Coastal Stewards

COASTAL STEWARDSHIP CURRICULUM:
A Resource Guide for Environmental Educators in Georgia

Marine Extension and Georgia Sea Grant
UNIVERSITY OF GEORGIA
Sea Grant

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GEORGIA DEPARTMENT OF NATURAL RESOURCES
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INTRODUCTION

Georgia's coastal region is rich in natural resources and human culture. Its coastline encompasses almost one third of the remaining salt marsh on the east coast of the United States. Diverse coastal habitats such as barrier islands, tidal rivers, salt marsh and maritime forest support abundant wildlife. The coastal ecosystem provides economic, ecologic and social benefits including, but not limited to, clean water, seafood and storm protection. These benefits, vital to human existence, are called ecosystem services. Cultural resources as well as generational and traditional knowledge of coastal residents are also an integral part of Georgia's coastline.

The region is also one of the fastest growing regions in the state (Coastal Regional Commission, 2018). As more people move to the coast, there is increased pressure on coastal resources, making it more important than ever to foster a sense of stewardship among the public. In the 1970's the United Nations identified a need for environmental education in addressing conservation challenges. The U.S. Environmental Protection Agency (2016) defines **environmental education** as "a continuum that covers the range of steps and activities from awareness to action with an ultimate goal of environmental stewardship" and **environmental stewardship** as the responsibility for environmental quality shared by all those whose actions affect the environment.

The authors define **coastal stewardship** as the responsibility for coastal quality shared by those whose actions affect the coast. Coastal quality encompasses healthy natural and cultural resources that contribute to thriving coastal ecosystems and economies. Impactful stewardship includes people as part of and not separate from, the coastal ecosystem and is vital to maintaining a healthy coast for generations to come. Environmental education for all ages is essential for the work to continue.

Curriculum Background

In 2017, University of Georgia's Marine Extension and Georgia Sea Grant responded to the need for expanded public programming by creating the **Coastal Stewards Program**, a series of environmental education workshops designed for adults and short format programs for families living on or visiting the Georgia coast. The goal of the program is to engage these audiences in activities designed to improve their knowledge of coastal ecosystems, enhance understanding of current issues impacting coastal communities, and inspire stewardship of natural resources.

The **Coastal Stewardship Curriculum** grew out of the Coastal Stewards Program and supports a growing movement of informal adult and family environmental education opportunities across the region. While there are many environmental education programs and curriculums serving k-12 students in the state, few of them specifically target adults and multi-age audiences.

To identify gaps in stewardship activities and resources on the Georgia coast, Marine Extension and Georgia Sea Grant held a series of focus groups that included environmental educators from thirteen different coastal organizations. Participants shared examples of stewardship activities used in teaching and identified needs for new stewardship-related content. Feedback from the focus groups was incorporated into a **Coastal Stewardship Curriculum Guide**. Several focus group members served as advisors throughout the development of the guide and served as external reviewers for its publication.

Guide Organization

This guide is a compilation of activities and resources that can be used to build stewardship topics and activities into programming for adults and families. Below is an overview of the guide's organization.

Section 1: Coastal Stewardship in Georgia

This section provides a broad overview of the coastal stewardship in the state, the legislation that guides the effort, and the teamwork required to move the work forward.

Section 2: Stewardship Workshops for Adults

The Coastal Stewards Program includes a series of workshops that engage adults in field, lab and lecture activities. Sample agendas and selected activities for these programs are presented. General resources and tips for workshop design are also included. Sample workshops are grouped by three content themes: wildlife and habitats, recreational use of coastal resources, and green infrastructure.

Section 3: Stewardship Programs for Families

General tips for providing stewardship opportunities in family programming are included in this section. Sample family programs are grouped by three content themes: habitats and wildlife, recreational use of coastal resources, and green infrastructure.

Section 4: Evaluation

To ensure program goals and learning objectives are being achieved, evaluation of the workshop being offered needs to be conducted. A general discussion of the value and thought behind a successful evaluation is presented. Tips for evaluating family programs are included as well.

Appendices

Appendix A includes ten (10) Stewardship Shorts that correspond to the three content themes: habitats and wildlife, recreational use of coastal resources, and green infrastructure. These are print ready PDF documents that can be distributed to participants. Appendices B, C and D are listings of organizations working in coastal Georgia whose personnel serve as subject matter experts. Appendix E is a listing of field trip destinations along the coast and may be consulted for explorations to include in programming or as professional inspiration during its development. Appendix F includes

material contributed by Dr. Milton Newberry III, and may be referenced for additional resources on evaluation design. Appendix G includes a few sample evaluation surveys and assessments. Appendix H includes citations for all in-text references.

Content Themes for Sections 2 and 3

Sections 2 and 3 focus on learning experiences for individuals who want to acquire knowledge of natural history, gain an **awareness** of coastal challenges, and finally build coastal **skills** - all critical steps towards **stewardship action**.

Sections 2 and 3 content is informed by three broad themes that relate to the ways in which people live, work and play on the Georgia coast.

Content Theme 1: Wildlife and Habitats:

Exploration of the coast can inspire connection with the natural world. This topic focuses on fostering positive behaviors when exploring coastal habitats including beaches, estuaries, wetlands and maritime forest. Activities include information on how to safely experience coastal habitats while respecting plants and wildlife found there.

Content Theme 2: Recreational Use of Coastal Resources:

Sustainable outdoor recreation can foster a relationship between individuals and their environment. Activities include focusing on building skill and confidence among the public in recreational fishing, crabbing and birding. Additionally, some activities provide information for consumers about the local seafood industry.

Content Theme 3: Green Infrastructure:

Development along the coast has increased as more people move into the region. The use of green infrastructure is one strategy for development that maintains or mimics the natural ecosystem processes. While green infrastructure has many definitions, the US Environmental Protection Agency defines green infrastructure solely as stormwater management. Activities included here primarily focus on the benefits of green infrastructure for managing stormwater and reducing non-point source pollution.

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SECTION 1

Coastal Stewardship in Georgia

SECTION 1:

Coastal Stewardship in Georgia

Cornerstones

Stewardship is a continual, ongoing process. Often it takes time, sometimes years, to see the impacts of actions made to address coastal challenges. Sharing success stories of actions taken to protect coastal resources is important in educational programming because it provides tangible examples of what "stewardship" can mean. In addition, psychological research indicates that one of the most effective ways to change behavior is by informing people that others in their social networks are behaving in the desired manner. Therefore, if communities and organizations behave in an environmentally friendly manner, that action serves as a powerful tool to motivate and energize people to be environmental stewards.

The Coastal Marshlands Protection Act is an iconic example of people working together to protect the Georgia coast and is recognized as one of the most effective laws in the nation for conserving wetlands (Georgia Department of Natural Resources, 2002). The Coastal Marshlands Protection Act was passed in 1970 to recognize and protect estuaries and salt marsh as a valuable public resource. The act distinguishes marsh from land, meaning it cannot be developed in the same way. These regulations have been instrumental in protecting the approximately 400,000 acres of Georgia's coastal marshlands (Georgia Department of Natural Resources, 2002). The Shore Protection Act was passed in 1979 and has protected the coast by regulating activities and structures occurring in beach and shore habitats (Georgia Department of Natural Resources, (n.d.a)).

Scientific research has provided evidence on the value of coastal habitats. Such information was vital to creating legislation such as the Coastal Marshlands Protection Act. The UGA Marine Institute on Sapelo Island, founded in 1953 by E.P. Odum and D. C. Scott, was one of the first research facilities to focus on salt marsh ecology. The seminal scientific research conducted at this site in Georgia brought international attention to the benefits provided by this ecosystem (University of Georgia).

The protection of marsh hammocks is another example where research was used to document the need for legislation protecting a coastal habitat. Marsh hammocks are defined as areas of upland between 1 acre and 1000 acres in size and found in salt marshes. Marsh hammocks are a type of small back-barrier island located between the barrier islands that border the ocean and the mainland. In the late 1990's and early 2000's an increasing number of permit requests were submitted to develop on marsh hammocks, including building bridges to these areas. In response, a Coastal Marsh Hammocks Advisory Council was formed which identified research questions that would be needed to inform how much development should be permitted on these islands (Coastal Marsh Hammocks Advisory Council, 2002)

The Southern Environmental Law Center and the Altamaha Riverkeeper conducted biological surveys on twenty-three publicly owned hammocks to address some of these research questions. Their findings documented the importance of these habitats for supporting a diversity and abundance of plant and animal life (Fabrizio & Calvi 2003). As a result of

researchers and conservationists working together, the new construction of bridges to hammocks was prevented and coastal Georgia's marsh hammocks remain mostly undeveloped.

In 2018, Georgia passed a state constitutional amendment Georgia Outdoor Stewardship Act (HB 332 2017-2018) that created the Georgia Outdoor Stewardship Trust Fund which will use sales taxes from sporting goods "to conserve lands that protect drinking water sources and the water quality of rivers, lakes, and streams; to protect and conserve forests, fish, wildlife habitats, and state and local parks; and to provide opportunities for our children and families to play and enjoy the outdoors" (Georgia Outdoor Stewardship Act. 2018).

Teamwork

State, federal and non-governmental organizations have worked together over the years to conserve undeveloped areas of land and water. Little Tybee Island and Ossabaw Island State Heritage Preserves, Altama Plantation Wildlife Management Area, Savannah Coastal Wildlife Refuge Complex and Cumberland National Seashore are all results of such collaborative efforts. Refer to Appendix E for a more comprehensive list of protected wild spaces that exist along the coast.

These organizations rely on people, whether employees, volunteers or concerned citizens, to move stewardship work forward. Public support can determine what legislation is proposed and passed. Coastal stewards include anyone interested in protecting the coast through their actions in work or daily life. They are all ages and come from different backgrounds. There are people making a difference through creative writing, making art, gardening, fishing, educating and advocating, conducting coastal research and running businesses. Inspiration may be found in middle school students creating portable fishing line recycling containers, in resource managers monitoring wildlife populations, and in park rangers maintaining public green space. Stewards include watermen and women harvesting local seafood, grandparents preserving language and cultural practices by sharing this knowledge with younger generations and artists creating with recycled materials.

Individually and collectively Georgians are working for a sustainable coast. Environmental education plays a pivotal role in continuing the work of coastal stewardship and growing the community of Georgians living daily and lightly on the coast. The work has just begun!

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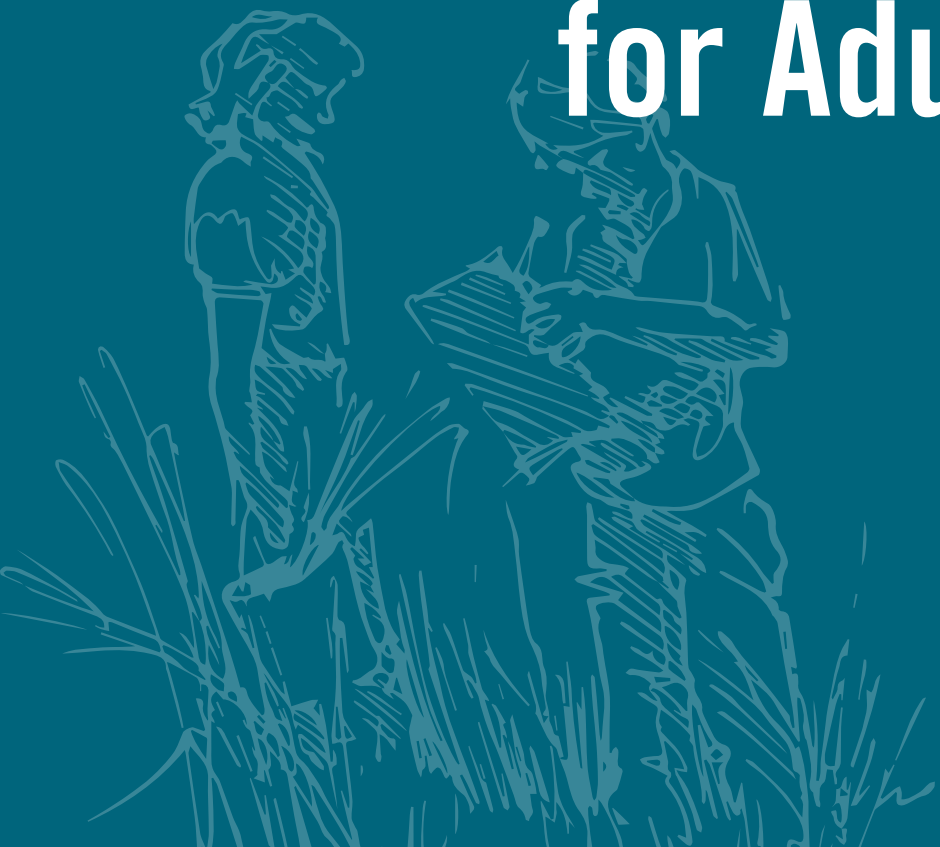
SECTION 2

Stewardship Workshops for Adults



SECTION 2:

Stewardship Workshops for Adults

Program Design

There are many ways to structure environmental educational programs. The components below were considered while planning Coastal Stewards workshops and address broad topics related to stewardship of coastal resources. The workshops modeled in this guide are intended for an audience of eco-tourists, residents, environmental educators, school teachers, and volunteers for environmental organizations.

Define your audience

Adult programs are often designed for groups who have the time to participate. Consider whether new programs will be sought out by individuals who are retired or those who are still working. The Coastal Stewards workshops were primarily held on Saturdays to encourage people who worked during the week to attend. Short format classes can also be offered during the week for those that have weekend work schedules or individuals who are retired. Continuing education for teachers or other environmental professionals is another option to investigate when deciding which audience to address.

Identify program objectives based on the need of the audience. For example, a rain garden design class might be most useful for homeowners, whereas a barrier island ecology workshop may be of interest to a broader range of individuals. Similarly, there might be a range of audiences that would find value in programs with similar topics. For example, separate Coastal Stewards workshops on saltwater fishing were designed specifically for new anglers and experienced anglers new to saltwater. Participants chose the workshop that best fit their needs. Clear information about the level of physical activity, the skills covered, and the activities planned will help participants find a program that meets their personal or professional goals.

Spend time on promotion

Promotion is essential to filling education programs, and it is particularly important when launching a new program. The availability and appropriateness of these platforms will vary based on a number of factors including an organizations resources, time, workshop location, and target audience. The methods listed below have proven successful in promoting programs of all types.

1. Add the event to local community event calendars, both print and digital.
2. Write a press release about the event and share with local print, radio or television news outlets.
3. Use social media platforms, such as Twitter, Facebook and Instagram, to reach broader audiences. Facebook has been the most effective platform for promoting the Coastal Stewards workshops. Make it easy for people to find the event by posting it on Facebook

and then share with workshop collaborators or speakers. Reach more people by investing in Facebook advertising which includes target parameters that provide the means to pinpoint an audience.

4. Word of mouth can be a powerful tool. Ask people within professional and personal networks to share with friends and colleagues. Give talks for community organizations like Rotary clubs, Kiwanis, garden clubs, or home-owners associations. Define and contact the target audience rather than waiting for an audience to find the program.
5. Try direct mailing. This may be useful if the target audience is geographically bounded, such as a workshop for residents within a specific neighborhood.
6. Register with Trip Advisor to encourage visitors to spread the word.

Get to know the workshop participants

It is important to get to know participants prior to the workshop. Communicate with participants during registration to find out more about their goals for the workshop. Ask questions to gauge individual knowledge about the topic at hand and to learn about their background and experience. This will help inform workshop instruction by encouraging participants to share talents and skills with each other. As participants share personal goals in advance of the workshop, be prepared to adjust the program accordingly and if possible. The more participants can directly apply what is learned during the workshop, the more engaged they are likely to be during the program. The goal is to provide challenging opportunities for growth in a supportive environment.

Prepare the group in advance

Adult participants will have a more enjoyable experience if they begin the workshop with realistic expectations. Be sure to share logistical details at least two weeks in advance of the workshop so they come prepared with the proper attire and supplies. The following information is sent to people who register for Coastal Stewards workshops.

- An informational email that includes the agenda, street address, a list of what to wear and bring, and contact information (phone/email address) for the person leading the workshop.
- A reminder email one week in advance that repeats the information above and provides any logistical updates.

Create a positive group dynamic

Build time into the workshop schedule to allow participants to get to know each other. One of the reasons adults attend programs is to build connections with like-minded people. This helps create an environment where individuals are more willing to try out new skills and experiences together. There are many ways to facilitate conversation.

- Provide name tags for all participants.
- Start with round-robin introductions.

- Include ice breaker activities for the group at the beginning of the workshop.
- Ask participants to share individual goals for the workshop with the group.
- Eat lunch as a group and schedule downtime between activities and presentations, allowing participants to engage with one another.
- If possible, set the physical environment up in a way that is conducive for interaction. For instance, arranging seats in a circle allows individuals to see all the other members in the group. At meals, arrange the tables so that people can easily talk with each other.

It is important to recognize that participants will enjoy a diversity of social interactions. Include both structured conversations and free time. Pay attention to how members of the group are reacting to different scenarios and adjust as needed.

Balance discussion with hands-on activities

Use a balanced variety of activities to accommodate a range of adult learning styles, including visual, auditory, reading/writing and physical. Lecture, lab, and field activities lend themselves to these different learning styles and provide something for everyone.

Lectures

Limit lectures to one hour, including time for questions. Post-workshop evaluation surveys completed by Coastal Stewards workshop participants revealed that people did not want to sit for more than one hour of presentations at a time. During these workshops, lectures are held before field activities. PowerPoints created by presenters are always shared with participants following the workshop.

PowerPoint is a familiar presentation style. The format can be a great way to include concise information and visuals, but it can sometimes discourage group interaction. Consider whether lecture content could be presented just as effectively in another format. Could a discussion about habitats or ecology be presented during a hike outdoors? Could the group visit a researcher's lab or field site instead?

Lab Activities

Lab activities often take more preparation and time but can be an effective way to teach new skills. Identify a few useful tools that have a citizen science component or provide examples of sustainable practices that participants can incorporate into their daily lives. Examples of lab activities include the use of microscopes to identify plankton, the use of dichotomous keys to identify plants and animals, and the installation of turtle excluder devices on crab traps.

Participants will get more out of practicing just a few skills rather than talking broadly about many different skills. For example, when teaching someone how to tie different fishing nots, focus on just one or two knots. Encourage the person to tie the knot with guidance and then practice it several times to gain confidence. If the skill requires a good bit of time to master, consider narrowing the program scope or presenting new skills over a series of program dates.

Field Activities

Coastal Georgia is a fantastic outdoor classroom. When venturing outside, have a safety plan in place. Know your organization's emergency protocol. Carry a portable first aid kit along with a cell phone or marine radio. Establish a back-up plan in the event of inclement weather. Afternoon thunderstorms are a regular occurrence in coastal Georgia, and wind is often a factor for boat trips. Stay alert to the comfort and well-being of participants and be flexible about the length of field studies. Heat-related emergencies are of particular concern for outdoor activities during summer programs.

Look for teachable moments. Have a plan for the field but be open to addressing wildlife encounters and other opportunities that may present themselves spontaneously while outdoors. Pay attention to the environment around the group while teaching and draw on the things that participants can see, hear, smell or touch safely. Always allow time for exploration.

Offer a certificate program

Certificate programs can produce a cohort or community of skilled citizens by defining a set of shared objectives and providing incentive for participants to follow through with a series of workshops. A series of classes with the same group of participants may also allow more time to build on skills and knowledge.

Certificate requirements must be clearly defined. Is the certificate a professional designation recognized within an industry? Does it provide professional learning units? Is it a certification of completion? The Coastal Stewards Program offers a certificate of completion that recognizes participants who have completed a total of 40 hours of instruction in Coastal Stewards workshops or classes. There are no official professional learning units associated with the certificate.

There are several examples of successful certificate programs in Georgia, including the Master Naturalist and Master Gardner programs offered by UGA Cooperative Extension and Warnell School of Forestry and Natural Resources, Habitat Certification offered by Coastal Wildscapes, Advanced Training in Environmental Education in Georgia offered by Environmental Education Alliance of Georgia and UGA's Warnell School of Forestry and Natural Resources.

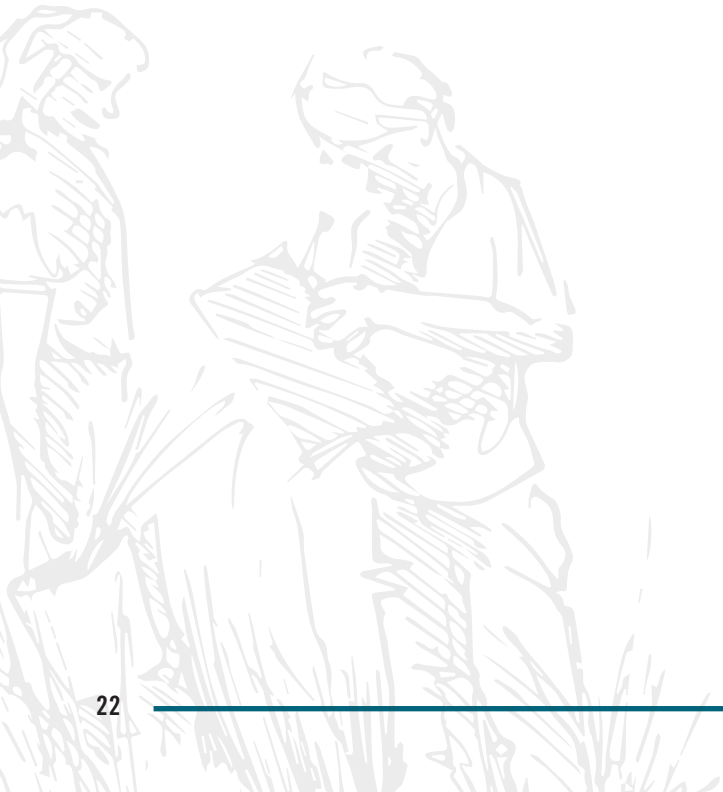
Coastal Stewards workshops may count towards an existing certificate program. For instance, the Advanced Training for Environmental Education in Georgia is a nationally accredited professional development certification program. As part of this program participants are required to attend 30 hours of specialization workshops which can include any professional development opportunity offered in Georgia that advances the participants content knowledge and skills (Environmental Education Alliance of Georgia, 2010). Contact the program administrator – ateeg@eealliance.org to see if your program meets the requirements of a specialized workshop.

Network and learn

Stewardship is a broad topic and an on-going collaborative process. Reach out to others when designing new stewardship programs. Actively participate in groups interested in a healthy coast. For example, consider attending Georgia Association of Marine Education's annual

conference or One Hundred Miles' Choosing to Lead Conference. Set up a booth at events like Sapelo Island Cultural Day, the Savannah Earth Day Festival or the Shrimp and Grits Festival on Jekyll Island. Strengthen relationships and networks throughout the year by participating in farmers markets or joining a community garden. Learn, experience, and share what you know with others.

Stay up to date on scientific research that relates to human impacts on the coast. Attend lunch and learns or evening lectures on current research and management. Georgia Department of Natural Resources Coastal Resources Division, UGA Skidaway Institute of Oceanography, and Coastal Wildscapes are a few of the organizations that host regular coastal lecture series. Invite a researcher or manager to present or lead an activity at your site. Many other institutions of higher education are engaged in coastal science and summaries of much of this research can be found arranged by topic on the website of the Georgia Coastal Research Council, http://www.gcrc.uga.edu. Georgia Sea Grant funds applied coastal research and information about currently funded research projects can be found at https://gacoast.uga.edu. For example, participants in a Coastal Stewards workshop on Georgia shrimp learned about Sea Grant funded research on black gill, a condition related to a parasite impacting shrimp. They then learned how to identify black gill in shrimp and contribute to the Black Gill Tracker app, which is a tool the public can use to assist researchers in better understanding this issue.



SAMPLE WORKSHOPS

Examples of nine adult workshops focused on coastal stewardship are presented in this section and grouped by content themes; habitats and wildlife, recreational use of coastal resources and green infrastructure.

Each workshop includes a sample agenda for a weekend workshop and three activities. These workshops are modeled after the Coastal Stewards workshops. The format and content should be modified based on programming objectives.

CONTENT THEME: Wildlife and Habitats

Knowing about basic natural history and coastal processes is foundational for stakeholders to make informed decisions. The three workshops included here focus on coastal habitats and wildlife.

Introduction to the Coast Workshop

This workshop is meant to be a broad overview, or sampler, of topics that could be explored in greater depth in a series of workshops. Be sure to discuss stewardship in general, foster group bonding and set group goals to provide direction and context for the program.

Upon completion of the workshop, participants will be able to

- List at least four habitats present on Georgia's coast such as salt marsh, maritime forest, estuary or beach and compare the biotic and abiotic factors shaping each.
- List conservation challenges facing Georgia's coast.
- Define the term ecosystem service.
- Describe examples of ecosystem services provided by Georgia's coast and propose impacts that could occur if environmental degradation occurs.

Sample Agenda

Friday:

Duration	Agenda Item
15 minutes	Check in
45 minutes	Dinner
30 minutes	Welcome, introductions and pre-tests
60 minutes	Lecture: Introduction Example: Any broad strokes overview of the geology, ecology, biology and human dimensions of the coast

Saturday:

Duration	Agenda Item
60-120 minutes	Lab: Organism study with water quality Example: Plankton and/or invertebrate lab
120 minutes	Field: Habitat exploration by land Example: Salt marsh study, maritime forest hike
60 minutes	Lunch
180 minutes	Field: Habitat exploration by water Example: Dolphin study, trawl, kayak trip
30 minutes	Wrap up, post-test and surveys

Activity 1: Lecture: Introduction to the Coast

Introduce participants to the Georgia Coast with a lecture or discussion. Invite a guest speaker to present this information. Line up a panel of speakers with backgrounds in ecology, geology or history. The goal of this introductory session is to help all participants understand basic coastal processes that inform conversations on conservation challenges and stewardship actions. For example, explain the movement of sand and water along the coast before diving into the benefits and drawbacks of various forms of erosion control.

