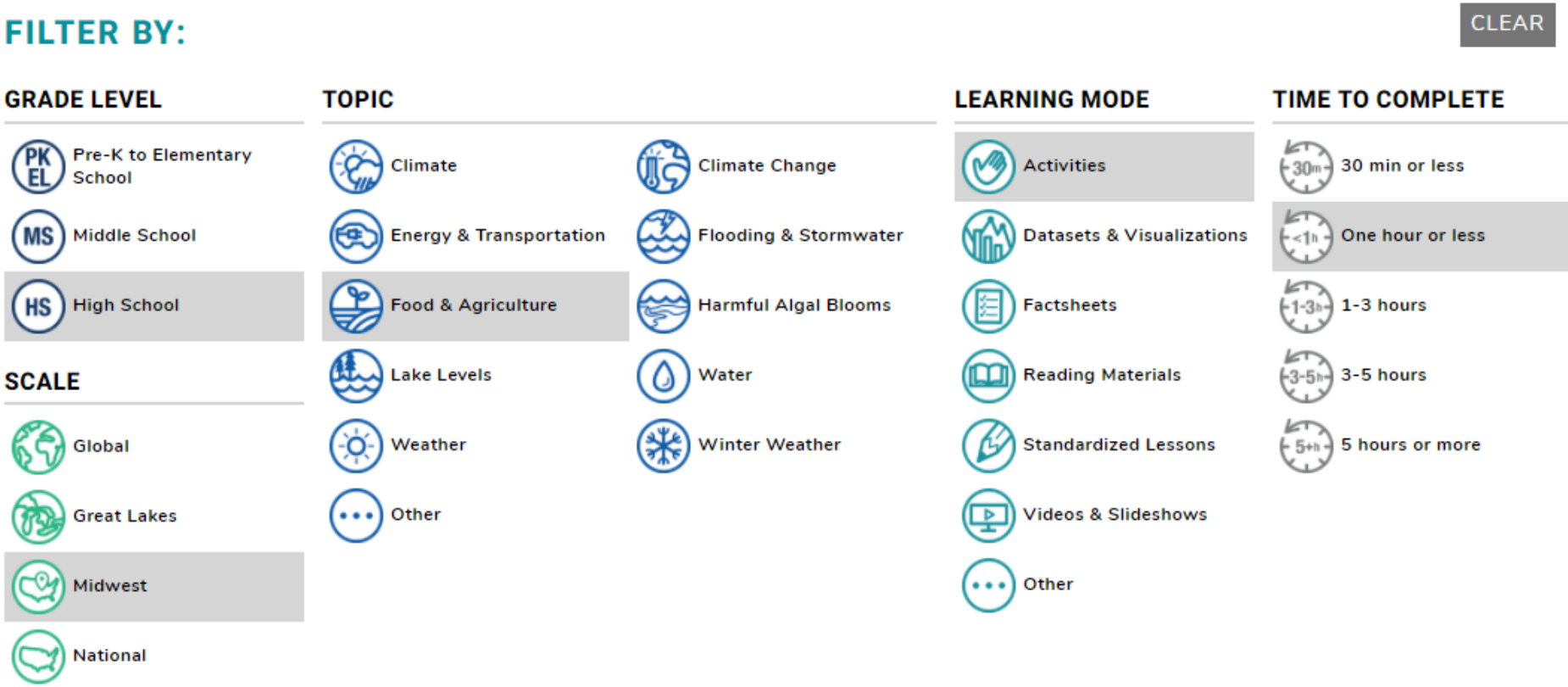
Toolkit Template

NLRS Explorer Toolkit will be based on the Illinois-Indiana Sea Grant Weather & Climate Toolkit

Can filter resources by audience, topic, learning mode, time needed, etc.



