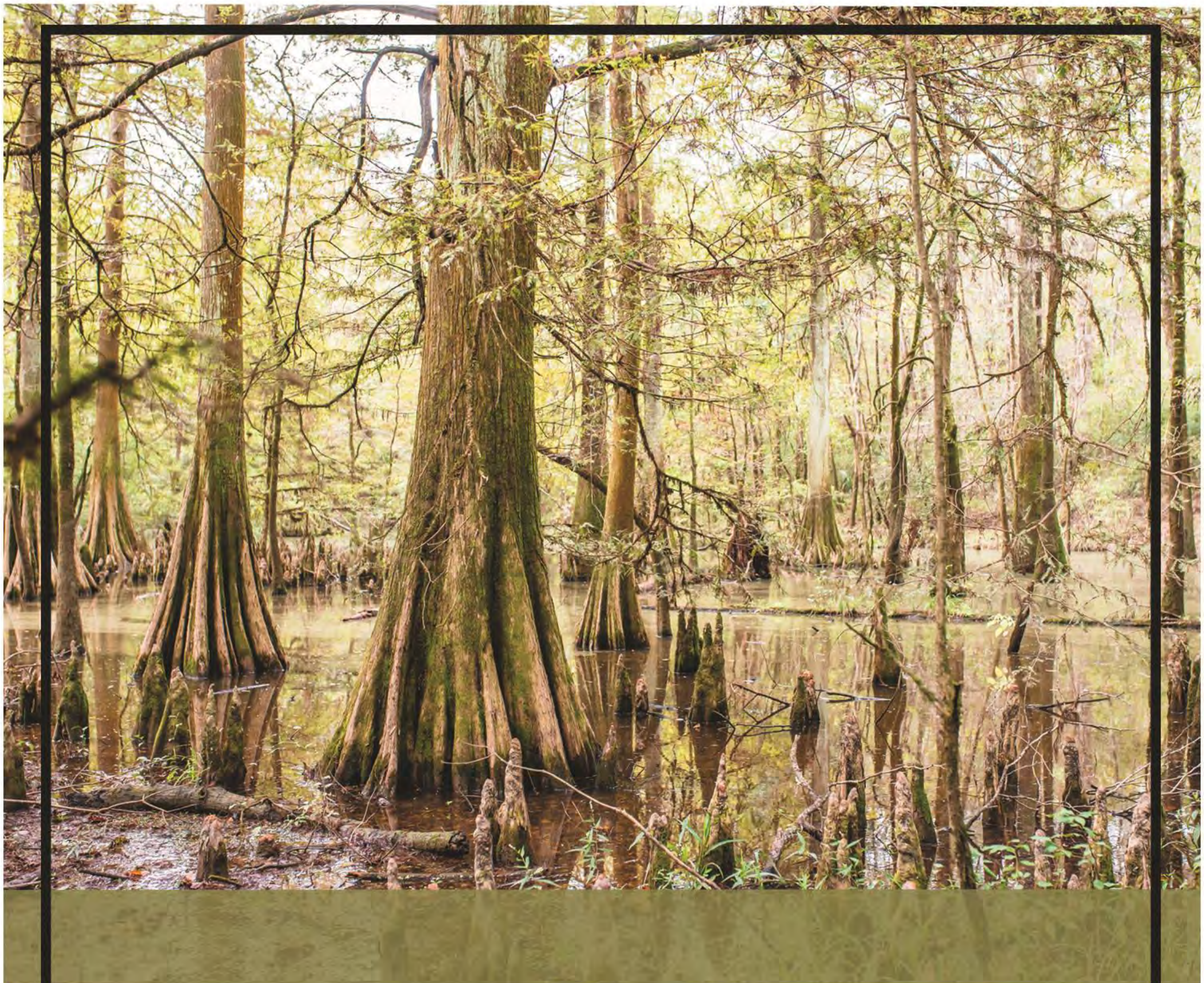

NATURAL RESOURCE MANAGEMENT PLAN

BREC's Natural Resource Management Plan

Prepared for The Recreation and Park Commission for the Parish of East Baton Rouge
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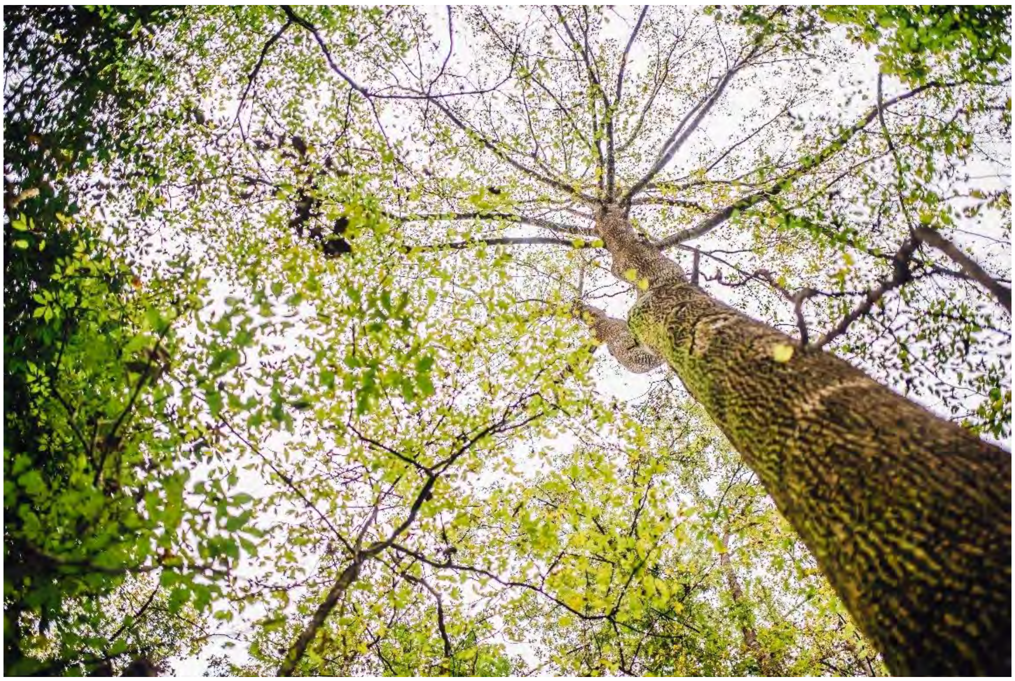

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Executive Summary

BREC's mission is to contribute to a healthier, more vibrant community by providing exceptional parks, open spaces, and recreational experiences for all of East Baton Rouge Parish. In doing so BREC is dedicated to the conservation of natural resources and the use of sustainable management practices. The purpose of BREC's Natural Resource Management Plan (NRMP) is to provide a framework for guiding BREC's natural resource management efforts. The Natural Resource Management Plan is the overarching document which outlines BREC's environmental protection procedures, resiliency planning, trail/amenity design and maintenance and habitat management protocols, among other things. The Natural Resource Management Plan should be used to coordinate agency-wide conservation efforts to achieve BREC's goals through specific actions and measurable metrics. BREC's five main conservation goals are to:

1. Promote recreational and educational activities focusing on appreciation and understanding of the natural environment.
2. Protect and restore unique, healthy, and historically representative habitats.
3. Preserve biodiversity and reduce the loss of native species.
4. Conserve, restore and expand ecosystem services for the benefit of local residents.
5. Manage resources adaptively using innovative approaches.

These goals are threaded throughout the document and relate directly to the objectives listed in the Action Plan. Outlining BREC's management objectives and the techniques used to achieve them provides a scientific approach to natural resource management that can be reevaluated and adjusted as needed.

To have the best understanding of the planning and management techniques discussed in the document, it is important to have a full understanding of the resources within the system. Therefore, the beginning of the Plan outlines the natural resources located within BREC parks, threats they face, and the parks and amenities managed by NRM staff. Subsequent sections provide guidance for planning that not only relates to conservation related projects but projects throughout the agency. These procedures allow BREC to generate data which assists in justifying land acquisitions, the value of ecosystem services and ecological benefits of BREC properties and ensure conservation of natural resources is considered in park planning. BREC is a leader of innovative park design, and this document reflects a focus on more resilient and sustainable practices that will strengthen the communities around BREC parks. This plan should be used in conjunction with other BREC plans which outline the management strategies for individual parks or specific practices such as invasive species removal or aquatics. The NRMP will be reviewed annually to ensure it reflects the most up to date data and planning and management techniques so that BREC can continue to provide exceptional service to the residents of East Baton Rouge Parish.