This lecture includes how proximity to the ocean defines the coastal zone and the range of coastal habitats. For instance, weather, climate, topography, sediment and salinity all define the distribution of animals and plants in the coastal area. Describe the movement of sediment and fresh water from inland to the coast. Show maps showing the whole state to introduce the concept of watersheds and how rivers affect coastal salinity. Highlight coastal water quality, and the impacts on the ocean from land-use practices even far inland.

Introduce types of water movement, waves, currents and tides, along with a basic explanation of the causes of each. Provide examples of how the coast changes over time (e.g., through erosion, sea-level changes, climate changes, etc.) and a discussion of how this relates to human use of coastal areas.

Consider including another discussion highlighting examples of stewardship in Georgia. For example, arrange a panel of citizens and volunteers to share their experiences with citizen science or conservation projects and ways that workshop participants can get involved. Introduce conservation challenges but also include successful actions communities have taken. At minimum incorporate a few points or slides in the lecture that broadly introduce human uses and benefits from the coast, and the stewardship actions participants can take. For ideas refer to the Stewardship Shorts in Appendix A.

Activity 2: Plankton lab

Plankton are free-floating organisms that drift in water and are important to discuss in an introduction to the coast for several reasons (NOAA, 2019). Plankton form the base of the food web in estuaries and the ocean. Phytoplankton, or microscopic marine algae, produce oxygen used by humans to breathe (NCCOS, 2017). Some species of plankton can also cause harmful blooms that impact human health. Zooplankton, or animal-like plankton, are important in the food web. Several commercially important species such as blue crabs and oysters spend part of their lifecycle as zooplankton.

A small lamp, compound microscopes, pipettes, slides and coverslips are useful tools for this lab. Plankton identification guides are available for download from educator resources page on the UGA Marine Extension and Georgia Sea Grant website. Although a compound microscope is ideal, another alternative is a classroom set of foldscopes, a type of inexpensive portable paper microscope. A plankton net is necessary for this activity. Purchase one or follow directions for creating a simple net in the lesson plan "Planet Plankton" in the Estuaries 101 Curriculum, developed by the National Estuarine Research Reserve System, accessible at https://coast.noaa.gov/estuaries/curriculum/.

The Phytoplankton Monitoring Network (PMN) is a citizen science monitoring project that trains volunteers to survey phytoplankton samples weekly to aid in early detection of harmful algal blooms. Invite a plankton monitoring volunteer to introduce survey protocols during the lab so participants can practice those skills. UGA Marine Extension and Georgia Sea Grant and the Burton 4-H Center coordinate weekly monitoring groups. Discuss ways to limit runoff into estuaries to prevent harmful algal blooms.

Activity 3: Salt marsh study

"Salt marshes of the southeastern coast occur in shallow areas between the barrier islands and the mainland and are flooded by tides twice daily. The large tidal range, coupled with the gentle slope of the land, contribute to the extensiveness of the marsh system." (Schoettle, UGA Marine Extension and Georgia Sea Grant). Georgia has 110 miles of coastline and 387,000 acres of marsh, almost a third of the salt marsh on the east coast of the United States (Department of Natural Resources, n.d. d)

Salt marshes are definitive features along the Georgia Coast, providing ecosystem benefits to humans including water filtration, erosion control, food and recreational opportunities. Spend time exploring in the marsh or along the marsh edge. Discuss the formation of salt marsh, the origin of sediment found there, and why salt marshes are typically located on the back side of barrier islands. Provide examples of legislation that protects this habitat.

Describe zonation in a salt marsh and what forces or factors determine these areas. If possible, walk through the different zones from high marsh to low marsh to levee to tidal creek. A boardwalk over the marsh may be a good option for participants with mobility challenges to safely experience the salt marsh.

Identify plants, crabs and snails found in a salt marsh and their adaptations. Show participants how to use an identification tool such as a dichotomous key or field guide and ask them to identify the organisms encountered. Leave time for participants to explore. Include a structured activity such as a salt marsh transect. Periwinkle snails are a prey item for diamondback

terrapins and commonly found in the salt marsh. Encourage participants to drive carefully and watch for terrapins crossing coastal roadways.

Consult Appendix C for connecting with colleges and universities working in Coastal Georgia and researchers who may be interested in sharing their work about salt marsh research. The Sapelo Island National Estuarine Research Reserve website contains great resources for learning about Georgia salt marsh including research posters and publications at https://sapelonerr.org.

Resources for Introduction to the Georgia Coast

Field Guides

Martin, J. (2012). *Life Traces of The Georgia Coast: Revealing the Unseen lives of Plants and Animals*. Indiana Press.

Sanger,D. & Parker, C. (2016). *Guide to the Salt Marshes and Tidal Creeks of the Southeastern United States*, South Carolina Department of Natural Resources.

Witherington, B. and Witherington, D. (2011) *Living Beaches of Georgia and the Carolinas: A beachcombers Guide*. Sarasota, FL: Pineapple Press.

Background Reading

Information about the overall health of Georgia's coastal ecosystems is available in the Coastal Georgia Ecosystem Report Cards, https://coastalgadnr.org/ReportCard

Seabrook, C. (2013). *The World of the Salt Marsh: Appreciating and Protecting the Tidal Marshes of the Southeastern Atlantic Coast*. Athens, GA: University of Georgia Press.

Sutter, P., Pressley, P., Geisen, J. et al. 2018. *Coastal Nature, Coastal Culture: Environmental Histories of the Georgia Coast*. Athens, GA: University of Georgia Press.

Citizen Science

I-naturalist, is a mobile and web app that uses photographs taken by the public to create a database of biodiversity information. This is a commonly used tool for bioblitzes, a type of event, usually involving volunteers, where the diversity and abundance of species are documented in an area, https://www.inaturalist.org/.

Natures Notebook is an observation based project similar to I-naturalist but focused specifically on phenology, or the study of seasonal changes in plants and animals, https://www.usanpn.org/natures_notebook/.

The Phytoplankton Monitoring Network relies on volunteers around the country to sample coastal waters and survey the phytoplankton present in order to aid in early detection of phytoplankton blooms https://coastalscience.noaa.gov

Curricula

Estuaries 101 Curriculum, NOAA's National Estuarine Research Reserve System (NERRS), https://coast.noaa.gov/estuaries/curriculum/

Field Trips

Georgia Sea Turtle Center, Oatland Island Wildlife Center, Sapelo Island National Estuarine Research Reserve, Tidelands Nature Center, Tybee Island Marine Science Center, UGA Marine Education Center and Aquarium

Barrier Island Ecology Workshop

Georgia's coast features a barrier island system with younger outer barrier islands bordering the ocean and older back barrier islands located between the landward edge of the front barrier islands and the mainland. Many of these islands are still relatively wild and undeveloped. Only four outer barrier islands are accessible to the public by road including Tybee Island, Jekyll Island, Sea Island and St. Simon's Island.

The following workshop is designed to provide an educational experience on an undeveloped barrier island with public access by boat. Wassaw, Ossabaw, and Cumberland Islands all provide opportunities for day trips. Contact island or refuge staff for more information about activities available to the public on these islands.

Upon completion of this workshop, participants will be able to

- List at least three of the barrier islands in Georgia.
- Draw or label a cross-section of the habitats found on an undeveloped barrier island.
- Describe challenges facing barrier island ecosystems and provide examples of existing conservation projects or organizations addressing these challenges.
- Identify how to personally contribute to barrier island conservation in the future.
- Demonstrate specific actions that protect these ecosystems such as giving shorebirds space, picking up litter or not walking across dunes.

Sample Agenda

The durations in this agenda are based on traveling by skiff to an undeveloped barrier island. Durations would need to be modified based on location and transportation needs.

Friday:

Duration	Agenda Item
15 minutes	Check in and pre-test
15 minutes	Welcome and Introductions
30 minutes	Dinner
45 minutes	Lecture: Introduction to barrier island ecology
15 minutes	Bathroom and stretch break
45 minutes	Lecture: Current research on barrier Islands Examples: Presenters from Georgia Sea Grant funded research, the Caretta Research Project, US Fish and Wildlife Service, Jekyll Island Authority, NOAA, Georgia Department of Natural Resources.

Saturday:

Duration	Agenda Item
15 minutes	Arrive and organize group, check that participants have appropriate clothing and gear.
60 minutes	Field: Boat trip or ferry ride to barrier island
120 minutes	Field: Cross island hike or field activity with researcher
60 minutes	Field: Picnic lunch and self-guided beach exploration
15- 30 minutes	Field: Natural history circle
60 minutes	Field: Hike back across island (if applicable)
60 minutes	Field: Boat trip back to mainland
15 minutes	Evaluations and wrap up

Activity 1: Cross Island Hike

Hike a cross section of a barrier island, exploring the different habitats found along the way from the salt marsh to the beach. Invite a naturalist or researcher to help interpret the exploration. Invite an island manager to present information on conservation, research and education efforts underway on Georgia's barrier islands. Share the history of the island, any relevant conservation actions that have contributed to the habitats remaining undeveloped, and any opportunities to get involved with volunteering on the island.

For example, if visiting Wassaw National Wildlife Refuge mention the Caretta Research Project, a non-governmental organization that monitors loggerhead sea turtles on the island or invite someone from the organization to present to your group. There are opportunities through Caretta Research Project for participants to help monitor the beaches on Wassaw for a week during sea turtle nesting season. There are also opportunities to volunteer with US Fish and Wildlife Service.

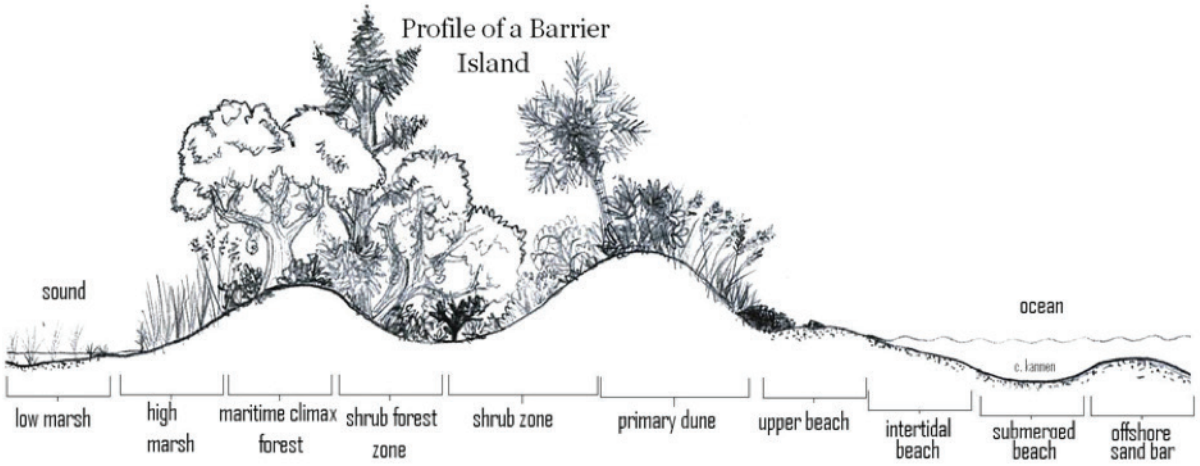


Figure 1: Cross section of habitats found on a Georgia barrier island, C. Kannen, UGA Marine Extension and Georgia Sea Grant.

fication. Explain the ecological significance of the results of these measurements. Stop along the trail to look at characteristic maritime forest plant parts (e.g., leaves, bark) and discuss how these are used to identify plant species. Bring a field guide or identification sheets and encourage participants to practice identifying plant species in pairs or small groups. Measure parameters such as light levels, soil profiling and water salinity.

Discuss the ways in which the present state of the forest is related to human history and land usage. Describe some variables that might affect the vegetation in a given area (e.g., soil type, fire history, drought, airborne salt). Discuss the ways in which invasive species can alter barrier island ecosystems, making it hard for native species to thrive. For example, the ambrosia beetle is an invasive insect that devastated populations of red bay trees throughout the Georgia coast. Spread of invasive species can be decreased by not moving firewood, avoiding releasing unwanted pets into the wild, and using native plants in landscaping.

Activity 2: Beach Exploration

Self-directed inquiry, encouraged by unstructured exploration, is essential in adult programming. Allow participants to explore the beach at their own pace. Participants might choose to bird, walk along the water's edge, or just sit and relax. Invite participants to gather non-living items that interest them to share with the group. Be available for questions or assistance as the group explores. Give a specific time to regroup and designate a central location that participants know to return.

Use the beach as your chalkboard to sketch illustrations in the sand while describing the physical processes that affect barrier island formation. Include the general shape of barrier islands in Georgia and show where salt marsh, forest and beach habitats are typically found. Bring a few magnifiers and compare sand from different areas of the beach. A sieve can be used to sort through sand at the surf's edge in search of fossil shark teeth.

Emphasize that sand and water on the coast move. Discuss the ways in which sediment is carried to the coast by rivers then redistributed by longshore currents, tides and waves. Generally, as longshore currents transport sediment, the north ends of barrier islands naturally wash away, called erosion, while the south ends build up sediment carried from the north, called accretion. To illustrate the longshore current toss an orange or other biodegradable object that floats into the water. Follow the orange visually to determine the direction of longshore currents along the beach. Discuss the challenges that erosion presents on developed barrier islands.

There are numerous extensions for a beach exploration. Highlight the wildlife found on Georgia's beaches, depending on the season and time of day. During the summer arrange for a guided sea turtle walk at night with an individual properly permitted through the Georgia Department of Natural Resources. Alternatively, engage participants in research techniques such as creating a beach profile. The lesson plan "Measuring Beach Profiles" by Phyllis and George Rumpp provides simple directions for this activity and is available on the Bridge Ocean Education Teacher Resource Center maintained by the Virginia Institute of Marine Science, http://www2.vims.edu/bridge/. A marine debris cleanup is another conservation extension. Use the Marine Debris Tracker app to record the types and quantities of litter found.

Activity 3: Natural History Circle

Draw a circle in the sand and invite participants to place items inside that are found during the beach exploration. Sort items according to whatever plan makes sense to the group. Groupings could be made according to common physical characteristics, phylum, size, natural vs human-made. Discuss and identify the items and connect each to relevant natural history or conservation messages. Familiarize yourself beforehand with the life histories of commonly found animals and shells. Bring a field guide for reference.

A few field guides that may be useful include Life Traces of the Georgia Coast by Anthony J. Martin and Living Beaches of Georgia and the Carolinas: A Beachcomber's Guide by Blaire and Dawn Witherington. You can also download and laminate single page coastal guides found on Marine Extension and Georgia Sea Grant's website educational resources page https://gacoast.uga.edu.

Discuss any litter found on the beach and include impacts of marine debris on coastal wildlife. More importantly, discuss the daily behaviors people can adopt to alleviate the impacts of marine debris on aquatic systems and the organisms living there. For more information and ideas on marine debris check out the marine debris activities listed under educator resources at https://gacoast.uga.edu. Microplastics impact even the tiniest of marine organisms. Very small plastics pieces and fibers that cannot be seen without magnification are produced when plastics break down. Learn more about microplastics research in Georgia at https://www.skio.uga.edu/.

Resources for Barrier Island Ecology

Field Guides

Schoettle, T. (1996). A Guide to a Georgia Barrier Island. St. Simons Island, GA: Watermarks Publishing and Printing.

Witherington, B. and Witherington, D. (2011) Living Beaches of Georgia and the Carolinas: A beachcombers Guide. Sarasota, FL: Pineapple Press.

Zydler, N. and Zydler T. (2004) The Georgia Coast: Waterways & Islands. Port Washington, WI: Sea Worthy Publications.

Background Reading

Bailey, C. W. B. and Bledsoe, C. (2001) God, Dr. Buzzard, and the Bolito Man: A Saltwater Geechee Talks about Life on Sapelo Island. New York, NY: Anchor Books, A Division of Random House, Inc.

Harlan, W. (2014) Untamed: The Wildest Woman in America and the Fight for Cumberland Island. Grove Atlantic, Inc.

The Georgia Department of Natural Resources, Coastal Resources Division, has developed a series of Know the Connection fact sheets including a cross section of a barrier island, https://coastalgadnr.org

Kutzler, E. and Stuckey, J. (2016) Ossabaw Island: A Sense of Place. Mercer University Press.

Citizen Science

The Caretta Research Project is a hands-on research, conservation and education program dedicated to studying and protecting loggerhead sea turtles on Wassaw National Wildlife Refuge, https://www.carettaresearchproject.org/

The Marine Debris Tracker App is a mobile app which can be used to document quantity and types of debris found, http://www.marinedebris.engr.uga.edu/

Curricula

The following curricula are not written documents but rather courses offered for adults in coastal Georgia.

Georgia Master Naturalist, https://www.warnell.uga.edu/outreach/georgia-master-naturalist

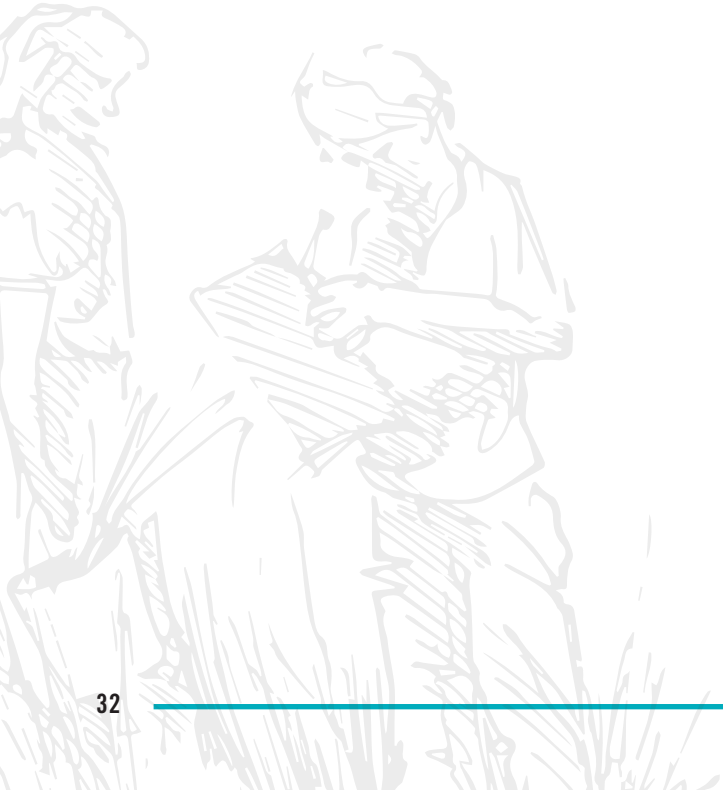
Low Country Master Naturalist, https://www.clemson.edu/extension/mn/training/lowcountry.html

Naturalist 101 Series, http://www.onehundredmiles.org/naturalist-101/

Aquatic WILD is a K- 12 curriculum that contains several activities relating to marshes that work well with adult audiences. In Georgia, Aquatic WILD training workshops are conducted by Georgia Department of Natural Resources. http://www.gaprojectwild.org

Field Trips

Cumberland Island National Seashore, Jekyll Island, Ossabaw Island State Heritage Preserve, Tybee Island, Wassaw National Wildlife Refuge



Coastal Birding Workshop

From snowy egrets to bald eagles, a wide variety of birds rely on estuaries and salt marshes for nesting, resting and feeding. In 2017, Coastal Georgia was designated as a location of hemispheric importance. Several shorebird species such as red knot and piping plover depend on Georgia's barrier islands and estuaries as stopover sites during migration (WHSRN, 2017). Shorebirds are highly sensitive to disturbance. It is critical that beachgoers are informed about how to respectfully share the beach with these animals.

Birds are also found in areas that humans use regularly such as in backyards and urban areas, making them a relatable subject for programming. When designing birding programs tailor activities for an adult audience. Is the goal to introduce new people to birding? Or perhaps engage existing experienced birders in citizen science activities?

Upon completion of the workshop, participants will be able to

- List at least five bird species found in Georgia.
- Describe citizen science and provide examples of bird related projects.
- Describe at least one challenges and conservation effort related to birds occurring locally
- Propose an idea of what they can do personally or collectively to conserve coastal birds.
- Describe specific benefits that coastal habitats provide coastal birds.
- Demonstrate identifying a bird using a field guide.
- Behave respectfully on the beach around shorebirds and share the reasons such behavior is needed.

Sample Agenda

Friday

Duration	Agenda Item
60 minutes	Dinner and pre-test
30 minutes	Welcome, icebreaker and introductions
60 minutes	Lecture: Bird conservation Example: Invite a professional working in conservation or management of coastal birds to speak

Saturday

Duration	Agenda Item
60 minutes	Lecture: Basic bird identification Examples: General bird ID, ID of specific groups of birds such as shorebirds
30 minutes	Lab: Using binoculars Example: Practice indoors or out, gear to try
60 minutes	Lecture / Lab: Backyard birding Example: Backyard Feeder Watch, gardening for birds, Bluebird nest boxes
60 minutes	Lunch
120-240 minutes	Field: Birding in the field Example: Field trip to a wildlife refuge or state park, birding by boat or by land, participate in a bird survey such as the international shorebird survey or e-bird
30 minutes	Wrap up, post-test and surveys

Activity 1: Basic Bird Identification

The basic skills needed for birding include species identification and the proper use of binoculars. Building skills takes practice so include enough time for participants to try these skills with the support of an experienced birder.

For new birders, cover the basic features of external bird anatomy that are helpful when using a field guide. Introduce broad characteristics which are commonly used to identify species including size, shape, color pattern, markings, call or behavior (McGowen,2014). Describe how to use a field guide. Provide photographs for participants to practice identifying using a field guide. Refer to the Cornell Lab of Ornithology, http://www.birds.cornell.edu/ for resources on teaching bird identification.

Be realistic about the number of species participants are expected to identify within one class or workshop. Focus on just a handful of the common birds found at the site where birding is planned, whether it be a beach, maritime forest or backyard bird feeder. Focus on broad groups of birds rather than specific species. For example, when birding on the beach practice identifying peeps, plovers and tringines (McGowen, 2014).

Choose a few birds to identify and focus on ones that are threatened or endangered. American Oystercatchers are a distinctive, relatively large bird that is easy to learn. The American Oystercatcher Working Group, http://amoywg.org, bands and conducts re-sighting surveys in Georgia. Visit their website to see a tracking map, meet some of the birds and learn more about conservation efforts. Red knots are another species to learn how to identify. These birds will migrate

thousands of miles and use Georgia's beaches and oyster scrapes as stopover locations. Often, large numbers of red knots can be seen in Georgia during April and May when horseshoe crab spawning is occurring, as the birds rely on horseshoe crab eggs for food.

Activity 2: Birding in The Field

Whether birding by boat or land, coastal Georgia offers many field locations to explore. Harris Neck National Wildlife Refuge is a hot spot for wood storks and other freshwater species of wading birds and waterfowl. The south end of Jekyll Island and the north end of Tybee Island are both publicly accessible areas for observing shorebirds. See Appendix E for additional ideas for field trips on public lands.

Before entering the field, go over group expectations and goals. Emphasize the respectful behavior to use around birds. Refer to specific actions in the Appendix A: Stewardship Shorts. Introduce a variety of gear used in birding including binoculars, spotting scopes or cameras. Discuss how these tools allow birders to observe without disturbing.

Stay alert to the group's comfort level in the field. Experienced birders are often used to spending long hours on focused birding, but new birders may not be. Be mindful of heat during the summer months and in areas with limited or no shade. If the group includes individuals with a range of skill levels, pair more experienced birders with new birders.

One useful identification strategy for new birders is to focus on the identification of a handful of common and easily recognizable species in different size classes. For example, the ruddy turnstone is a small shorebird, the willet is medium-size and the great blue heron is one of the largest coastal birds in Georgia. All have markings and features that are fairly easy to identify. Encourage participants to observe through binoculars and point out distinguishing features.

A bird's behavior is another useful way to identify species observed in the field. Encourage participants to look for behavioral cues using some of the questions below.

- How would you describe their movement?
- Are they flying, wading or perching?
- What type of habitat are they utilizing?
- Do you notice the birds interacting with other birds?

Activity 3: Participate in Bird Surveys

Incorporate citizen science activities and conservation topics into birding programs for additional emphasis on stewardship. Invite a researcher, manager or other professional to present current work related to shorebirds.

Engage experienced birders in an international shorebird survey by connecting with Manomet, Georgia Department of Natural Resources or a participating chapter of the National Audubon Society. The survey protocol requires training and a four-hour time frame, two hours before and after a high tide during the months of spring and fall migration. This activity is best used with individuals who are already familiar with shorebird identification or in a program occurring over a longer period with plenty of time for practicing and building confidence in the skillset.

E-Bird, managed by the Cornell Lab of Ornithology is one of the world's largest citizen science projects (Sullivan, 2009). Birders complete checklists lists of the species observed in the field, including location, time, and birding method. Birders can track the birds seen while contributing to conservation and science. The checklists are made available to the public and are used to create a global dataset on bird distribution, abundance and habitat association. This data informs conservation decisions and is used in peer reviewed publications.

Use E-bird to keep a group list of observed species during your birding trips or any outdoor exploration with the public. The data collected contributes to a better understanding of bird populations around the world. Remember to start the application in a location with Wi-Fi before heading into the field in order to create a map of your trip. Checklists can also be completed on paper and entered later on the computer. Access data and maps online to share with the public and use as a teaching tool for an indoor extension of the activity. Use the app or online portal to help plan a birding field trip by looking the locations of local bird sighting hotspots.

