St. Tammany Parish

2020 - 2021 Adopt a Pond Program

Official Teacher Packet

Welcome!

This packet is designed to help teachers become familiar with the St. Tammany Adopt-A-Pond program. Begin by reviewing its contents and keep on hand for future reference.

Use this Teacher Packet, the PowerPoint Program Introduction and the Water Quality Test Videos to help your group improve data collection methods and techniques. Ask the Adopt-A-Pond Coordinators or experienced teachers for helpful hints or clarification on program implementation (Program Partners Contact List).

The packet is conveniently divided into sections to quickly find expectations, Action Items for Teachers, and answers to questions you may have about the Adopt-A-Pond Program. **Action Items** Teachers should be aware of will be highlighted by bold lettering with the packet and noted in the Table of Contents.

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SECTION 1: PROGRAM GOALS AND OBJECTIVES

The St. Tammany Parish Adopt a Pond Program is a dynamic program that incorporates outreach measures and wetland development to improve communities throughout the Parish. Local wetland habitat development in retention and detention ponds provide the outdoor education sites to cultivate young stewards and future resource managers. Additionally, this program empowers participating teachers to extend standardized curricula with information and data collected by students in a real world situation.

Goals:

The main goal of the project is to create awareness of the critical roles developed ponds play in water quality and water storage. More specifically, these retention and detention ponds provide:

1. Developing wetland habitats
2. Reduced flooding in local neighborhoods
3. Reduced nutrient loading in local waterways
4. Hands on real world outdoor classroom learning experience
5. Stewardship over local environments by students and teachers
6. Extended STEM curricula potential

Objectives:

Students will participate in hands on learning developed to show the dynamic role local ponds play in watershed management, and how vegetative plantings can improve water quality in regional waterways that connect to the Gulf of Mexico.

Specific Objectives include:

1. Students learn water quality monitoring tests and to determine waterbody health
2. Students learn to plant trees and the importance of plants in wetland habitats
3. Students learn ecological monitoring (plants and animals recorded during visits)
4. Teachers expand lessons with data collected on field trips, allows for extension of STEM curricula, including comparative analysis data over time (graphing, statistics, verbal/written discussions, etc.)
5. A long range objective for the Adopt a Pond Project is to increase numbers of informed citizens, stewardship of local wetland habitats, and future resource managers

Program Background:
The Adopt a Pond Program is a partnership between St. Tammany Parish Government, St. Tammany Parish School Board, LSU AgCenter and LA Sea Grant. Formalized in the fall of 2018, this partnership began with six (6) schools, 11 teachers, and nearly 200 students. Winter 2019, over 2300 trees were planted to enhance 1 retention and 5 detention ponds. Students also learned water quality monitoring and techniques, and the importance of plants while planting sapling trees.

In Year Two (2019-2020), three new schools were added and additional lessons on wildlife and plant community ecology. Ecology lessons encourage students to collect data on animals at the pond sites, and to note plant communities, including any invasive species that colonize the sites.

PowerPoint presentations were developed for classroom introduction to the program for all participating schools, in Year 1. These presentations will be updated as needed and revised with teacher input at the end of each Program Year. LSU AgCenter and LA Sea Grant Agents will offer classroom, introductory presentations for new schools and/or teachers added to the program.

Action Item: Teachers will be asked to submit dates for field trip scheduling during August for the fall semester and during Janurary for the winter planting (late Jan – end of Feb) during the spring semester.

Teachers are encouraged to use the water Quality Test Kits that were provided during Year 1 to practice the methods for water monitoring **prior to field events**. As funding is secured for subsequent years of the Program, new schools will be provided with testing kits. For schools without test kits, LSU AgCenter/LA Sea Grant Agents will demonstrate water testing methods during the introductory class, prior to the field trip, and provide test kits at field sites.

Action Item: Teachers should use the water quality monitoring test kits and equipment to familiarize students with monitoring procedures prior to field trip events.

During the fall semester, school field trips to local ponds will include student water quality testing and ecological monitoring. During the winter (February and early March) vegetative plantings and water quality monitoring will be conducted. Data collected on field trips will be maintained overtime so that schools may use it for comparison in to enhance lesson plans for STEM curricula.

> ***NOTE:*** *A data base and Program Website are planned for the future, to ensure an easy way to share data and introduce the Program.*

Data from all surveys will be shared with St. Tammany Parish to be used in further documentation of the effectiveness of flood control and pollution reduction. As an applied research project, students participating in the project will gain valuable experience using STEM methods learned in the classroom. This project reflects how science and technology are used in everyday life, in our own local communities.

Students conducting water quality monitoring at a pond site.

Left photograph, testing water transparency.

Right photograph, mixing sample for nutrient measurement.

Defining Success

Long and mid- range successes for the Adopt a Pond Program will include:

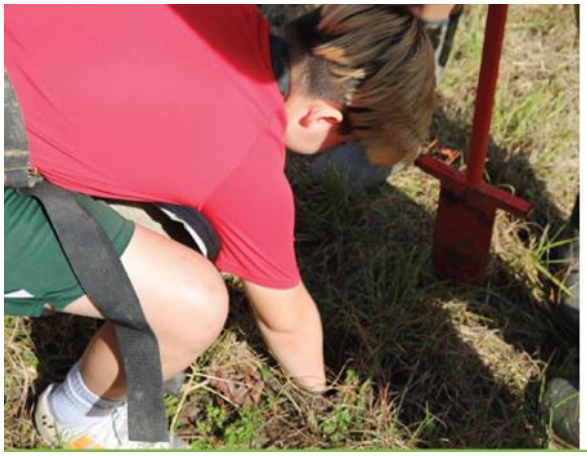
1. Increased stewardship in local wetland environments;
2. Stormwater pollution reduction;
3. Reduced flooding;
4. Neighborhood aesthetics and recreation opportunities;
5. Increased wildlife habitat;
6. Develop resource managers.

Program Activity Outline

The School Year is broken down into fall and spring semesters. The spring semester coincides with winter (planting) field trips. Fall semester are an opportunity for students to learn water quality testing, monitor previous year plantings and observe plant and animal communities.

