

Resource Guide for Marine Science Classes

South Cross Bayou Water Reclamation Facility

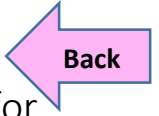
Teacher Resources

- [Resource Overview](#)
- [Standards & Learning Targets](#)
- [Teacher Guide for 20-50-80 Menu](#)
- [Teacher Guide for Activity Options](#)

Student Resources

- [All-Purpose Product Rubric](#)
- [SCB Resume Rubric](#)
- [20-50-80 Menu](#)
- [Product Criteria Cards](#)

Marine Science Resource Overview



Choice! The following resources were designed to allow for teacher choice. Choice for teachers allows for customizing *what* students are expected to learn and differentiating *how* students are expected to demonstrate learning. By choosing the critical learning focus and the methods of demonstrating mastery, teachers design appropriate boundaries for students.

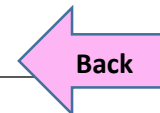
A tour of South Cross Bayou Wastewater Treatment Facility provides opportunities for your students to learn a tremendous amount of relevant information aligned to the Florida Standards for Marine Science. The Florida Standards have been provided and specific Learning Targets have been written to guide the learning expectations and outcomes. Teachers should review the [Florida Standards and Learning Targets](#) provided and choose which Learning Targets will be the critical focus for students.

A wide variety of Activity Options were developed to meet the needs and learning styles of diverse students. Activity Options have been grouped into three different point values based on the amount of student work associated with the activity. Teachers should review the [Activity Options](#) for the chosen Learning Targets and select a total of eleven Activity Options that are a good fit for their classroom and learners. (*Note: Students will only be expected to complete two of these eleven Activity Options*). To create a customized 20-50-80 Menu for their class, teachers should copy the eleven chosen Activity Options and paste them into the appropriate boxes of the template for the [20-50-80 Menu](#). This ensures that students will only see the eleven Activity Options that are predetermined by the teacher.





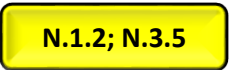









By establishing these boundaries, teachers can infuse *student* choice as well. Many teachers observe that if students have both choice and voice then there is an increase in motivation and desire to learn.

Students will preview the [20-50-80 Menu](#) before the SCB tour and predetermine *two* learning activities that best fit their interest, comfort and learning style. Students have many combinations to choose from to earn the necessary 100 points. Scaffolded supports for learning, as well as transparency of expectations, are provided through the descriptions on the [20-50-80 Menu](#), [Product Criteria Cards](#) and [All-Purpose Product Rubric](#) (or [SCB Resume Rubric](#)). The desired effect of students knowing *how* they will use the information from the SCB tour is an increase in motivation and desire to learn.

MARINE SCIENCE STANDARDS & LEARNING TARGETS



Pinellas County Schools Mission Statement/ Florida Standards
<input type="checkbox"/> Learning Targets

PCS Mission: Educate and prepare each student for college, career, and life.	
<input type="checkbox"/> Identify and describe various careers available in wastewater treatment.	
<input type="checkbox"/> Determine required education, training, and skills necessary for a career in wastewater treatment.	   
SC.912.N.1.2 Describe and explain what characterizes science and its methods.	
SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science.	
<input type="checkbox"/> Discuss how each of the following characteristics of science are specifically present within SCB's processes to treat wastewater: use of models, adherence to ethical practices, identification and systematic testing of key variables, adaptability, and development of innovative technology and techniques that allow for improvements in quality of life.	
SC.912.L.14.6 Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspective of both individual and public health.	
<input type="checkbox"/> List and describe the impacts to human health of improper waste management.	
<input type="checkbox"/> Determine the role that the Chlorine Contact Tank and UV System play in protecting individual and public health.	
SC.912.L.15.13 Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.	
<input type="checkbox"/> Describe how the population of anaerobic bacteria in the Anoxic Tanks is subject to Natural Selection.	
<input type="checkbox"/> Describe how the population of aerobic bacteria in the Aeration Tanks is subject to Natural Selection.	
SC.912.L.16.10 Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.	
<input type="checkbox"/> Determine how the use of bacteria as biotechnology in the both the Anoxic and Aeration Tanks impacts the environment.	
<input type="checkbox"/> Determine how the use of bacteria as biotechnology in the Digesters impacts the environment.	
SC.912.L.17.10 Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.	
<input type="checkbox"/> Diagram and explain how South Cross Bayou Wastewater Treatment Facility is part of the Water Cycle.	  
<input type="checkbox"/> Diagram and explain how the anaerobic bacteria in the Digesters are part of the Carbon Cycle.	
<input type="checkbox"/> Diagram and explain how the anaerobic bacteria in the Anoxic Tanks are part of the Nitrogen Cycle.	
<input type="checkbox"/> Diagram and explain how the aerobic bacteria in the Aeration Tanks are part of the Nitrogen Cycle.	
SC.912.L.17.11 Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.	
<input type="checkbox"/> Analyze how water can be a renewable resource.	 
<input type="checkbox"/> Discuss the costs and benefits of treating wastewater.	
<input type="checkbox"/> Discuss the costs and benefits associated with onsite energy production and the associated fertilizer pellet production.	