Resources for Coastal Birding

Field Guides

Bull, J. and Farrand, J. 1977. The Audubon Society Field Guide to North American Birds: Eastern Region, New York, NY: Alfred Knopf Publishing

The Merlin Bird Identification App, Cornell Lab of Ornithology, http://merlin.allaboutbirds.org

Wilson, J. (2011) Common Birds of Coastal Georgia. Athens, GA: University of Georgia Press

Background Reading

All About Birds is a website developed by the Cornell Lab of Ornithology with photographs, sound recordings, identification and natural history information by species, http://www.birds.cornell.edu/

The Georgia Department of Natural Resources Wildlife Division website includes information about state management of bird species such as the bald eagle, https://georgiawildlife.com/

Citizen Science

Christmas Bird Count, https://www.audubon.org/conservation/science/christmas-bird-count

E-Bird, https://ebird.org/home

International Shorebird Survey, Manomet, https://www.manomet.org,

Project Feederwatch, https://feederwatch.org/

Curricula

Master Birder is a six week in-person course offered by One Hundred Miles, Manomet and Georgia Department of Natural Resources, http://www.onehundredmiles.org/masterbirder/

The Cornell Lab of Ornithology has a series of online webinars covering shorebird identification, http;//www.birds.cornell.edu/

Flying WILD is supplemental curriculum created by Project WILD that focus on bird an is great resources for activities to do with groups or at festivals to talk about birds. In Georgia, Flying WILD training workshops are conducted by Georgia Department of Natural Resources. https://www.gaprojectwild.org

Field Trips

Colonial Coast Birding Trail Sites, Fort Pulaski National Monument, Georgia Southern University Center Lamar Q. Ball, Jr. Raptor Center, Harris Neck National Wildlife Refuge, Tybee Island, Wassaw National Wildlife Refuge

CONTENT THEME: Recreational Use of Coastal Resources

Georgians benefit from coastal ecosystems in several ways. They provide food and improve quality of life. Responsible recreational use of coastal resources is always encouraged, and may include birding, kayaking or fishing. The following workshops focus on recreational activities related to sustainable harvesting and consumption of seafood. The four workshop topics include saltwater fishing, Georgia oysters, Georgia shrimp and Georgia blue crabs.

Fishing, crabbing, oystering and cast netting are all engaging ways to connect the public with natural resources on the coast. Be sure to follow regulations and obtain a recreational fishing license. All participants over the age of sixteen are required by Georgia law to have a fishing license as well. License purchases help support coastal conservation efforts in the state. Saltwater anglers will also need to obtain a free Saltwater Information Permit from https://gooutdoorsgeorgia.com. Refer to the Georgia Department of Natural Resources Special Permits webpage to determine if a special permit is required (Georgia Department of Natural Resources. (n.d.b))

Safety should come first for any activity near water. Practice skills before teaching others. Or enlist the help of experts to instruct. Rinse any gear used in salt water immediately afterwards with fresh water and allow to dry completely to prevent rust and mold. Be mindful of heat related emergencies, particularly during summer months and in areas with little or no shade.

Saltwater Fishing Workshop

Saltwater fishing is a popular recreational activity and this workshop provides a way to educate adults about implementing responsible and sustainable fishing practices that protect and preserve coastal resources.

Upon completion of the workshop, participants will be able to

- Demonstrate how to rig a fishing rod, cast and properly handle fish.
- Identify common types of fishing gear and proper fish handling practices.
- Describe how water quality and healthy estuarine habitats impacts fish populations.
- Describe how management guidelines protect fish populations.
- Properly measure and identify common fish species.
- Determine if a fish is legal and safe to keep for food.

Sample Agenda

Duration	Agenda Item
60 minutes	Dinner, welcome and pre-test
60 minutes	Lecture: Sustainable saltwater fishing Examples: Fisheries management, best practices for choosing gear and handling fish during catch and release, fish habitat restoration, fishing line disposal
60 minutes	Fish identification lab

Saturday

Duration	Agenda Item
60 minutes	Lecture: Planning a fishing trip Example: Where, when and how of fishing
60-90 minutes	Lab: Introduction to gear Example: Practice knots, tying hooks, different styles of rigs, dehooking on boxes
240 minutes	Field Trip: Fishing Example: Rod and reel, cast net, seining
60 minutes	Lab: Fish cleaning
30 minutes	Wrap up, post-test and surveys

Activity 1: Introduction to Gear

The proper rigging and use of fishing gear are essential skills to teach new anglers. Before fishing with the group, spend time teaching participants how to tie fishing knots. Then, provide time for them to practice rigging their own gear, casting the line, and removing hooks. Provide examples of commonly used gear types and make sure to share information about Georgia's fishing regulations.

To teach participants how to tie fishing knots, remember that individuals have different learning styles. Describe what to do at each step, provide a slide or handout with step-by-step visuals, and have materials, like fishing line and hooks, so they can practice tying the knot themselves. Consider pairing newer anglers with more experienced anglers during the gear lab.

The Take Me Fishing website, developed by the Recreational Boating and Fishing Foundation, has some great examples of common rigs, knots and tackle. Use this site for visuals of rigs or to look up state specific information on fishing spots, common fish species and fishing forecasts https://www.takemefishing.org/saltwater-fishing/saltwater-fishing-tackle-knots/

Discuss the effects of each method of rigging and gear type on fish stress and mortality. Invite an expert in fisheries management to present the importance of using proper handling practices and following fishing regulations in order to sustain the sport. Pair the lecture with hands-on opportunities to use tools that assist in proper handling.

For example, a de-hooking device is one tool to reduce handling time for fish and minimize mortality among released fish. Have participants practice first on a rubber fish model or a cardboard box. Have participants compare circle and J hooks. Circle hooks are less likely to gut hook a fish because they typically catch in the corner of the animal's mouth.

Fish may experience barotrauma, or damage caused by gas expanding in their body as a result of pressure changes as they are brought rapidly to the surface from deep water. If you're going to include offshore fishing strategies, consider recommending using a descending device to return the fish to depth before releasing. For more information and demonstration videos about treating barotrauma visit Florida Sea Grant's website, https://catchandrelease.org or Georgia

Department of Natural Resources Fish Smart webpage, https://coastalgadnr.org/FishSmart.

Activity 2: Catch and Release Fishing

Practice proper fish handling practices while catch and release fishing. Florida Sea Grant has an extensive online resource with information about best practices for catch and release fishing at http://catchandrelease.org/. Stingrays and small sharks are commonly caught species when fishing inshore in coastal Georgia. Comfort in handling these animals safely and properly is essential.

(1) Practice casting on land first. Remind anglers to be mindful of hook safety. (2) Encourage participants to bait their own hooks and release fish. Model these skills and be available to assist as needed. (3) When fishing from skiffs or docks, ask participants to gently lower their line into the water instead of an overhead cast. The tide will take the line out naturally. Avoid overhead casts to reduce the risk of injuries. Space participants so lines are less likely to get tangled. Use circle hooks, a knotless rubber net, dehooking devices and wet hands to minimize stress on released fish.

If gear or experience with saltwater fishing is lacking, consider arranging a field trip to a site that offers fishing classes. Check with local fishing clubs, Georgia Department of Natural Resources, marinas, local Coastal Conservation Association chapters, aquariums, fish hatcheries and environmental education centers to see what options are available.

Activity 3: Fish Cleaning and Filleting

Recreational anglers may be interested in fishing for food. New anglers need to know how to properly identify and measure a fish. Fishing regulations are species specific and involve minimum or maximum size requirements. Similarly, guidelines for safe seafood consumption often vary depending on the fish species.

If the catch will be consumed, consult safe seafood consumption guidelines at https://epd.georgia.gov/fish-consumption-guidelines. Mercury can accumulate in the tissues of fish and concentrate in fish. UGA Marine Extension and Georgia Sea Grant also offer a mercury testing program using hair clippings. Find out more at https://gacoast.edu. The mercury testing is open to anyone interested and particularly recommended for pregnant women or those planning a pregnancy.

Start with a fish identification lab. Purchase or collect sample fish of commonly found species. Printed and laminated illustrations or photographs of fish species will work as well. Participants should use a dichotomous key, field guide or other identification tool to identify the species and determine if it is legal and safe to keep for food. Identify all fish in the field.

Demonstrate how to fillet a fish for eating. If supplies allow, have participants practice filleting fish. Obtain frozen fish as backup for the demonstration in case fish are not caught during the program. Pull the frozen fish out to thaw before heading into the field. The Seafood at Your Fingertips website developed by Florida Sea Grant, includes directions for how to filet a fish, https://www.flseagrant.org/seafood/seafoodatyourfingertips/.

Fish carcasses can be shared at drop-off locations around the coast as part of the sportfish carcass recovery program coordinated by the Georgia Department of Natural Resources. The head of the fish carcass contains an ear bone (otolith) that is often used to age the fish. The length of the fish can determine age as well. Anglers contributing specimens for researchers to measure and age help advance understanding of fish populations. The data has been used in stock assessments, which determine how many fish can be sustainably harvested (Georgia Department of Natural Resources, Marine Sportfish Recovery Project)

Even if participants don't catch fish during the workshop, share the Georgia Seafood Directory, available at georgiaseafood.org, to locate local retailers and wholesalers selling fish to eat.

Resources for Saltwater Fishing

Field Guides

Dalmier, K. (2007) Fishing Georgia: An Angler's Guide to More than 100 Fresh and Saltwater Fishing Spots. Lyons Press.

Robins, C., Ray,G., and Douglas, J. (1986) A Peterson Field Guide to Atlantic Coast Fishes of North America. New York, NY: Houghton Mifflin.

Background Reading

For information about fisheries management and conservation read more at the Atlantic States Marine Fisheries Council, website, http://www.asmfc.org/

The Georgia DNR sportfish regulations booklet is updated annually and includes fishing regulations and safety guidelines for consuming fish caught in Georgia. Regulations for recreational crabbing, oystering and cast-netting of shrimp are included here as well, https://gadnr.org/

Background information on what the saltwater information permit is and how to obtain one is available on the Georgia Department of Natural Resources Coastal Resources Division website, https://coastalgadnr.org/SIPPermit

The Georgia Outdoor Map is interactive online map that includes public boat ramps, fishing piers, coastal charts https://www.georgiaoutdoormap.com/

The Marine Fishes of Georgia website isn an extension of Georgia department of Ntural reources fish posters and includes life history, food value, fishing methods, bait and tackle for marine fish species, http://www.marinefishesofgeorgia.org/

Citizen Science

Cooperative Angler Tagging Program and Marine Sportfish Carcass Recovery Project, Georgia Department of Natural Resources, Coastal Resources Division, https://coastalgadnr.org/

For information about citizen science that contributes to fisheries management and conservation visit the South Atlantic Fishery Management Council website, http://safmc.net/citizen-science-initiative

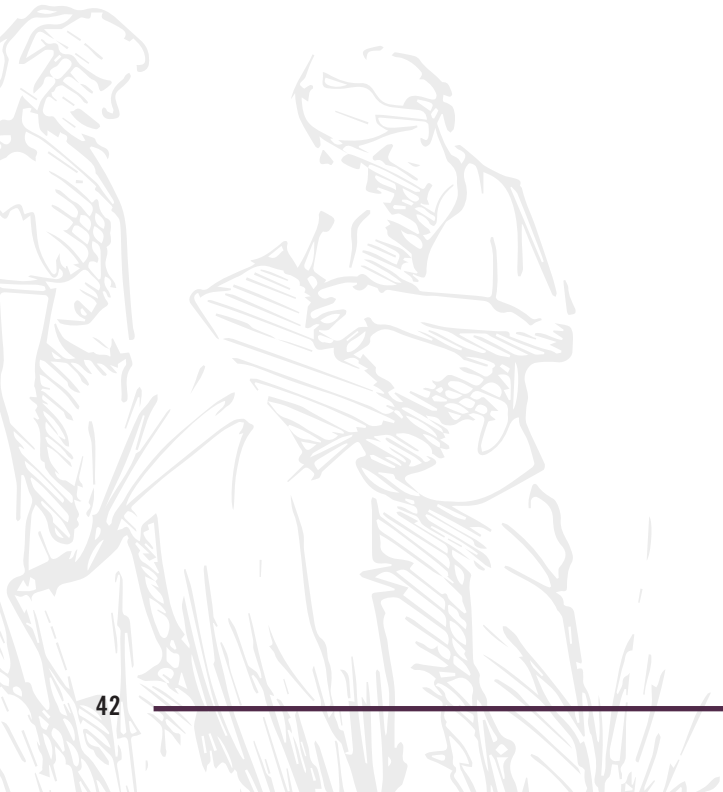
Curricula

Catch and Release Fishing, Florida Sea Grant, http://www.catchandrelease.org/

The Take Me Fishing, Recreational Boating and Fishing Foundation, https://www.takemefishing.org/saltwater-fishing/saltwater-fishing-tackle-knots/

Field Trips

Go Fish Education Center, UGA Marine Education Center and Aquarium



Georgia Oysters Workshop

In Georgia, oysters are a keystone species and defined as an organism that "produces a major impact on its ecosystem and is considered essential to maintaining optimum ecosystem function or structure" (Keystone, 2019). Important ecosystem services provided by oysters include water filtration, reduced erosion, habitat, and food for both humans and wildlife. Oysters are also culturally and historically significant to Georgia. Native Americans created structures called shell rings out of oyster shells that date to approximately 3,000-4000 years ago (National Park Service, 2002).

Upon completion of the workshop, participants will be able to

- Demonstrate shucking an oyster.
- Identify the external and internal anatomical features of an oyster.
- Describe the life cycle of an oyster.
- Describe the significance of oysters in local coastal economies and cultures.
- Describe current oyster aquaculture efforts.
- Explain why oysters are a keystone species in Georgia estuaries and list the ecosystem services they provide.
- Identify plankton and measure water quality parameters including salinity, temperature and sedimentation.
- Be able to identify at least one action that individuals can take to protect water quality.

Sample Agenda

Duration	Agenda Item
30 minutes	Check in, pre-test and introduction
60 minutes	Lecture: Introduction to oyster biology and ecology
120 minutes	Lab: Oysters Example: Oyster filtering, Water quality, Oyster dissection
30 minutes	Lecture: Oyster aquaculture and research
60 minutes	Field trip: Oyster hatchery tour
45 minutes	Lunch
120 minutes	Field trip: Visit oyster farming research area by boat
15 minutes	Wrap up, post-test and surveys

Activity 1: Oyster Lab

Engage participants in a hands-on lab focused on the natural history of oysters. Dissect an oyster to examine the anatomical features. Relate form to function by discussing how oysters use each part of their bodies to make a living. In particular, look at the way oysters use their gills to filter water for food. Examine the gill structure and set up live oysters in water with an algae paste to observe the filtration. On average, an adult Georgia oyster filters 1.5 gallons of water an hour (Georgia DNR, 2017). As filter feeders, oysters are also impacted directly by water quality issues such as pollution and stormwater runoff. Discuss ways to minimize pollution.

More detailed lesson plans on oyster dissections, filtration experiments and other oyster labs are included in the GEORGIA Education Program Curriculum, developed by UGA Marine Extension and Georgia Sea Grant. The "Fanatic Filterers" lesson plan in the GEORGIA curriculum aligns well with a stewardship workshop as it focuses on oyster filtration with connections between high water quality and healthy oysters (Sanders and Sweeney Reeves, 2007). The Estuaries 101 Curriculum, developed by the National Estuarine Research Reserve System, includes a lesson plan "Ode to an Oyster" with more detailed dissection directions.

Extend this lab with a field trip to a living oyster reef. Walk near the salt marsh or plan a boat trip at low tide to see living oyster reefs. Encourage participants to use what they learned about oyster anatomy and life cycles in the lab to explain the location of oysters within the estuary. Remind them of the ecosystem services discussed in the lab and look for evidence of these in the field. Look for animals using the reef for habitat or eating oysters. Schedule oyster related lab and field activities with UGA Marine Education Center and Aquarium, https://gacoast.uga.edu.

Activity 2: Hatchery Tour

Schedule a tour of the state's first oyster hatchery at the UGA Shellfish Research Lab.

Researchers at the lab are working with oyster farmers to study how best to grow single oysters better suited for eating on the half shell. The farmed oysters are the same species as the wild oysters but raised and handled in a way that produces a single oyster rather than a clump. Find out more at https://gacoast.uga.edu.

Activity 3: Oyster Roast

Learn while you eat! Use an oyster roast to review anatomy, discuss the cultural importance of oysters and provide information about how participants can find and purchase local oysters to eat. If possible, compare the roasted taste of wild oysters to that of farmed single oysters from Georgia or South Carolina. Visit the Georgia Seafood Directory, at georgiaseafood.org to find local wholesalers and retailers in Georgia. Schedule lunch at a restaurant serving local seafood products.

Always follow safety guidelines when cooking with shellfish. Eating raw and undercooked shellfish can cause illness. Learn about Vibrio vulnificus, an infection from the consumption of raw shellfish at http://www.safeoysters.org/. The site also includes educational materials, recipes and consumer safety information for buying, storing and cooking oysters.

Invite a chef, shucker, researcher or grower to speak about their work in the oyster industry. Find out more about oyster farming in the South at https://www.oystersouth.com/. Learn more about the historical and cultural importance of oysters with a trip to the Pin Point Heritage Museum, the site of an oyster canning factory near Savannah, Georgia.

Discuss the size requirements and designated locations where recreational shellfish harvest is allowed in Georgia. To harvest wild oysters be sure to follow all fisheries regulations and advisories. These include obtaining a fishing license, gathering from designated shellfish harvest areas and staying below minimum catch limits. Consult Georgia Department of Natural Resources for the most current regulations. And always follow safety guidelines for storing and preparing shellfish. Find out more at Safe Oysters, https://safeoysters.org. Safe Oysters is a website developed by UGA Marine Extension and Georgia Sea Grant focused on information related to vibrio vulnificus infection. The website also includes information about purchasing, storing, preparing and cooking oysters.

Roast the oysters for the group if you are certified to serve food to the public. Boil water in a large pot that has a removable strainer with a handle. Remove any oysters with gaping shells. These are dead and should not be eaten. Add the oysters and steam until most of the shells open. Serve while hot. Coastal living magazine includes four recipes for cooking oysters, https://www.coastalliving.com/food/seafood-basics/how-to-cook-oysters, (Coastal living, n.d.)

Resources for Georgia Oysters

Field Guides

Ruppert, E. E, & Fox, R. S. (1988). Seashore Animals of the Southeast, Columbia, SC: University of South Carolina Press.

Georgia Seafood Directory, https://gacoast.uga.edu/outreach/resources-outreach/georgia-seafood-directory/

Background Reading

Gallant, A. J. (2018) A High Low Tide: The Revival of a Southern Oyster, University of Georgia Press.

Gallant, Andre. (2019). Hope on the Half Shell, Garden and Gun. Retrieved from https://gardenandgun.com/feature/hope-half-shell/

Oyster South is a non-profit organization comprised of chefs, restaurant owners and shellfish growers that promotes and provides information about southeastern farmed oysters, https://www.oystersouth.com

Citizen Science

Coastal Georgia Adopt-A-Wetland is a monitoring program that includes surveys in brackish and saltwater wetlands, https://gacoast.uga.edu/education/adult-education/adopt-a-wetland/

UGA's Oyster Restoration Project engages the public in collecting oyster shells and bagging shells for use in living shorelines and reef restoration, https://gacoast.uga.edu/education/adult-education/oyster-restoration/

Curricula

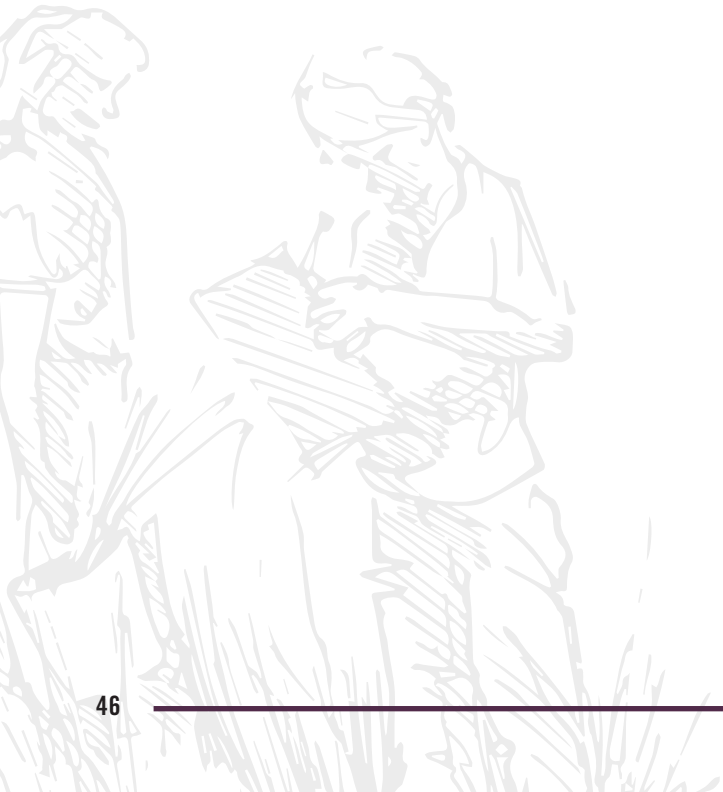
Coastal Georgia Adopt-A-Wetland Curriculum https://gacoast.uga.edu/wp-content/uploads/2016/05/AAW_Curriculum.pdf

Georgia's Wetland Treasures, http://knowtheconnection.com/images/stories/documents/GA_Wetland_Treasures.pdf

Ode-to-an-Oyster curriculum, NOAA, https://coast.noaa.gov/estuaries/curriculum/an-ode-to-the-oyster.html

Field Trips

Pin Point Heritage Museum, UGA Shellfish Research Lab and Oyster Hatchery, Skidaway State Park, Sapelo Island



Georgia Shrimp Workshop

Shrimp are culturally, economically and ecologically important in Georgia as the state's most recognized and valuable commercial fishery. Georgia shrimpers were influential in developing sea turtle excluder devices, a part of the shrimp net that reduces bycatch when trawling. Cast netting for bait shrimp is a common recreational activity.

White and brown shrimp are the most common species caught in Georgia. Stay up to date on information about U.S. shrimp fisheries and find descriptions of these shrimp species at Fish Watch, https://www.fishwatch.gov/, maintained by the National Oceanic and Atmospheric Administration.

Upon completion of the workshop, participants will be able to

- Head a shrimp and identify the external anatomical features of the shrimp.
- Describe the life cycle of a shrimp.
- Explain why Georgia estuaries are important to healthy shrimp populations.
- Describe the significance of shrimp in local coastal economies and cultures.
- Describe current shrimping effort and management of the fishery.
- Demonstrate cast netting.
- Be able to identify at least one resource for purchasing or harvesting local shrimp as consumers.

Sample Agenda

Duration	Agenda Item
30 minutes	Check in, pre-test and introduction
60 minutes	Lecture: Biology and management of Georgia shrimp
60 minutes	Field or lecture: Shrimping in Georgia Examples: Tour of shellfish processing plant, tour UGA Marine Extension and Georgia Sea Grant Brunswick Station invite a shrimper to come speak, show documentary
60 minutes	Lab: Cast nets
60 minutes	Lunch, including local shrimp on the menu
60 minutes	Lecture: Black gill update or other current research
180 minutes	Field: Trawl with research activities Example: Black gill sampling, sorting and recording catch
30 minutes	Wrap up, post-test and surveys

Activity 1: Cast Nets

Teach participants how to throw a cast net to catch shrimp. Practice on land first. Then, find a shallow area near shore to practice in the water. For more information search "cast net" on the Take Me Fishing website, https://takemefishing.org, for a video tutorial and step by step directions. Rinse gear in fresh water immediately following use in salt water.

Mending damaged nets is a necessary skill in any fishing activity. Practice knots used in net mending. Ask someone experienced in net mending to demonstrate the technique. Give each person a small square of net to mend.

Cast netting for bait shrimp requires a recreational fishing license which participants can purchase through Georgia Department of Natural Resources, local bait shops or online.

Activity 2: Estuary Trawl

Arrange an estuary trawl to provide participants with a first-hand experience of harvesting shrimp and reinforce information about the natural history and management of shrimp in Georgia. Shrimp are caught commercially using trawling gear. While it is not usually feasible to ride on a commercial shrimping boat, there are several research and educational vessels that offer public trawls. The trawler drags a cone shaped net behind the boat to catch organisms living along the bottom. When the net is pulled on board, participants help sort and record the catch.

Contact UGA Marine Extension and Georgia Sea Grant to book a trawling trip on the R/V Sea Dawg or R/V Georgia Bulldog. For university groups, contact the UGA Marine Institute on Sapelo Island to see if boat trips on their trawling vessel are currently available. There are private charter boats that offer trawling as well.

Participation in a trawl is useful for learning about the shrimping industry and provides the opportunity to discuss the history of shrimping in Georgia. The history of Turtle Excluder Device (TED) designs is a long one in coastal Georgia. Shrimpers, scientific researchers and extension agents collaborated over time to test and refine TEDs for both efficiency and low environmental impact. Tour the warehouse at the UGA Marine Extension and Georgia Sea Grant Brunswick Station to see examples of historic and current turtle excluder and bycatch reduction devices tested by the R/V Georgia Bulldog. The station also features a collection of miniature examples of various styles of trawling nets and a wealth of information on the history of shrimping on the Georgia coast.

An estuary trawl highlights estuary habitat and reinforces the connection between a healthy coastal ecosystem and seafood species abundance. Shrimp are ecologically important as a prey item for a wide variety of coastal organisms, including humans.

By sorting the catch, recording data and measuring water quality participants gain confidence in research skills applicable to many citizen science projects. Identify current citizen science projects, such as the Shrimp Black Gill Tracker App, developed by UGA Skidaway Institute of Oceanography, and UGA Marine Extension and Georgia Sea Grant.

To provide participants context before the trawl watch a documentary about the shrimp indus-

try. A Century of Shrimping: Portrait of an American Industry is a 20-minute film developed by UGA Marine Extension and Georgia Sea Grant that provides a brief introduction to the history of the fishing industry and is publicly accessible on YouTube. Shifting Baselines Shifting Baselines written by Mehment Caglayan and directed by Cathy Sakas is another documentary about the state of Georgia's shrimp industry. Contact UGA Marine Extension and Georgia Sea Grant for assistance locating either of these films.