1. School Board Coordinator engages interested teachers and schools – **continuous**
2. Fall Teacher Training/Meet and Greet **- August**
3. New Teacher Assistance – program introduction and hands-on water quality instruction for students, **begins in September, occurs before field trip to pond site**
4. Teachers conduct classroom water quality testing education prior to field events
5. Fall pond trip, **scheduling dates September - November**
6. Winter teacher assistance – additional classroom instruction as needed, **January**
7. Teachers conduct classroom water quality testing prior to field events
8. Winter pond trip is dependent on plant arrival, **target January – early March** (ideally February)
9. **Teachers complete the Program Evaluation** and return to coordinators, before summary meeting
10. Yearly Program Summary Meeting with teachers and coordinators, **May**

SECTION 2: PROGRAM IMPORTANCE AND EXPECTATIONS



Photographs of winter field trips.

Left: planting trees.

Right: collecting water for testing.

IMPORTANCE

Waterbodies across the Parish and State are monitored for health by the LA DEQ as directed by the USEPA. Federal Legislation mandates a standard of health for waters of the US (Clean Water Act) to ensure preservation of our natural resources and maintenance of safe waters for recreation and wildlife.

The decision to plant trees was made to support the Parish efforts to increase tree canopy due to huge losses after devastating impacts from recent hurricanes. Trees and other volunteer plants improve the aesthetics of the retention/detention ponds, frequently located in neighborhoods. Trees improve communities by providing cool inviting areas for recreation and relaxation. The Environmental Benefits of trees help communities lower costs and improve natural resources.

Energy Conservation: A natural air conditioner. The evaporation from a single tree can produce a cooling effect of ten room size AC's operating 20 hours a day. This results in lower, local temperatures. In winter trees act as windbreaks and can reduce winter heating costs.

Water Filtration and Retention: Trees capture and slow rainfall and their roots filter nutrients from the water. This capacity reduces stormwater runoff and potential flooding.

Wildlife Habitat: Provides food and shelter for birds, insects and other wildlife.

Carbon Sink: Ability to absorb carbon dioxide in the atmosphere.

Native Plants: Reduces nuisance and invasive plants in local environments.

The Adopt a Pond Program helps restore the tree canopy in St. Tammany and develop an engaged citizenry that appreciates and is responsible for local wetland habitats.

Skills obtained from this project will directly align with science standards (Section 6). High School standards like - *Environmental Awareness & Protection, Ecosystems, Resources & Resource Management,* and *Human Impact and Sustainability.* Junior High science standards will align with *Biodiversity & Change* and *Genetics & Change.*

Field Trip Expectations

Each school will be designated a retention or detention pond area near their school location. Teachers will assist students in conducting field activities with guidance from the Parish and LSU partners. When needed, additional volunteer instructors will be engaged to assist in student activities. Parents and chaperones are encouraged to participate in activities, with the focus on students conducting tests and collecting data. During Year 1, the LSU AgCenter 4-H Youth Wetland Education Program provided water quality testing kits. Grant funds are an ongoing pursuit for subsequent Program years, however schools should try to procure water quality testing supplies and equipment on their own. The trees are provided by St. Tammany Parish through local funding or grant funding.

> ***NOTE:*** *It should be understood that all funding for this project can include public and private means and has* ***measures of accountability****. Schools are not required to provide funding, however the partnership has the expectation that schools will provide substitute teachers and buses or other transportation.*

Since these spaces are public outdoor spaces, each participant should be prepared with proper clothing and exercise safety precautions. Weather conditions may require warm clothing or rain jackets, teachers should be mindful of weather forecasts for field trips. Field sites do not have covered or indoor refuge from inclement weather. Alternately, cool/cold days in southeast Louisiana can change quickly, we suggest layered clothing in case the day warms up or cools off. Hats are suggested. Most sites have a variety of wildlife and should be observed only, and never be approached or picked up. Many sites have tall vegetation, long pants are suggested. These areas are developed wetlands and surfaces can often be slippery or wet after a rain, be sure to wear appropriate footwear.

Students will need to wear water proof boots or shoes.
Water may be knee or thigh high in some areas.

SECTION 3: FIELD TRIP METHODS – materials list

Students participating in the Adopt a Pond Program can be engaged in three different ways during class and field events. During the fall, students will take water samples and measure parameters related to healthy aquatic systems, and conduct ecological study of plant and animal communities. In the winter, students will plant trees at the ponds sites, as identified by the Parish, and repeat water quality measurements.

Results from a teacher evaluation at the end of the first year showed an interest by students in the trees they planted: What will the pond site look like; and how well did the trees grow? In Year 2, an ecological component was added so students can monitor tree growth and plant community development, including associated wildlife inventory. The following outlines the materials and methods used to conduct these studies.

****Note**: Students will use quantitative and qualitative observations within the survey area. In the near future, an Adopt a Pond website will be set up with a link to data service for teachers and coordinators to access. This will be set up by LA Sea Grant.*

A. Water Quality Monitoring

Students will take water samples and measure water conditions (pH, temperature, salinity, dissolved oxygen, turbidity, and excess nutrients) at a local detention/retention pond before and after vegetative plantings. Water quality measurements will be used by St. Tammany Parish to track improvements of water leaving the pond site and entering other waterbodies.

ACTION ITEM: Teachers familiarize students with directions of water quality testing equipment (utilize Water Quality Videos). Talk about why these specific tests or measurements are important in monitoring water bodies (Power Point Program Introduction provided to each teacher).

Materials (including equipment, test kits, and other tools, see Section 11)**:**

- Secchi Disc or Secchi Tube (water clarity test)
- Thermometer
- Dissolved Oxygen testing kit
- pH testing kit
- Wide Range Nitrate test tablet kit, Low Range Nitrate Nitrogen test kit
- Wide Range Phosphate test tablet kit, Low Range Orthophosphate test kit
- Refractometer (salinity)
- Bucket for water sample collection
- Rope to tie to bucket for water sample collection
- Waste container for used water quality tests
- Goggles and gloves for tests using acid solutions
- Pencil
- Data sheet

Methods:

1. Students will be divided into groups and assigned a water quality parameter to test or measure.
2. Each group will begin by filling in the data sheet provided for Water Quality.
3. Students will collect a sample of water from the pond in the bucket, use care not to disturb the bottom where soils or detritus can be re-suspended into the water column.
4. First measure temperature and share with the group, and make a note of the time water sample was collected.
5. Return to the tables and conduct assigned test or measurement, carefully following the test instructions.
6. Record measurements on the data sheet provided.
7. If time allows, students should switch tables and conduct another set of measurements.
8. Teachers will collect data sheets and share with deEtte Smythe, St. Tammany Parish Government.