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1 Introduction

As a nationally accredited agency, BREC is dedicated to the conservation of natural resources and the use of sustainable management practices to create a more resilient system for the residents of East Baton Rouge Parish (EBR). Achieving this requires coordination between departments, clear management objectives, and dynamic strategies which come together to form a strong adaptive approach to natural resource management. The Natural Resource Management Plan is the overarching document which outlines BREC's environmental protection procedures, resiliency planning efforts, trail/amenity design and maintenance and habitat management protocols among other things. The following provides a brief overview of the plan, background information on natural resource management at BREC, and how the plan evolved to its current state.

1.1 Purpose and Scope

The purpose of BREC's Natural Resource Management Plan is to provide a framework for guiding BREC's natural resource management activities. These activities should always follow BREC's five main conservation goals which are to:

1. Promote recreational and educational activities focusing on appreciation and understanding of the natural environment.
2. Protect and restore unique, healthy, and historically representative habitats.
3. Preserve biodiversity and reduce the loss of native species.
4. Conserve, restore and expand ecosystem services for the benefit of local residents.
5. Manage resources adaptively using innovative approaches.

In doing so, the Natural Resource Management Plan should be used to coordinate agency-wide conservation efforts to achieve BREC's goals through specific actions and measurable metrics. Outlining BREC's management objectives and the techniques used to achieve them provides a scientific approach to conservation that can be reevaluated and adjusted as threats to resources change and management strategies prove successful. It is the hope that the strategies within this plan adapt and flow just as our local ecosystems do to new influences.

1.2 Background

1.2.1 History of BREC

The Recreation and Park Commission for the Parish of East Baton Rouge (BREC) was established in 1946 as a political subdivision of the state of Louisiana to provide natural resource areas, parks, playgrounds, recreation facilities, and recreation programs to all citizens of East Baton Rouge Parish through a professionally administered organization. The organization has grown considerably since then, now operating 175 parks which encompass over 6,500 acres and a variety of facilities throughout the parish.

It is BREC's mission to contribute to a healthier, more vibrant community by providing exceptional parks, open spaces and recreation experiences for all of East Baton Rouge Parish.

BREC is a nationally accredited agency by the Commission for Accreditation of Park and Recreation Agencies (CAPRA) which has won a National Recreation and Park Association (NRPA) Gold Medal award twice for its exceptional service to the community. BREC not only serves the residents of Baton Rouge but also several other cities within the parish including Baker, Central and Zachary, and is currently the largest landowner in the parish.

1.2.2 History of Resource Management at BREC

Roughly 50 years after BREC's inception, the first Natural Resource Management Plan was created and passed by BREC's Commission (Figure 1). The plan was written in response to the public's expressed interest to protect and manage unique forms of natural beauty in the parish. According to a 1990 public survey, over 90% of residents agreed that BREC should "preserve as much as possible of the open spaces and forest areas remaining in the parish" and that BREC should "acquire and preserve land with unique natural features such as Bluebonnet Swamp." The initial plan not only defined conservation areas but also the other types of BREC parks and provided a list of potential properties to acquire for conservation. The plan was designed to be reviewed annually and updated as necessary. Since it was first written, the Natural Resource Management Plan has been updated 5-6 times to account for an updated park system. In its current 2021 form, the plan includes the most extensive updates as BREC's focus on conservation and sustainable practices expands.

Figure 1. BREC's 2013 NRM Plan (Source: BREC).

Just a few years after the plan was first drafted, in 1997, BREC's first conservation area and nature center, Bluebonnet Swamp, was opened in the heart of the parish. It provided one of the first opportunities for residents of EBR Parish to experience a board-walked path through a Cypress – Tupelo Swamp which was actively programmed and interpreted by naturalists. This initial conservation area was designed to be the hub of nature activity in the parish where over time, additional parks called Satellite Conservation Areas would be opened to the public in other parts of the parish with trails and other outdoor recreation amenities.

Over the last twenty years, the opportunities that BREC provides to residents has increased through acquiring new properties like BREC's largest conservation area, Frenchtown Conservation Area, and through developing new amenities, including over 20 miles of hiking trails now scattered across the system. Through a dedication to social equity, BREC has moved away from a hub and spoke model and is now focused on ensuring there are a variety of outdoor recreational experiences in conservation areas around the parish for all local communities as land availability and habitats allow.