Activity 3: Shrimp Boil

Sample Wild Georgia Shrimp and use the meal as an educational opportunity. Order heads-on shrimp from a local retailer and lead a basic anatomy lesson before eating. Refer to Varden, Colemean and Decotes's Louisiana Sea Grant's 1999 publication Shrimping in Louisiana for a labeled diagram of shrimp anatomy and a map of the life cycle of shrimp within the estuary. Point out the rostrum or spike protruding on the head. Show participants how to determine the sex of a shrimp and let them practice identifying males and females. Invite participants to sort shrimp into those with noticeably darker gills and those whose gills look clear. Note that shrimp with black gill are still delicious and safe to eat.

Discuss distinguishing features that can be used to identify the species. For instance, the antennae of white shrimp are 2.5 to 3 times the length of the animal's body (https://www.fishwatch.gov.) Run a fingernail along the rostrum to feel the groove there. Brown shrimp have a groove that stretches the length of the rostrum. A similar groove on white shrimp is shorter than the rostrum. Invite a fisherman to join the group to eat and talk with participants in a less formal setting.

If you are certified to serve cook a shrimp boil or low country boil and practice heading, peeling and deveining shrimp in the process. For more directions on cooking demonstrations and visuals of how to prepare shrimp explore the Seafood at Your Fingertips website developed by Florida Sea Grant, https://www.flseagrant.org/seafood/seafoodatyourfingertips/.

Resources for Georgia Shrimp

Field Guides

Georgia Seafood Directory, https://gacoast.uga.edu/outreach/resources-outreach/georgia-seafood-directory/

Ruppert, E. E, & Fox, R. S. (1988). Seashore Animals of the Southeast, Columbia, SC: University of South Carolina Press.

Trawling Identification Guide, UGA Marine Extension and Georgia Sea Grant, https://gacoast.uga.edu

Background Reading

A Century of Shrimping: Portrait of an American Industry, is a twenty minute film developed by UGA Marine Extension, https://www.youtube.com/watch?v=n3ji62ZWoJQ

For information about the Georgia Shrimp Association and local industry visit http://www.wildgeorgiashrimp.com/home.html.

For images of shrimp anatomy and lifecycle visit South Carolina Department of Natural Resources website, http://www.dnr.sc.gov/marine/species/whiteshrimp.html

To learn more about the history of Turtle Excluder Devices visit thte UGA Marine Extension and Georgia Sea Grant website, https://gacoast.uga.edu/research/major-projects/ted/

NOAA Fisheries manages a website, Fish Watch, that includes profiles of all United States fisheries, including species profiles and catch data, https://www.fisheries.noaa.gov/ and https://www.fishwatch.gov

Citizen Science

Shrimp Black Gill Tracker App, http://shrimp.gii.uga.edu/sbgguide.pdf

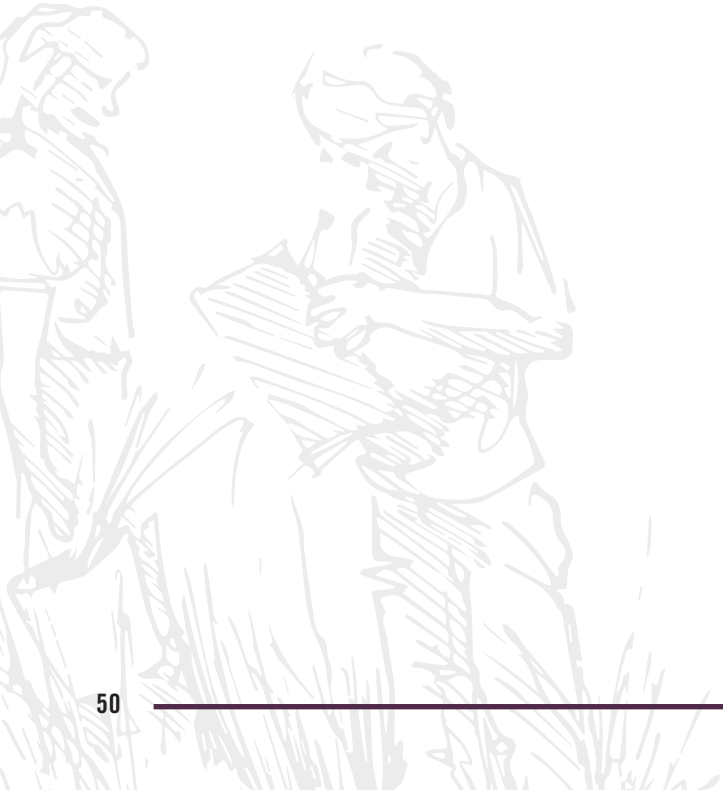
Phytoplankton Monitoring Network, https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/pmn/ and https://gacoast.uga.edu/education/adult-education/phytoplankton-monitoring-network/

Curricula

Estuaries 101 Curriculum, NOAA's National Estuarine Research Reserve System (NERRS), https://coast.noaa.gov/estuaries/curriculum/

Field Trips

UGA Marine Extension and Georgia Sea Grant Brunswick Station, UGA Marine Education Center and Aquarium



Georgia Blue Crab Workshop

The commercial blue crab fishery is one of the largest in Georgia. Blue crabs rely on healthy estuaries for habitat. Poor water quality can impact crab population health. In the early 2000s, changes in salinity allowed an opportunistic parasite to thrive, devastating blue crab populations and the crabbing industry (Lee and Frisher, 2002). Introduce workshop participants to recreational crabbing and eating local crab to build an appreciation for the estuary which supports this seafood. In addition, in order to ensure there are crabs for generations to come, it is important to educate recreational crabbers about the need for following size requirements and releasing sponge, or egg bearing, crabs, so that they can reproduce and replenish the population.

Upon completion of the workshop, participants will be able to

- Pick a crab and identify the external anatomical features of the crab.
- Describe the life cycle of a blue crab.
- Explain why Georgia estuaries are important to healthy crab populations.
- Describe the significance of crab in local coastal economies and cultures.
- Describe current crabbing effort and management of the fishery.
- Demonstrate baiting and setting a crab trap and holding a live blue crab.
- Identify regulations for recreational crabbing including obtaining a fishing license, properly marking traps, size requirements and release of sponge crabs.
- Be able to identify at least one resource for purchasing local crab as consumers.

Sample Agenda

Friday

Duration	Agenda Item
60 minutes	Check in, pre-test and dinner
30 minutes	Welcome and introductions
60 minutes	Lecture: Crab research, industry and biology Example: Invite a manager, a commercial crabber or a former crab picker to eat dinner with you and present.

Saturday

Duration	Agenda Item
60 minutes	Lecture: Crab research, industry and biology
60 minutes	Lab: Crab lab Example: Life cycle, crab comparisons
60 minutes	Lab/Lecture: Constructing drop nets
120 minutes	Crab picking and lunch
180 minutes	Field: Crabbing
30 minutes	Wrap up and post test

Activity 1: Crab Lab

Use an interactive lab to teach about the life cycle and morphology of crabs. Crabs spend part of their life cycle as plankton drifting in coastal waters. Crabs start as zoea, a small planktonic form resembling a shrimp with a spike protruding from their head. They develop large eyes in a second planktonic larval stage called a megalops. Pull a plankton tow and look for any zoea or megalops. A downloadable plankton identification guide is available at https://gacoast.uga.edu. Alternatively, order preserved slides of zoea and megalops from an online biological education supply store.

Use a crab comparison lab to study crab anatomy and adaptations. With proper permits, collect live crabs of various species and display in a shallow tank. Or, gather molts of several species to use for observation. Ask participants to compare the morphology, or outer anatomy, of the animals. What features are similar for all the crabs? Which features differ by species? What do those features tell us about how the crab makes its living? For instance, crabs with paddle-like appendages are well adapted for swimming as compared with those with pointed legs adapted for walking along the bottom. Different size and shape claws relate to differing food sources. A spider crab's small delicate claws are well suited for scavenging decaying organic matter compared to the large, strong claws of stone crabs which are well suited for crushing oysters and other crustaceans. Consider visiting an aquarium to view live crabs.

Activity 2: Crabbing

Crabbing is a fun way to teach about blue crabs. While blue crabs can be caught year-round in Georgia, the best time to go crabbing is usually in the warmer months between April and October. Consult Georgia Department of Natural Resources for details or changes in crabbing season.

Drop nets are relatively inexpensive and can be used to collect blue crabs for a short period of time, making them a good option if you have access to a public or shared dock. If dock access is possible, invest in a wire crab trap to leave set up overnight. Wire traps are a common gear type among recreational crabbers and these traps catch more crabs with less effort. If participants are interested in learning how to crab for food, this is a useful trap to introduce.

Plan for at least one hour of crabbing if using drop nets and use chicken or fish scraps for bait. Make sure educators leading the activity are comfortable holding blue crabs and stone crabs safely. Model the proper ways to hold a blue crab for participants and encourage participants to ask for assistance if they catch a crab. Drop nets work best when they sit on the bottom for 5-10 minutes at a time.

Stay up to date on current crabbing regulations and incorporate this information into the program. For instance, demonstrate how to properly measure a blue crab and have participants practice as well. Emphasize regulations about the minimum size required to keep a crab. At the time of writing this manual that size is five inches from spine to spine for a hard crab. It is required by law to release all females with eggs on their abdomen, known as sponge crabs.

Bycatch reduction devices are also required by law. These are smaller openings in the sides of the crab trap designed to allow small crabs and fish to escape. Show the location of these on a wire trap. The opportunity to set up a new trap from start to finish, including the bycatch reduction devices and labeled green buoy is a very educational activity. Bring a few turtle excluder devices, TEDs, and have participants attach them to a metal crab trap. The TEDs are not required by law but help prevent diamondback terrapin drownings by creating an opening that is too small for the turtles to enter the traps.

Activity 3: Crab picking

Plan ahead for cooking crabs as most whole blue crabs sold in Georgia require preorders. Many seafood retailers have a specific day and a window of availability between when the crabbers drop off the catch and when the consumer needs to pick it up. Use the Georgia Seafood Directory, at georgiaseafood.org to find retailers and wholesalers in Georgia that sell blue crab.

Invite a speaker who has experience in the industry to meet with the group. This might include someone who works as a crabber, someone from a seafood retailer, a chef or someone who worked in the crab picking factories. Alternatively, take a field trip to Pin Point Heritage Museum in Savannah, Georgia.

Cook whole blue crabs and demonstrate how to pick them. Invite participants to practice picking and eating their own crab. Review identification of male or female crabs by looking at the abdomen. Protect indoor tables with newspapers as crab picking can be messy! Individuals often have passionate opinions on whether the best way to cook a blue crab is steamed or boiled. There are recipes for both strategies online. The Southern Living magazine article, How to Cook and Eat Blue Crab, available at www.southernliving.com provides additional directions (Claro, n.d.).

Resources for Georgia Blue Crabs

Field Guides

Ruppert, E. E, & Fox, R. S. (1988). Seashore Animals of the Southeast, Columbia, SC: University of South Carolina Press.

Georgia Seafood Directory, https://gacoast.uga.edu/outreach/resources-outreach/georgia-sea-

food-directory/

Background Reading

Blue crab information, research findings and educational resources can be found on the Virginia Institute of Marine Science website, https://www.vims.edu/research/topics/blue_crabs/index.php.

For information on issues impacting blue crabs read articles on the Maryland Sea Grant website, https://www.mdsg.umd.edu/topics/blue-crabs/blue-crabs.

To read the Georgia Department of Natural Resources Coastal Resources Division management plan on blue crab read, https://coastalgadnr.org/sites/default/files/crd/RecFish/State_FMPs/BlueCrabFMP2008.pdf

Citizen Science

Phytoplankton Monitoring Network, https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/pmn/ and https://gacoast.uga.edu/education/adult-education/phytoplankton-monitoring-network/

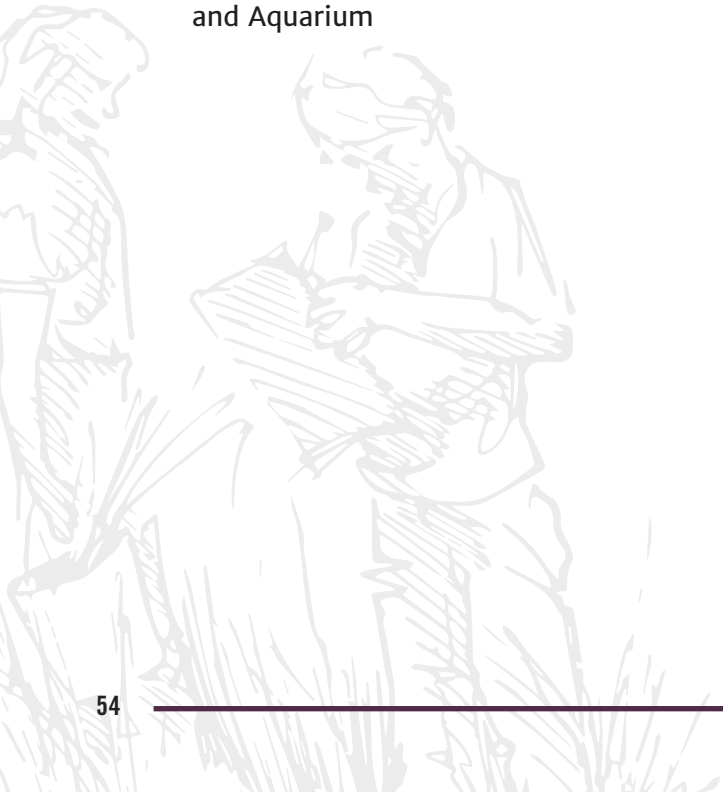
Curricula

CrabEcology Curriculum for Grade 3 is a downloadable educational resource on the UGA Marine Extension and Georgia Sea Grant website with games and activities, https://gacoast.uga.edu/wp-content/uploads/2016/05/CrabEcology_Curriculum.pdf.

Lesson plans are available on the Estuaries 101 Curriculum developed by NOAA's National Estuarine Research Reserve System (NERRS), https://coast.noaa.gov/estuaries/curriculum/.

Field Trips

Pinpoint Heritage Museum, Tybee Island Marine Science Center, UGA Marine Education Center and Aquarium



CONTENT THEME: Green Infrastructure

The term green infrastructure has several definitions. In this manual, large-scale green infrastructure is the interconnected network of undisturbed natural areas (intact salt marsh and maritime forest habitats) and open spaces that provides vital social, economic and ecologic benefits to humans and wildlife. Site-scale green infrastructure includes low impact development stormwater practices (such as rain gardens and permeable pavement) that mimic the natural capacity of the landscape to absorb and filter precipitation where it falls. Marine Extension and Georgia Sea Grant partnered with students at the Savannah College of Art and Design to create a short, animated film titled, "Coastal Georgia's Green Infrastructure and Stormwater Management." The film introduces the topic of green infrastructure, and it is appropriate for people of all ages.

Introduction to Green Infrastructure Workshop

There are many examples of low impact development practices that contribute to green infrastructure. Likewise, there are many natural places in coastal Georgia that also contribute to a network of green space. It is worth investing an entire workshop on what green infrastructure is, why it is important and how to advance it. Follow up workshops could delve into specific low types of green infrastructure.

Upon completion of the workshop, participants will be able to

- Define what green infrastructure is and why it is essential for human wellbeing.
- List three primary components of a green infrastructure network, links, sites, and hubs.
- Provide examples of green infrastructure in coastal Georgia.
- Define how land use practices impact nonpoint source pollution.
- Describe a personal experience visiting a green infrastructure site.
- Assess an existing private or community landscape(s) to determine if green infrastructure practices are desirable.
- Demonstrate installation or maintenance skills for a low impact development site.

Sample Agenda

Friday:

Duration	Agenda Item
60 minutes	Check in, pre-test and dinner
20 minutes	Group introductions and goals
60 minutes	Lecture: Overview of green infrastructure concepts

Sample Agenda

Saturday:

Duration	Agenda Item
60 minutes	Lecture: Green infrastructure case studies
60 minutes	Lab: Green infrastructure role play
60 minutes	Field: Visit an established demonstration site
60 minutes	Lunch
180 minutes	Field/Lab: Install a small practice
30 minutes	Wrap up, post test

Activity 1: Introduction to Green Infrastructure Lecture

Define the term green infrastructure, introduce key concepts and provide plenty of examples and case studies. The animated video "Coastal Georgia's Green Infrastructure and Stormwater Management" provides a brief introduction to the topic. Invite a speaker with expertise in the field such as someone from the Department of Natural Resources, UGA Marine Extension and Georgia Sea Grant or the Georgia Forestry Commission. Local design professionals such as engineers, landscape architects, planners may also be able to contribute. Remember that acronyms can be confusing for people outside the green infrastructure or stormwater field.

Discuss how a green infrastructure network connects ecosystems and landscapes in a system of hubs, sites and links. Learn more about hubs, links and sites in green infrastructure by reading the Green Growth Guidelines, developed by Georgia Department of Natural Resources, http://coastalgadnr.org.

Hubs include the highest quality, largest and least fragmented ecological landscape attributes that serve as ecological building blocks for the network. They come in all shapes and sizes such as large reserves and protected areas (national wildlife refuges, state parks), large publicly owned lands, private working lands and regional/community parks and green spaces. They provide core habitat for native plant and animal communities and allow ecological processes to function undisturbed.

Sites are smaller than hubs and contribute important ecological and social values, such as protecting wildlife habitat and providing space for nature-based recreation and relaxation.

Links are the critical connections that tie the green infrastructure system together and can include green spaces or corridors connecting these hubs, and sometimes sites as well. The links can help minimize the impacts on wildlife and plants of habitat fragmentation, helping the ecosystem stay healthy and functioning. Examples might include a greenway, bike paths or riparian buffer zones.

An alternative to a PowerPoint lecture might be a driving or walking tour of demonstration sites. A list of green infrastructure demonstration sites and the Coastal Georgia Low Impact Development (LID) inventory is available on the Georgia Department of Natural Resources Coastal Resources Division website.

Activity 2: Green Infrastructure Roleplay

Review and explore different green infrastructure practices with a role-playing exercise. Split the workshop participants into smaller groups of 3-5 people and ask them to pretend that they are a county zoning committee that has been tasked with creating a strategy or plan a zoning plan to accommodate increasing county population while maintaining the green infrastructure. Provide each group with dry erase markers and a laminated map of the county. Encourage participants to designate residential, commercial, agriculture, timberland, recreational and undeveloped areas and to draw these zones on the map. Discuss ways that land can be acquired for conservation such as land purchases and easements. What strategies will they use in to implement the plan? Maps are one way to help participants visualize green infrastructure concepts. Allow participants to work through their plans in small groups but pose a few guiding questions if needed such as:

- Where will residential areas be located on the map?
- Are there areas for industry?
- Are the green spaces connected? If not, could a greenway or other practice be added to connect core green spaces?
- Which natural areas are most important to keep undeveloped in order to maintain core habitat and connectivity between those core areas?

Another roleplaying tool related to green infrastructure is The Watershed Game, developed by Minnesota Sea Grant. Participants choose among different possible practices to gain points based on the amount of pollution prevented as well as the economic benefits of the money brought in by the practice. There are two versions of the game, a classroom and a local leader version. Use the local leader version with adult groups.

Activity 3: Install a green infrastructure practice

Engage participants in hands-on activities related to installation, restoration or maintenance of a low-impact development stormwater practice within a green infrastructure network. Depending on the duration of your program, plan to complete one small project from start to finish or to include participants in a component of a larger project. For instance, a smaller practice could be the assembly of a rain barrel. Contact the Coastal Resources Division of Georgia Department of Natural Resources to see if there are any rain barrel workshops scheduled. Disconnection of rain gutter spouts to release water onto permeable surface is another example of a smaller scale practice that can be completed within a short time frame.

An example of a larger installment is a raingarden or bioretention cell (which may require engineering/municipal approval), which landscaped depressions that captures and treats stormwater runoff (Jarret, 2019). A sandy medium, or other material that drains well is placed under the depression so that as water flows into the depression it then infiltrates down. Plants are selected to absorb water and filter contaminants. Participants could help with planting, watering and maintenance (weeding).

Alternatively, walk participants through each installation step of a new rain garden. For this type of project, it might be helpful to offer a series of workshops, classes or workdays so that the project can be spread out over time. That way, participants can see all of the steps from design to installation to maintenance. For a long-term project consider engaging a group of

people who already meet regularly such as an afterschool program or a volunteer group.

In addition to the low impact development practices mentioned above there are also examples of large-scale green infrastructure in parks, refuges and other undeveloped areas. Arrange for participants to assist in the construction or maintenance of a nature trail or a river cleanup. Georgia Department of Natural Resources and Coastal Wildscapes regularly hold invasive species removal and gardening work days at the Altama plantation. The Savannah National Wildlife Refuge Complex or the state park system may also have volunteer opportunities.

Resources for Introduction to Green Infrastructure

Field Guides

The Coastal Georgia Low Impact Development Inventory is an interactive map accessible on Department of Natural Resources, Coastal Resources Division website. The map includes locations of a variety of best management practices from cisterns, permeable pavement, rain gardens, green roofs and more within the eleven coastal counties of Georgia, https://www.arcgis.com/home/item.html?id=19e663171d6f4d8fa04500ea0c8e98b9.

For pictures of natural coastal locations in Georgia's green infrastructure network explore the story map on the Georgia Forestry Commission website, http://www.gfc.state.ga.us/.

Background Reading

Benedict, Mark A. and McMahon, Edward T. Green Infrastructure: Linking Landscapes and Communities. Washington, D.C., Island Press. 2006.

Green Infrastructure Center is a consulting group with tools, resources, background reading and case studies on their website, http://www.gicinc.org/about.htm.

There is a story map of green infrastructure on the Georgia Forestry Commission website under the urban forests tab, http://www.gfc.state.ga.us.

Swanson, D. A. (2012) Remaking Wormsloe Plantation: The Environmental History of a Lowcountry Landscape, University of Georgia Press

Citizen Science

The Great Georgia Pollinator Census, coordinated by University of Georgia Cooperative Extension is held in August and involves citizens recording the number and types of pollinators on flowering plants, https://ugaurbanag.com/ggapc/.

The Scientific Research and Education Network (SciREN) is an annual lesson plan workshop for researchers and networking event for researchers and teachers typically held in Athens, https://sciren.org/networking-events/sciren-georgia/

Southeast Early Detection Network (SEEDN) is a mobile and web app for detecting invasive plant species, developed by University of Georgia Center for Invasive Species and Ecosystem

Health, https://www.eddmaps.org/southeast/

Curricula

Georgia Master Gardner is an in-person course coordinated by UGA Cooperative Extension and designed to increase knowledge of gardening among the public and build a volunteer workforce in the state, http://extension.uga.edu/programs-services/georgia-master-gardener-extension-volunteer-program.html

Field Trips

Green Infrastructure Bioretention Cell Demonstration Site at Howard Coffin Park, UGA Marine Extension and Georgia Sea Grant Ecoscapes Native Plant Demonstration Garden (Brunswick facility), Gascoigne Park Rain Garden, Cay Creek Wetland Interpretive Center

Landscaping for Stormwater Workshop

Stormwater management relates to coastal stewardship because run-off can carry pollutants into waterways. How we use the land impacts how much runoff will occur and what pollutants might be picked up and carried to the ocean as water moves across the landscape. Consider developing a workshop that introduces nonpoint source pollution and stormwater impacts and provides tools for managing and treating stormwater onsite. Design programs for home owners to learn about actions they can take at home.

Upon completion of the workshop, participants will be able to

- Define watersheds and stormwater and identify the watershed they live in.
- Describe non-point source pollution, including examples of sediment, pathogens, nutrients from fertilizers, pesticides, temperature, and potential impacts of those pollutants on coastal ecosystems.
- Propose the ways in which a rain garden will reduce nonpoint -source pollution and flooding onsite.
- Calculate the approximate amount of potential stormwater run-off for a site.
- Demonstrate a percolation test.
- Create a rain garden design.
- Evaluate which plant species are most appropriate to their site conditions.

Sample Agenda

Friday

Duration	Agenda Item
60 minutes	Check in, pre-test and dinner
15-30 minutes	Group introductions and goals
60 minutes	Lecture: Stormwater and non-point source solution

Saturday

Duration	Agenda Item
60 minutes	Lecture: Stormwater best management practices
60 minutes	Field: Non-point source pollution activity Example: Mapping non-point source pollution or storm drain stenciling
60 minutes	Lab: Calculating stormwater runoff Example: percolation test, quantifying area
60 minutes	Lunch
180 minutes	Design a stormwater practice Example:Lecture with break out groups: 1. design 2. choosing plants 3. site maintenance
60 minutes	Wrap up: Share designs with group, post test

Activity 1: Mapping Nonpoint Source Pollution

Use a modeling tool to help participants visualize the impacts of different land use practices and water quality. An Enviroscape is a three-dimensional model that can be used for illustrating non-point source pollution. Participants can build their own watershed models using clay, picnic tables, plastic bottles or other objects covered by a tarp.

Map potential sources of nonpoint source pollution with participants. Print an aerial map of the workshop location. Provide clipboards and pencils and encourage participants to walk outdoors, marking sources of nonpoint source pollution on the map. Regroup and discuss the areas they flagged and ways to prevent or minimize the pollution. Consider pairing this activity with storm drain marking or a litter cleanup. Always get permission from your local county or city government before marking storm drains. More details on leading storm drain markings and litter cleanups are provided in Section 3: Public Stewardship Programs for Families.

To extend the activity, invite a local Riverkeeper or Cooperative Extension Agent to speak about the Adopt-a-Stream program which includes water quality monitoring efforts around the state. Citizen science activities like these provide an early detection system for potential pollution and water quality issues.