SC.912.L.17.16 Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

- Identify sources of wastewater.*
- Recognize how pollution sources enter the wastewater system.*
- List and describe the environmental impacts of improper waste management.*
- Determine the role that Headworks plays in reducing surface water pollution.*
- Determine the role that Grit Removal plays in reducing surface water pollution.*
- Determine the role that Primary Clarifier Tanks play in reducing surface water pollution.*
- Determine the role that Anoxic and Aeration Tanks play in reducing surface water pollution.*
- Determine the role that the Secondary Clarifier Tanks play in reducing surface water pollution.*
- Determine the role that the Denitrification Tanks play in reducing surface water pollution.*
- Determine the role that the Outflow Cascade plays in reducing surface water pollution.*
- Identify two greenhouse gasses being produced and managed in the Digesters. Discuss the environmental impacts of releasing these greenhouse gasses.*

L.17.16

L.17.16

L.17.16

SC.912.L.17.17 Assess the effectiveness of innovative methods of protecting the environment. (Marine Science Honors Only)

- Assess the effectiveness in protecting the environment for three sustainable practices within South Cross Bayou Wastewater Treatment Facility.*

L.17.17

SC.912.L.17.18 Describe how human population size and resource use relate to environmental quality.

- Describe the environmental impact of using reclaimed water.*

L.17.18

SC.912.L.17.2 Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.

- Explain why the cascade outflow system at South Cross Bayou is critical for the survival of aquatic life in Joe's Creek.*

L.17.2

Marine Science Teacher Guide for 20-50-80 Menu



Learning Targets

Relevant [9-12 Science Standards for Marine Science](#) are provided and specific [Learning Targets](#) have been developed. Teachers choose the [Learning Targets](#) and associated [Activity Options](#) that are a desired critical focus for their students.

Student Materials Needed for Activity Options

lined paper	glue/tape	markers	colored pencils	white paper
scissors		file folder (for board game)	smartphone or tablet with video recording	

Special Notes

Since the [Activity Options](#) have either a 20, 50 or 80 point value, the [All-Purpose Product Rubric](#) must be customized by the students. When using the [All-Purpose Product Rubrics](#) have students circle the correct point value for the product (20, 50 or 80) and record the correct partial point values at the top of the full and half credit columns. Use the tables below for partial point values:

Full	Half	No
4	2	0
4	2	0
4	2	0
4	2	0
4	2	0
20 Points Possible		

Full	Half	No
10	5	0
10	5	0
10	5	0
10	5	0
10	5	0
50 Points Possible		

Full	Half	No
16	8	0
16	8	0
16	8	0
16	8	0
16	8	0
80 Points Possible		

Time Frame

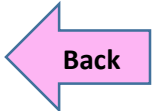
Allow one or two 50 minute class periods prior to your SCB visit to have students preview resources and predetermine two activities from the [20-50-80 Menu](#).

Allow two or three 50 minute class periods after your SCB visit to have students complete their two chosen activities from the [20-50-80 Menu](#).

Additional Forms

All-Purpose Product Rubrics (two per student)	SCB Resume Rubric (for SCB Career Resume)	Product Criteria Cards
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Marine Science Teacher Guide for Activity Options



Teachers, below is the master list of suggested in-class activities for students to demonstrate mastery on the [Learning Targets](#). You will narrow down three 20 point options, four 50 point options and three 80 point options and place the eleven options on the [20-50-80 Menu template](#). Prior to the SCB tour, students will choose two activities (with a sum of 100 points) from the options you provide. Back in the classroom after the SCB tour, students will complete both activities they have selected.

