SAVING LAKE WALTON

Carla's Story: Saving Lake Walton

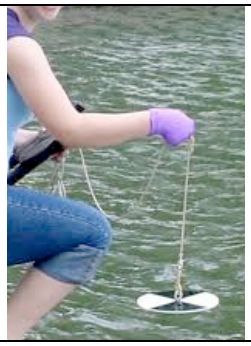
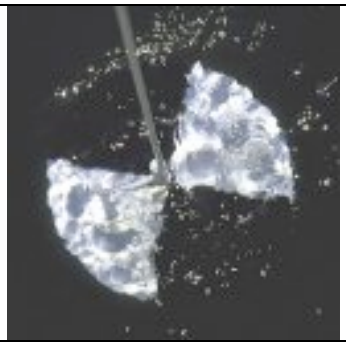
Carla and her parents live in the town of Springfield. Carla likes living in Springfield because she enjoys walking her dog Zippy down to Lake Walton, which is near her house. Carla also goes to Lake Walton to meet her friends. They play frisbee and soccer in the park along the lake, but mainly they just sit on the shore and talk. One thing they never do is go swimming. Mainly, because the water doesn't look very clean. It is a soupy green and in the summer, when the weather is really hot, it even smells bad. Wheeeeew! One time, Zippy chased a muskrat into the lake and he got sick afterwards. Carla thinks it was probably because of the water or maybe the algea. If you ask her, she'll tell you that the lake looks "poopy". She'll also tell you how sad it is that she lives in a city with a big lake that she can't even swim in.

A picture of the lake that Carla took when she was at the park.

One time, when Carla was complaining about the quality of the lake, her brother said, "Well, if you care so much, why don't you do something about it?" Carla's first response was, "Yeah sure, like there is anything I can do." But, as she thought more and more about it, she began wondering, "hmmm…. maybe there is something I can

do to clean up the lake." Carla decided that if she was going to help fix the lake, she first needed to learn more about what was wrong with it. For that, she knew just where to start… with her Uncle Bill. Carla's uncle Bill is a limnologist, a scientist who studies lakes. It's a no brainer to start with him, right?

When she visits her Uncle Bill, he is happy to hear that Carla is interested in studying the lake. He even agrees to take her over to his lab, so that he can give her a secchi test – an instrument that is used to measure water clarity. Carla is really excited to try the secchi disk, so she hurries down to the lake and begins taking readings along the shore near her house. Carla drops the disk in the water, waits for it to disappear, then marks down the depth. She does this several times and writes each of the recordings in her notebook.

Picture of Carla using a secchi disk to check water quality.	Close-up of secchi disk being dropped in the water.
	

When she finishes testing the clarity of the lake, Carla returns to her uncle's house to show him the readings. As he reads the findings, he nods his head. Finally, he says…

"Hmmm…. this is interesting..."
"What's interesting?"
"Well, according to your readings, the lake is becoming eutrophic."
"Eu… what?"
"Eutrophic. It means that there is an overabundance of the nutrients in the lake like phosphorous that make the plants grow."
"That sounds good to me. We all need nutrients."
"No, no, no… if the lake has too many nutrients it can cause algal blooms and algal blooms can be bad."
"Really? Maybe that's why Zippy got sick?"
"Also, you know how you're always complaining about how bad it smells by the lake? Well, that "poopy" smell is caused by algal blooms."
"Really? So, what can be done about it?"

"Well, for starters you need to find out what nutrients are in the lake and where they are coming from."
"How would I do that?"
"My friend Lisa works at the DNR. She might have the data you're looking for. Let me give her a call. In the meantime, you might want to read this book to learn more about eutrophic lakes."

Carla's Uncle Bill grabs a book from his bookshelf and hands it to her. The book is called, *Everything you ever wanted to know about eutrophic lakes, but were afraid to ask.* Carla wanted to say, "are you kidding, this looks pretty boring", but instead she said, "Thanks Uncle Bill, I'll take a look at this later today."

TO BE CONTINUED…

ACTIVITY 1 – READ CHAPTER ONE OF THE BOOK THAT UNCLE BILL GAVE CARLA – IT IS CALLED INTRODUCTION TO TROPHIC STATES. THEN ANSWER THE TWO QUESTIONS ON THE BOTTOM OF PAGE 4.

Introduction to trophic states

Have you ever noticed that not all lakes are the same? Some have crystal clear water and sandy bottoms while others are pea-soup green in color with lots of mucky sediments. Some lakes have reddish water with a few plants floating on the surface and others are so full of plants, it seems we could walk across them. All of these characteristics provide clues about the lake's *biological productivity* – its ability to support life.