Note: Individual instructions for each water quality measurement can be found in the water quality kits. Classroom training can be provided upon request and is subject to scheduling constraints of the trainer.

B. Tree Planting

Sapling trees will be provided for planting. Species are determined by location and planted within the site based on requirements for tree survival and growth. Dibbles will be provided by the Program for digging holes at appropriate depth and width to accommodate tree roots. Care should be taken to protect stem and root from excessive bending or breakage.

Species Planted

Bald Cypress (*Taxodium distichum)*

Hardiness Zones 4–10; features a spread of around 25' at maturity; grows to a height of 50–70'; medium growth rate; height increases of 13–24" per year; grows best in acidic, loamy, moist, sandy, silty loam, well-drained and clay soils; adaptable to wet or dry conditions; flood tolerant. Bald Cypress forms distinctive groves in swampy areas that provide adaptable ecosystems home to various wildlife.

Tupelo Gum (*Nyssa sylvatica*) also known asTupelo, Black gum, or sour gum.

Hardiness Zones 4–9; Grows 30'-50' high; features a spread to 20'-30'; Prefers well-drained, acid soils, and full sun to partial shade. Grows best in in acidic, loamy, moist, rich, sandy, silty loam and well-drained soils. Its fruit attracts birds and wildlife and offers food for bees in early to late spring.

Green Ash (*Fraxinus pennsylvanica)*; also known as swamp ash

Hardiness Zone 2-9; features a spreading canopy capable of blocking sunlight and providing shade; grows to a height of 50-60 ft. with a canopy spread of about 25 ft.; fast growth rate; and prefers wet soils, but can tolerate some drought. Seeds provide food for wood ducks, finches and cardinals.

Cow Oak (*Quercus michauxii)* also known as swamp chestnut oak

Hardiness Zones 5 to 9; Height reaches between 40’ and 60’ with a spread of 30’-50’; prefers acidic, moist loams in full sun. Thrives in sandy soils. Tolerates some part shade but not full shade. Tolerates wet soils and occasional flooding. Various wildlife, consume acorns as well as livestock including cows, hence the additional common name of cow oak.

Live Oak (*Quercus virginiana*)

Hardiness Zones 8 to 10; Height reaches between 40’-80’ with a spread of 60’-100’; characteristically has a short trunk with low branching and a broad-spreading rounded crown; easily grown in average to wet, well-drained soils in full sun and tolerates a wide range of soils. Acorns are consumed by a variety of wildlife.

Nuttall Oak (*Quercus nuttallii)*

Hardines zones 5 to 9; reaches a height of 60’-80’ feet with spread of 35’-50’ capable of blocking sunlight; fast growth rate; tolerates wet soil as well as moderate drought. Prefers acidic, loamy, sandy, moist, wet, well-drained, and clay soils. Important species for wildlife management due to its high production of acorns.

Willow Oak (*Quercus phellos*)

Hardiness Zones 5 to 9; reaches a height of 40’-60’ with a spread of 35’; tolerates poorly drained oils; prefers full sun and acidic soil; Prefers acidic, loamy, moist, sandy, well-drained, wet and clay soils. Important wildlife food source for mammals including wood ducks and mallards when areas are flooded.

Plum (*Prunus angustifolia* Marsh.)

Hardiness Zones 5 to 9; reaches a height up to 6’-25’; adaptable to sandy soils; performs well when planted on heavier clay loam soils; Early growth and survival requires weed and grass control. Plums are considered drought tolerant once established. Thorny thicket is valuable for wildlife nesting and fruit is consumed numerous songbirds.

Persimmon (*Diospyros virginiana)*

Hardiness Zones 8 to 10; reaches a height 35’-60’ with a spread of 15’-35’; adaptable to a wide range of soils; however, not tolerant to salt. Considered an excellent soft mast eaten by many wildlife species; low-value deer browse.

C. Plant Survey Methods

The Plant Survey is designed to document community development over time. Previously planted trees (saplings) will be located and identified to species, and monitored for survival and growth overtime. Volunteer trees will also be measured and monitored for growth. Measure tree height only, until trees develop truck size greater than 2 inches around. An estimate of plant community development includes identifying dominate and unique plants at each pond site.

ACTION ITEM: Teachers should familiarize students with local, native and invasive tree species; and locate online taxonomic guides.

1. Trees (woody plants)

Materials

1. Taxonomic Guide and list of site tree plantings (provided at pond site event)
2. Tape measure
3. Flags – optional, as needed
4. Data Sheet
5. Pencil
6. Clip Board

Methods

1. Students should split into groups of at least 2, ideally 4 or 5.
2. Each group will chose and area of the site to make observations and take measurements.
3. One student in each group will record tree measurements
4. Other students will locate planted trees
5. Identify trees
6. Measure tree height – from soil surface to top of tallest center stem

Repeat the method above for volunteer trees (trees that grew at the site, but were not planted as part of the program).

2. Herbaceous plants (lacking woody stems)

Materials

1. Taxonomic Guide &
   Sample Plant Guide (provided)
2. Data Sheet
3. Pencil
4. Clip Board
5. Camera or Camera Phone - optional
6. Web access to online plant identification websites – optional

NOTE: A camera or phone with camera may be used to take photographs of unidentified plants. Photos should show any and all identifying parts - stem, bark, leaves and any blooms or seeds.

Methods

1. Identify dominate herbaceous plants using sample plant guide provided.
2. If plants cannot be identified in the field, take a picture of the plant, taking care to capture flowers, leaves, and stems and identify using websites in the classroom
3. Estimate abundance within the planting area, by individual plant species.