Activity 2: Calculating Stormwater Runoff

Share tools for assessing the amount of stormwater runoff. Try the National Stormwater Calculator developed by the Environmental Protection Agency at https://swcweb.epa.gov/. This site includes soil maps, average rainfall records and the percentage of a site that is impervious. This information is important for understanding how much water is likely to run off a site.

To calculate the amount of area covered by impervious surfaces use an aerial map with a scale and basic geometry. For instance, use the map scale to determine the length and width of a square house roof and multiply to get the area. Alternatively, head outside with a transect tape and calculator and ask participants to physically measure the length and width of any drive-

ways, parking lots or other easy to access impervious surfaces.

A percolation test is a simple and hands-on activity for workshop participants to try. Dig a hole, fill it with water and place a ruler in it. Note the time it takes the water to be absorbed by the soil as indicated by the dropping water level on the ruler. Directions for a percolation test can be found at Grey Water Action's website.

Activity 3: Design a Stormwater Practice

Provide time and materials for participants to design a stormwater practice. Depending on location it is important to focus on practices that are geared toward residential applications such as rain gardens and rain barrels. Depending on size and location some practices may require engineering and municipal approval. The design could be based on a pre-determined site used by everyone in the workshop. Select a site where the design could be applied as a publicly accessible demonstration site in the future. This could be their home, work or another familiar site. This option is more labor intensive for the facilitator, but participants can potentially apply their design directly. If time is short, narrow the activity to just one type of stormwater practice, such as a rain garden. It is essential to communicate with participants prior to the workshop to determine if the location they propose is appropriate for installing a stormwater management practice. For instance, if the location selected by a participant isn't appropriate for installing a rain garden, then a four-hour design session about rain gardens might not be applicable to that participant.

For rain garden design, include three main design topics; site selection including determining both the location and size of the garden, choosing plants, and planning installation and maintenance. One way to structure the design session is to walk through the steps as a group during a brief lecture before placing participants into groups where they go through the steps together. Introduce things to keep in mind for site selection and then provide 30 minutes or so for participants to work on selecting a location on the site to place the garden and how large to make it before the next lecture on plant design.

Alternatively, enlist the help of at least three experts, one for each topic area, to run a design station. At the beginning of the design session, provide time for the experts to introduce the topic area in a panel for no longer than ninety minutes total, including question and answer. Following the presentations, divide the group into three smaller groups and have them rotate through the three stations simultaneously.

Be sure to spend an equitable amount of time providing feedback and answering questions for each participant. Create time slots where individuals sign up for one-on-one consultation with a design professional. Another approach is to split the participants into smaller groups of 4-5 people to work through the design process together with the help of a design professional. Enlist one design professional per group so the activity requires less time.

Resources for Landscaping for Stormwater

Field Guides

The UGA Marine Extension and Georgia Sea Grant EcoScapes program includes a native plant search engine and guidance document (https://gacoast.uga.edu/outreach/resources-outreach/

native-plant-search-engine/) and information about plants appropriate for rain gardens and other stormwater practices, https://gacoast.uga.edu/outreach/programs/ecoscapes/rain-wise-landscapes/.

The UGA Marine Extension and Georgia Sea Grant EcoScaspes program also includes various native plant resources that can be incorporated into site-specific landscape conditions or goals (salt tolerant, pollinators), where to find native plants, and how to use the EcoScapes native plant search engine, https://gacoast.uga.edu/outreach/programs/ecoscapes/.

Background Reading

Greywater Action includes directions for a percolation test, https://greywateraction.org/.

The Georgia Stormwater Management Manual and the Coastal Stormwater Supplement include information on pollution prevention and best management practices for the state. Both are accessible on the Georgia Department of Natural Resources, Environmental Protection Division website, https://epd.georgia.gov/storm-water.

There are a multitude of background readings and technical advice on the Stormwater Program website of the US Environmental Protection Agency, https://www.epa.gov/npdes/npdes-storm-water-program.

Citizen Science

The Rain Garden App, developed by the University Connecticut is a tool for people to use when designing their own rain garden and includes every step from site location to maintenance. https://nemo.uconn.edu/tools/app/raingarden.htm

Adopt-a-stream is a water quality monitoring program that utilizes volunteers to detect pollutants, which could be carried by stormwater, in waterways throughout Georgia, https://adoptastream.georgia.gov.

Stormwater can also carry litter into coastal waters where it becomes marine debris. The clean-swell app, https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/clean-swell/, is a way for the public to enter data on debris removed. The app was developed by the Ocean Conservancy and is used in the International Coastal Cleanup, an annual marine debris removal and citizen science project, https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/.

Curricula

The Crumbled Watershed Model is a lesson plan developed by the University of Nebraska Lincoln Extension in their curriculum, Stormwater Education for Kids at https://water.unl.edu/article/stormwater-management/stormwater-education-kids/

Georgia Department of Natural Resources hosts rain barrel workshops and more information can be found at https://coastalgadnr.org/RainBarrelWS.

The Watershed Game is an interactive roleplaying activity developed by Minnesota Sea Grant https://watershedgame.umn.edu/.

Project Wet, coordinated by Georgia Environmental Protection Division is a curriculum and activity guide for water education including many activities related to stormwater, https://projectwet.georgia.gov.

Field Trips

Georgia Department of Natural Resources includes a list of demonstration sites on their website, https://coastalgadnr.org/DemoSites.

There is a living shorelines demonstration site at Skidaway Island State Park, https://gastateparks.org/SkidawayIsland/.

The Coastal Georgia Low Impact Development Inventory is an interactive map accessible on Department of Natural Resources, Coastal Resources Division website. The map includes locations of a variety of best management practices from cisterns, permeable pavement, rain gardens, green roofs and more within the eleven coastal counties of Georgia, https://www.arcgis.com/home/item.html?id=19e663171d6f4d8fa04500ea0c8e98b9.

Coastal Stewards

SECTION 3

Stewardship Programs for Families

SECTION 3:

Programs for Families

Families that explore outdoors together share and build values about nature and develop an emotional affinity for coastal spaces. The following section includes tips for designing public programs for families and is guided by the same content themes as Section 2: Stewardship Workshops for Adults. Fifteen activities are presented for multi-age audiences and are arranged by three content themes: habitats and wildlife, recreational use of coastal resources and green infrastructure.

Program Design

This section presents general tips for designing stewardship programs for families.

Define your audience

Family programming encompasses a wide range of ages and types of events from structured classes to festivals. When designing a program, identify the target audience and the objectives you want accomplish. Set an age range for participants as well as minimum and maximum group size. Are you planning a one-hour program for a small group of toddlers and their caregivers or a hands-on fishing class for older children and their families? Will you offer a multi-age learning session as a one-time program or a rotation station during a large festival event? Most of the ideas included here work best for smaller, structured classes, although a few of the selected activities may be applied for festival-style events. The activity ideas included in this section are written for participants aged 5-14 with accompanying adults.

Connect to national stewardship education efforts

Although this curriculum guide focuses on fostering stewardship of Georgia's coastal resources, the state's citizens are connected to the global community as well. It is important to build public understanding of how local actions play a significant part in global challenges and solutions. One way to build ocean literacy and stewardship potential is by highlighting national and international education frameworks in family programming. Three national and international frameworks to refer to during program development are 1) Environmental Education Framework, https://naaee.org/our-work/programs/guidelines-excellence 2) Next Generation Science Standards, https://www.nextgenscience.org and 3) Ocean Literacy Principles, http://oceanliteracy.wp2.coexploration.org.

Register your event with a national or international movement to amplify its impact and show participants how they can make differences in local and global conservation challenges. These education initiatives often provide social media posts, lesson plan ideas and more, and reduce the effort required for hosting an event.

Consider hosting or participating in an event associated with one of the themes listed below.

Several organizations on the Georgia coast look for partners to present or table at events on and around these dates. Examples of larger education initiatives that are relevant in coastal Georgia include:

National Estuaries Week, https://www.estuaries.org/national-estuaries-week

World Oceans Day, http://www.worldoceansday.org

Earth Day, https://www.earthday.org

International Coastal Cleanup, https://oceanconservancy.org

World Migratory Bird Day, https://www.migratorybirdday.org

Offer a range of events

Festivals and celebrations

Festivals typically attract large numbers of attendees and include multiple concurrent activities. Although the contact time per person is typically shorter than that of a structured class, festivals are one way to reach new audiences. Create learning or activity stations that participants can move through at their own pace. Provide clear directions with event signage or a map that indicates the location for all activities planned. Consider using a "passport" that attendees can have stamped after participating in each activity, and some sort of incentive for obtaining a certain number of stamps (e.g. entry in a door prize drawing). Assign staff or volunteers to assist at each station.

There are many organizations that provide outreach programming in coastal Georgia. Invite partners to set up tables or activities. Give partners at least three to six months' advance notice and determine the need for electrical outlets, nearby water, tables, chairs, or other items on the day of the event. If you are planning outside activities, be sure to identify a weather backup plan and communicate this with any participating partners.

Consider asking a first response team to be onsite in the event of an emergency. Inform all educators, volunteers and participating partners about specific emergency protocols. Identify AED locations, emergency contacts and phone numbers, and the location of the first aid and responder station, if applicable. Schedule a brief meeting with volunteers and staff to run through updates on logistical information and answer any questions before the event begins.

Outreach tabling

Outreach events provide opportunities for an educator or volunteer from an organization to travel to a community, school or other location. These events are a great way to share stewardship information with new audiences. Keep activities short to engage participant attention for just a few minutes at a time. Use props that the public can interact with and that will encourage questions. Design a booth or table with one or two learning objectives in mind. For example, what is one stewardship action visitors can take away from a visit to the table? Print the Stewardship Shorts in Appendix A to use as handouts and conversation starters.

Bring a signup sheet to collect email addresses in order to follow up with people interested in future programs. Check with the event organizer to see if tents, tables, chairs, and electrical access will be provided. Bring an extra extension cord just in case. Outreach can be a rewarding volunteer activity for individuals interested in teaching about conservation in the broader

community. Be sure to communicate event details with volunteers including directions, contact information, target audience, and supplies to bring. Schedule volunteers for no more than two-hour shifts at a time and build in breaks.

Structured programs

One to three hours is a good length for a family program. Plan more activities than are needed and keep in mind the attention span of different age groups. Adding five minutes to a child's age is a good rule of thumb to determine the maximum time to spend on an activity facilitated by the educator. For example, plan to switch up activities every ten minutes when working with groups of five-year-old children (Quill, 2015).

Remember the value and fun of play. Children engaged in an activity of their choice or in play within small groups will usually stay engaged longer. Consider ways to create participant choice within your programming. For example, the UGA Marine Education Center and Aquarium hosts "Toddler Touch Tanks" a series of hour-long classes led by an educator for families with children ages 2-5. The class starts as a group, often with a story or song followed by guidelines of how to interact with animals in the touch tanks. Participants can then choose between activities during structured free time. Activities set up in the room include a stack of books related to the week's topic, an area with toys and puppets representing local animals and a space with arts and crafts supplies. An educator is available to facilitate interactions with live animals and answer questions while families explore. Towards the end of the hour the educator regathers the group for a game, song or a brief wrap up conversation.

Target program promotion

Public programs require promotion to be successful. Each event and organization will have its own procedure for promotion. The same promotion resources mentioned in program design for adult workshops in Section 2 apply for family programming as well.

Spread the word about your program by connecting with other organizations that work with families. Libraries, teachers, pre-schools, homeschool co-ops, daycare centers, Facebook groups for parents, scouting groups, the YMCA, and 4-H are just a few examples of organizations to contact. Participate in the family STEM night at a local school and bring event flyers or a newsletter sign-up list. Some school districts may have open houses where groups can share information. Take advantage of seasonal advertising opportunities. Newspapers and monthly magazines often run a special segment in late spring highlighting local summer camps and programs for families.

Communicate clearly during registration

Parents and caregivers are often juggling many responsibilities, so make registration as streamlined and simple as possible. Organizers of the event need to provide clear communication of participant age and supervisory requirements. Be sure to provide permission slips and waivers if applicable and adequate child to adult ratios if adult guardians will not be staying for the program. Educators should be properly trained in first aid and understand established protocol for signing children in and out.

Although pre-registration may not be feasible for open-house style events or festivals, it may

be helpful to capture the contact information of participants. Designate a welcome table and staff or volunteer to orient visitors as they arrive, answer questions, and share a sign-up sheet for future programs, if applicable. Assign a person to count visitors as they arrive, particularly if there is no admission fee record kept.

SAMPLE ACTIVITIES

CONTENT THEME: Wildlife and Habitats

This section presents five activities for connecting families with wildlife and habitats on Georgia's coast. Refer to Appendix E: Wild Paces and Education Places for a list of field trip sites and opportunities available at state parks, wildlife refuges and nature centers. Strive to create safe, low-stress and enjoyable opportunities for the public to directly experience nature. Be open to all discoveries made by individuals and invite them to share with the group. Appendix A: Stewardship Shorts that pair well with these activities and provide talking points include Estuary Etiquette, Beach Behavior, Wetlands Wisdom and Coastal Inspirations.

Habitat Explorations

Exploration can build an emotional affinity between participants and the Georgia coast. Maritime forest, salt marsh, and beach habitats are all fairly simple to access. For a successful and energizing outdoor adventure, include a brief introduction, simple activities that can be done on the move and time for self-directed exploration, personal reflection and sharing discoveries.

A few other things to consider when exploring the coastal outdoors include safety, participant comfort, weather, and tides. Let participants know well in advance what to bring and how to dress. Sun and insect protection, water, clothing appropriate for the weather and comfortable shoes will make the outing more fun. Boots or old sneakers are good to wear for marsh explorations. Provide thorough pre-trip information and be prepared for participants to come unprepared. Gather and maintain a grab bag of extra warm layers, rain gear and boots. Be sure to carry a first aid kit and cell phone.

Briefly introduce participants to the habitat to explore and set some guidelines for safety and group goals. Encourage observation and use focusing activities. Look and listen along a nature trail or gather around a hula hoop in the salt marsh to identify and count plants and animals. Look for salt on the cordgrass leaves and identify animal tracks. Printable identification guides for the marsh and beach are available at https://gacoast.uga.edu.

Build in time for participants to explore. Set boundaries and designate a signal to draw the group back together for discussion or transition. Leave time for questions. Regathering participants in a circle often focuses the group and allows them to hear each other better while outdoors. On windy days try to stand so the wind carries your voice towards the group rather than away from it. Position yourself so that participants have their backs to the sun. After exploration, connect participants with at least one way to help protect that habitat.

Sharing Nature: Nature Awareness for all Ages by Joseph Cornell (2015) is a classic collection of ideas to use when exploring outdoors. Check out the fact sheets in Appendix A: Stewardship Shorts for more ideas as well.

Wildlife Observations

Observation of wildlife can build empathy for the natural world. Binoculars, hand-held magnifying glasses, bug boxes and foldscopes are all useful tools for this activity. Encourage par-

ticipants to sit quietly for a chance to see more wildlife or try spending part of a hike walking silently. Stand quietly with eyes closed to listen intently. Always emphasize observing, not disturbing. Stay a safe distance from animals in the field and always communicate and follow wildlife regulations. Remind observers to look for colors, textures, shape, size and behavior of animals. If you have a special collection permit for education or research, gather some empty shells, molts or sheds for them to explore with their sense of touch.

When observing dolphins in the estuary it is important to communicate that feeding dolphins is not only illegal but unhealthy for the animals. Feeding can change dolphin behavior, leading individuals to beg at boats and docks which can increase the likelihood of them being struck by boats. Bald eagles and sea turtles are examples of animals in Georgia protected by the Endangered Species Act (USFWS). Shorebirds are particularly sensitive to disturbance and any beach exploration should include information on how to share the beach respectfully with the birds. Appendix A: Stewardship Shorts including Beach Behavior, Estuary Etiquette and Boat the Coast outline appropriate behavior participants should use around sea turtles, marine mammals and shorebirds.

Citizen science

Documentation of habitat exploration can deepen learning but also contribute to scientific knowledge and conservation efforts. Citizen science projects engage non-scientists in the process. Add the citizen science component of monitoring water quality while exploring the estuary or collect marine debris and report it. Use a refractometer to measure salinity and a thermometer to measure temperatures during salt marsh, beach or estuary explorations. Adopt-a-Stream and Adopt-a-Wetland are two programs that provide training in water quality monitoring. Find out more at https://adoptastream.georgia.gov.

iNaturalist and Nature's Notebook are two observation-based citizen science programs that work well for all ages. Both have an accompanying mobile app. Consider the purchase of a few tablet computers so participants can enter data on site.

Use of a paper data sheet or notebook may be easier in the field, with larger groups. Find more information at https://www.inaturalist.org and https://www.usanpn.org/natures_notebook.

Even very young children can participate in documentation. For example, make a group count of the number of fiddler crabs, spiders or flowers seen while exploring. Invite the group to sit in one location and observe for several minutes. Or provide a place for them to draw what they saw. Ask follow-up questions about their drawings such as:

- Where did you see that plant or animal?
- Will you tell me more about your drawing?
- How was the animal moving when you saw it?

Art and writing

Writing and making art can help individuals observe more closely and share observations about the natural world. Journaling can be used by all ages. Journaling "helps us remember that science and art are processes. Both require using creativity and making observations in order to ask questions about the world around us." (Lindsay, 2009).

Provide a few prompts to start written reflection. Leave the process of journaling open ended enough, however, so that each participant can focus on the topics that spark their interest. If working with a group over a longer period, such as in a summer camp, journals can also be used as qualitative evaluation of participant experiences.

Sketching can help observers notice new details. If possible, go outdoors to draw. Rectangles cut out of cardboard make an inexpensive and portable hard surface for participants to use outside. The following ideas come from Woods Walking: A Naturalist's Guide to the Jay Wolf Nature Trail by Anne Lindsay in 2009.

"Drawings in your journal need not be perfect or artistic. Try sketching the following:

- The outline of a bird or leaf
- Animal traces left behind such as tracks on the ground or a half-eaten pinecone
- Animal behavior (e.g. flying, perching, or foraging) using stick figures
- The topography of where you are (e.g. the shapes of logs, bushes, trees)
- A simple map of your corner of the forest (a well labeled map can tell a story)
- A diagram that illustrates a cross section of the forest or one square foot of the forest floor"

Bring the outdoors inside by collecting natural items to draw such as shells, seeds or small branches. Use recycled materials to create dioramas or sculptures. Visit an aquarium or nature center to draw living animals on exhibit. Georgia River of Words is a curriculum that focuses on nature art and writing and includes a statewide poetry and art contest for school-aged children, https://projectwet.georgia.gov/ga-river-words.

Games and Play

Play is fundamental to learning, so set up the program space in a way that encourages it. Puppets and felt boards are great tools for engaging toddlers and pre-K children to engage in unstructured play. A water table, or any shallow container of water can invite exploration. Likewise, a sand table with small shovels and shells can provide children an area in which to experiment. These can create messes so should be set up in an appropriate location. Scavenger hunts are a self-guided activity that can be used indoors or out.

Many commonly played childhood games can also be modified to teach about habitats and wildlife. For instance, musical chairs can be played with chairs as "empty shells" and players as "hermit crabs" so that as the game progresses there are fewer and fewer shells. In the wrap up discussion we discuss how shells might disappear from the beach and what might happen to the hermit crabs in that situation. Use the game to reinforce stewardship practices such as limiting the number of shells taken away from the beach.

For older students, simulation games provide a way to introduce ecology concepts about population dynamics and conservation challenges. Project Wild, Project Aquatic Wild and Project Flying Wild workshops offered by the Georgia Department of Natural Resources, include many to try. Project Learning Tree and Project Wet are two other curricula to investigate. You will need to attend one of the project's trainings to receive the curricula.

CONTENT THEME: Recreational Use of Coastal Resources

Catch and release crabbing, fishing, and collecting with nets are all fun ways to introduce the public to a recreational activity directly connected to coastal resources. Be sure to follow legal guidelines and have the correct collection permits. Georgia Department of Natural Resources and US Fish and Wildlife Service are the best contacts for applying for a collection permit.

Safety should come first for any activity near water. Practice crabbing or fishing before teaching the skill. Or enlist the help of experts to assist in the teaching. Rinse any gear used in salt water with fresh water immediately afterwards and allow to dry completely to prevent rust and mold.

Birding, hiking, and paddling are other examples of recreation that use coastal resources sustainably. Appendix A: Stewardship Shorts that pair well with these activities and provide talking points include; Estuary Etiquette, Beach Behavior, Boat the Coast, Fish the Coast, Coastal Cuisine and Coastal Inspirations.

Birding:

Birds can be found almost anywhere, and birding is a form of sustainable recreation applicable to many different programs. When birding with children, start by practicing with binoculars. Look for small binoculars that can easily fit in a child's hands and adjust the eyepieces to fit the width between their eyes. Review and demonstrate the proper use of binoculars step by step. Different binoculars can be focused in different ways. Some even focus automatically. The following are example directions for the compact binoculars used at the UGA Marine Education Center and Aquarium:

1. Put the binocular strap around your neck.
2. Push together or pull apart the eyepieces so that they match up with your eyes.
3. Look at a large, non-moving object in the distance. For example, look at the roof of a building or a telephone pole.
4. Close one eye and with the other keep looking at the object. If it what you see looks blurry, turn that eyepiece until it looks clear.
5. Now open both eyes. If it looks blurry with both eyes open, turn the dial in the middle until it looks clear.

Practice focusing on objects that don't move, such as trees, buildings, or parked cars. Another option is to print out images of birds so that participants can start to practice bird identification while also practicing with the binoculars. These images can be hung with string on trees, affixed to a stake or wire to stand up in the yard, or even taped to walls inside a classroom.

Combine birding with a maritime forest hike or beach walk. Or add a story time, craft and game for younger children. Make cardboard binoculars out of paper towel tubes cut in half and taped together. Set out different stuffed animal birds to find with their "binoculars". Appendix A : Stewardship Shorts Wetlands Wisdom, Beach Behavior, Estuary Etiquette and Boat the Coast provide information about behaving respectfully around birds.

The Bird Sleuth education program through Cornell Lab of Ornithology includes more activity

ideas and background reading for birding with K-12 children and families. Project Flying Wild, coordinated by Georgia Department of Natural Resources, is another great resource for bird-related lesson plans and activities.

Crabbing and Fishing:

Drop nets are relatively inexpensive and can be used to collect blue crabs for a short period of time. If you have dock access, consider investing in a wire crab trap to set up overnight. Refer to the Georgia Department of Natural Resources, Coastal Resources to stay up to date on crabbing regulations. Provide regulation information in the program.

Plan for at least an hour of crabbing if using drop nets and use chicken or fish scraps for bait. Make sure educators leading the activity are comfortable holding blue crabs and stone crabs safely. Model it for participants as well and encourage participants to ask for assistance if they catch a crab. Drop nets work best when they sit on the bottom for 5-10 minutes at a time. Plan to lead a few simple activities like I Spy or group storytelling so younger participants wait long enough before checking traps for crabs.

Combine crabbing with other activities for a longer program. For instance, family programs at the UGA Marine Education Center and Aquarium include touch tanks and a measuring activity using laminated blue crab photos before going out to the dock. For more activities consult the CrabEcology Curriculum, https://gacoast.uga.edu.

Fishing is another fun recreational activity directly related to coastal resources. UGA Marine Education Center and Aquarium programs use bamboo poles to fish with participants aged five to nine and rod and reel to fish with participants aged ten and older. Stingrays and small sharks are common species to catch when fishing inshore in estuaries of coastal Georgia. Make sure leaders are comfortable handling and releasing these animals respectfully and safely.

Consider a field trip to a location that teaches fishing classes. Local Coastal Conservation Association chapters, aquariums, fish hatcheries and environmental education centers may provide fishing programs. The Georgia Department of Natural Resources (DNR) Coastal Resources Division hosts several children's fishing tournaments a year. Contact DNR if you want to add fishing to family programming, both for required permit guidelines and ideas on how to get started.

Collecting with Nets:

Cast nets, seines, and minnow traps are all methods for catch and release collections of small invertebrates and fish in coastal waters and can be exciting additions to habitat explorations. Practice using cast nets on land before heading to the water's edge. Throwing the cast net so it opens fully takes practice and difficulty increases with the size of the net. For family programs, it may be important to purchase a variety of sizes. Be sure to have at least a few small nets (4-6 foot diameter).

Seining in coastal Georgia is more easily done in beach habitats rather than in salt marsh creeks. Several people hold a pole attached to each end of the long rectangular net. They wade into the water with the net so that it stretches perpendicularly to the shore and then walk forward holding the net with the top of the poles tipped back at an angle. As the net starts to fill, the individuals holding the deep-water pole pivot towards shallower water and together the

team pulls the net onto the shore. Consider the surf, weather and participant age when deciding whether to allow participants to pull the net. Once the catch is brought onshore, it is generally best to transfer one or two individuals of each species found in the net into buckets or coolers of water, releasing the remaining animals back into the environment. Model respectful behavior by using wet hands to handle fish and to release gently and quickly. You can then provide interpretation on the species caught, using the specimens in the buckets.

Gyotaku:

Gyotaku (ghee-yo-tah-koo) is an art form originating in Japan using fish rubbings. Gyotaku may have been used traditionally to record catches and document fish. This indoor activity is also an artistic way to study fish anatomy. While these prints were traditionally made from real fish, rubber fish molds are available from online education or art supply stores. Apply a thin layer of paint on the mold with a sponge. Then place the paper or fabric on top. To transfer the paint, press gently on the paper or fabric using fingertips. Thin rice paper or natural fabrics like cotton and canvas work best. If printing on cloth, encourage participants to practice on paper first. Plain newsprint works well. Fabric paint is best when printing on cloth; acrylic works best for printing on paper. Only a tablespoon or so of paint is needed for a series of prints. The final product often takes at least an hour to dry. This activity works well with ages eight and older.