Toolkit Icons



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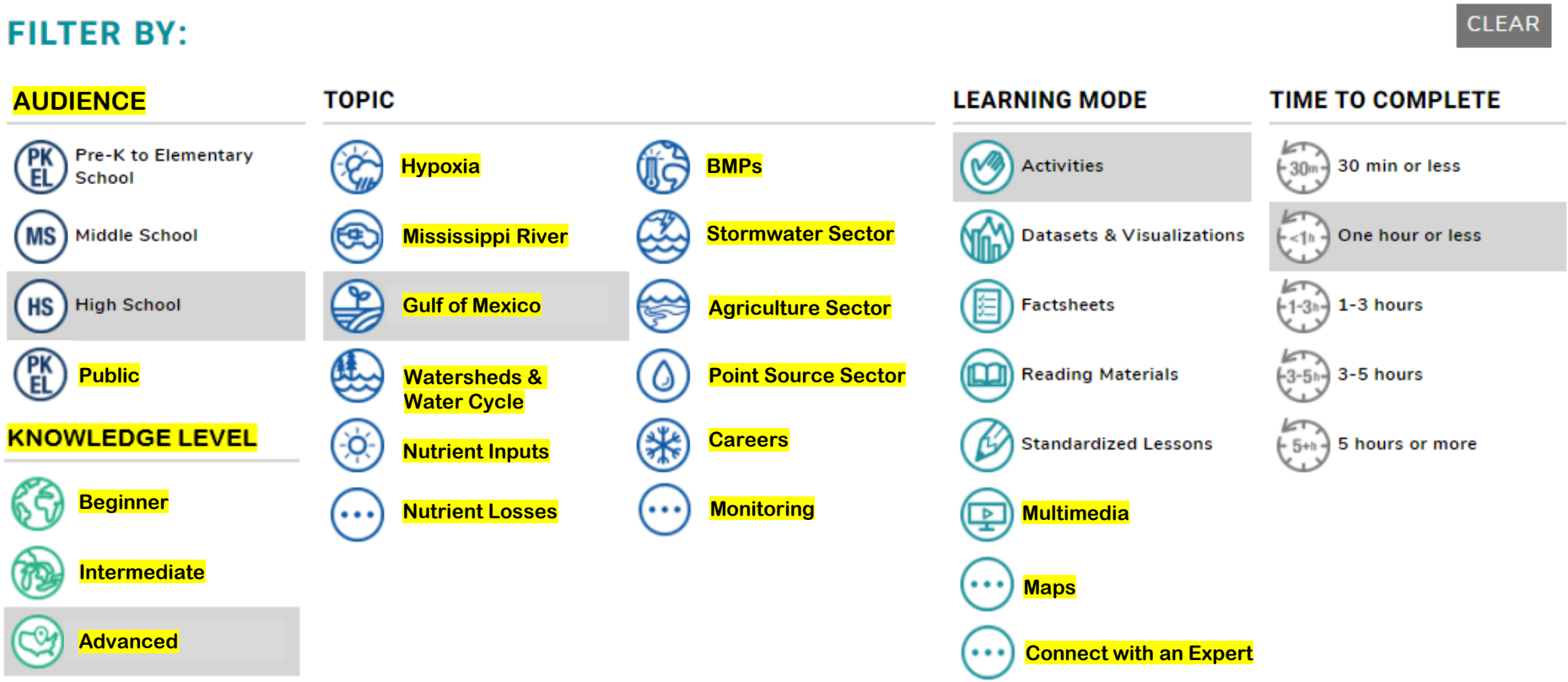
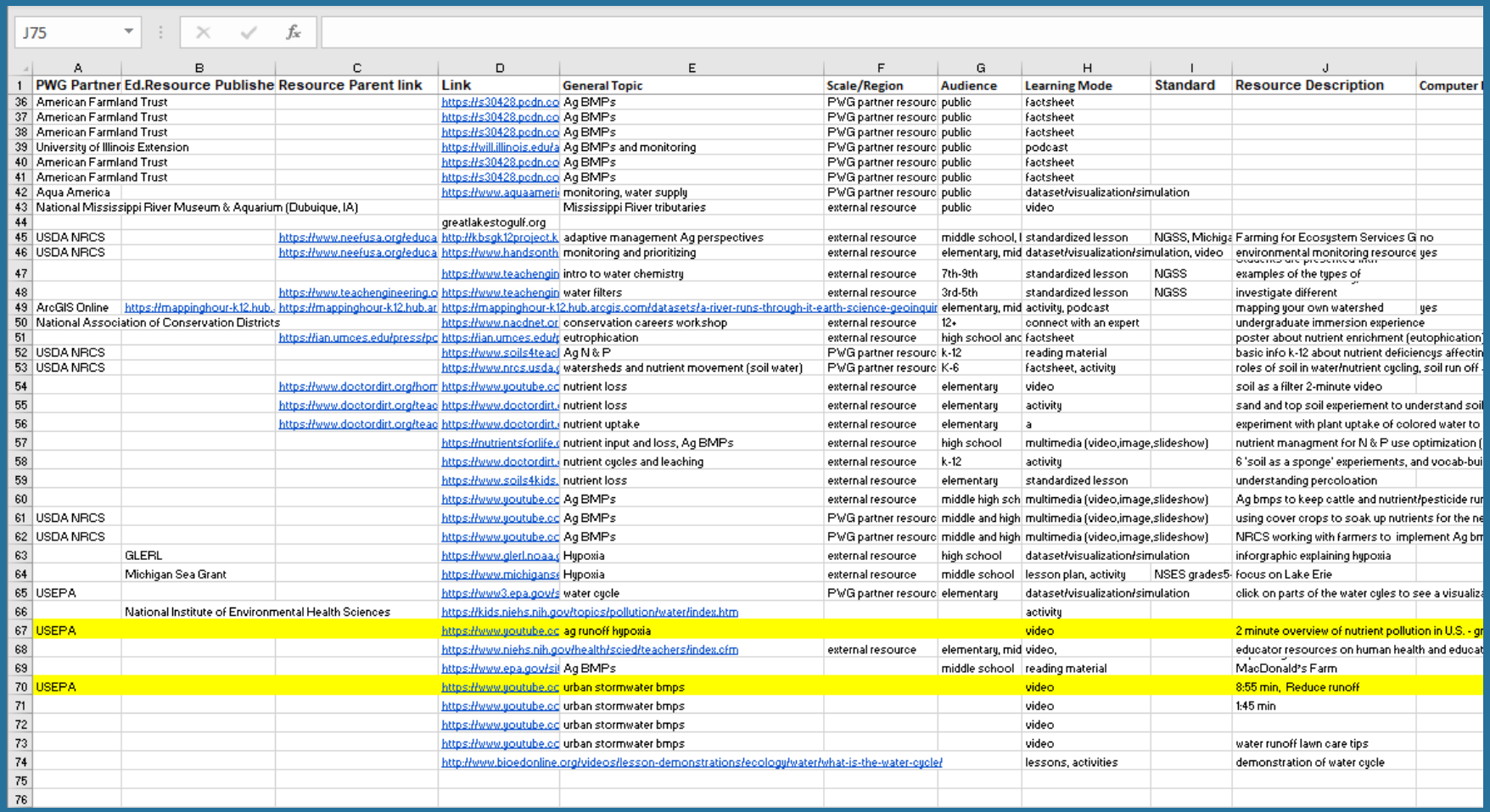