   1 through 5; 1 being least abundant to 5 being most abundant.
4. Give brief description of plant community - are plants flowering, are leaves changing color (seasonally), are they healthy looking or stressed due to drought conditions.
5. Precipitation can be tracked using USGS (US Geological Survey) Water Watch website https://waterwatch.usgs.gov/?id=ww_current and may be used in the classroom to extend discussions about the plant community and conditions at the pond sites.

D. Wildlife Survey

Wetland habitats are described by the plants (flora) and animals (fauna) present and are referred to as Communities. Animals actively participate in the development of the plant community and can reengineer their surroundings. An example of an animal reengineering the habitat is a beaver and the home (lodge) it builds in streams. Although we do not expect to find beavers in our pond sites, we may find other animals that have adapted the habitat or taken advantage of local resources. Visually inspect the site for birds and mammals. Look around wet areas for turtles, fish or other aquatic animals. Record species and number present and in comments, note where they were found.

1. Overall Pond Site Survey

Materials

1. Bird Field Guide, Fish Guide, Turtle Guide, Snake Guide (provided at field event)
2. Data Sheet
3. Pencil
4. Clip board

Methods

1. Upon arrival at the site, look for birds in trees or along the edge of the water or wet areas.
2. Note any animal tracks or other signs like scat and make notes in the comment section.
3. Some sites are constantly wet, note whether there are fish, or turtles visible.
4. Sites that are mostly dry, check the channelized water in narrow ditch - quickly look for fish or other aquatic animals.
5. Animal observations should take no more than 15 minutes and can be noted as observed while surveying plants.

Wildlife observed at retention/detention sites.

SECTION 4: DATA SHEETS

Printable data sheets have been provided in electronic format through e-mail.

St. Tammany Parish Adopt-A-Pond Program **Water Quality & Ecology Sampling Field Form**

Collected by: ____________________ Pond Name: ____________________

QUANTITATIVE OBSERVATIONS: Date Sampled: ____________________

	Sites within Pond measured by students	Temp.		NO_3 Nitrate	PO_4 Phosphate	pH	Time	DO	Water Clarity/ Turbidity
		(⁰C)	(⁰F) [1]					mg/L	
Measurement	1								
	2								
	3								
	4								
Statistics	Mean/ Average								
			[1]	Convert ºC to ºF: ºF = 1.8 (# ºC) + 32 (line up decimal) =					

QUALTITATIVE OBSERVATIONS:

Weather characteristics (clouds, wind, sky) ____________________

Water (if any: color, motion) ____________________

Type of water bottom (type, texture; ex: is the bottom sandy, packed with clay, decayed organic matter/detritus)

____

Flora/Plants (outside survey area) ____________________

General/Overall site findings (additional notes) ____________________

Ecology Data Sheet Plant Survey

Denote trees planted for project by * next to species name.

See methods for instructions to determine Abundance (1-5) of Herbaceous Plants.

Site:		**Survey Date:**	
Trees and Shrubs		**Herbaceous Plants**	
Species Name	Height (ft.)	Species Name	Abundance (1-5)
1.		1.	
2.		2.	
3.		3.	
4.		4.	
5.		5.	
6.		6.	
7.		7.	
8.		8.	
9.		9.	
10.		10.	
11.		11.	
12.		12.	
13.		13.	
14.		14.	
15.		15.	

Wildlife (fauna)			
Birds, Mammals, Insects		**Fish, Reptiles, Turtles**	
Species Name	quantity	Species Name	quantity
1.		1.	
2.		2.	
3.		3.	
4.		4.	
5.		5.	
6.		6.	
7.		7.	
8.		8.	
9.		9.	
10.		10.	
11.		11.	
12.		12.	
13.		13.	
14.		14.	
15.		15.	

SECTION 5: PROGRAM EVALUATIONS

Evaluations are an important tool in measuring the success and value of the program. Students will be asked questions in order to determine increased knowledge of topics before and after the program. Evaluations also help assess participant attitudes, behavior and science literacy. A teacher evaluation will take place at the end of the year to enhance the success of the program and improve areas that don't result in desired outcomes or support the goals and objectives of the project.

**Teacher suggestions and recommendations for additional lessons are essential to developing and maintaining a successful program for years to come!*

Instructions for Evaluations:

Teachers: Administer the Student Evaluation as a pre-test, before Classroom or Pond Field Event. Depending on exposure to the Program, teachers will administer test prior to the event. Typically completed in the fall semester.

Teachers: Administer the Student Evaluation, again as a post-test, after the Pond Field Event. Students will be tested to see if the materials were understood, after their last field trip of the year. Typically completed in the spring semester.

Teachers: e-mail results to Carol Franze and/or Whitney Wallace, see contact list in this packet.

Teacher Evaluations will be due by the Summary Meeting at the end of the School Year.

Teacher Program Evaluation Questions

1. Why did you get involved in the Adopt a Pond Project?
2. What did you like about the program?
3. What would you improve/change about the program?
4. Will you continue to participate in the program?
5. Are you able to incorporate components of the project into your curriculum?
6. What keeps you from incorporating the program into classroom curriculum?

St Tammany Parish Adopt a Pond Program: Student Evaluation

Directions: Multiple Choice Questions, choose the best answer or all that apply.

1. What is the Adopt a Pond Program? (**choose all that apply**):
   A. Enhanced learning opportunities in local wetland habitats.
   B. Monitoring water quality in the pond.
   C. Monitoring paper/plastic trash that collects in the pond.
   D. Increased tree canopy in the Parish.
   E. Reducing pollution and flooding to local waterways and surrounding areas.

2. What are the two main services provided by retention and detention ponds?
   A. Areas for four wheelers and motorcycles.
   B. Develop baseball fields and soccer fields.
   C. Water quality improvement and storm water management.
   D. Areas for swimming and paddle boating.

3. How do retention/detention ponds function within a watershed?
   A. An area of land that remains dry and doesn't flood during rainfall events.
   B. Rain water is diverted through a pond, then slowly released into another waterbody.
   C. An area developed for recreational off road vehicles.
   D. An area developed for trash collection and local dumping.