Fish Identification:

Fish identification labs can be used to teach about coastal fish species and provide opportunities to communicate information about research, management, recreational fishing and safe consumption of seafood. Dichotomous keys are a useful tool for the identification of plants, animals or minerals in the natural world. If you have the required permits this activity can be done with preserved fish species. Or you can use cut-out and laminated pictures of fish. Modify the dichotomous key depending on the age group. For young children you may only have a few fish species that are easy to distinguish such as a shark, a flounder and a puffer fish. This activity is appropriate for ages 8 and up. Fish identification guides are also useful tools and can be used as alternatives to a dichotomous key.

This lab lends itself well to referencing characteristics and anatomical features of fishes as well as discussions about how physical adaptations help fishes survive and thrive in their environment. Form and function are good topics to discuss when studying the anatomy of any plant or animal. Fish labs can also be a jumping off point into the topics of fisheries management and safe seafood consumption guidelines. Free Georgia fishing regulations books are available at the UGA Aquarium, Georgia DNR, bait and tackle shops or online.

If you don't have access to fresh-caught or preserved fish, create cut-outs with printed photos of fish. Tie in regulations by having participants take an imaginary fishing trip. This can be as simple as laying out the paper fish on a table for participants to choose from. For added effect attach magnets to the fish. Put the magnetic fish in something representing a waterway such as inside a circle made by a hula hoop or a blue table cloth. Tie a magnet onto a string attached to a pole or stick. Participants use the magnetic pole to catch fish and then identify and measure their catch. Sort the catch into the fish that are a legal size and a safe for eating and those that should be released according to fishing regulations.

CONTENT THEME: Green Infrastructure Activities

Green infrastructure has several definitions. In this manual, the term is used to refer to the system of connected areas where nature provides vital social, economic and ecologic benefits. This includes intact salt marsh and maritime forest habitats as well as low impact development practices that mimic nature, such as rain gardens and permeable pavement. Marine Extension and Georgia Sea Grant partnered with students at the Savannah College of Art and Design to create a short, animated film titled, "Coastal Georgia's Green Infrastructure and Stormwater Management." The film introduces the topic of green infrastructure, and is appropriate for people of all ages, https://vimeo.com/193902038.

Green infrastructure can provide habitat for wildlife like birds, pollinators, reptiles and mammals. Consider adding a discussion of green infrastructure into any of the habitat and wildlife activities mentioned earlier. Another benefit provided by green infrastructure is management of rainwater in ways that prevent flooding and runoff of pollution into coastal waters. The selected activities described here focus on teaching about this benefit.

Project Wet through the Georgia Environmental Protection Department is a well-established curriculum for teaching about water. Educator certification trainings show how to use the activities and gain access to an online portal of activities, resources and lessons.

The Environmental Protection Agency also has many resources for both background reading and activity ideas for teaching about green infrastructure. Another recommended reading for activity ideas on teaching about water is Wow! The Wonders of Wetlands Educators Guide by Kesselheim et al.

Appendix A: Stewardship Shorts that pair well with these activities and provide talking points include; Water Conservation at Home, Watersheds and Stormwater and Living Resiliently on the Coast.

Watershed visuals

Everyone lives in a watershed, or a region in which all water flows across or through. The area typically drains to one waterbody, like a river, lake or marsh. Many rivers in Georgia run to the sea, so actions inland can impact the ocean. Visuals and interactive activities help people understand what a watershed is, how it relates to stormwater pollution and why green infrastructure is important to watershed health.

A low-cost and simple way to model a watershed is with washable markers and a few 8.5 x 11 sheets of paper. University of Nebraska Lincoln Extension (https://water.unl.edu/) has a free lesson plan Crumpled Watershed Model on their Stormwater Education for Kids website.

If you have the resources, there are also several models that can be used for an interactive visual. The Watershed Game, created by Minnesota Sea Grant, is a role-playing simulation where players select different best management practices to prevent pollution in the watershed. The classroom version of the game would be most appropriate for families.

An Enviroscape is a similar watershed simulation which uses a three-dimensional model. Participants can add potential pollutants and various levels of "rainwater" to observe what happens during storms. The coastal model includes topography more similar to that of coastal Georgia than the standard model.

The lesson plan, Oil Spill: The Rest of the Story on NOAA's Estuary Education website (https://coast.noaa.gov/estuaries/) is a low-cost, hands-on activity for modeling non-point source pollution and the impacts of stormwater.

Stormwater stenciling

Storm drains in coastal Georgia empty directly into waterways that connect to the ocean. Typically, these drains do not direct stormwater to a wastewater treatment facility before entering waterways. Most pollution washed down the drains from sidewalks, driveways, roadways and parking lots will enter coastal waters. Educating residents about where storm drains empty is an important step in preventing non-point source pollution carried by stormwater.

Stenciling or marking storm drains is one way to engage coastal residents of all ages in the stormwater education effort. Do not mark storm drains without permission from and consultation with your local city or county stormwater division. Storm drain marking often helps these entities reach their education requirements for permitting so they may even be able to provide you with some of the marking materials and a map of storm drains in your area.

Many places use adhesive tiles as markers now. If using stencils and paint, make sure to check with the city or county to ensure you purchase the correct type of paint. Although the actual marking may take less time consider hosting at least a two-hour event to factor in time needed to coordinate teams, go over the activity and travel to the drains.

Marine Debris Cleanup

Plan a family-friendly cleanup or see if other organizations are hosting cleanups. Provide gloves and require proper footwear by participants. Grabbers may also be useful, especially for getting trash out of vegetation. You will also need garbage bags, buckets or bushel baskets. If logistically feasible use buckets instead of bags because it reduces single use plastics and can protect participants from sharp objects that might poke through the bags. Empty the non-recyclable contents of buckets into a dumpster. Encourage participants to bring a reusable water bottle instead of a single use plastic bottle. Provide a cooler of water for refills. You will be practicing what you preach by reducing single use plastics which often end up as debris.

A litter cleanup pairs well with a stormwater marking activity to illustrate how stormwater can carry litter into coastal waterways where it becomes marine debris. Sort debris at the end of the cleanup and discuss the differences between plastics, metals and other materials. This sorting can be paired with an art activity utilizing the debris. Make a collage or sculpture using the items collected. Another activity could be to glue bottle caps to cardboard to make a mosaic. Alternatively, glue just one or two bottlecaps per piece of cardboard and encourage participants to draw legs, fins, heads or other anatomy around the cap to create an image of an animal impacted by debris.

For more ideas check out the Marine Debris and Me Curriculum on the UGA Marine Extension and Georgia Sea Grant website. Emphasize the connections among all the world's ocean basins by participating in The Ocean Conservancy's annual International Coastal Cleanup. The website includes tips for hosting your own cleanup and infographics about marine debris based on the data collected during cleanups. The National Oceanic and Atmospheric Administration is another place to look for videos, lesson plans, the Marine Debris Tracker app and background information.

Make a Watershed Map

Maps help us visualize where pollution comes from as well as where natural places and green infrastructure provide benefits. The stores, roadways, schools and houses that communities use are all part of "infrastructure." Green infrastructure provides necessary services and goods to humans and to wildlife. Use an online map app to create an aerial view of an area that is walkable with the group. Have participants walk around outside and draw any storm drains seen on the map. Mark potential sources of non-point source pollution and areas with green space. Regroup and talk about what they found and relate it to watersheds, stormwater and green infrastructure. This activity works for ages eight and up. Project Wet includes several watershed mapping activities for elementary and middle school and is a useful resource for any water education.

Alternatively, have participants make a physical map themselves. Provide blank paper and ask them to draw a map of a known area. Or ask them to draw their own neighborhood, school or another area important to them. Use discussion prompts to add detail to the maps. What are sources for food, water, shelter and where are they located? Where do they play or work? How do they get to those places? Are rivers, marsh or forest located in the watershed area? Where would they add additional gardens or other green space to the map?

Several extensions of this activity include making a group story map from the perspective of a local animal like a songbird, squirrel or treefrog. When compared with their neighborhood maps, are there any overlaps where both wildlife and humans are benefitting? Are there conflicts? Where could green infrastructure be added on the map so that both people and wildlife have access to food, water, shelter and places to work and play?

Demonstration Site

Share green infrastructure solutions by giving examples of or visiting sites with low impact development. Georgia DNR Coastal Resources Division lists a number of publicly accessible local demonstration sites at https://gadnr.org. The EcoScapes Garden at the UGA Marine Extension and Georgia Sea Grant's Brunswick Station also provides examples of landscaping for stormwater and drought with native plants. A portion of the Jay Wolf Nature Trail at the UGA Marine Education Center and Aquarium is constructed with a permeable surface.

For younger audiences, consider designing a scavenger hunt for use on the demonstration site. Look for different elements of green infrastructure, such as rain cisterns or barrels, permeable pavers, disconnected gutters or native plants. Provide a picture as well as text on the scavenger hunt for items that may unfamiliar to participants. Include more in-depth information about the function of these elements as take-home materials. If travel is not feasible, share a demonstration site virtually by using the Coastal Georgia's Green Infrastructure & Stormwater Management Video https://vimeo.com/193902038.

For the greatest educational experience and stewardship potential, engage participants in creating a demonstration site. Plan a community work day to plant a rain garden. Contact the Georgia Department of Natural Resources, Coastal Resources Department to find out about rain barrel workshops.

In addition, consider restoring or expanding habitat at your site to add to the green infrastructure. Plan a native species planting at your facility or another publicly accessible location. Plantings native species are something that families can do together and that will attract more wildlife to the area. Bird feeders and baths, homes for solitary bees and brush piles are other ways to provide water, shelter and food for wildlife. Coastal Wildscapes, the Georgia Coastal Botanical Garden, UGA Cooperative Extension and the Xerces Society are other resources for landscaping sustainably. The UGA Ecoscapes program, https://gacoast.uga.edu, has information on gardening for wildlife including a native plants search engine.

Another extension is to use a demonstration site as the location for families to participate in a citizen science project. For example, the Great Georgia Pollinator Census, coordinated by UGA Cooperative Extension, is a simple citizen science activity that is appropriate for a multi-age group. Participants watch a flower for fifteen minutes and record the number and general types of pollinators observed (bumble bees, small bees, wasps, beetles, etc.) The census event page includes resources for making simple bee homes out of wood, which could be another activity for families to work on together.

The Bird Sleuth curriculum, developed by Cornell Lab of Ornithology, has great resources for incorporating feeders into educational activities for all ages, including contributing to the citizen science project Feeder Watch, which compiles data from people recording what types of birds and how many come to a feeder in yards across the country. When creating or utilizing a wildlife garden, include discussions of green infrastructure and examples of natural and human-made landscapes that provide ecological benefits for people and wildlife.

Coastal Stewards

SECTION 4

Program Evaluation

SECTION 4:

Program Evaluation

Evaluation of programs takes time and planning, but it is well worth the effort. It can provide feedback from participants about what workshop aspects worked well and what aspects need improvement. It can also provide information on whether participants are learning new concepts and how confident they are on the skills being taught. This can inform future program design to best meet the goals of both the educator and participants.

Evaluation can also illustrate impacts of the programming and provide feedback about whether goals are being accomplished and objectives met. This information helps tell a story about the impact and value of a program and can potentially be used as a tool for securing additional funding or resources for a project. It can also help organizations prioritize the types of programs in which to invest time and resources to most effectively reach goals. The following section includes general tips for evaluating public programming.

For a more detailed discussion of evaluation and additional references, read Appendix F: Introduction to Evaluation by Dr. Milton E. Newberry III, Associate Professor University of Georgia's College of Agricultural and Environmental Science. See Appendix G for sample surveys and pre- and post-tests to modify and use.

EVALUATION TIPS AND TOOLS

Timing and quantity of evaluation

Conduct an evaluation during or immediately after a program to document participant feedback and for future planning. Evaluation tools will vary based on the program structure. A 40-hour course for adults will likely warrant more extensive evaluation than an open house family event where participants are just passing through.

The ultimate goal of stewardship programming is that participants will apply what they learned in their daily lives. Include immediate evaluation at the end of the program and then follow up with another evaluation 6-12 months after the program. This provides information on what knowledge and skills participants retained and evidence of whether the educational experiences had an impact on participant's behavior. For example, if hosting a rain garden design workshop, send out a survey or conduct follow up phone interviews 6 months later to see if any of the participants have implemented their design at home. For a seafood workshop survey participants about their seafood consumption habits six months after the class. Other measures might include whether any participants have started to volunteer for a coastal organization or applied skills from the workshop into their profession. For instance, have teachers made a lesson plan or presented to their students about the topic area?

Keep surveys short, no more than one page, front and back. For programs that involve a series of classes with the same participants, consider ways to minimize how often those participants are asked to respond to the same questions.

Evaluating family programs

Families with young children may not have the time to fill out formal surveys. Be creative in evaluating mixed aged groups. One simple evaluation tool is a verbal conversation during the wrap up portion of the program. For a small group or in a sharing circle each person can provide a "high" or best part of the program and a "low" or least favorite part. If possible, take notes to record responses. Try writing a prompting question such as "Draw what you saw" or "Share what you learned" on a large sheet of paper or whiteboard for participants to respond to. Ask participants to write a three-line poem or invite them to act out a skit based on what they learned.

Examples of evaluation tools

The following are examples of evaluation instruments used during of how the Coastal Stewards workshops and family programs. The tools are applicable to many different program topics and structures and are intended to be modified. Start by defining the goals for the program evaluation to inform what types of tools to use. For example, in evaluating the Coastal Stewards programs, coordinators were interested in monitoring three primary questions:

1. Are participants learning knowledge and skills related to coastal stewardship?
2. Is there an additional impact for participants, their communities or the environment as a result of this programming?
3. Are the workshops meeting the expectations and goals of the participants? And if not,
4. what can be improved to better meet their goals?

Pre and post tests

Pre and post tests ask the same questions of participants at the start and end of each workshop. Test scores before and after are compared to measure whether content knowledge was gained. Participants complete a pre and post test during each Coastal Stewards workshop, however the tool is not used for shorter format programs. Let program length inform the number of questions used.

Confidence rating

A confidence rating asks participants to rank their comfort level on a series of skills before and after and educational program. The ranking is usually a numbered scale, for instance 1-5 where 1 is not confident and 5 is very confident. A confidence rating question is included on the post test for each Coastal Stewards workshop. This is designed to measure whether participants are learning or improving on skills related to coastal stewardship. Examples of skills that participants have been asked to rank their confidence on include designing a rain garden, measuring water quality and using a dehooking device during catch and release fishing.

Participant Surveys

A survey includes questions about the participant's experience and asks for feedback on the

quality of the programming. Coastal Stewards workshop surveys include questions designed to evaluate both quantitatively and qualitatively what participants enjoyed during a workshop and what could be improved. For example, Coastal Stewards surveys include a list of each lecture, lab and field activity in the workshop and ask participants to rate their experience for each from 1 to 5, where 1 represents unsatisfactory and 5 represents exceptional. A blank space is provided for additional comments on each activity.

Typically, participants are given a survey at the start of the workshop so that they can fill out responses for each activity during the workshop breaks if they prefer. Surveys could also be given at the end. This tool is primarily used to inform future workshop planning. However, there are also several open-ended questions that ask what participants have learned and how they plan to use it. Open ended questions serve as a first measure of the expected impact from the program. For instance, if some teacher participants note that they plan to use the information in their classroom, follow up with a survey six months later asking if information was used as anticipated. If not, request additional information about the challenges or barriers may prevent them from implementing the information or skills.

Focus Group

Focus groups are facilitated conversations with a small group of individuals. This evaluation tool can produce more in-depth responses but takes time and is most effective with fewer than ten people. It might not be feasible to do a focus group for every workshop. One forty-minute focus group was held with participants at the end of the Coastal Stewards Landscaping for Stormwater workshop. A program evaluation specialist was engaged to facilitate and record focus group responses which will be used in planning for future workshops.

Informal Conversations

Shared meal time is included during every Coastal Stewards workshop. During this time educators and the program coordinator sit and talk with participants. This can be a time to informally ask how the participants' experience is going so far and what activities or aspects of the workshop they like and dislike. So that the experience is still fresh on the mind, debrief with co-facilitators, presenters or educators after the program ends or within a week following a workshop. This is a time to share any of feedback or comments from participants that were received informally and to share any other observations educators made about the group dynamic, participant engagement, what seemed to work well and what could be improved.

APPENDICES

Table of Contents

APPENDIX A: Stewardship Shorts

Stewardship Shorts are 1-2 page PDF documents designed to communicate conservation challenges and stewardship solutions along Georgia's coast. These concise fliers are easy to share through social media and online platforms. Each provides background information, stewardship actions, and connections with organizations that do similar work. They may be used by environmental educators and the public. Ten Stewardship Shorts are organized here under three themes presented throughout the curriculum guide.

Wildlife and Habitats

Beach Behavior

Estuary Etiquette

Wetlands Wisdom

Recreational Use of Coastal Resources

Fish the Coast

Boat the Coast

Coastal Inspirations

Coastal Cuisine

Green Infrastructure

Water Conservation for Your Home

Watersheds and Stormwater

Resilient Living on the Coast

Take Action

Stay off sand dunes

Pack in and pack out

Observe, don't disturb

Explore

Tybee Island Marine Science Center
www.tybeemarinescience.org

Jekyll Island
www.jekyllisland.com

Cumberland Island National Seashore
www.nps.gov/cuis

Sapelo Island National Estuarine Research Reserve
http://sapelonerr.org

Connect

Wildlife Resources Division, Georgia Department of Natural Resources
Georgiawildlife.com

Ogeechee Audubon
ogeecheeaudubon.org

Caretta Research Project
Carettaresearchproject.org

Georgia Sea Turtle Center
gstc.jekyllisland.com

Keep Golden Isles Beautiful
KGIB.org

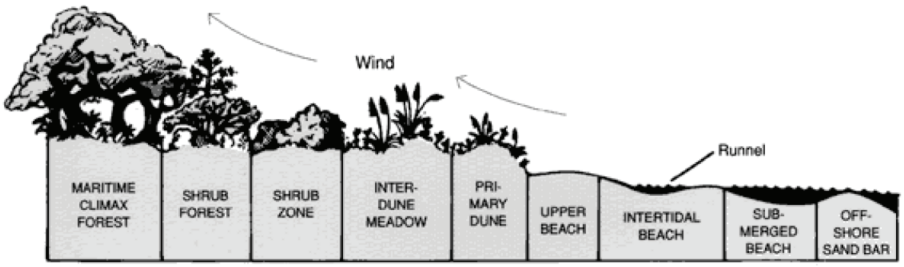
STEWARDSHIP SHORT:
Beach Behavior

Georgia beaches are inviting places to play, relax and view wildlife. Use these basic etiquette tips to keep beaches safe and enjoyable for people and wildlife.

Action 1 | STAY OFF SAND DUNES

Dunes are formed when sand deposited by wind accumulates above the high tide line of the beach. Vegetation that grows there helps hold sand in place with strong, intricate root systems. Dunes protect coastal areas from erosion and flooding during storms and harsh weather events. Insects, birds, reptiles and small mammals depend on dune vegetation for food and shelter. Walking on dunes can cause erosion, damage fragile plants, and disturb wildlife.

- Use the provided boardwalks when crossing to the beach.
- Never pick sea oats or other plants growing on the dunes.
- Know what is permitted under the Georgia Shoreline Protection Act.



Action 2 | PACK IN AND PACK OUT

All marine debris comes from people. One of the most common forms is plastic, which never degrades, and instead breaks down into smaller and smaller pieces. Birds, marine mammals, and other ocean creatures can be negatively impacted by marine debris through ingestion or entanglement.

- Properly dispose of your garbage and don't leave any items behind.
- Deposit cigarette butts in receptacles.
- Ask your servers to skip the straw when ordering beverages.
- Choose a reusable cooler and water bottle.

Action 3 | **OBSERVE, DON'T DISTURB**

It's important to remember that we share the beach with animals that rely on this habitat for food, shelter, resting and nesting. Disturbing these animals or their habitat can be detrimental to their health.

Invertebrates

- Take only empty shells from the beach. Please do not remove living animals.
- Flip over horseshoe crabs that are stranded upside down on the beach.
- Learn to differentiate between live (fuzzy and brown) and dead (smooth and white) sand dollars. Leave brown ones on the beach.

Shorebirds

- Leave your dogs at home to avoid disturbing birds resting on the beach.
- Observe from afar with binoculars and encourage others to do the same.
- Walk in wet sand below the high tide line. Many shorebirds nest directly on the beach above the high tide line.
- Avoid posted nesting sites.

Sea turtles

- Turn off beachside lights during nesting season (May to August). Lights confuse hatchlings, baby sea turtles, and make it hard for them to find the ocean.
- Fill in holes and flatten sandcastles before you leave the beach. Human-made obstacles can slow a hatchling's journey from the nest to the ocean and increase its likelihood of being eaten by birds or small mammals.
- Don't disturb turtle tracks. Researchers use them to identify species and mark nests for protection.
- Avoid marked nesting sites.

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GEORGIA
Department of Natural Resources
Coastal Resources Division

This Stewardship Short was prepared by Marine Extension and Georgia Sea Grant under grant award #NA17NOS4190164 to the Georgia Department of Natural Resources from the Office for Coastal Management, National Oceanic and Atmospheric Administration. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of DNR, OCM or NOAA.

Beach Behavior References

Department of Natural Resources (2018). Give beach-nesting birds their space. [Press Release] Retrieved from https://georgiawildlife.com/give-beach-nesting-birds-their-space.

Department of Natural Resources (2018). Sea Turtle Recovery Efforts [Website] Retrieved from https://georgiawildlife.com/conservation/seaturtles.

National Oceanic and Atmospheric Administration. Marine Debris [Website] Retrieved from https://oceanservice.noaa.gov/hazards/marinedebris/

Lindsay, A. Woods Walking: A Naturalist's Guide to the Jay Wolf Trail (2009)

STEWARDSHIP SHORT:

Estuary Etiquette

Coastal Stewards

Take Action

Leave it intact

Connect with people and place

Observe, don't disturb

Explore

Sapelo Island National Estuarine Research Reserve
sapelonerr.org

Georgia State Parks Crooked River and Fort McAllister
gastateparks.org

Cumberland Island National Seashore
www.nps.gov/cuis

Savannah Coastal Refuges Complex
fws.gov/refuge/Savannah

Connect

The Dolphin Project
www.thedolphinproject.org

NOAA Fisheries
www.fisheries.noaa.gov

UGA Shellfish Research Lab
gacoast.uga.edu

Rivers network
www.rivernetwork.org

Georgia DNR Coastal Resources Division
coastalgadnr.org

Georgia's estuaries are bodies of water that form where rivers meet the sea. Fresh and saltwater mix, creating a unique, ideal habitat for a variety of coastal plants and animals.

Action 1 | LEAVE IT INTACT

Georgia's coastal estuaries include salt marshes, marsh hammocks, tidal creeks and oyster reefs. Estuaries provide habitats and nursery areas for migratory birds, marine mammals, and commercially valuable fish and shellfish. Estuarine habitats filter pollutants from our waterways, stabilize sediments and protect properties from erosion and storm surge. It is important to keep Georgia's estuaries pristine.

- Properly dispose of solid and liquid waste to keep our coastal waters healthy.
- Support oyster restoration efforts in Georgia by donating oyster shells to the G.E.O.R.G.I.A program. Oyster reefs provide habitat for fish and crabs, filter and clean the water, and protect estuarine shorelines from erosion. Learn more at gacoast.uga.edu/oyster-restoration .
- Know your Georgia Coastal Marshlands Protection Act, which limits development that impacts these sensitive areas. Learn more at coastalgadnr.org.

Action 2 | CONNECT WITH PEOPLE AND PLACES

Explore the estuary and meet the people, plants and animals connected to this extraordinary habitat. Learn about estuary functions to find out how you can play a positive role in the ecosystem.

- Enjoy the estuary's edge by foot while hiking, birding or fishing.
- Explore estuarine waters with a guided charter boat, paddle trip or kayak class.
- Visit a marine education center to learn more about estuarine plants and wildlife.
- Connect with your local Riverkeeper (Waterkeeper.org) to get involved with conservation projects.

Action 3 | OBSERVE, DON'T DISTURB

When visiting estuaries, be sure not to disturb the local wildlife. Always keep your distance and dedicate time to learning about the animals that rely on these habitats.

Terrapins

The diamondback terrapin is the only turtle in North America that lives in brackish water, which includes a mix of fresh and saltwater.

- When boating or paddling be alert for terrapins and sea turtles.
- Watch for terrapins crossing roads during nesting season, which is from May to July.
- Do not attempt to relocate turtles. Never remove adults, eggs or hatchlings from their natural habitat.

Birds

From snowy egrets to bald eagles, a wide variety of birds rely on estuaries and salt marshes for nesting, resting and feeding.

- Avoid all posted nesting sites.
- Observe from a distance using binoculars.
- For more information about what to do if you encounter a bald eagles nest consult the Department of Natural Resources' website georgiawildlife.com/bald-eagle.

Marine Mammals

Dolphins and manatees are examples of marine mammals commonly found in Georgia estuaries.

- Do not approach, feed, touch or give fresh water to dolphins or manatees. These interactions are all considered harassment.
- Under the Marine Mammal Protection Act, it is illegal to "hunt, harass, capture, or kill" marine mammals.
- Consult www.fisheries.noaa.gov for more information on safe viewing guidelines for marine mammals.
- If you observe a stranded marine mammal contact GA DNR at 1-800-2-SAVEME.

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Estuary Etiquette References

National Oceanic and Atmospheric Administration (2018, June 25). What is a salt marsh? Retrieved from https://oceanservice.noaa.gov/facts/saltmarsh.html.

National Oceanic and Atmospheric Administration- Office of Protected Resources (2017, October 10). Marine Mammal Protection Act. Retrieved from https://www.fisheries.noaa.gov/marine-mammal-protection-act.

Authors: Kayla Clark, Anne Lindsay, Cecilia Nachtmann

STEWARDSHIP SHORT:
Wetlands Wisdom

By definition, a wetland is an area that is saturated with water for most or all of the time. Freshwater wetlands and the upland areas around them are particularly beautiful and critical to coastal ecosystems.