Database List

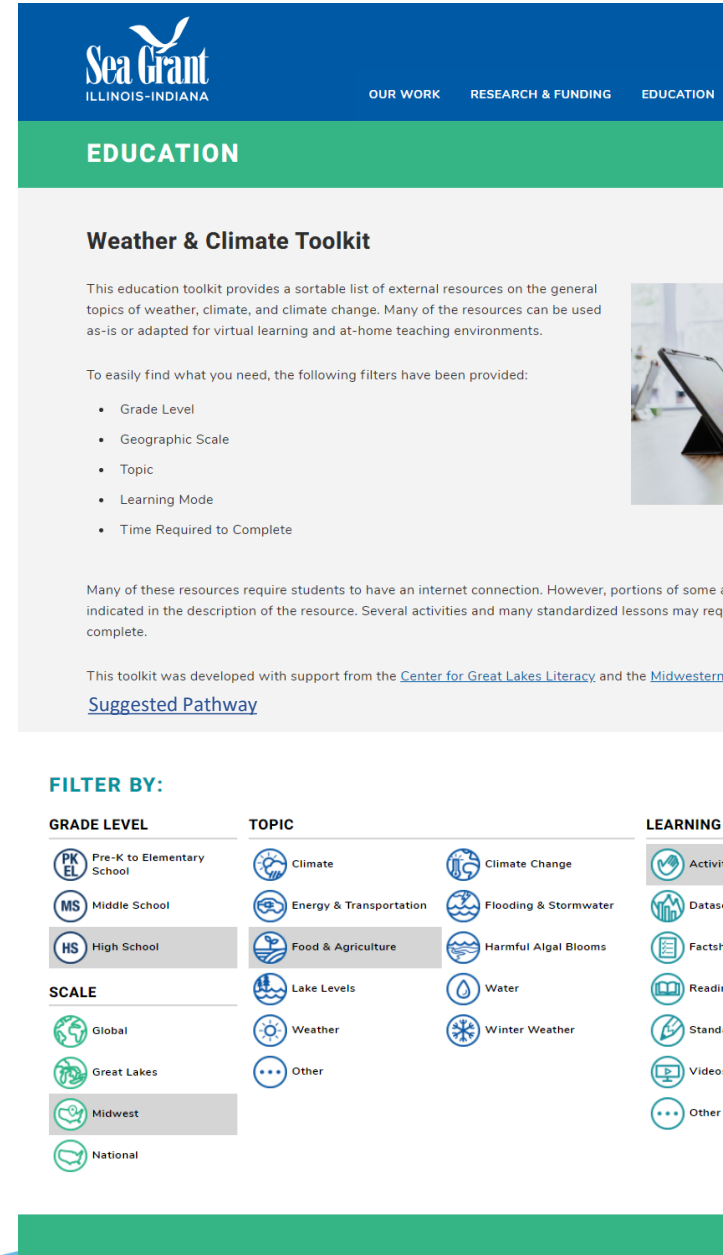


J75

	A	B	C	D	E	F	G	H	I	J	
1	PWG Partner	Ed.Resource Publishe	Resource Parent link	Link	General Topic	Scale/Region	Audience	Learning Mode	Standard	Resource Description	Computer
36	American Farmland Trust			https://s30428.pcdn.co	Ag BMPs	PWG partner resourc	public	factsheet			
37	American Farmland Trust			https://s30428.pcdn.co	Ag BMPs	PWG partner resourc	public	factsheet			
38	American Farmland Trust			https://s30428.pcdn.co	Ag BMPs	PWG partner resourc	public	factsheet			
39	University of Illinois Extension			https://will.illinois.edu/a	Ag BMPs and monitoring	PWG partner resourc	public	podcast			
40	American Farmland Trust			https://s30428.pcdn.co	Ag BMPs	PWG partner resourc	public	factsheet			
41	American Farmland Trust			https://s30428.pcdn.co	Ag BMPs	PWG partner resourc	public	factsheet			
42	Aqua America			https://www.aquaameri	monitoring, water supply	PWG partner resourc	public	dataset/visualization/simulation			
43	National Mississippi River Museum & Aquarium (Dubuique, IA)				Mississippi River tributaries	external resource	public	video			
44				greatlakestogulf.org							
45	USDA NRCS		https://www.neefusa.org/educa	http://kbsgk12project.k	adaptive management Ag perspectives	external resource	middle school, l	standardized lesson	NGSS, Michiga	Farming for Ecosystem Services G	no
46	USDA NRCS		https://www.neefusa.org/educa	https://www.handsonth	monitoring and prioritizing	external resource	elementary, mid	dataset/visualization/simulation, video		environmental monitoring resource	yes
47				https://www.teachengin	intro to water chemistry	external resource	7th-9th	standardized lesson	NGSS	examples of the types of	
48			https://www.teachengineering.o	https://www.teachengin	water filters	external resource	3rd-5th	standardized lesson	NGSS	investigate different	
49	ArcGIS Online	https://mappinghour-k12.hub.	https://mappinghour-k12.hub.ar	https://mappinghour-k12.hub.arcgis.com/datasets/a-river-runs-through-it-earth-science-geoinquir		elementary, mid	activity, podcast			mapping your own watershed	yes
50	National Association of Conservation Districts			https://www.nacdnet.or	conservation careers workshop	external resource	12+	connect with an expert		undergraduate immersion experience	
51			https://ian.umces.edu/press/pc	https://ian.umces.edu/r	eutrophication	external resource	high school and	factsheet		poster about nutrient enrichment (eutophication)	
52	USDA NRCS			https://www.soils4teac	Ag N & P	PWG partner resourc	k-12	reading material		basic info k-12 about nutrient deficiencys affectin	
53	USDA NRCS			https://www.nrcs.usda.g	watersheds and nutrient movement (soil water)	PWG partner resourc	K-6	factsheet, activity		roles of soil in water/nutrient cycling, soil run off	
54			https://www.doctordirt.org/hom	https://www.youtube.cc	nutrient loss	external resource	elementary	video		soil as a filter 2-minute video	
55			https://www.doctordirt.org/teac	https://www.doctordirt.(	nutrient loss	external resource	elementary	activity		sand and top soil experiement to understand soil	
56			https://www.doctordirt.org/teac	https://www.doctordirt.(	nutrient uptake	external resource	elementary	a		experiment with plant uptake of colored water to	
57				https://nutrientsforlife.(	nutrient input and loss, Ag BMPs	external resource	high school	multimedia (video,image,slideshow)		nutrient managment for N & P use optimization (	
58				https://www.doctordirt.(	nutrient cycles and leaching	external resource	k-12	activity		6 'soil as a sponge' experiements, and vocab-bui	