4. What are ways we can determine the condition of waterbodies? **(select two answers)**
   A. By determining chemical, physical, and biological characteristics, usually for a particular purpose such as drinking, swimming, or aquatic animal habitat.
   B. By measuring dissolved oxygen, pH, water clarity, temperature, salinity, nitrates and phosphates.
   C. Put plants in the water and see if they live.
   D. Put fish in the water and see if they live.
   E. Place cameras around pond to take pictures throughout the year.

5. How do vegetative plantings improve retention/detention ponds? (**choose all that apply**)
   A. slow water flow – mitigate flooding
   B. reduce the amount of paper/plastic trash
   C. plants absorb excess nutrients and potential toxics
   D. provide habitat for many animals
   E. tree roots increase soil strength and stability

6. Why is it important to measure dissolved oxygen in the water? To determine if _____.
   A. plants can photosynthesis
   B. there is enough to support animal life
   C. the water is acidic or basic
   D. the water is polluted

7. Why are "clean" or healthy local waterways important?
   A. They provide water for cooking.
   B. They reduce air pollution.
   C. They provide habitat for aquatic animals.
   D. They aren't, all the water flows out to the oceans.

8. What has been your favorite part of the Adopt a Pond Project? (if you haven't been to a pond site, answer what you look forward to doing)
   A. Testing water quality.
   B. Planting trees.
   C. Surveying plants and measuring tree growth.
   D. Observing and learning about animals at the pond.

St. Tammany Parish Adopt a Pond Program: Student Evaluations – Answer Sheet

Answers: highlighted

1. What is the Adopt a Pond Program? (**choose all that apply**):
A. enhancing learning opportunities in local wetland habitats
B. monitoring water quality in the pond
D. increasing tree canopy in the Parish
E. reducing pollution and flooding to local waterways and surrounding areas

2. What are the two main services provided by retention and detention ponds?
C. water quality improvement and storm water management

3. How do retention/detention ponds function within a watershed?
B. rain water is diverted through a pond, then slowly released into another waterbody

4. What are ways we can determine the condition of waterbodies? **(select two answers)**
A. by determining chemical, physical, and biological characteristics, usually for a particular purpose such as drinking, swimming, or aquatic animal habitat
B. by measuring dissolved oxygen, pH, water clarity, temperature, salinity, nitrates and phosphates

5. How do vegetative plantings improve retention/detention ponds? (**choose all that apply**)
A. slow water flow – mitigate flooding
C. plants absorb excess nutrients and potential toxics
D. provide habitat for many animals
E. tree roots increase soil strength and stability

6. Why is it important to measure dissolved oxygen in the water?
B. to determine if there is enough to support animal life

7. Why are "clean" or healthy local waterways important?
C. they provide habitat for aquatic animals

8. What has been your favorite part of the Adopt a Pond Project? (if you haven't been to a pond site, answer what you look forward to doing) – Accept any answer.

SECTION 6: SCIENCE STANDARD ALIGNMENT

Jr. High Grade Science Standard Alignment:

Unit 5 Biodiversity & Change

7-MS-LS2-4: Interactions, Energy & Dynamics

- Construct an argument supported by empirical evidence that changes to physical/biological components of an ecosystem affect populations.
- **Clarification Statement**: Emphasis in on recognizing patterns in data, making inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

3D Learning:

- SEP Evaluate: Engage in argument from evidence
- DCI: Ecosystem dynamics, functioning and resilience
- CC: Stability and change.

7-**MS-LS2-5:** Interactions, Energy & Dynamics

- Undertake a design project that assists in maintaining diversity and ecosystem services.
- **Clarification Statement**: Examples of ecosystem services could include water purification, nutrient recycling, habitat conservations or soil erosion.

3D Learning:

- SEP Reason Scientifically: Construct explanations and designing solutions.
- DCI: Engineering design – developing possible solutions
- CC: Stability and change.

Unit 5: Genetics & Traits

8-MS-ESS3-3: Earth & Human Activity

- Apply scientific principles to design a method of monitoring and minimizing human impacts on the environment.

- **Clarification Statement**: Examples of the design process may include examining human environmental impacts, assessing kinds of solutions that are feasible, designing/evaluating solutions that could reduce human impact. Ex: water usage, land usage, pollution.
    - **3D Learning**:
        - **SEP**: Investigate/Reason scientifically; Construct explanations/design solutions.
        - **DCI**: Human impacts on Earth's systems & developing possible solutions.
        - **CC**: Cause and effect.

High School Environmental Science Standard Alignment:

Unit 2: Environmental Awareness & Protection

HS-EV2-1: Design/evaluate solution to limit non-point source pollution into state waterways.

- **Clarification Statement**: Examples include nitrogen and phosphorus.
    - **3D Learning**:
        - **SEP**: Reason Scientifically; Construct explanations/design solutions.
        - **DCI**: Pollution/environment, Environmental choices, Defining/delimiting engineering problems.
        - **CC**: Structure and function.

Unit 3: Ecosystems

HS-LS2-7: Design, evaluate, refine a solution for reducing impacts of human activities on the environment/biodiversity.

- **Clarification Statement**: Examples include urbanization and dissemination of invasive species.
    - **3D Learning**:
        - **SEP**: Reason Scientifically; Construct explanations/design solutions.
        - **DCI**: Ecosystem dynamics/functioning/resilience, Biodiversity and humans, Developing possible solutions.
        - **CC**: Stability and change.

Unit 4: Resources & Resource Management

HS-EVS1-1: Analyze/interpret data to identify factors that affect sustainable development and natural resource management in Louisiana.

- **Clarification Statement**: Evidence of LA's natural resource wealth is found in understanding functions and values of varied ecosystems and environments.
    - **3D Learning**:
        - **SEP**: Evaluate; Analyze and interpret data.
        - **DCI**: Louisiana's natural resources (function/value of wetlands).
        - **CC**: Stability and change.

Unit 6: Human Impact and Sustainability

HS-EVS1-2: Obtain, evaluate, communicate information on effectiveness of management or conservation practices for one of LA's natural resources with respect common considerations such as social, economic, technological, and influencing political factors over the past 50 years.

- **Clarification Statement**: Increases in commercial/recreational uses of land may result in the need for environmental policies and call for changes in long established practices.

  3D Learning:
  - SEP: Obtain, evaluate, communicate information.
  - DCI: Resource management for Louisiana.
  - CC: Systems and systems models.