20 Points Options *Teachers, place <u>three</u> options on the 20-50-80 Menu .	
L.17.11	Develop a 5 page children’s book for second graders that explains and illustrates an answer to the question “Will we run out of water?” Think about how in ideal circumstances water can be considered a renewable resource. Be sure to include at least three factors that determine if water is truly available for use.
L.17.16	Develop a 5 page children’s book for second graders that explains and illustrates an answer to the question “Where does wastewater come from?” Think about the various pipes and pumping stations that deliver wastewater for treatment. Be sure to include at least 5 specific sources and or activities that generate the incoming wastewater.
L.14.6	Create two Public Service Announcement Signs that promote the image of SCB Water Reclamation Facility in locally maintaining our accustomed standards of human health. Consider that in Pinellas County we are fortunate to have state of the art waste management facilities employing techniques that improve the quality of life for residents. Each sign should explore one way that human health suffers in the absence of proper waste management.
L.15.13	Write and illustrate a comic strip to depict how the aerobic bacteria in the Aeration Tanks, as well as the anaerobic bacteria in the Anoxic Tanks, are subject to natural selection.
L.17.2	Write and illustrate a comic strip to depict how a properly functioning Cascade System impacts the carrying capacity of two organisms of your choosing within Joe’s Creek.

50 Points Options *Teachers, place <u>four</u> options on the 20-50-80 Menu .	
N.1.2	You are assistant to the education outreach coordinator at SCB. You have been tasked with recruiting science minded students for an internship at SCB. The regional science fair will be the perfect opportunity to recruit. Design a display board or a brochure that communicates how SCB embodies scientific practices and methods. Include how SCB does the following: use of models, adherence to ethical practices, identification and systematic testing of key variables, adaptability, and development of innovative technology and techniques that allow for improvements in quality of life.
N.3.5	
L.17.16	Create an interactive map of SCB water reclamation facility. For every location on the map where a process is being used that results in reducing surface water pollution create a flap that when lifted up explains the method the wastewater is being treated and how that treatment results in the reduction of surface water pollution. Remember that the treated wastewater is eventually released as surface water.

L.17.10	Create a Pinellas County Wastewater Specific Nitrogen Cycle Diagram poster. View a generic nitrogen cycle diagram to get a starting point, but then customize the components to include the various specific Pinellas County nitrogen source examples and include SCB water reclamation facility in the cycling of nitrogen in our local environment.
L.17.10	Create a Pinellas County Wastewater Specific Carbon Cycle Diagram poster. View a generic carbon cycle diagram to get a starting point, but then customize the components to include the various specific Pinellas County carbon sources that enter our wastewater. Be sure to track the carbon as it moves through the SCB facility and track the way(s) it leaves the facility and rejoins the local.
L.17.10	Create a Pinellas County Wastewater Specific Water Cycle Diagram poster. View a generic water cycle diagram to get a starting point, but then customize the components to include the various specific Pinellas County water source examples and include SCB water reclamation facility in the cycling of water in our local environment.
L.14.6	Write and record a 2-3 minute speech for a town hall meeting. There is a proposal to reduce wastewater treatment funding by specifically eliminating the chlorine contact tank and UV system. Because you oversee facility operations, your role at the town hall meeting is to speak as an expert in the purpose and processes involved in the chlorine contact tank and UV system at the town's water reclamation facility. In your speech provide a scientific explanation of the types of energy conversions involved throughout the facility as well as the role in protecting human health.
PCS Mission	Create a resume for a specific career at SCB. Use a professional template when creating your resume. Be factually accurate when writing the resume. For instance, professional/technical skills, school programs, length of time to complete degree, certifications, state licensure and previous work experience from actual work places. This activity will be graded using the SCB Resume Rubric instead of the All-Purpose Product Rubric.

80 Points Options *Teachers, place <u>three</u> options on the 20-50-80 Menu .	
L.16.10	Write a training manual for the new position of Microbiologist at SCB. In addition to describing the overall environmental impact from the biotechnology of maintaining healthy bacteria populations in the Digester, the purpose of the training manual is to provide the background information and the specific monitoring tasks to perform to maintain the highest carrying capacity for populations of anaerobic bacteria in the Anoxic Tank and aerobic bacteria in the Aeration Tank. Be sure to predict how specific biotic and abiotic limiting factors would impact carrying capacities of these bacteria populations at SCB.
L.17.11	Design a Cost & Benefit board game that incorporates a minimum of: 2 costs and 2 benefits of treating wastewater, 1 cost and 1 benefit of onsite energy production, 2 costs and 2 benefits of producing fertilizer pellets at SCB, 1 cost to the environment for releasing a surplus of a greenhouse gas produced and managed in the Digesters, 1 cost to the environment for releasing a surplus of a different greenhouse gas produced and managed in the Digesters, 2 benefits to using fertilizer pellets in sustainable land use practices, and 1 benefit for each sustainable practice you identify at SCB.
L.17.16	
L.17.17	Design a Resource Recovery board game that assesses the effectiveness of protecting the environmental by recovery of: natural gas during the wastewater treatment process, biosolids during fertilizer pellet production, water for reclaimed use.
L.17.18	
PCS Mission	Write and present to the class Three Facts & A Fib for each of three different careers that are present at SCB. You may use resources provided by SCB to help you identify careers and give you general information, but your 9 facts and 3 fibs must be information that was not included in the SCB resources. Conduct independent research on the three careers when writing your facts and fibs.