59				https://www.soils4kids.	nutrient loss	external resource	elementary	standardized lesson		understanding percoloation	
60				https://www.youtube.cc	Ag BMPs	external resource	middle high sch	multimedia (video,image,slideshow)		Ag bmps to keep cattle and nutrient/pesticide run	
61	USDA NRCS			https://www.youtube.cc	Ag BMPs	PWG partner resourc	middle and high	multimedia (video,image,slideshow)		using cover crops to soak up nutrients for the ne	
62	USDA NRCS			https://www.youtube.cc	Ag BMPs	PWG partner resourc	middle and high	multimedia (video,image,slideshow)		NRCS working with farmers to implement Ag bm	
63		GLERL		https://www.glerl.noaa.(	Hypoxia	external resource	high school	dataset/visualization/simulation		infographic explaining hypoxia	
64		Michigan Sea Grant		https://www.michigans	Hypoxia	external resource	middle school	lesson plan, activity	NSES grades5-	focus on Lake Erie	
65	USEPA			https://www3.epa.gov/s	water cycle	PWG partner resourc	elementary	dataset/visualization/simulation		click on parts of the water cyles to see a visualiz	
66		National Institute of Environmental Health Sciences		https://kids.niehs.nih.gov/topics/pollution/water/index.htm				activity			
67	USEPA			https://www.youtube.cc	ag runoff hypoxia			video		2 minute overview of nutrient pollution in U.S. - gr	
68				https://www.niehs.nih.gov/health/scied/teachers/index.cfm		external resource	elementary, mid	video,		educator resources on human health and educat	
69				https://www.epa.gov/sit	Ag BMPs		middle school	reading material		MacDonald's Farm	
70	USEPA			https://www.youtube.cc	urban stormwater bmps			video		8:55 min, Reduce runoff	
71				https://www.youtube.cc	urban stormwater bmps			video		1:45 min	
72				https://www.youtube.cc	urban stormwater bmps			video			
73				https://www.youtube.cc	urban stormwater bmps			video		water runoff lawn care tips	
74				http://www.bioedonline.org/videos/lesson-demonstrations/ecology/water/what-is-the-water-cycle/				lessons, activities		demonstration of water cycle	
75											
76											

Toolkit Pathway *(Suggested)*

1. **Gulf of Mexico Hypoxic Zone**
    a. *Before moving on*: Should understand what hypoxia is and its causes. Should be aware that hypoxia is happening in the Gulf of Mexico near the Mississippi River.
2. **Connection between Illinois and Gulf of Mexico**
    a. *Before moving on*: Should understand tributaries and watersheds and how they connect areas in the MARB to the Mississippi River and, by extension, the Gulf of Mexico
3. **Nitrogen and Phosphorus**
    a. *Before moving on*: Should understand why nitrogen and phosphorus are used as inputs and how excess nutrients can affect waterways.
4. **Illinois Nutrient Loss Reduction Strategy**
    a. *Before moving on:*
        i. Should understand how the strategy came to be, strategy goals, how the partnership approach works.
        ii. Should understand how Illinois waterways are monitored and the idea behind prioritizing watersheds.
        iii. Should understand best management practices and be able to connect BMPs to the sector they help (point source, agriculture, urban stormwater).
        iv. Should understand the strategy is a “living document” that Illinois must adaptively manage to continue progress, as well as understand barriers to progress and advantages to Illinois’ approach.
5. **Careers**
    a. *Before moving on*: Should understand that there is a plethora of career options available for those interested in implementing the strategy.