Lakes can be grouped into one of four categories called **trophic states**. The adjectives used to describe each of these four trophic states, from the lowest level of biological productivity to the highest, are as follows:

- oligotrophic (oh-lig-oh-TROH-fic) - means lacking nutrition.
- mesotrophic (mes-oh-TROH-fic) - means mid-range or medium nutrition.
- eutrophic (you-TROH-fic) - means abundant or excess nutrition.
- hypereutrophic (HI-per-you-troh-fic) - overabundant nutrition.

Total phosphorus – is a measure of all the forms of phosphorus found in a collected water sample. Phosphorus is a nutrient needed for the growth of all plants, including algae and aquatic plants. When this nutrient is in low supply, low biological productivity can generally be expected. When this nutrient is in abundance, high productivity and growth of algae and/or plants can be expected.

Total nitrogen – is a measure of all the forms of nitrogen found in a collected water sample. Nitrogen is also a necessary nutrient for the growth of plants, including algae and aquatic plants. When total nitrogen is in low supply, low biological productivity can generally be expected, along with clearer water.

QUESTON 1: Why do lakes with low phosphorous levels often lack abundant plant growth?

QUESTION 2: Which of the four lake states would produce the worst water clarity – i.e., the one where the secchi disk would disappear fastest?

eutrophic / oligotrophic / hypereutrophic / mesotrophic

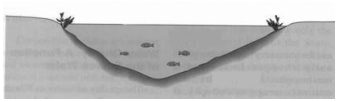
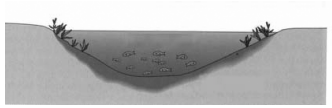
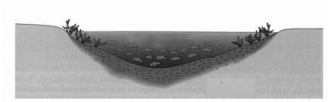
Carla's Story: Part Two – Eutro… what?

About a week after talking with her Uncle Bill, Carla receives an envelope in the mail from Lisa Rodriquez. At first Carla is confused, but then she realizes that Lisa is Uncle Bill's friend – the woman who works at the Department of Natural Resources as a water chemist. The envelope includes a letter thanking Carla for her interest in learning more about Lake Walton and a chart that has some water quality data on it. The chart compares the water quality at four lakes that are near where Carla lives. While she is most interested in reading the data about Lake Walton, Carla hopes that she can also learn something new by comparing Lake Walton to some other nearby lakes.

DNR Report – Water Quality Lake Walton, Green Lake, Wind Lake, Weaver Lake

Lake	Total Phosphorus (micrograms/L)	Total Nitrogen (micrograms/L)	Secchi Depth (feet)
Lake Walton	50	650	5'
Green Lake	10	300	14'
Wind Lake	120	1600	1.5'
Lake Weaver	25	600	8'

ACTIVITY 2 – USE THE DNR REPORT ABOVE AND THE TROPHIC STATE CHART TO COMPLETE THE QUESTIONS ON PAGE 7.

Tropic State	**Image: Production Level / Aquatic Plant Growth**	**TP** Total Phosphorous (micrograms/liter)	**TN** Total Nitrogen (micrograms /liter)	**SD** Secchi Depth (feet)	**Attributes**
Oligotrophic		**< 15**	**< 400**	**> 13 ft**	A typical **oligotrophic** water body will have clear water, few aquatic plants, few fish, not much wildlife, and a sandy bottom. Oligo – **means scant or lacking nutrition.**
Mesotrophic		**15 - 25**	**400 - 600**	**8 – 13 ft**	A typical **mesotrophic** water body will have moderately clear water and a moderate amount of aquatic plants. Meso – **means mid-range or medium nutrition.**
Eutrophic		**25 - 100**	**600 - 1500**	**3 – 8 ft**	A typical **eutrophic*** water body will either have lots of aquatic plants and clear water; or it will have few aquatic plants and less clear water. In either case, it has the potential to support lots of fish and wildlife. Eu – **means abundant nutrition.**
Hypereutrophic		**> 100**	**> 1500**	**< 3 ft**	A typical **hypereutrophic** water body will have very low water clarity, the potential for lots of fish and wildlife, and it may have an abundance of aquatic plants. Hyper – **means over-abundant nutrition**

Source: Florida LAKEWATCH http://lakewatch.ifas.ufl.edu

Activity 2 – Trophic States

QUESTION 1: Use the classification chart on page 6 to determine the ***trophic state*** of each of the lakes near Carla's house. Circle the correct answer.