SECTION 7: WATER QUALITY VOCABULARY

Carbon Sink - a forest, ocean, or other natural environment viewed in terms of its ability to absorb carbon dioxide from the atmosphere.

Culvert – restricting flow from inside the pond to outside the pond to another water body

Dissolved Oxygen (DO) – amount of oxygen dissolved in the water; produced by photosynthesis

< 2 ppm = very low **ppm is parts per million**

5 ppm or > (is good for most animals) = growth and activity

Nutrients – elements and compounds essential for plant growth (Nitrogen and Phosphorus)

pH – measure of acid/base level, in this case water

1 = strong acid (stomach or battery)

7 = neutral (tap water) **Fish and many aquatic animals prefer a 6.5 to 8 range.**

14 = strong base (bleach or drano)

Salinity – measure of dissolved salt in water; **ppt units (parts per thousand)**

Turbidity – measure of water clarity or lack of clarity (sunlight reaching a depth within water column (measured in cm or m)

Secchi Disc – a black and white disc used to measure clarity of water at depth within a water colum

Stream Width – measurement of water within the outflow channel

Sinuosity – stream's tendency to move back and forth over the pond bottom; stream has wide bends or straight channel

Velocity – movement of water flowing in the channel of dry ponds

Water Bottom – refers to soil texture, condition, or whether paved or amended in some way

Water Color – clear can easily see the bottom, no color, and/or tinted (green or brownish).

SECTION 8: WETLAND ECOLOGY VOCABULARY

Adapt – to adjust to new conditions.

Aquatic – relating to water, plants or animals obligate to water.

Aquifer – an underground layer of rock and sand that contains water.

Bottomland Hardwood Forest – forested, periodically flooded wetlands found along rivers.

Brackish Marsh – marshes occurring where salinity ranges from 3-15 parts per thousand (ppt).

Carbon Sink - a forest, ocean, or other natural environment viewed in terms of its ability to absorb carbon dioxide from the atmosphere.

Carnivore – any organism that eats other consumers; meat eaters.

Classification – the ordering of organisms into groups on the basis of their relationships (referred to as taxa - kingdom, phylum, class, order, family, genus and species).

Community – a naturally occurring group of different species of organisms that live together and interact as a self-contained unit.

Compound Leaf – a leaf composed of multiple leaflets (Figure 1. Leaf pattern diagram).

Consumer – any organism that cannot produce its own food and must get its energy by eating other organisms.

Decomposer – organisms such as fungi and bacteria that feed on dead material causing the chemical breakdown of the material.

Detention Pond – a developed pond that collects rain runoff allowing the excess water to drain out to local rivers or streams slowly to reduce flooding, may become dry between rain events (dry pond).

Detritivore – any organism that consumes detritus.

Detritus – dead, decaying plant material.

Endangered - any species which is in danger of extinction throughout all or a significant portion of its range.

Estuary – the habitat where freshwater (rivers and streams) mix with saltwater (ocean).

Fauna – a grouping of animals.

Flora – plants of a particular geographic area.

Food Chain - transfer of food energy from plants to one or more animals; a series of plants and animals linked by their food relationships.

Food Web – a series of linked food chains.

Freshwater Marsh – grassy (dominated by grasses, reeds, rushes and sedges) wetlands that occur along rivers, streams, and lakes.

Habitat - a place where specific plants or animals live.

Herbivore – any organism that eats only producers (plants).

Intermediate Marsh – a transitional habitat between fresh and brackish marshes where the salinity is about 3 parts per thousand (ppt); common plants include bull tongue, Roseau cane, and wiregrass.

Invasive Species – an organism that causes ecological or economic harm in an environment where it is not native.

Marsh – a wetland habitat (fresh or saltwater) dominated by grasses, sedges, rushes and reeds.

Microhabitat – a precise location within a habitat where an individual species is normally found.

Nonpoint Source Pollution – pollution entering waterways through land runoff, rain and other precipitation, seepage or hydrologic modification; including agriculture runoff, runoff from urban areas and roadways, and land erosion.

Omnivore – any organism that eats both plants and animals.

Palmate Venation - vein arrangement with veins radiating outward from the base of the leaf like fingers spread out from the palm of the hand. (diagram showing leaf morphology).

Parallel Venation - vein arrangement with veins parallel from the base to the tip of the leaf. (diagram showing leaf morphology).

Pinnate Venation - vein arrangement with one main vein extending from the base to the tip of the leaf and smaller veins branching off the main vein. (diagram showing leaf morphology).

Point Source Pollution – pollution originating from a direct source, such as pipes, ditches, wells, vessels and containers.

Pollutant - any substance introduced into the environment that adversely affects the usefulness of a resource.

Predator – an animal that hunts and eats other animals for food.

Prey – an animal that is killed and eaten by another animal.

Producer – any organism that is capable of producing its own food, usually through photosynthesis.

Retention Pond – a developed pond that collects rain runoff, allowing excess to slowly flow to rivers and streams to prevent flooding, continually has water between rain events (wet pond).

Saltwater Marsh – wetland grasses occurring in salt water (15-18 ppt), usually along the coast; dominated by grasses such as Spartina alterniflora (oyster grass).
Scavenger – an animal that eats dead plant material or dead animals.

Simple Leaf - a leaf composed of a single blade. (diagram showing leaf morphology).

Swamp – a forest saturated by water periodically or continually, such as cypress tupelo with standing water most of the growing season or bottomland hardwood, which are only flooded periodically during rainy season.

Taxa (Taxon) - taxonomic group, whatever its ranking (i.e., Class, Order, Family).

Taxonomy - the science of classifying organisms according to their shared characteristics and evolutionary relationships.

Terrestrial – of the land as opposed to water.

Threatened - any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Topographic Map - a line and symbol representation of natural and artificially created features in an area.

Watershed - the land area that drains into a body of water.

Water Quality - the overall health of a body of water, including the measured chemical, physical, and biological characteristics.

Wetlands - land areas that are wet due to a close relationship to a body of water or groundwater, or land areas that are flooded regularly; they support vegetation adapted for life in saturated soil conditions.