<p>PCS Mission</p>	<p>You are an employee at SCB and have been asked to speak at a local high school for the Great American Teach-In. Prepare a presentation that describes your role within the treatment facility. Share with the class about a situation (power outage to the city due to storms, infiltration/inflow of stormwater due to leaking pipes, sensor failure in the monitoring of water parameters, etc) when you had to problem solve a major crisis.</p>
<p>PCS Mission</p>	<p>Create a WebQuest to explore new resource recovery practices being used throughout the world that are currently <i>not being used</i> at SCB. Consider that resource recovery is an innovative sustainable practice that helps offset the environmental and economic costs of wastewater treatment. Design a WebQuest that has participants researching and answering guided questions about relevant details.</p>

All-Purpose Product Rubric **Product:** _____ **20, 50, or 80 Point Option** **Name:** _____

Aspect	Full Credit <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">Points</div>	Half Credit <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">Points</div>	No Credit <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;">0 Points</div>	Peer Feedback	Self Evaluation
Content: Is the content of the product well chosen?	Content chosen represents the best choice for the product. Graphics are well chosen and related to content.	Information or graphics are related to content, but are not the best choice for the product.	Information or graphics presented do not appear to be related to topic or task.		
Completeness: Is everything included in the product?	All information needed is included. Product meets the product criteria and the criteria of the task as stated.	Some important information is missing. Product meets the product criteria and the criteria of the task as stated.	Most important information is missing. The product does not meet the task or does not meet the product criteria.		
Creativity: Is the product original?	Presentation of information is from a new perspective. Graphics are original. Product has elements of fun and interest.	Presentation of information is from a new perspective. Graphics are not original. Product includes an element of fun and interest.	There is no evidence of new thoughts or perspective in the product.		
Correctness: Is all of the information included correct?	All information presented in the product is correct and accurate.	N/A	Any portion of the information presented in the product is incorrect.		
Communication: Is the information in the product well communicated?	All information is neat and easy to read. Product is in appropriate format and shows significant effort. Oral presentations are easy to understand and presented with fluency.	Most of the product is neat and easy to read. Product is in appropriate format and shows significant effort. Oral presentations are easy to understand, with some fluency.	The product is not neat and easy to read or the product is not in the appropriate format. It does not show significant effort. Oral presentation was not fluent or easy to understand.		
Total Grade					

SCB Resume Rubric

Career: _____

50 Point Option

Name: _____

Aspect	Full Credit	Half Credit	No Credit	Peer Feedback	Self Evaluation
<p>Format: Does this have the appearance of a professional job resume?</p>	<p>Resume is computer generated, has balanced margins, is visually appealing, highlights strengths & information, appropriate font style and size used with variety. 10 Points</p>	<p>Resume is computer generated, has balanced margins, highlights strengths & information, no variation in font style and/or size. 5 points</p>	<p>Resume is handwritten, format detracts from strengths & information, font distracts from readability. 0 Points</p>		
<p>Job-Specific Information: How well does your information describe your skillset?</p>	<p>Action phrases are used to describe duties and skills, information demonstrates ability to perform the job, and professional terminology is used when describing skills. 16 Points</p>	<p>3 duties/skills lack action phrases, some information demonstrates ability to perform the job, and some professional terminology is used when describing skills. 8 Points</p>	<p>5-6 duties/skills lack action phrases and information does not clearly demonstrate ability to perform the job. 0 Points</p>		
<p>Resume Content: How rich in detail is your resume?</p>	<p>Heading, objective, skills, experience, certification and education covered in detail. Extra information given to enhance resume. 14 Points</p>	<p>Heading, objective, skills, experience, certification and education covered with little detail. Minimal information given to enhance resume. 7 Points</p>	<p>Missing one or more: heading, objective, skills, experience, certification or education. No extra information given to enhance resume. 0 Points</p>		
<p>Spelling & Grammar: How well do you display your ability for written communication?</p>	<p>No spelling or grammar errors. 10 Points</p>	<p>3 spelling or grammar errors. 5 Points</p>	<p>5-6 spelling or grammar errors. 0 Points</p>		
Total Grade					

Name: _____

Date: _____

Marine Science 20-50-80 Menu

Student Directions: Choose two activities from the menu below. **The activities must total 100 points.** Place a checkmark next to each box to show which activities you will complete. All activities must be completed by _____.