Lake Walton: oligotrophic / mesotrophic / eutrophic / hypereutrophic

Green Lake: oligotrophic / mesotrophic / eutrophic / hypereutrophic

Wind Lake: oligotrophic / mesotrophic / eutrophic / hypereutrophic

Lake Weaver: oligotrophic / mesotrophic / eutrophic / hypereutrophic

QUESTION 2: Explain the relationship between each of the following:

a. Secchi depth and trophic state –

b. Total phosphorus and trophic state –

Carla's Story: Part Two – A garden for rain?

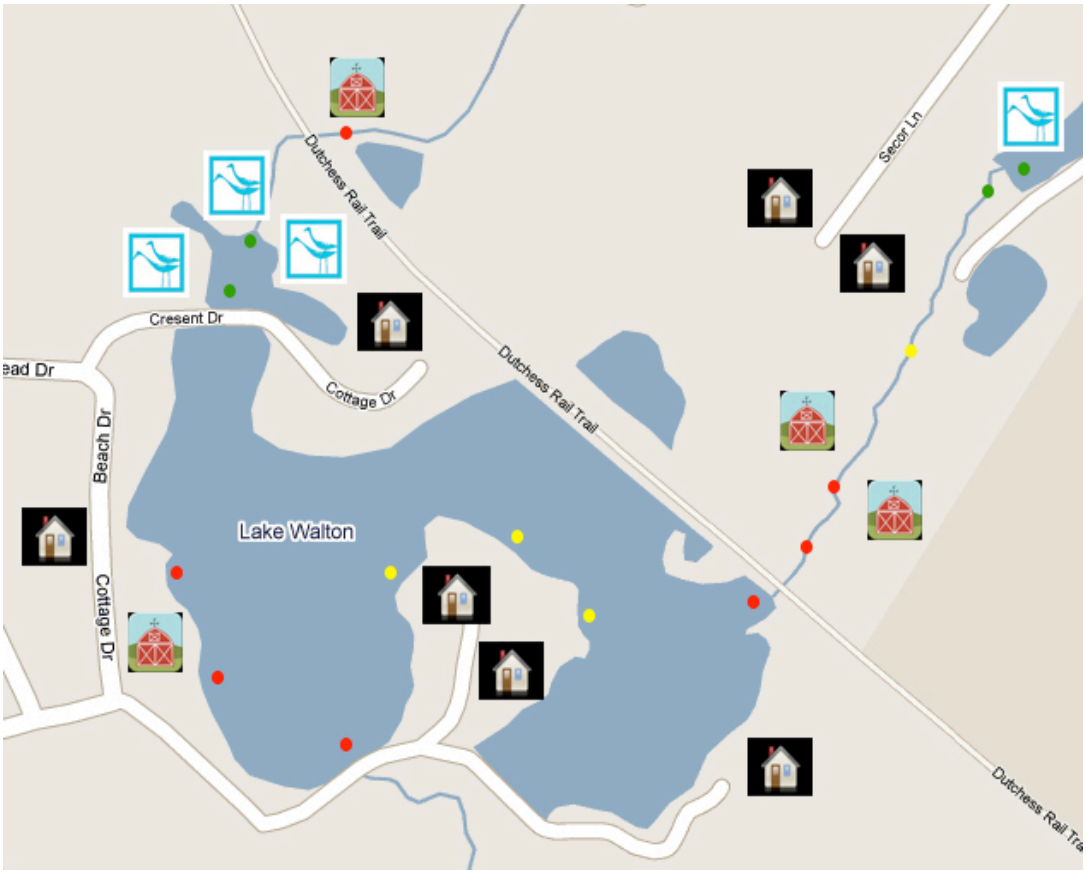
The next day on her way home from school, Carla sees her neighbor Mr. Johnson doing some gardening in his front yard. Carla likes Mr. Johnson because he's funny (and he gives out the best Halloween candy), so she stops to say hello.

"Hi Mr. Johnson. How are you?"
"Oh, howdly-doodley Carla. I'm doing great. Just trying to get some yard work in before the rain comes."

Carla looks up at the sky, which is full of dark rain clouds. She hopes this doesn't mean that her soccer practice is going to get cancelled again. Her team is going to a tournament soon and they could really use the practice.