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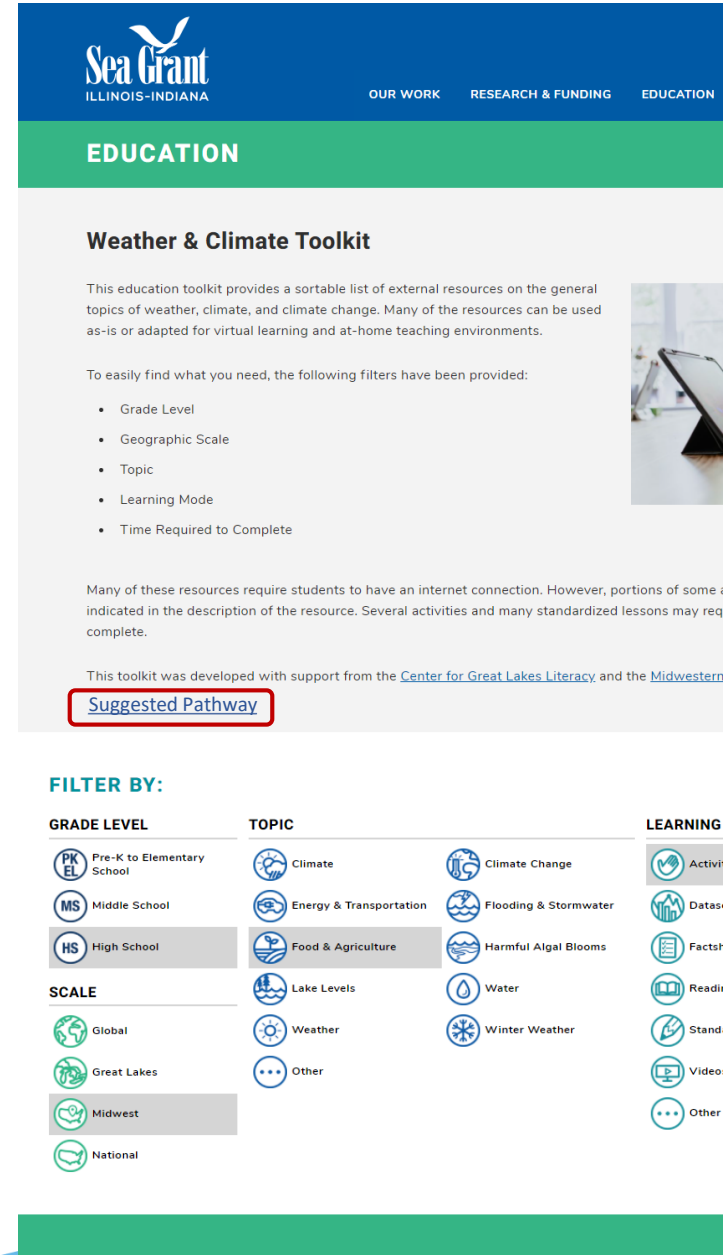
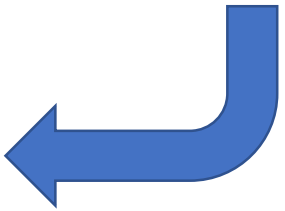