SECTION 9: RESOURCE MATERIALS

Leaf Key to common trees in Louisiana – Guide to Louisiana trees.

https://www.lsuagcenter.com/NR/rdonlyres/BA8FFA18-B7CD-4D98-88FF-AF234D5F9ACD/18437/pub1669LeafKey.pdf

The Leaf Key can be found at the LSU AgCenter website at the link above, and is in pdf format for printing ease or students can use the online version.

How to Use the Leaf Key

It is easy to identify the common trees of Louisiana with this guide. Long words have been left out and pictures are used to identify the leaves instead of written descriptions. Common trees include native and introduced trees from other parts of the United States or from foreign countries.

You can identify most tree leaves if you follow these steps:

1. Read the description at each numbered heading in the key on page 4 and by process of elimination find the group to which the leaf of any unknown tree belongs. Diagrams of the leaf characters used in the key are show on page 5.

2. Turn to the picture numbers for this group. Leaf descriptions are repeated in the upper corner of the each page throughout the key.

3. Match the leaf with the picture it most closely resembles to find its name.

Wetland Plant Identification WebSites:

USDA Natural Resource Conservation Service, Plant Materials Program
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/plantmaterials/technical/publications/?cid=nrcs143_026853

Texas A&M Wetland Plant website
https://aquaplant.tamu.edu/plant-identification/

University of Florida, plant directory
http://plants.ifas.ufl.edu/plant-directory/

Introductory Program PowerPoint – obtain from Coordinators.

Video links for Water Quality Testing – obtain from Coordinators.

Printable Data Sheets – obtain from Coordinators.

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Additional supplies: Two Buckets, gloves, googles, hand wipes, chemical waste container, trash bag, data sheets.

Kits:

1. Dissolved Oxygen

- Dissolved oxygen titration test kit
- 50 tests
- **Range 0-10 mg/L**

2. Nitrate

- LaMotte Nitrate Module Refill
- Tablets to perform **50 tests**
- **Range: 0, 4, 8 ppm NaO3**

3. Phosphate

- **LaMotte phosphate module refill**
- **Tablets to perform 50 tests**
- **Range: 0, 1, 2, 4 ppm PO43**

4. pH

- LaMotte precision pH test kit
- Materials to perform **100 tests**
- **Range 3-10.5 pH, at .5 pH increments**

Test Strips – 100

5. Temperature

- **-5 to 50 degrees Celsius**

6. Water Clarity

60 cm, Turbidity Tube

7. Salinity

- Refractometer
- Measures salinity (0-100 ppt) and specific gravity (1.000 – 1.070)

Temperature

1. Put bulb end of thermometer into the sample water to a depth of 4 inches
2. Leave in the water for **3 minutes**
3. Read temperature without removing the bulb end of the thermometer from the water, note temperature for comparison
4. Let thermometer stay in the water sample for one more minute and read again
5. If the temperature has not changed, record the temperature on the data sheet
6. If the temperature has changed, let the thermometer stay in the water at one minute increments until the temperature is stable.
7. Record Temperature on the Data Sheet

Temperature should be reported in degrees Celcius and can be calculated from Farenheit in the classroom.

Water Clarity

1. Stand with your back to the sun so that the turbidity tube is shaded

2. Pour sample water slowly into the tube using a cup until the tube is full

3. Look straight down into the tube with your eye close to its opening

4. Have somebody else slowly release water from the tube – Depending on the specific turbidity tube, type a or b:

   a) using the clamp at the bottom until you can just make out the Secchi pattern at the bottom of the tube; or
   b) press the tube against the ground to release water slowly, until the Secchi pattern is visible

5. When the pattern is visible, record water depth in cm from the ruler on the side of the tube

6. Dump water from tube onto the ground and repeat this process 2 more times for a total of 3 readings

Dissolved Oxygen – fixing the sample and titration instruction.

1. Rinse the sample bottle with sample water **3 times** – do not pour water back into the water sample bucket, discard rinse water on the ground

2. Tightly cap the bottle and submerge in sample water

3. Remove the cap and allow the bottle to fill, dislodge any air bubbles

4. Replace the cap while the bottle is submerged

5. Turn bottle upside down to check for air bubbles – if present discard sample and repeat

6. Remove the cap from the bottle

7. Immediately add 8 drops of **Manganous Sulfate Solution** and add 8 drops of **Alkaline Potassium Iodide Azide**

As shown in the picture, hold the dropper bottle vertically upside-down, and not at an angle, when dispensing a reagent – squeeze the bottle gently to dispense the reagent one drop at a time

8. Cap the bottle and mix by inverting several times – **a precipitate will form**

9. Allow the precipitate to settle below the shoulder of the bottle – as shown in picture

10. Add 8 drops of **Sulfuric Acid**

11. Cap and gently invert the bottle to mix the contents until the precipitate and the reagent have totally dissolved – the solution will be clear yellow to orange if the sample contains dissolved oxygen

At this point the sample has been **"fixed"** (amount of oxygen will not change) and may be titrated later when you return to the classroom

Dissolved Oxygen Titration

12. Fill the test tube (0608) with the fixed sample to the 20mL (milligrams/litre) line.

13. Fill Titrator with Sodium Thiosulfate, 0.025 N (4169).

14. Titrate - press one drop at a time, mixing until sample color is pale yellow.
    DO NOT DISTURB TITRATOR, set aside till Starch solution is added.

15. Add 8 drops of Starch Indicator (4170 WT).

16. Slowly, Continue Titration until blue color just disappears and solution is colorless.

17. Read the result from Titrator (what is left in the Titrator), DO is reported as ppm. mL is the same as ppm (parts per million).

18. Repeat test 2 times for a total of three. Can begin at no. 12 with fixed solution or fix additional samples.

SHORT FORM INSTRUCTIONS – Dissolved Oxygen (DO)

Read all instructions before performing test. Use this guide as a quick reference.