"What are you working on?"
"I'm putting in a rain garden."
"A rain garden? What's that?"
"It's a garden designed to reduce runoff."
"Runoff, uhhh?
"Yeah, like when it rains later today all of the water that comes down has to go somewhere, right?"
"I guess so."
"While some of it will get absorbed into the ground, but a bunch of it will also end up running into the street."
"Is that bad?"
"Well, it depends. In our neighborhood a lot of the rain that washes into the street eventually drains into the lake. Not only that, it also carries a bunch of stuff into the lake along with it."
"Like trash?"
"Sure, but trash isn't the biggest issue. The rain also washes other things into the lake like lawn fertilizer."
"Lawn fertilizer?"
"Yeah, people use fertilizer to help their lawns grow. When it rains some of the fertilizer ends up in the lake. The problem is that many fertilizers have phosphates and nitrogen in them."
"Phosphates? Wait, I just learned about that. That's not good for the lake!"
"Nope, that's why I'm planting this rain garden. It will collect the water and keep it from running directly into the lake."
"Wow, that's pretty cool. You're actually helping the lake."
"Yep, you can too Carla. Maybe you can build a rain garden for your own yard."
"I'll consider it. Right now, I need to get to soccer practice. See ya later!"

Phosphate Levels: Lake Walton goes green



- Red = High Phosphate Levels
- Yellow = Avg. Phosphate Levels
- Green = Low Phosphate Levels

Wetlands

Agricultural

Residential

QUESTION 1: Why might phosphate levels be higher in some areas of Lake Walton than others?

QUESTION 2: If your goal were to reduce phosphate levels, place a mark on the map where would you develop more wetlands? Why would you develop them here?

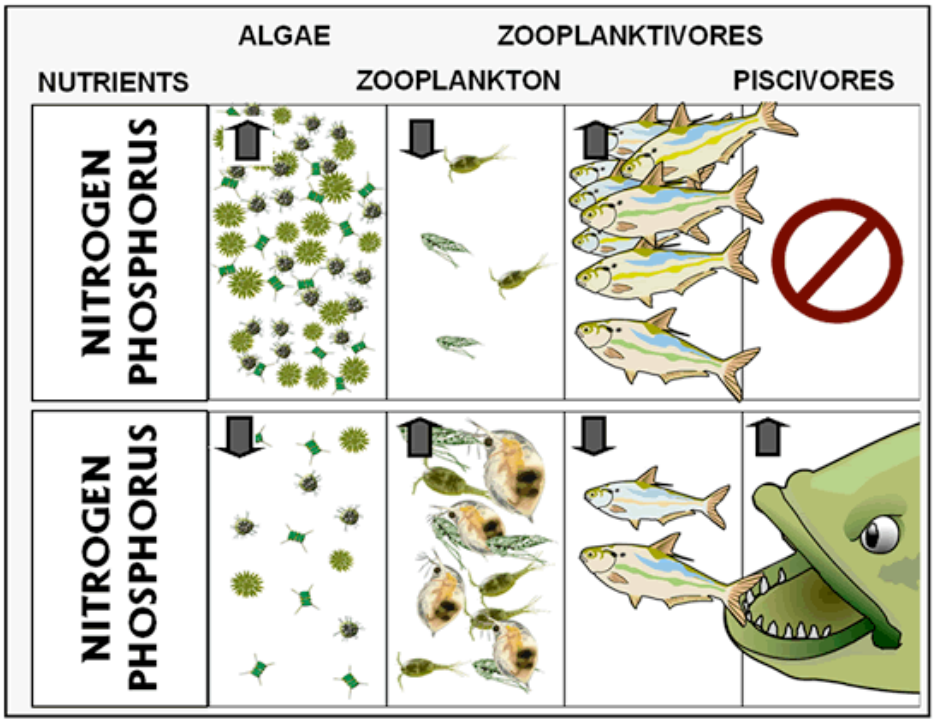
Algea Growth – The plot (and the algea) thickens

One day in Carla's science class the teacher. Mrs. Cramer says, "Today we are going to be studying piscivore, zooplanktivore, and plankton." Some of the students in class groan, but Mrs. Cramer laughs and says, "This topic is going to be more fun than you think. Plankton is actually pretty interesting and important for lakes." Carla laughs when Mrs. Cramer says plankton, because it reminds her of Sponge Bob. It was her favorite show when she was a kid. At first Carla is not very interested in the topic – she even starts daydreaming about her favorite Sponge Bob episodes - but when Mrs. Cramer mentions that Lake Walton has a problem with too few piscivores, her ears perk up…

Zooplankton: A group of small animals that eats algae. They are important to lakes because they help keep algae growth under control.

Zooplanktivores: A group of fish that eats zooplankton. If they eat all of the zooplankton, then there is nothing left in the lake to eat the algae.