NLRS Explorer: Teacher Guide

Gulf of Mexico Hypoxic Zone

- *What is a hypoxic zone/hypoxia?*
  a. "Hypoxia" means low oxygen and is primarily a problem for estuaries and coastal waters. Hypoxic waters have low dissolved oxygen concentrations and cannot support marine life, which is why the term "dead zone" developed.
- *What causes it?*
  a. Hypoxia can be caused by a variety of factors, including excess nutrients, primarily nitrogen and phosphorus, and waterbody stratification (layering) due to saline or temperature gradients. In the Gulf, hypoxia is caused by excess nutrients.
- *How does it work?*
  a. These excess nutrients can promote algal overgrowth and lead to eutrophication. As dead algae decompose, oxygen is consumed in the process, resulting in low levels of oxygen in the water.
  b. Eutrophication is when a body of water becomes overly enriched with minerals and nutrients, which cause excessive growth of algae. This process may result in oxygen depletion of the water body.
- *How big is the hypoxic zone?*
  a. The size changes each year based on the amount of nutrients are passed down the Mississippi River. Hurricanes can also impact the size, as the storms can add oxygen when mixing up the water and reduce the hypoxic zone size.
  b. NOAA scientists estimated the hypoxic zone size in July 2020 to be approximately 6,700 square miles. The long-term average measured size is 5,387 square miles. This is roughly the size of Connecticut.
- *Why is it important?*
  a. ….

During August meeting with Extension Educator Peggy Doty, she suggested creating a "teacher guide" so that the teachers feel confident teaching the material to students



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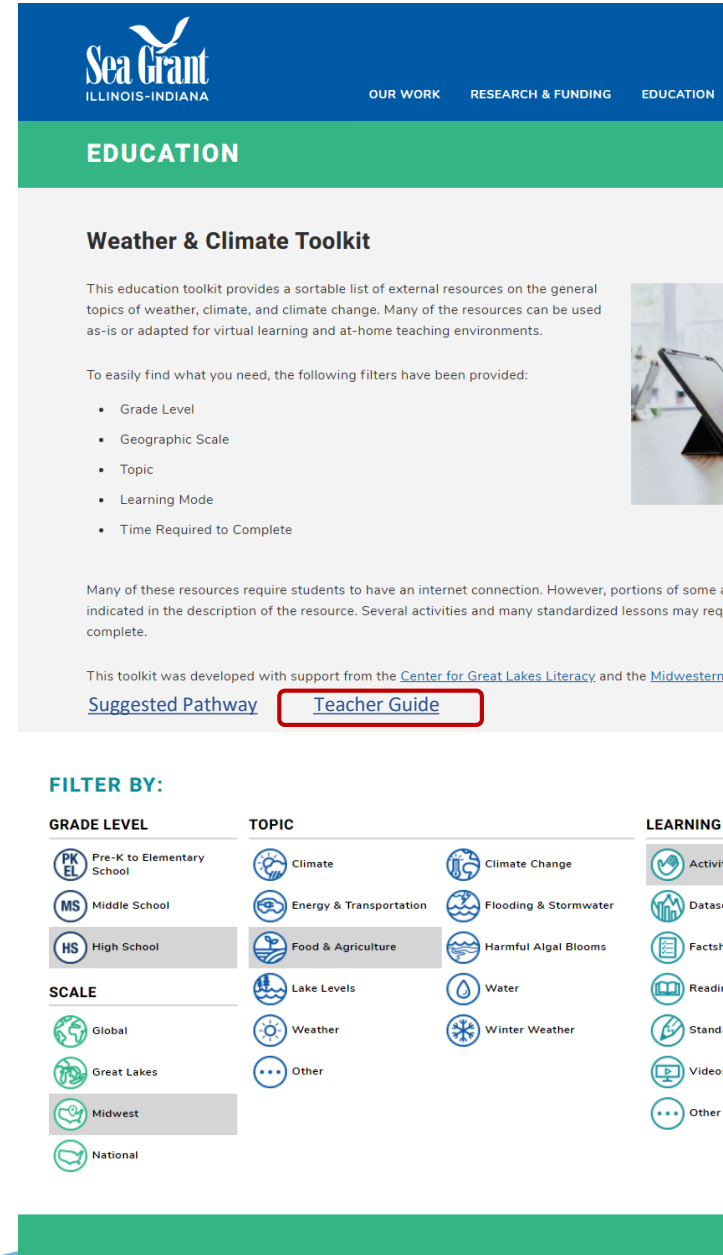

Workplan

NLRS Explorer Goals

1. **Increase knowledge** about and interest in nutrient issues in the Mississippi Atchafalaya River Basin and Illinois' role in these issues
2. **Increase educator knowledge and confidence** in teaching the Illinois NLRS content
3. **Increase student interest** in Illinois NLRS career pathways