1. Fill Water Sampling Bottle (0688-DO).
2. Add 8 drops of *Manganous Sulfate Solution (4167).
3. Add 8 drops of *Alkaline Potassium Iodide Azide (7166).
4. Cap and mix.
5. Allow precipitate to settle.
6. Add 8 drops of Sulfuric Acid, 1:1 (6141WT).
7. Cap and mix until reagent and precipitate dissolve. Sample is “fixed”.
8. Fill test tube (0608) to the 20 mL (milligrams/litre) line.
9. Fill Titrator with *Sodium Thiosulfate, 0.025N (4169).
10. Slowly, Titrate until sample color is pale yellow. DO NOT DISTURB TITRATOR, you will use again and determine results.
11. Add 8 drops of Starch Indicator (4170WT).
12. Slowly, Continue titration until blue color just disappears and solution is colorless.
13. Read result in ppm (parts per million, same as mg/L) Dissolved Oxygen.

Precision pH Test Kit (Blue Test Kit)

1. Insert Wide Range pH Octa-Slide Bar into the Octa-Slide Viewer

2. Rinse the test tube with sample water **3 times** – when rinsing do not pour water back into water sample bucket, pour rinse water on the ground

3. Fill the test tube to the 10 mL line with sample water

4. Add **10 drops** of Wide Range pH Indicator

As shown in the picture, hold the dropper bottle vertically upside-down, and not at an angle, when dispensing a reagent – squeeze the bottle gently to dispense the reagent one drop at a time

5. Cap the test tube and mix by inverting several times

6. Insert the test tube into the Octa-Slide 2 Viewer

7. Match sample color to a color standard and record as pH

8. Pour solution into waste container and repeat process 2 more times for a total of 3 readings

pH Test Strips

1. Remove one pH strip from tube
2. Dip in sample water briefly
3. Immediately compare color of test strip to color chart located on tube
4. Record result as pH
5. Dispose of used pH strip and repeat the process 2 more times for a total of 3 readings

Nitrate TesTabs

1. Rinse the test tube with sample water **3 times** – when rinsing do not pour water back into water sample bucket, pour rinse water on the ground

2. Fill the test tube to the 5 mL (milligrams/litre) line

3. Add one Nitrate #1 TesTab

When adding a TesTab cover the entire tablet with thumb and push through to tube

4. Cap the tube and mix by inverting multiple times until the tablet has disintegrated

5. Add one Nitrate #2 TesTab – Immediately slide the tube into the protective sleeve

When adding a TesTab cover the entire tablet with thumb and push through to tube

6. Cap the tube and mix by inverting for 2 minutes to disintegrate the tablet

7. Wait 5 minutes – while you are waiting for this sample to finish, begin the process for the next sample since you are repeating this test 2 more times!

8. Remove the protective sleeve and compare the color of the sample to the Nitrate Color Chart

9. Record the result as ppm (parts per million) Nitrate

10. Dump solution into **waste container** and repeat process 2 more times for a total of 3 readings

Not for all Schools; AAPP Use TesTabs Instructions

Nitrate Nitrogen Low Range Comparator

1. Rinse the water sampling bottle 3 times with sample water
2. Fill the water sampling bottle with sample water
3. Slide the Nitrate-Nitrogen Low Range Comparator Bar into the Low Range Comparator Viewer
4. Fill one test tube to the 10 mL line with sample water, remove the cap, and place in the rear hole on the top of the Low Range Comparator
5. Fill one test tube to the lower line (5 mL) with sample water
6. Dilute to the second line with **Mixed Acid Reagent**
7. Cap and mix
8. Wait 2 minutes
9. Use the spoon to add one level measure of **Nitrate Reducing Reagent**
10. THE MIXING PROCEDURE IS VERY IMPORTANT
11. Cap tube and invert slowly and completely 30 times in 1 minute to insure complete mixing
12. Wait 10 minutes
13. Remove the cap and insert tube in the front hole on the top of the Low Range Comparator
14. Position the comparator so that light shines down through the test tubes
15. Tilt the comparator until the color standards and sample are illuminated
16. Match the color of the reaction to the color standards
17. Read the result from the Low Range Comparator Bar and record as ppm Nitrate-Nitrogen
18. To convert to nitrate, multiple by 4.4 and record as ppm Nitrate
19. Pour test tube contents into waste container on table

Phosphate TesTabs

1. Rinse the test tube with sample water **3 times** – when rinsing do not pour water back into water sample bucket, pour rinsing water out onto the ground

2. Fill the test tube to the 5 mL (miligrams/litre) line

3. Add one Phosphorus TesTab

When adding a TesTab cover the entire tablet with thumb and push through to tube

4. Cap the tube and mix by inverting several times until the tablet has disintegrated

5. Wait 5 minutes

6. Compare the color of the sample to the Phosphate Color Chart

7. Record the result as ppm (parts per million) Phosphate

8. Dump solution into **waste container** and repeat process 2 more times for a total of 3 readings

Use a separate cup to rinse the used test tube with sample water before starting this test over again

Not for all Schools – Refer to TesTab Instructions

Phosphate Low Range Comparator

1. Slide the Phosphate Low Range Comparator Bar into Low Range Comparator Viewer
2. Rinse both test tubes with sample water 3 times
3. Fill a test tube to the 10 mL line with untreated sample water, remove the cap, and insert in the rear hole on the top of the Low Range Comparator
4. Fill the other test tube to the 10 mL line with sample water
5. Use 1.0 mL pipet to add 1.0 mL of **Phosphate Acid Reagent**
6. Cap and mix
7. Use the spoon to add one level measure of **Phosphate Reducing Reagent**
8. Cap and mix until dissolved
9. Wait 5 minutes
10. Remove cap from test tube and place in the front hole on the top of the Low Range Comparator
11. Position the comparator so that light shines down through the test tubes and tilt the comparator until the color standards and sample are illuminated
12. Match the color of the reaction to the color standards and read the result from the Low Range Comparator Bar
13. Record as ppm Orthophosphate
14. Pour test tube contents into waste container on table

Salinity – Refractometer Method

1. Using pipette, place a few drops of sample water on the prism

2. Close the daylight plate so the water spreads across the entire surface of the prism without air bubbles or dry spots

3. Allow the sample to temperature adjust on the prism for 30 seconds

4. Hold the daylight plate in the direction of a light source and look into the eyepiece

5. Read the scale value at the point where the blue and white portions meet and record your result as ppt (parts per thousand)

6. Rinse and dry off the prism and repeat this test 2 more times for a total of 3 readings