20 Points	
<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	

50 Points	
<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	

80 Points	
<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	

Students, attach the Product Criteria Cards for your two activities in the spaces below.

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Marine Science Product Criteria Cards

Student Directions: The cards below convey additional criteria for various products. Cut out the two applicable product criteria cards and attach each to your 20-50-80 Menu.

<p style="text-align: center;">Children's Book</p> <ul style="list-style-type: none"> • Has a cover with book's title and student's name as author • Has 5+ pages • Each page has an illustration along with the content/story • Neatly written or typed 	<p style="text-align: center;">SCB Career Resume</p> <p><i>See <u>SCB Resume Rubric</u> for product criteria.</i></p>	<p style="text-align: center;">Sign</p> <ul style="list-style-type: none"> • Is the size of standard poster • Includes at least five pieces of important information • Has a clear and concise message that is easy to recognize • Contains both words and images • Name and location of where to post is on the back
<p style="text-align: center;">Display Board or Brochure</p> <ul style="list-style-type: none"> • Uses either a cardboard trifold board (of any size) or a standard sheet of paper folded to create three columns • Clear and visible overall title and section headings • Uses graphics, charts, images etc (can be hand drawn or printed) • Neat and legible • Thoroughly meets the content 	<p style="text-align: center;">Comic Strip</p> <ul style="list-style-type: none"> • 8.5" x 11" or larger • On white paper • 6+ cells • Contains meaningful dialogue • Imagery is in color 	<p style="text-align: center;">Town Hall Speech</p> <ul style="list-style-type: none"> • Was videotaped or audio recorded • Script was written and provided to teacher • Begins with introduction and explains your credentials or authority to speak on the subject • Provides appropriate background knowledge and detail for the type of audience • States the purpose for speaking • Has a clear wrap-up that restates the purpose of the speech • Voice was loud and easy to understand

<p style="text-align: center;">Interactive Map</p> <ul style="list-style-type: none"> • Includes a scale • Has two or more layers that are viewable by lifting paper • Images are in color and are clear • Explanations are thorough and concise • Has a title that explains the location 	<p style="text-align: center;">Poster</p> <ul style="list-style-type: none"> • Is the <u>size</u> of standard poster paper • Includes at least five pieces of important information • Has a clear title • Contains both words and pictures • Name is written on back 	<p style="text-align: center;">Training Manual</p> <ul style="list-style-type: none"> • 5+ pages • Has a cover that states the job/position and company • Contains contact information • Connects the mission/vision/purpose of the company to the mission/vision/purpose of the position • Contains concise step by step descriptions of job duties • Identifies what to look for if things go wrong • Explains impact of when things go wrong • Explains troubleshooting to fix or avoid problems • Has images or diagrams • Has descriptive section headings
<p style="text-align: center;">Board Game</p> <ul style="list-style-type: none"> • 4+ thematic game pieces • 25+ colored/thematic squares • 20+ question/activity cards • Thematic title on the board • Complete set of rules for game play • At least the size of one open file folder 	<p style="text-align: center;">WebQuest</p> <ul style="list-style-type: none"> • Must quest through at least 5 government websites • Websites should be linked in the document • Submit to teacher by PowerPoint • At least 3 questions for each website • The links and questions should be included as slides • Answers should be put in the notes section for each slide • Must address the topic 	<p style="text-align: center;">Presentation: Great American Teach-In</p> <ul style="list-style-type: none"> • Take on the role of the SCB employee • Cover at least 5 important facts about the job of the employee • Should be 3-5 minutes in length • Script must be approved by teacher before information is presented • Must have props or some form of costume • Allow for questions at the end of presentation
<p style="text-align: center;">Three Facts & A Fib</p> <ul style="list-style-type: none"> • Can be typed, written or on PPT • Contains exactly four statements: three true statements and one false statement • False statement should not be obvious • Paragraph should be included that explains why the fib is false 		