Action 1 | LEAVE IT AS YOU FOUND IT

Wetlands provide plant and animal habitat, improve water quality and prevent flooding. However, they are very sensitive to disturbances, so take care not to alter these areas in any way.

- Properly dispose of any trash, liquid and pet waste.
- Keep pets on a leash and stay on designated trails.

Savannah Riverkeepers

Action 2 | PREVENT INVASIVE SPECIES

Invasive species are plants or animals that have been introduced into areas outside of their normal range and cause harm in their new location. They often lack natural predators and are able to out-compete native species. Prevent the spread of invasive species in coastal areas.

- Never transfer living animals (including unwated pets) or plants to new locations.
- Clean your boat thoroughly and allow it to dry completely before using it in another area.
- Don't transport firewood long distances.

Take Action

Leave It As You Found It

Prevent Invasive Species

Respect the Locals

Explore

Okefenokee Swamp Park
okeswamp.com

Altamaha WMA
georgiawildlife.com/altamaha-wma

Savannah National Wildlife Refuge
www.fws.gov/refuge/savannah

Cay Creek Wetland Interpretive Center
www.coastalwildscapes.wildapricot.org/Cay-Creek

Connect

Savannah River Ecology Lab
srel.uga.edu

Cooperative Invasive Species Management Area
www.coastalgeorgiacisma.org

Herp mapper
https://www.herpmapper.org

Frogwatch USA
https://www.aza.org/frogwatch-usa-volunteers

Action 3 | **RESPECT THE LOCALS**

Wetlands are used by many species for feeding, resting and nesting. Be a good wetland neighbor.

Wading Birds

Disturbances can cause adult birds to "flush," or leave the nest, forcing them to unnecessarily expend energy and sometimes abandon the nest entirely.

- Observe from afar using binoculars, and encourage others to do the same.
- Avoid all posted nesting sites.

Alligators

Alligators benefit coastal wetlands. Their holes fill with water and serve as refuge for many animals during the dry season. Alligator attacks are unlikely and avoidable.

- Do not feed or harass alligators or any other wild animals. It is illegal and dangerous.
- Stay at least 60 feet from alligators; keep children and pets away from the water's edge.

Snakes

Of the 46 species of snakes found in Georgia, only six are venomous. Snakes serve a natural and helpful purpose by keeping pest populations in check.

- Watch your step. If you encounter a snake give it plenty of room.
- Snakes are protected by law in Georgia. Killing non-venomous snakes is illegal. For more information visit www.gadnr.org.

Amphibians

Amphibians include frogs, toads, salamanders, and newts. Georgia has 31 species of frogs and toads and 54 species of salamanders. These animals spend a portion or all of their life cycle in freshwater.

- Amphibians breathe in part through their skin, so it's best not to handle them.
- Do not remove amphibians from the wild or disturb their habitat.

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Authors: Kayla Clark, Anne Lindsay, Cecilia Nachtmann

STEWARDSHIP SHORT:

Fish the Coast

Coastal Stewards

Take Action

Know the Fishing Regulations

Practice Sustainable Fishing

Follow Best Practices

Get Involved

Explore

Georgia Outdoor Map
www.georgiaoutdoormap.com

Sapelo Island WMA
georgiawildlife.com/sapelo-island-wma

Gray's Reef National Marine Sanctuary
graysreef.noaa.gov

Connect

Georgia Department of Natural Resources
https://gadnr.org

Coastal Conservation Association
www.joincca.org

Clean Coast
www.cleancoast.org

South Atlantic Fishery Management Council
safmc.net/citizen-science-initiative/

Georgia Rivers Network
https://www.garivers.org

The Georgia coast is abundant in a variety of seafood. If you follow regulations and respect the environment, fishing on the coast can be a fun and rewarding experience!

Action 1 | KNOW THE FISHING REGULATIONS

Fishing regulations are established to help protect and conserve marine resources for future generations. Ensure you are fishing legally by staying up to date on state and federal requirements.

- Purchase a state recreational fishing license to fish, shrimp, crab, or harvest oysters and clams. Not only are fishing licenses required by law, but a portion of the license sales goes towards fish habitat conservation efforts. Licenses can be purchased at most sporting goods stores or bait and tackle shops as well as online at www.gooutdoorsgeorgia.com.
- Acquire a free and mandatory saltwater information permit, or SIP card, at coastalgadnr.org/SIPPermit.
- Learn how to properly measure a fish. Know the current size and possession limits for each species. This information is available in the free DNR sportfish regulations booklet, which you can download at gadnr.org. Paper copies are also available at coastal bait shops or the UGA Aquarium.
- If you plan to eat your catch, consult safe seafood consumption guidelines at epd.georgia.gov/fish-consumption-guidelines.

Action 2 | PRACTICE SUSTAINABLE FISHING

- Use native bait to avoid introducing non-native and potentially invasive species.
- Check crab traps every 24 hours and install a bycatch reduction device on your trap to prevent terrapin drownings.
- It is required by law to install cull rings on your crab trap. These are circular openings which allow crabs smaller than regulation size to escape from the trap.
- Don't cast your line if a sea turtle or marine mammal is in the area. Give them at least 50 yards of space.
- If you do hook a sea turtle, pull it in with a net and immediately contact GA DNR at 1-800-2-SAVEME. Do not try to remove the hook yourself. If you cannot reach the response team and are unable to bring the turtle to shore, cut the line as short as possible before releasing the turtle.
- Dispose of monofilament line properly. Fishing line that isn't properly discarded can remain in the environment for hundreds of years and entangle wildlife.

Action 3 | FOLLOW BEST HANDLING PRACTICES

Reduce your impact on wild fish populations during catch and release fishing by applying best handling practices that minimize injury and mortality among released fish. Learn more at www.catchandrelease.org

- Circle hooks have the lowest risk of injury and mortality during catch and release.
- Use a dehooking device to reduce handling time. If possible, dehook fish in the water.
- If you must bring a fish onboard, use a knotless rubber landing net, support the animal's body horizontally, use wet hands and avoid lifting the fish by the jaw.

Action 4 | GET INVOLVED

Fisheries scientists strive to promote and manage sustainable fish populations. Find out how you can get involved to become a steward within the angler community.

- Participate in fishing-related citizen science like the Marine Sportfish Carcass Recovery Program or the Cooperative Angler Tagging Program.
- Get involved with conservation efforts impacting your favorite waterway.

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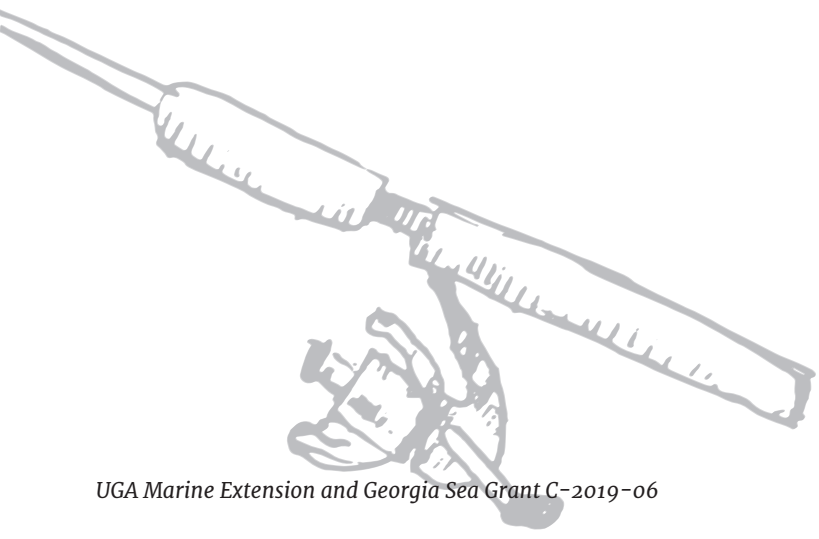

STEWARDSHIP SHORT: Boat the Coast

Coastal Stewards

Take Action

Boat Respectfully

Paddle Wisely

Observe, Don't Disturb

Explore

Georgia Sea Turtle Center
https://gstc.jekyllisland.com

Georgia Outdoor Map
www.georgiaoutdoormap.com

Georgia River Network
https://www.garivers.org

Connect

Clean Marina Program
www.cleanmarina.org

Clean Coast
www.Cleancoast.org

Georgia Department of Natural Resources
https://Gadnr.org

Coast Guard Auxiliary
http://www.cgaux.org

Rivers Alive Annual Cleanup
https://riversalive.georgia.gov

One of the best ways to experience the beauty of the Georgia coast is by water. Be aware of local weather, tides and currents. Georgia has a 6-10 foot tidal range. At low tide many tidal creeks become impassable. The speed and direction of currents will also change rapidly during the tidal cycle. If you travel the coast by motorboat, kayak or paddleboard, be sure to keep some of these tips in mind.

Action 1 | BOAT RESPECTFULLY

You are responsible for your speed and wake. Unchecked, both can be dangerous to people, habitats and wildlife by increasing the chance of a collision or causing shoreline erosion.

- Take a boat safety class.
- Always observe no wake zones.
- Don't speed through tidal creeks. It reduces your ability to avoid hazards and causes shoreline erosion.
- Wear polarized sunglasses to decrease glare from the water and improve vision.
- Direct a passenger to look for obstacles in the water as there is often low visibility in Georgia's coastal waters.
- Avoid discharging oil or dumping plastics in U.S. waters. These actions are illegal under federal law.

Satilla Riverkeeper

Action 2 | PADDLE WISELY

When paddling through an estuary, follow safety guidelines to ensure that your trip is enjoyable and accident-free.

- Always wear a lifejacket, and carry water, first aid, a whistle, and a cell phone or marine radio.
- Check the weather forecast and tides before heading out, and plan your trip accordingly.
- Only launch and land at designated access points.
- Never paddle alone. Consider joining a guided trip to learn about local conditions in certain areas.
- Always file a float plan with a friend or family member.

Action 3 | OBSERVE, DON'T DISTURB

While out on the water, do not disturb shorebirds, marine mammals or turtles. If you accidentally collide with an animal or come across a dead or injured marine mammal or sea turtle in the water, call Georgia DNR at 1-800-2-SAVEME.

Marine Mammals and Sea Turtles

Boaters should be aware of sea turtles, dolphins and manatees when out on the water. In 2017, 29 percent of sea turtle injuries and deaths in Georgia were attributed to boat strikes.

- Always observe marine life viewing guidelines at www.fisheries.noaa.gov.
- Don't approach animals in your boat, as this can be dangerous for both them and you.
- Don't feed marine mammals or sea turtles. Not only is this illegal, but it changes their behavior and can be detrimental to their survival.
- It is illegal to harass or harm marine mammals or sea turtles under the Marine Mammal Protection Act and the Endangered Species Act.
- Navigate responsibly by following channel markers. When in shallow water, stay particularly alert for well-camouflaged manatees

Shorebirds

When boating inshore or anchoring your boat near the shore you may encounter shorebirds, which are highly sensitive to disturbances.

- Leave dogs at home. It is illegal to bring dogs to certain islands. Even if they are allowed, they should not be permitted to chase or harass shorebirds.
- Walk in wet sand below the high tide line. Many shorebirds nest directly on the beach above the high tide line. Even brief disturbances of the adult birds can impact egg survival, particularly during hot summer months.
- Observe from afar with binoculars to avoid disturbing resting, feeding or nesting behavior.

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Authors: Kayla Clark, Anne Lindsay, Cecilia Nachtmann

STEWARDSHIP SHORT: Coastal Inspiration

Coastal Stewards

Take Action

Connect with the Past

Celebrate Local Artistry

Get Creative

Explore

Georgia State Parks & Historic Sites
https://Gastateparks.org

Gullah Geechee Heritage Corridor
https://www.gullahgeecheecorridor.org

National Park Service
www.nps.gov

Ossabaw Island Foundation
http://www.ossabawisland.org

Pin Point Heritage Museum
https://chsgeorgia.org

Connect

Coastal Museums Association
http://coastalmuseums.org

Georgia Historical society
https://Georgiahistory.com

Georgia Department of Natural Resources
https://gadnr.com

National Parks Arts Foundation
https://www.nationalparksartsfoundation.org

South Arts
https://www.southarts.org

Georgia's coastline has long been a source of creative energy for artists. Whether you enjoy art or create it, gather ideas and inspiration from the natural and cultural resources of the coast.

Action 1 | CONNECT WITH THE PAST

Experience the culture and history that shaped coastal Georgia. Respect the relics and structures that remain.

- Listen to the locals! Talk to people who have lived on the coast for a long time.
- Visit a state historical site, join a history tour, or check out a cultural museum.
- Leave all archaeological artifacts found on historic sites, state or federal land.
- Do not dig or use a metal detector on private property without the permission of the landowner and the Georgia Department of Natural Resources.

Below are some of the coastal art and history organizations to look into.

Arts on the Coast, Richmond Hill artsonthecoast.org	**Geechee Kunda Museum, Riceboro** (912) 884-4440	**Georgia Council for The Arts** gaarts.org/about
Georgia Council for American Indian Concerns www1.gadnr.org/caic/	**Georgia Archeological Site File** archaeology.uga.edu/gasf/	**Glynn Visual Arts** www.glynnvisualarts.org
Green Scene of Coastal Georgia www.GreenSceneGA.org	**Jekyll Island Arts Association** www.jekyllartists.com	**Loop It Up** www.loopitupsavannah.org
Sapelo Island Cultural and Revitalization Society (SICARS) www.sapeloislandga.org/home	**Savannah Art Association** www.savannahartassociation.com	**The Society for Georgia Archeology** thesga.org

Action 2 | CELEBRATE LOCAL ARTISTRY

Seek out galleries and art exhibits that feature local artists. Celebrate Georgia's unique spirit and culture by attending art, music, film and literary festivals.

- Learn from Gullah Geechee artists during the annual Cultural Day Festival on Sapelo Island and the Georgia Sea Islands Festival on St. Simons Island.
- Check out a local film festival such as the Green Screen Film Festival or the Gray's Reef Film Festival.
- Attend or volunteer for music or book festivals on the coast.

Action 3 | GET CREATIVE

Let the natural beauty of the Georgia coast inform your art. Use your art to engage and inspire others to conserve the coast.

- Join a local arts association to participate in workshops, classes or contests.
- Explore wild barrier islands during an artist or writers retreat or check out what opportunities your local wildlife refuge offers.
- Lose yourself in novels, poetry and non-fiction books set in coastal Georgia
- Share your work by volunteering with an arts after-school program.
- Donate your artwork to causes that support coastal conservation.

Mosaic made from bottle caps at the Savannah Youth Ocean Conservation Summit

Viola Martin, a member of the Gullah Geechee community of Pin Point leads a crab drop-net knitting class.

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Authors: Kayla Clark, Anne Lindsay, Cecilia Nachtmann

STEWARDSHIP SHORT: Coastal Cuisine

Coastal Stewards

Take Action

Buy Local

Protect Estuaries

Attend a Seafood Festival

Explore

Georgia Seafood Directory
gacoast.uga.edu/outreach

UGA Brunswick Station
gacoast.uga.edu

Pin Point Heritage Museum
www.chsgeorgia.org/phm

Connect

UGA Shellfish Research Lab
gacoast.uga.edu

Georgia Department of Natural Resources
gadnr.org

Slow Food of Coastal Georgia
www.slowfoodcoastalga.org

Georgia Shrimp Association
www.wildgeorgiashrimp.com/home.html

Experience the delicious seafood that the Georgia coast has to offer. Follow these tips to help conserve the environment that is vital to healthy fisheries.

Action 1 | BUY LOCAL

Buying locally harvested seafood can lower your carbon footprint. There are typically fewer steps involved in processing local seafood, and the product doesn't have to travel as far to reach consumers. Locally caught seafood adheres to state and federal regulations. Purchasing products that are harvested in the U.S. supports the long-term health and sustainability of domestic fisheries. However, it's not always possible to buy Georgia-harvested seafood. It may be unavailable or more expensive if the product is out of season or not harvested in the area. You can learn about local seafood availability in Georgia by following the tips below.

- Ask your server to identify local or regional options on the menu.
- Use the Georgia Seafood Directory to find local seafood wholesalers and retailers.
- Attend one of UGA Marine Extension and Georgia Sea Grant's seafood programs. Learn more at gacoast.uga.edu.
- If you are interested in catching your own seafood, purchase a fishing license through the Georgia Department of Natural Resources.
- Seafood caught in some areas of coastal Georgia should only be consumed on a limited basis. Consult local guidelines for safe seafood consumption at epd.georgia.gov/fish-consumption-guidelines.

Action 2 | PROTECT ESTUARIES

Estuaries are bodies of water that form where fresh and saltwater mix. Over 70 percent of the seafood species harvested on the Georgia coast utilize estuaries and salt marshes during at least part of their lives. Shrimp, Georgia's most valuable fishery, depend on healthy estuaries to complete their life cycle. Without healthy estuaries, Georgia's fishing industry would be unable to support itself.

- Properly dispose of solid and liquid waste to keep our coastal waters healthy.
- Know how to properly use pesticides and fertilizers in your yard. Both can be picked up by rainwater and eventually contaminate the estuary. For more information visit the UGA Cooperative Extension Georgia Pesticide Safety Education Program website.

- Contribute to the construction of artificial oyster reefs by donating shells to the G.E.O.R.G.I.A program. These reefs provide shelter, filter and clean the water, and prevent erosion.
- Know your Coastal Marshlands Protection Act, which limits development that impacts these sensitive areas.

Action 3 | ATTEND A SEAFOOD FESTIVAL

Seafood festivals on the Georgia coast are not to be missed! There are many great events where you can learn about coastal fisheries while tasting the bounty estuaries provide.

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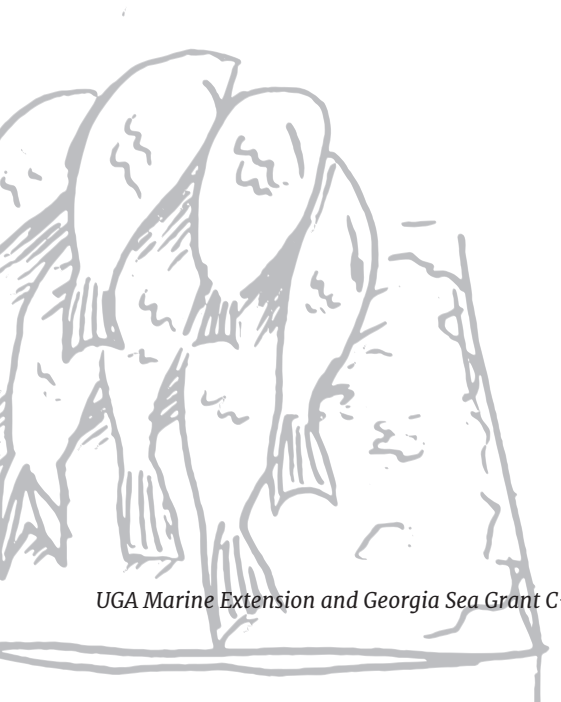

STEWARDSHIP SHORT: Water Conservation

Coastal Stewards

Take Action

Disconnect and Collect

Garden Green

Conserve Freshwater

Explore

Visit a green infrastructure demonstration site
coastalgadnr.org/DemoSites

Cay Creek Wetlands Interpretive Center
www.coastalwildscapes.org/Cay-Creek

Connect

Savannah Tree Foundation
www.savannahtree.com

Department of Natural Resources- Coastal Resources Division
coastalgadnr.org

Georgia Forestry Commission
www.gfc.state.ga.us

UGA Marine Extension and Georgia Sea Grant
gacoast.uga.edu

Coastal Wildscapes
www.coastalwildscapes.org

The health of our coastal waterways is everyone's responsibility. Green infrastructure helps protect and restore habitat by mimicking the natural water cycle. By using low impact development practices at home, you can help prevent flooding and pollution by promoting treatment and absorption of stormwater at the source. Stormwater is water from rainfall or other precipitation that falls on impervious surfaces where it cannot be absorbed such as pavement or roofs.

Action 1 | DISCONNECT AND COLLECT

Rainwater often flows off roofs to driveways, directing water into storm drains. Most water that enters storm drains will go directly to waterways without getting treated. Implementing the strategies below can decrease the amount of pollution flowing into streams and rivers.

- Reduce rooftop runoff by rerouting gutter downspouts, allowing water to flow onto grass or gravel and seep into the ground. This is called downspout disconnection.
- Collect and store stormwater from your gutter using rain barrels.

Action 2 | GARDEN GREEN

Lawns and gardens can be a source of pollution if fertilizer, pet waste and pesticides run off with stormwater. By using green infrastructure practices, outdoor spaces can be transformed into effective tools for slowing and treating water.

- Plant a rain garden in a shallow basin, allowing the water to collect and slowly infiltrate.
- Leave forested areas or other natural vegetation on your property intact whenever possible.
- Landscape with native plants from the Georgia coast. These plants are well-adapted to grow locally, requiring less fertilizer and water. They also provide food and shelter for wildlife and beneficial insects that eat unwanted pests, eliminating the need for pesticides.
- Pick up and properly dispose of pet waste. Pet waste can harbor bacteria like E. coli.

Action 3 | CONSERVE FRESHWATER

Less than 1 percent of all the water on earth is fresh and available for consumption, and we all share it. Unfortunately, this water is under threat from overconsumption, saltwater intrusion, and more frequent and severe drought. The Floridan aquifer is an underground layer of water that provides the main drinking water source for a large portion of the Southeast, including coastal Georgia. Withdrawals from this source have increased by five times over the past 60 years. This groundwater can supply wetland habitats as well as the water we use in our homes. The following water conservation tips will help reduce the amount of groundwater you consume.

- Fix leaks immediately, as they can waste up to 180 gallons per week.
- Install or replace old appliances with water-efficient ones.
- Remember to turn the water off while brushing your teeth and avoid taking long showers.
- Water your plants in the evening to prevent water loss from evaporation during the day.
- Position your sprinklers so that they water your plants, not driveways and sidewalks.
- Allow freshwater from rain to replenish groundwater by using low impact development practices such as replacing impervious areas with permeable surfaces.
- Use water collected from a rain barrel to irrigate your plants.

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Authors: Kayla Clark, Anne Lindsay, Cecilia Nachtmann

STEWARDSHIP SHORT: Watersheds and Stormwater

Coastal Stewards

Take Action

Prevent Pollution

Slow the Flow

Venture Out

Explore

Altamaha Wildlife Management Area
georgiawildlife.com/altamaha-wma

EPA Healthy Watershed Protection
www.epa.gov/hwp

Georgia Outdoor Map
gadnr.org

Georgia State Parks
gastateparks.org

Connect

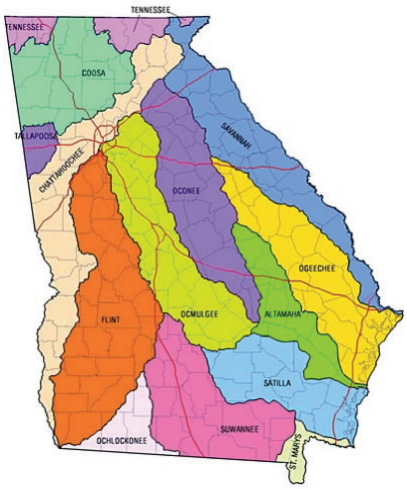
Georgia Adopt-a-Stream
adoptastream.georgia.gov

Savannah Tree Foundation
www.savannahtree.com

Keep Golden Isles Beautiful
www.kgib.org

Georgia Water Coalition
www.gawater.org

Riverkeepers for Savannah, Altamaha, Ogeechee, Satilla and St. Mary's
www.waterkeeper.org



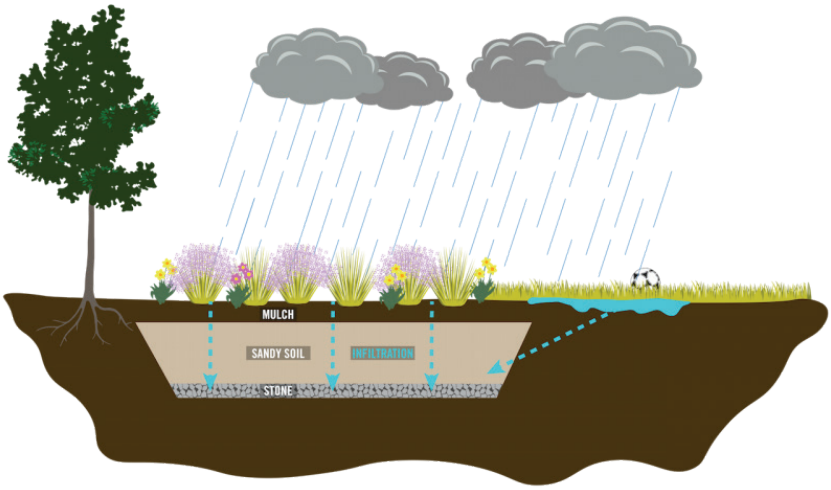
There are 78 major river basins or watersheds, in the U.S., including 14 in Georgia. Credit for map: Georgia Department of Natural Resources

Everyone lives in a watershed, or a region in which all water flows across or through. The area typically drains to one waterbody, like a river, lake or marsh. Many rivers in Georgia flow to the sea, which means actions inland impact the ocean. Follow these tips to learn about your watershed and help preserve coastal water quality.

Action 1 | PREVENT POLLUTION

When stormwater flows over the ground, it picks up pollutants that eventually end up in local estuaries and the ocean. This type of pollution is called nonpoint source pollution, and it is the leading cause of water quality problems in America. Chemicals can also enter watersheds through your home if washing machines, sinks, toilets and showers.

