

Eutrophication: Causes & Effects



Ann Conklin

Biology/General Science/Chem teacher
at West Campus Alternative & Spanish
teacher at Vinton-Shellsburg HS

2021 extern at Johnson CCB/Kent Park

Part I: Overview of Workplace

JCCB was established in 1964 (county seat: Iowa City). In 1966, land was acquired that would become FW Kent Park, which is currently 1082 acres of camping, trails, swimming, wakeless boating, Conservation Ed. Center, and more. Frederick Wallace Kent was a celebrated local photographer, author, and birding enthusiast.

Board Members: Gene Zdrazil, President; Bill Waldie, Vice-President; Carolyn Buckingham, Secretary; Bonnie Winslow-Garvin; Connie Mutel.

Part I: Overview of Workplace (cont'd)

FW Kent Park Lake Timeline

1969: Dam completed. 1970: Lake filled. 1991-92: Dredged, added catch basins. 2014: Listed on the Iowa Impaired Waters list for phosphate, *E. coli*, cyanobacteria (AKA blue-green algae); previously listed for pH.

Study was completed, dredged again. Prairies replaced trees (erosion control), more catch basins were created. Fish stocked (removed Grass Carp). Aquatic vegetation piers were placed. Adjacent property acquired with help of NHF - previously used for cattle and suspected source of pollutants. Future plan: will be converted to prairie.

Part II: Workplace focus

“The FW Kent Park Lake restoration effort will provide a resource that ensures water that is safe, clean, & visually appealing for water based recreation activities such as swimming, fishing & boating while providing a healthy aquatic environment and a sustainable fishery.”

-Vision Statement, FW Kent Park Lake Watershed Assessment and Management Plan (2014)

Q: After extensive time and resources dedicated to this project, what is the status? What improvements could still be made? Are there any surprises?

A: Not perfect, but much safer and more supportive of life and recreation. The campground showerhouse and dump station are sites of concern for potential point-source contamination.

Part II: Workplace Focus

Water Quality Testing

Procedure

- 31 sites tested weekly
- E. coli also tested weekly at some sites
- Test again following 1.25"+ rain event

F.W. Kent Park Field Form
Kent Lake
Date: 6/23/2021
Estimated Rainfall Past 24 hrs (in): 1.9"

Sampled by: S. Peyton, A. Conklin, R. Brown
Meters Calibrated by: S. Peyton

Weather at time of sampling: 64°F, Light rain, Winds SSW @ 15-25 mph

Standards	Time	Temp. C°	Temp. F°	5 mg/L D.O. (mg/L)	TT(cm)	Secchi (M)	6.5-9 pH	9 mg/L total Nitrate (mg/L)	9 mg/L total Nitrite (mg/L)	.035 mg/L Phosphate (mg/L)	35 µg/L Phosphate (µg/L)	Ammonia-N (mg/L)
ATL_N	8:21	23.5		5.89	—	2.85*	8.01	0.0	0.0	0.04	40	0.1
ATL_N2	8:20	24.3		7.02	—	2.91	8.10	0.0	0.0	0.03	30	0.1
ATL_N3	8:57	24.5		7.14	—	3.32	8.12	0.0	0.0	0.05	50	0.1
ATL_Ramp	8:03	24.3		6.60	—	1.46*	7.88	0.0	0.0	0.10	100	0.1
ATL_Board	9:11	24.1		7.12	—	2.18	8.09	0.0	0.0	0.14	140	0.1
ATL_C2	8:03	23.8		6.76	—	2.15	8.04	0.0	0.0	0.07	70	0.1
ATL_Deep	8:57	24.1		7.28	—	3.42	8.15	0.0	0.0	0.03	30	0.1
ATL_Discharge	10:37	23.2		6.51	762	—	8.68	0.0	0.0	0.21	210	0.2

Notes: *Bottomed out

Staff Involved/Contributing

- Larry Gullett, Director
- Dave Wehde, Natural Resource Manager
- Jeremy Rieck, Natural Resource Mgmt Specialist, author of FWKPL Watershed Assessment & Mgmt Plan
- STEM Externs: Robert Brown, me
- Seasonal employee: Sabrina Peyton

Part III: Introduce the Project or Problem

Students will complete a hands-on or virtual lab with *Elodea* to review/explore the process, products, and factors that impact photosynthesis and rate of cellular respiration.