Our Objectives

Phase I (Due February 2021):

1. **Compile existing educational resources** into a database, with specific attention to those developed by Policy Working Group partners.
    a) Achieved when we have the teacher guide, a complete database, identified videos, interactive maps, etc.
2. **Build and share a comprehensive toolkit** on the IISG website.
    a) Achieved when toolkit page is online and functioning and when we have shared it and can gather metrics on it.
3. **Identify educational resource gaps.**
    a) Achieved when we analyze toolkit content and consult with educator partners to determine where additional resources are needed. (Phase II transition)

Workplan

Our Objectives (Continued)

Phase II (TBD):

1. **Select and partner with an experienced curriculum writer** to analyze toolkit content and resource gaps and to develop an NLRS learning pathway. This partner will use the **Next Generation Science Standards (NGSS)** Learning Pathways approach to facilitate students practicing science, engineering and technology applications of NLRS content.
    a) Achieved when there is a clear workplan for learning pathway
2. **Develop needed educational resources** and pilot a learning pathway, including experiential learning and career exploration resources for learners.
    a) Achieved when we have feedback from the pilot and career resources developed
3. **Create professional development opportunities** for educators to increase knowledge and confidence in teaching NLRS content.
    a) Achieved when we have finished a professional development course. This captures these metrics: number of educators and students reached, changes in awareness (noted via pre- and post-surveys), meaningful change surveys (educator and student qualitative data samples), feedback from pilot group of educators

Workplan Phase I

March

March 31: Chris Davis introduced the idea

- Met before the NMC meeting
- Eliana and Kate took notes on the idea

April/May/June

Determined how to present Illinois NLRS

July

Identified Phase I as developing an Illinois NLRS Toolkit

- Includes resources from various partners and institutions
- Will need to develop activities and pilot them
- Identified Peggy Doty to help develop and pilot activities

Identified Phase II as developing curriculum and hosting the educational content online

- Identified "Environmental Pathways: Why is the Pond Green?" as potential model
- Identified cK-12 and Moodle potential websites to host content

Internal Review

- Present progress to Eliana Brown, Terri Hallesy, and Pat Charlebois
- Incorporate feedback

Present to Illinois EPA

- Present progress to Chris Davis and Trevor Sample
- Incorporate feedback

August

Meet with Peggy Doty to outline collaborations

- August 6: Meeting with Peggy Doty

Schools return, in-person and virtually

Teacher study guide

- Kate will make this
- Include labels/tags so teachers can use the study guide and know what to search in the resources to teach it

Update PPT

- Career exploration template
- Mock-up sites

Workplan Phase I

September

Gather existing activities for Toolkit

Work with Peggy Doty and others to gather existing activities

Check in with Eliana and Terri

Incorporate feedback

Create mock-up Google Sites site for NLRS Explorer

October

Present to Communications Subgroup

Incorporate feedback

Prepare for Illinois NLRS Workshop (11/6/20)

Finalize presentation to Policy Working Group

November

Nov 6: 2020 Illinois NLRS Workshop

During Workshop

Present on the Toolkit and introduce it

Ask for feedback and additional resources

Get approval from Policy Working Group to pursue

After the Workshop:

Send post-workshop survey to attendees. Include question about NLRS Toolkit.

Send survey results to Steering Committee.

November (continued)

After PWG Approval

Debut the Toolkit on Illinois NLRS social media pages.

Hire Jackson Sky to do back-end developing.

Hire Joel Davenport to design icons.

Incorporate feedback from partners.

December

Short video

Develop short introductory video that conveys the message/key points of NLRS

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Workplan Phase II

January

Last minute changes
Jackson Sky website developments

February

Jackson Sky finishes website development
Share with Illinois teachers

Later on

Career exploration template and gather responses

Google Expeditions tours

Maps:

Look at the Resource Mapping Management Tool and perhaps create a “BMP Project Near Me’ layer.

Great Lakes to Gulf

Nutrient Levels by Watershed

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Potential Metrics

- Number of students reached
- Number of educators reached

- Changes in awareness (noted via pre- and post-surveys)
- Qualitative surveys (educators and students)

- Website metrics: visits, file downloads
- Requests for assistance

Thank you!

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