- Use recommended amounts of fertilizer. For more information visit extension.uga.edu/programs-services/pesticide-safety-education.html
- Wash your car on grass instead of paved surfaces.
- Keep storm drains clear and never put grass clippings, used paint or motor oil in them.
- Pick up and properly dispose of pet waste, which can harbor bacteria like E. coli.
- Don't flush medications. Many chemicals are not removed by wastewater treatment.
- Consider using phosphate free detergents and soaps.
- Skip single-use plastics, like straws and plastic bags, and invest in reusable products. Plastic never breaks down and instead degrades into smaller and smaller pieces.
- Consider adding a microfiber-catching device to your washer and dryer. Microfibers from synthetic fabrics are found in many waterbodies.



A bioretention cell is a green infrastructure stormwater management practice that consists of layers of sandy soils, mulch and stone that capture and treat runoff.

Action 2 | SLOW THE FLOW

Stormwater is water from rainfall or other precipitation that falls on impervious surfaces. These are surfaces that don't absorb water, like a road or a parking lot. When stormwater is not managed properly it can cause flooding, poor water quality, and eroded shorelines. Most storm drains do not lead to treatment plants, so anything that goes in them will likely end up directly into rivers or estuaries. Green infrastructure practices help slow and treat stormwater on site.

- Plant trees. They take up water in their roots, hold soil in place, and promote infiltration (water seeping into the soil).
- Implement simple and inexpensive management techniques in your home such as rain barrels, rain gardens, and downspout disconnection.
- Help your community plan and implement larger scale methods for managing stormwater, like bioretention ponds and permeable pavement. Find out how to get involved at gacoast.uga.edu/stormwater.

Action 3 | VENTURE OUT

One of the best ways to help protect your watershed is to see it for yourself. Determine which watershed you live in, and then get out there and explore!

- Locate your watershed using water.usgs.gov.
- Participate in a river or coastal clean-up.
- Join a water quality monitoring group such as a local (Waterkeeper.org).
- Take part in a tree-planting event.
- Have fun! Kayak, hike, swim, or simply relax by your local stream, river or estuary.

Marine Extension and Georgia Sea Grant
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Sea Grant

NOAA
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

GEORGIA
Department of Natural Resources
Coastal Resources Division

This Stewardship Short was prepared by Marine Extension and Georgia Sea Grant under grant award #NA17NOS4190164 to the Georgia Department of Natural Resources from the office for Coastal Management, National Oceanic and Atmospheric Administration. The Statements, findings, conclusions and recommendations are those of the author(s) and do not necessarily reflect the views of DNR, OCM or NOAA.

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Authors: Kayla Clark, Anne Lindsay, Cecilia Nachtmann

STEWARDSHIP SHORT: Resilient Coastal Living

Coastal Stewards

Take Action

Prepare for Coastal Hazards

Protect Coastal Habitats

Invest in Green Infrastructure

Explore

FEMA Flood Map Service Center,
https://msc.fema.gov/portal/home

Georgia Flood Map Program
http://www.georgiadfirm.com/

National Center for Atmospheric Research (NCAR) Storm Surge Animation
https://youtu.be/q6W_20bwqWo

NOAA Coastal Flood Exposure Mapper
https://coast.noaa.gov/digitalcoast/tools/flood-exposure.html

Connect

Georgia Emergency Management Agency
www.gema.ga.gov

Ready Georgia
ready.ga.gov

UGA Marine Extension and Georgia Sea Grant
https://gacoast.uga.edu

Georgia Climate Project
www.georgiaclimateproject.org

Georgia Forestry Commission
http://www.gfc.state.ga.us

The Georgia coast is a dynamic place, with constantly shifting sands, water and weather. Protecting and maintaining coastal resources can help communities become more resilient against hazards like hurricanes and flooding.

Action 1 | PREPARE FOR HAZARDS

Coastal hazards are increasing as our region experiences rising sea levels, more frequent severe storms, warming temperatures and heavier rain events. Preparing, whether as an individual or as a community, can help minimize harm from coastal hazards.

- Storm surge, or higher water levels caused by a storm, can occur rapidly and is one of the most damaging aspects of a coastal flood hazard. Learn more about storm surge by exploring the National Storm Surge Hazard Maps produced by the National Hurricane Center, https://www.nhc.noaa.gov/nationalsurge/.
- Consider if retrofitting, which involves making changes to a building to protect it from hazards, would be a good fit for your home. Some retrofits include elevating, floodproofing, or relocating buildings. Learn more at https://www.fema.gov.
- Make a hurricane plan and build an emergency kit. Find out more at https://ready.ga.gov.
- Sign up for weather alerts through your local emergency management agency.

Action 2 | PROTECT COASTAL HABITATS

Coastal habitats naturally buffer impacts from coastal hazards, protecting coastal communities and making them more resilient. Salt marshes, oyster reefs, and dunes help reduce erosion and flooding. Forests along the Georgia coast can also reduce flooding during storms, as well as provide cooler temperatures during heat waves.

- Volunteer with local conservation organizations to help monitor, restore and protect coastal habitats.
- Always use boardwalks or public access points when visiting the beach to prevent damage to dunes.

Action 3 | INVEST IN GREEN INFRASTRUCTURE

We all depend on built infrastructure such as roads, houses and grocery stores to function as a society. Green infrastructure practices offer an alternative to hardened infrastructure. These practices use vegetation, soils, and other elements that protect and restore habitat by mimicking the natural water cycle. When green infrastructure is planned, designed and funded following the same approach as built infrastructure, it can enhance coastal resilience in communities impacted by hazards.

- Explore this planning tool to learn about green infrastructure in coastal Georgia, http://maps.crc.ga.gov/CoastalGreenInfrastructure/.
- Visit green infrastructure demonstration sites for ideas of what low impact development practices your community can implement, https://coastalgadnr.org/DemoSites.
- Attend local government planning meetings to learn more about green infrastructure projects in your area.
- Volunteer to plant trees or request a planting in your neighborhood by connecting with the Savannah Tree Foundation.
- Learn about living shorelines, a form of erosion control that is a natural alternative to a hardened structure like a bulkhead. More information is available on the Georgia Living Shoreline Map, http://arcg.is/1GfnuC

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Authors: Kayla Clark, Anne Lindsay, Cecilia Nachtmann

APPENDIX B: Government Agencies Working on the Coast

State and federal partnerships are critical to coastal research, management, and education efforts. The following agencies maintain facilities, programs, projects, and personnel along the Georgia coast to provide area expertise and service to the community.

Federal Emergency Management Agency, https://www.fema.gov/

South Carolina Department of Natural Resources, https://scdnr.gov.

Georgia Adopt-a-Stream, https://adoptastream.georgia.gov/

Georgia Department of Natural Resources (GA DNR), https://gadnr.org/

GA DNR Coastal Resources Division, https://coastalgadnr.org

GA DNR Wildlife Resources Division, https://georgiawildlife.com/

GA DNR Georgia Environmental Protection Division, https://epd.georgia.gov//

GA DNR Georgia State Parks and Historic Sites, https://gastateparks.org/

Georgia Emergency Management Agency, https://gema.georgia.gov/

Georgia Forestry Commission, http://www.gfc.state.ga.us/

NOAA Gray's Reef National Marine Sanctuary, https://graysreef.noaa.gov/visit/

NOAA Sea Grant, https://seagrant.noaa.gov/

U.S. Fish & Wildlife Service National Wildlife Refuge System, https://www.fws.gov/refuges/whm/coastalandmarine.html

APPENDIX C: Colleges and Universities Working on the Coast

Georgia's institutions of higher learning are engaged in research, academics, and outreach across the state. The following public colleges and universities maintain research projects, programs, facilities, and personnel on the coast. Faculty and staff affiliated with these institutions provide area expertise and guidance.

College of Coastal Georgia, https://www.ccga.edu/page.cfm?p=500

Georgia Southern Biology, https://cosm.georgiasouthern.edu/biology/

Georgia Tech Department of Biological Sciences, https://biosciences.gatech.edu/

Savannah State University, Department of Marine and Environmental Science, https://www.savannahstate.edu/cost/mar-env-science/

University of Georgia (UGA), https://www.uga.edu/

UGA Cooperative Extension, http://extension.uga.edu/

UGA Georgia Coastal Research Council, http://www.gcrc.uga.edu

UGA Marine Extension and Georgia Sea Grant, https://gacoast.uga.edu/

UGA Marine Institute on Sapelo Island, https://ugami.uga.edu/about

UGA Odum School of Ecology, https://www.ecology.uga.edu/

UGA Skidaway Institute of Oceanography, https://www.skio.uga.edu

UGA Savannah River Ecology Lab, https://srel.uga.edu/

UGA River Basin Center, https://rivercenter.uga.edu/

UGA Warnell School of Forestry and Natural Resources, https://www.warnell.uga.edu/

APPENDIX D: Non-Governmental Organizations Working On the Coast

Georgia's coastal community benefits from the work of organizations which partner with academic and government entities to advance stewardship opportunities for all ages. The following organizations are committed to public education and engagement.

Clean Marina Program, http://www.cleanmarina.org/

Coast Guard Auxiliary, http://www.cgaux.org/

Coastal Conservation Association, http://ccaga.org/

Coastal Wildscapes, https://www.coastalwildscapes.org/

Dolphin Project, http://www.thedolphinproject.org/

Environmental Education Alliance of Georgia, https://www.eealliance.org/

Georgia Conservancy, https://www.georgiaconservancy.org/

Georgia Climate Project, http://www.georgiaclimateproject.org/

Georgia Association of Marine Education, https://gaome.wildapricot.org/

Georgia Rivers Network, https://garivers.org/

Keep Golden Isles Beautiful, http://www.kgib.org/

Little St. Simons Island, https://www.littlestsimonsisland.com/

Moon River District, http://moonriverdistrict.com/

Nature Conservancy, https://www.nature.org/en-us/about-us/where-we-work/united-states/georgia/

Ogeechee Audubon, https://www.ogeecheeaudubon.org/

One Hundred Miles, http://www.onehundredmiles.org/

Ossabaw Island Foundation, http://www.ossabawisland.net/

Rivers Network, https://www.rivernetwork.org/

Savannah Tree Foundation, http://www.savannahtree.com/

Slow Food of Coastal Georgia, http://www.slowfoodcoastalga.org/

Water Keeper Alliance Coastal Georgia:

Altamaha, http://www.altamahariverkeeper.org/

Ogeechee http://ogeecheeriverkeeper.org

Satilla https://www.satillariverkeeper.org/

Savannah http://www.savannahriverkeeper.org/

St. Mary's http://stmarysriverkeeper.org

APPENDIX E: Wild Spaces and Educational Places

Field trips are essential to stewardship programming for all ages. Listed below are natural areas and environmental education facilities along the Georgia coast. Venture out to explore natural areas, participate in education programs, or learn as you go on your own self-guided experience.

National Wildlife Refuges and Monuments

Cumberland Island National Seashore, https://www.nps.gov/cuis/index.htm

Fort Pulaski National Monument, https://www.nps.gov/fopu/index.htm

US Fish and Wildlife Service, Savannah Coastal Refuges, https://www.fws.gov/refuge/Savannah/

Wassaw Island National Wildlife Refuge, https://www.fws.gov/refuge/wassaw/

Sapelo Island National Estuarine Research Reserve and Visitors Center, https://sapelonerr.org/

Georgia State Parks and Historic Sites,

https://gastateparks.org/ Coastal region sites include:

Crooked River State Park

Fort Jackson State Historic Site

Fort King George Historic Site

Fort Morris State Historic Site

Fort McAllister State Park Stephen C. Foster State Park

Hofwyl-Broadfield Plantation

Laura S. Walker State Park

Reynolds Mansion on Sapelo Island

Skidaway Island State Park

Wormsloe State Historic Site

Georgia State Wildlife Management Areas

Altamaha Wildlife Management Area, https://georgiawildlife.com/altamaha-wma

Sapelo Island WMA, https://georgiawildlife.com/sapelo-island-wma

Ossabaw Island WMA, https://georgiawildlife.com/ossabaw-island-wma

Education Centers and Museums

Cay Creek Wetlands Interpretive Center, https://www.coastalwildscapes.org/Cay-Creek

Coastal Georgia Botanical Garden (UGA), https://coastalbg.uga.edu/

Coastal Heritage Association member sites, http://www.chsgeorgia.org/

Coastal Museum Association member sites, http://coastalmuseums.org/

Driftwood Education Center, http://www.driftwoodee.org/

Georgia 4 H Centers include:

Burton 4-H (Tybee), http://georgia4h.org/4-h-centers/burton-4-h-center/

Georgia 4-H at Camp Jekyll, http://georgia4h.org/4-h-centers/georgia-4-h-at-camp-jekyll/

Tidelands Nature Center, http://georgia4h.org/4-h-centers/4-h-tidelands-nature-center/

Georgia Sea Turtle Center, https://gstc.jekyllisland.com/

Georgia Southern University Center for Wildlife Education and Lamar Q. Ball, Jr. Raptor Center, https://academics.georgiasouthern.edu/wildlife/

Jekyll Island, https://www.jekyllisland.com/

Mary Kahrs Warnell Forestry Education Center, https://www.warnell.uga.edu/mary-kahrs-warnell-forest-education-center

Oatland Island Wildlife Center, http://internet.savannah.chatham.k12.ga.us/schools/oat/default.aspx

Pin Point Heritage Museum, http://www.chsgeorgia.org/phm

Tybee Marine Science Center, https://www.tybeemarinescience.org/

UGA Marine Education Center and Aquarium, https://gacoast.uga.edu/uga-aquarium/visit-us/

UGA Marine Extension Brunswick Station, https://gacoast.uga.edu

APPENDIX F: Introduction to Evaluation

By Dr. Milton E Newberry III

University of Georgia, College of Agricultural and Environmental Sciences, Department of Agricultural Leadership, Education & Communication

Dr. Newberry studies the characteristics that draw individuals towards environmental conservation and education and what attributes they gain from their involvement. He conducts research on the use of program evaluation in environmental education programs, including how to effectively evaluate programs where animals are used in teaching.

Dr. Newberry evaluated the UGA Marine Extension and Georgia Sea Grant Coastal Stewards Workshops and provided guidance on the type of evaluation to include in these pilot programs.

Introduction to Evaluation

Within UGA Cooperative Extension and other outreach organizations, one of the main duties of educators and professionals is to develop public programs. A program is a series of activities that builds upon each other to achieve a specific goal. Over time, the need for exhibiting the value ofprograms has increased as governmental and non-governmental budgets are cut (Lamm, Israel, & Diehl, 2013). This need led to the increasing importance of program evaluation.

Program evaluation is the use of social science research methodologies (e.g., qualitative, quantitative, and mixed-methods) to systematically investigate the effectiveness of programs to determine whether the programs are achieving their goals (Arnold & Cater, 2016; Jayaratne, 2016; Lamm et al., 2013; Rossi, Lipsey, & Freeman, 2004). Evaluation is one strategy to examine and provide feedback on the effect and impact of a program. Furthermore, conducting evaluations have several benefits for professionals who work with adult and family programs. Program evaluation allows users to:

a. Assess information related to the number of programs delivered, number of participants served, or number of resources used during a program (i.e., accountability assessment)

b. Collect information to help determine the strengths, weaknesses, opportunities, and threats regarding implementation of a program (i.e., program enhancement)

c. Use information gathered to determine whether a program is implemented as planned (i.e., program monitoring)

d. Accumulate information from current and prospective clients on their needs in relation to a program (i.e., needs assessment) (Arnold & Cater, 2016; Jayaratne, 2016; Lamm et al., 2013; Rossi et al., 2004).

There are several types of evaluation tools depending on the type of data that must be collected. Quantitative evaluations allow professionals to generalize findings and predict behavior. If quantitative data is required for the evaluation (i.e., numbers, frequencies, percentages, inferential statistics, etc.), then a survey with approximately 20 questions is an effective tool to use. You can also use a Likert scale to measure abstract concepts, such as attitudes. Qualitative evaluations allow professionals to contextualize findings and interpret behavior. Evaluations requiring qualitative data (i.e., text, drawings/pictures, recordings, etc.), then an interview, observations, and photovoice are several effective tools. An interview can have 10 questions to

collect rich testimonials from clients. Observations can be made to look at programmatic effect. Photovoice allows participants to answer a set of questions using pictures and provide feedback describing why the specific pictures were used. It is important to remember that the type of information needed and the clients guide the development of the evaluation.

To learn more about how to conduct program evaluations:

- American Evaluation Association
- Rutgers University Program Evaluation
- Empowerment Evaluation – Knowledge & Tools for Self-Assessment, Evaluation Capacity Building, and Accountability (2nd ed.)

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APPENDIX G: Sample Evaluation Tools

Sample 1: Coastal Stewards Workshop for Adults Pre Test

Coastal Stewards

Green Infrastructure Workshop

Pre Test

1. Rain can...

    a. Infiltrate into the ground

    b. Be utilized by plants and evaporate into the atmosphere

    c. Runoff impervious surfaces

    d. All of the above

2. What are some of the benefits of using native plants in your landscape?

    a. reduces the need for pesticides

    b. provides food, nesting and shelter for many native plant dependent pollinators, birds, beneficial insects and other wildlife

    c. promotes local native plant and animal biodiversity and stewardship of our natural heritage

    d. prevents further invasive plant introduction

    e. filters stormwater effectively

    f. conserves water

    g. all of the above

3. How much higher are infiltration rates (water absorbing into the soil) of forested areas compared to turf or grass areas?

    a. 2-3%

    b. 5-10%

    c. 10-15%

    d. 18-20%

4. Which of the following low impact development practices requires the least maintenance?

    a. Rain barrels

    b.Green roof

    c. Permeable pavement

    d. Downspout disconnection

    e. Rain gardens

5. Provide an example of each of the three key elements of a green infrastructure network:

Hub (Core): _____

Site: _____

Link (Corridor) :_____

6. In addition to preventing stormwater runoff, what health benefits do green spaces and forested areas provide?

a. _____

b. _____

c. _____

d. _____

7. What are some potential sources of pollution that can enter coastal waterways in stormwater runoff:

True or False: For the following questions # 8- 10, please circle whether you think the statement provided is true or false.

8. Most stormwater infrastructure, such as storm drains and storm sewers, in Georgia drains to the wastewater treatment plant.

True or False

9. Rain gardens are a type of low impact development/green infrastructure that can be used in a residential setting (i.e. my home).

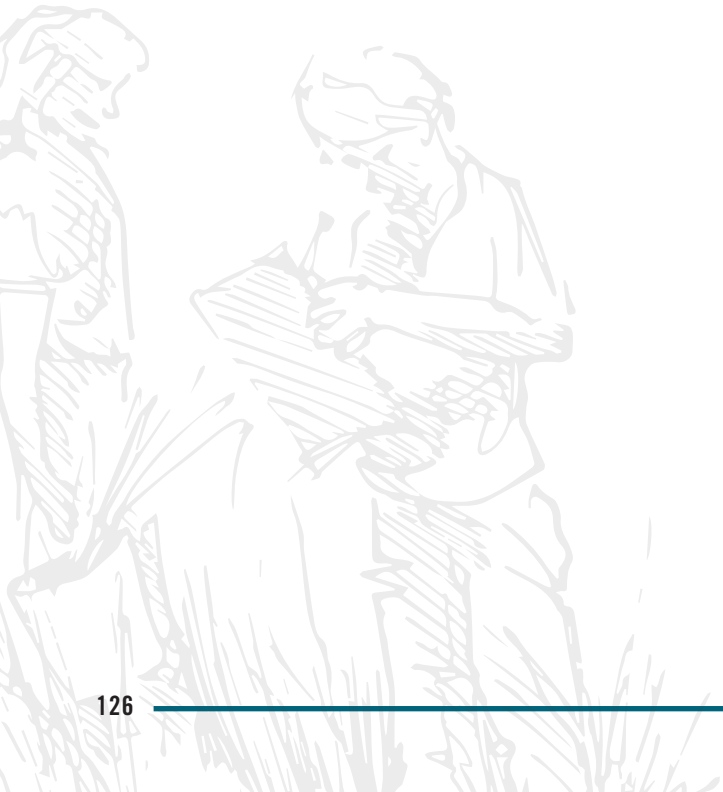
True or False.

10. You can enhance your landscape with native plants to filter and absorb rainwater.

True or False

Skill/Activity	Before Workshop	After Workshop
Identifying non-point source pollution	1 2 3 4 5	1 2 3 4 5
Assessing stormwater runoff on your site	1 2 3 4 5	1 2 3 4 5
Designing a rain garden	1 2 3 4 5	1 2 3 4 5
Choosing plants for a rain garden	1 2 3 4 5	1 2 3 4 5
Maintaining your rain garden	1 2 3 4 5	1 2 3 4 5

Please rate how confident you are in the following activities on a scale of 1- 5 where 1 is the least confident and 5 is the most confident.



Sample 2: Coastal Stewards Workshop for Adults Post Test

Coastal Stewards

Green Infrastructure Workshop

Post Test

1. Rain can...

    a. Infiltrate into the ground

    b. Be utilized by plants and evaporate into the atmosphere

    c. Runoff impervious surfaces

    d. All of the above

2. What are some of the benefits of using native plants in your landscape?

    a. reduces the need for pesticides

    b. provides food, nesting and shelter for many native plant dependent pollinators, birds, beneficial insects and other wildlife

    c. promotes local native plant and animal biodiversity and stewardship of our natural heritage

    d. prevents further invasive plant introduction

    e. filters stormwater effectively

    f. conserves water

    g. all of the above

3. How much higher are infiltration rates (water absorbing into the soil) of forested areas compared to turf or grass areas?

    a. 2-3%

    b. 5-10%

    c. 10-15%

    d. 18-20%

4. Which of the following low impact development practices requires the least maintenance?

    a. Rain barrels

    b.Green roof

    c. Permeable pavement

    d. Downspout disconnection

    e. Rain gardens

5. Provide an example of each of the three key elements of a green infrastructure network:

Hub (Core): _____

Site: _____

Link (Corridor) :_____

6. In addition to preventing stormwater runoff, what health benefits do green spaces and forested areas provide?

a. _____

b. _____

c. _____

d. _____

7. What are some potential sources of pollution that can enter coastal waterways in stormwater runoff:

True or False: For the following questions # 8- 10, please circle whether you think the statement provided is true or false.

8. Most stormwater infrastructure, such as storm drains and storm sewers, in Georgia drains to the wastewater treatment plant.

True or False

9. Rain gardens are a type of low impact development/green infrastructure that can be used in a residential setting (i.e. my home).

True or False.

10. You can enhance your landscape with native plants to filter and absorb rainwater.

True or False

Skill/Activity	Before Workshop	After Workshop
Identifying non-point source pollution	1 2 3 4 5	1 2 3 4 5
Assessing stormwater runoff on your site	1 2 3 4 5	1 2 3 4 5
Designing a rain garden	1 2 3 4 5	1 2 3 4 5
Choosing plants for a rain garden	1 2 3 4 5	1 2 3 4 5
Maintaining your rain garden	1 2 3 4 5	1 2 3 4 5

Please rate how confident you are in the following activities on a scale of 1- 5 where 1 is the least confident and 5 is the most confident.

Sample 3: Stewardship Workshops for Adults – Focus Group Guide

Coastal Stewards Workshop – *Landscaping for Stormwater* Focus Group Guide

Thank you for participating in the Coastal Stewards: Landscaping for Stormwater Workshop. Here today, we ask you to participate in a focus group where we can collect some information on the workshop experience. Please respond to the best of your ability. Your responses are confidential and may be used to construct an evaluation report of the workshop. No personal identifiers will be recorded in the process of the focus group.

1. Let's talk about the workshop in general. What went well with the Landscaping for Stormwater workshop?
2. What can be improved in regards to the Landscaping for Stormwater workshop?
3. Currently you can get a certificate of recognition as a "Coastal Steward" after taking 5 workshops, although there are no continuing education credits. How important is earning the certificate to you?
4. We are constantly looking to improve the workshops to best help participants and make it easier for individuals to participate. What is/are some barriers to participating in the Coastal Stewards workshops?
5. What can UGA Marine Extension and GA Sea Grant do to remove the barriers to attending the workshops?
6. What is the main "take-home" message you learned during the Landscaping for Stormwater workshop?
7. How confident are you in being a coastal steward?
8. How we can be most effective in increasing public stewardship of coastal resources?
9. What can UGA Marine Extension and GA Sea Grant do to help support you in being an effective coastal steward?
10. What else would you like to share regarding the Coastal Stewards – Landscaping for Stormwater workshop?

Sample 4: Public Program Participant Survey

Program: _____ **Date:** _____
 # people in party: _____

Please take a few moments to provide feedback on the program you attended today.

1= Unsatisfactory, 2=Improvement needed, 3= Meets Expectations, 4= Exceeds Expectations, 5=Exceptional

Program & Facility Evaluation	Rating	Additional Comments
Length of Program		
Content / Activities		
Education Staff		
Registration payment (including price)		

Have you been to the UGA Marine Education Center and Aquarium previously? _____

Have you been to a public program previously?_____

How did you find out about today's program? Please be specific if you can._____

What did you learn?

Sample 5: Public Programs Participant Survey – New Programming

We are developing new public program offerings and want to hear from you!

What topics would you like to learn about? Are there specific activities you would like offered?

For each of the following please rate your preference from 1-5, where 1 is the worst and 5 is the best:

Time of week to hold events:

Weekday Afternoons_____ Weekday Mornings _____ Weekday Evenings _____ Saturdays_____

Length of event:

1 hour_____ 2 hour_____ 3 hour_____ 1 day workshop _____ 2-day workshop_____

Frequency of events:

Weekly_____ Monthly_____ Quarterly_____ Annually_____

For each of the following kinds of programs please put a check in the box that best describes how likely you would be to attend in the future:

Event	No interest, I would not attend (1)	Minimal interest, I might attend once (2)	Some interest, I would attend once (3)	Interested, I would attend a few times	Very interested, I would attend regularly (5)
Fieldtrips					
Lectures					
Adult environmental education courses					
Action days (tree planting etc.)					
Toddler or Pre-K family programs					
Family programs					
Drop off program for middle or high school youth					
Open House/ Festival					
Other (please specify)					

Thank you for your feedback!

APPENDIX H: References

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