How do photosynthesis and plant respiration impact lake health? How does dissolved oxygen level affect lake ecology?

Students will sort animals based on habitat and region (an answer key will be provided).

What animals live in Kent Park Lake? Predict what would happen if D.O. decreased. What can be done to reverse it?

Part IV: Standards

Students would be assigned work depending on the credits and standards needed for graduation, one from each column.

Focus of Scientific Investigation	Presentation Format (end product)
<p><u>HS-LS1-5</u> <u>HS-LS1-7</u> <u>HS-LS2-5</u> <u>HS-LS2-7</u> <u>HS-LS4-5</u> <u>HS-ESS3-4</u></p>	<p>Science Literacy: <u>RST.11-12.9</u> <u>RST.11-12.7</u></p> <p>ELL: : <u>English Language Proficiency (ELP) Standards</u> (recommend “Grades 11-12, Standard 5”)</p> <p>Ideas: Board game, PSA, Wanted Poster (pollutants or invasives), Mural, Computer Animation, Infomercial</p>

Part IV: Driving and Essential Questions

Again, the main driving questions and underlying questions may vary slightly depending on student learning targets and the type of product they plan to create.

Level 1: How do photosynthesis and plant respiration impact lake health? How does dissolved oxygen level affect lake ecology?

Level 2: What causes eutrophication/algae bloom? What effect could that have on plants, animals, humans?

Level 3: Can the methods used at KPL be used elsewhere? Can algae blooms/dead zones be prevented?

[Teacher Resource: Eutrophication Learning Map](#)

Part V: Extern Host Role

Students will interview Johnson CCB/Kent Park staff to determine the reasoning and justifications for the resource management approaches taken during lake restoration project.

Staff will oversee/provide feedback on the students' creation of materials describing the Kent Park Lake Restoration Project. They could select student projects to share publicly to increase local awareness. These could be printed, posted in the Conservation Ed Center, or recorded.

Part VI: Design Elements Checklist

Can you document these elements?

1. Challenging Problem or Question
2. Sustained Inquiry
3. Authenticity
4. Student Voice and Choice
5. Reflection
6. Critique and Revision
7. Public Product

Recommended References & Extensions

1. Pollution activity: [Dire Diet \(Project WILD\)](#)
2. Pollution activity: Hazardous Links, Possible Solutions (Project WILD)
3. Aquatic Life Survey activity: Water Canaries (Project WILD Aquatic)
4. [Activity: Effect of Light Wavelengths on Photosynthesis | manoa.hawaii.edu/ExploringOurFluidEarth](#)
5. [Photosynthesis Virtual Lab](#)
6. [Dead Zone Data Activity Final.docx](#)
7. [IDEM: Hoosier Riverwatch: Training Manual](#)
8. [Iowa's Nutrient Problem – Iowa is the Major Contributor to the Dead Zone in the Gulf of Mexico](#)
9. ['Dead zone' task force states, including Iowa, getting \\$840,000 from EPA](#)
10. [Study: Iowa nitrogen pollution in the water is getting worse](#)
11. <https://iowaenvironmentalfocus.org/tag/dead-zone/>
12. [Iowa farmers help fight dead zone in Gulf of Mexico](#)
13. [Measurement Confirms Largest Dead Zone on Record](#)
14. [Gulf of Mexico Hypoxia: Do Iowa Farmers cause the "Dead Zone"?](#)
15. [The Gulf Of Mexico's Dead Zone Forecasted To Reach Near Record Size](#)
16. [Gulf of Mexico Dead Zone: What, Where, Why?](#)
17. [Watersheds: Role, Importance, & Stewardship | Mississippi State University Extension Service](#)
18. [Nitrates in Iowa Water | Iowa Science Phenomena](#)
19. [Clean Water and Farm Pollution Lawsuit | Iowa Science Phenomena](#)
20. [Eutrophication | Iowa Science Phenomena](#)