Piscivores: These fish eat zooplanktivores. If a lake doesn't have piscivores, then the zooplanktivore population goes up.



Source: Lakes of Missouri Volunteer Program -- http://www.lmvp.org/Waterline/fall2005/topdown.htm

Carla's Story: Read all about it

As Carla starts to learn more about the lake, her interest grows. She also starts asking her teachers and Uncle Bill more about the lake and even convinces her parents to help her plant a rain garden. One day, her Uncle Bill stops over at her house and hands her some newspaper clippings.

"These are for me? I don't read the paper!"
"Well, maybe you should start."
"I only read stuff online."
"Well, you can read the paper online ;) Anyway… I wanted to show you these articles because there is a big debate going on related to the lake. I thought you might want to get involved."
"What's going on?"
"Well, you'll have to read the articles, but it has something to do with some new laws that are being debated."
"Laws? How does that impact the lake?"
"Well one of the laws relates to fishing in Lake Walton and the other relates to run-off from farms in this area"
"Oh, I guess that does relate to the lake."
"I thought that you might want to write a letter to Senator Randall trying to convince her that something should be done to improve the health of Lake Walton."
"Why does she need convincing? Doesn't everyone want to clean the lakes?"
"It's not that simple… she wants clean lakes, but she thinks that the laws are already too strict."
"Too strict? But what about the lake?"
"Good question… maybe you can ask her that in your letter."
"I have to run, but I'll leave these for you to read."
"Read? But it's so nice outside."
"So go read outside!"
"Ugghhhh"
"It's your choice, but if you want to write a good letter than you need to know what you're talking about. You'll be more convincing if you use solid evidence to defend your arguments."

In the News: Ripped from the headlines

New law seeks to reduce farm runoff

Springfield Times, April 2011

A new law being debated would force farmers to build additional retention ponds and buffers between their land and waterways. People in favor of the law argue that the new rules will reduce the amount of manure runoff, which often contains high levels of phosphorous and nitrogen. Both of these chemicals can lead to algae growth in local rivers and lakes. Those against the new rules, including Senator Randall (R-Springfield) argue that the new rules would cost money and make it hard for farmers to stay in business. They also state that the current laws regulating phosphorous runoff are strong enough. One compromise being considered is to give farmers grants or other subsidies to help cover the cost of building the ponds and buffers.

Springfield Rowing Team Disbands

Springfield-Area Sporting News, April 2011

The Springfield Middle School has disbanded its rowing team because Lake Walton is no longer suitable for rowing. “We can barely get the boats out on the water when the algae blooms”, says coach Greg Larson. Another issue is the smell that comes from the lake in the summer as a result of decaying algae. “It’s no wonder that everybody heads to the pool in the summer instead of coming to the lake”, says 7th grader Keasha Ramsey. “The lake was never this gross when I was a kid.”

New fishing regulations being debated

Springfield Times, April 2011

Two new fishing rules being considered by the Department of Natural Resources are being watched closely by local anglers. The first rule would place additional limits on the number of large game fish caught in Lake Walton. The DNR argues that Lake Walton’s current piscivore population is far too small. “We need piscivore in the lake because they keep the lake from becoming eutrophic. Many anglers, however, argue that there are already too many fishing laws. Another concern is that additional size limits and other restrictions will result in fewer people coming to Lake Walton to fish. In turn, some are worried that this will hurt the local economy.

In the News: Local Opinions

QUESTION OF THE DAY: Should the city of Springfield ban phosphorous-based lawn fertilizers?

Most definitely. My neighbor is one of those crazy lawn dudes. His lawn is really lush and you know he's putting some super crazy chemicals on there. I'm afraid to let my dog go poop in his yard because I don't want the little guy getting sick.

No way, no how! I'm tired of the man telling me what to do. Too many laws, too many signs, too many rules!!! Don't get me started. Ummmm… It looks like you already did."

Homeowners should have a choice about what they want to do on their own property. Besides, I'm not convinced that phosphorous has anything to do with the lake. Where is the evidence?

You don't need phosphates to make your lawn green. There are a ton of other ways to provide nutrients for your lawn.

Dear Senator Randall...

Dear Senator Randall,

I live in Springfield and enjoying spending time at Lake Walton. Unfortunately, I think Lake Walton is really sick right now and I believe that it is our job to make it better. Here are three things I think that you and the other politicians in this area should do to improve the health of Lake Walton.

IDEA 1:

Why will this help?

IDEA 2:

Why will this help?

IDEA 3:

Why will this help?

Sincerely,

Carla Francis
Middle School Student and Friend of Lake Walton