1.3 BREC Divisions Associated with the NRMP

Historically, natural resource management was carried out by several departments at BREC, all of which had additional goals and objectives besides natural resource management. These departments included the conservation division, park operations, special facilities, and recreation. Although natural resource management was intended to be a collaborative effort across these departments, collaboration was often difficult due to the size and complexity of the BREC park system. It was thus realized that a division focused solely on the management of BREC's natural resources was needed to provide a directed approach across the agency. The following sections describe the current divisions directly responsible for carrying out natural resource management or conservation education related goals.

1.3.1 Natural Resource Management Division

In 2018, BREC's Commission approved the creation of the Natural Resource Management (NRM) Division, a division dedicated solely to natural resource management within BREC. The Natural Resource Management Division is currently located in the Planning and Engineering Department (PE) where it is directed by an Assistant Director who reports directly to the Assistant Superintendent of Planning. Since preservation and restoration of resources is so closely tied to the planning and design of parks and amenities, placing the NRM division within PE has fostered a strong relationship between the Planning, Design, Construction, and Urban Trails divisions also located in the PE Department.

Within PE, the NRM division is responsible for overseeing the study and management of BREC's natural resources as outlined in this plan. Within the NRM division the Assistant Director is assisted by coordinators who are responsible for overseeing activities related to their specific expertise, such as trails and botany, and the coordinators are further assisted by specialists in carrying out assigned tasks. Figure 2 is an organizational chart illustrating the structure of the Natural Resource Management Division.

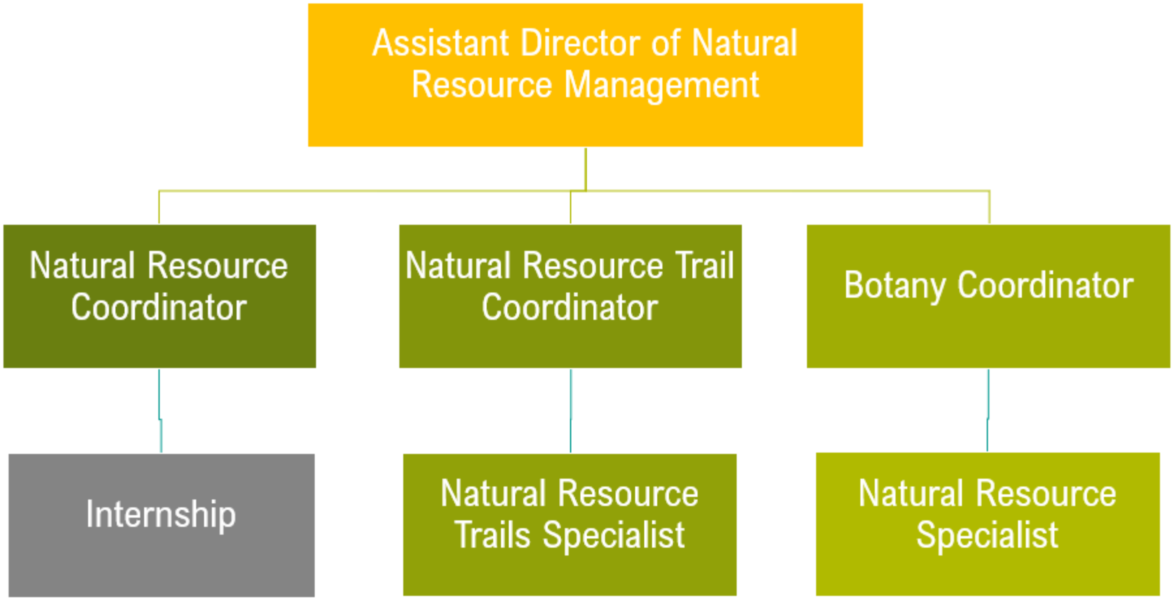


Figure 2. Natural Resource Management Division Organizational Chart.

1.3.2 Conservation Outdoor Recreation and Environmental Education Division

In addition to the NRM Division, the Conservation Outdoor Recreation and Environmental Education (CORE) Division was also created in 2018 to consolidate conservation programming and interpretive efforts within BREC. CORE is responsible for providing recreational and educational activities focusing on an appreciation and understanding of the natural environment. The CORE Division consists of Conservation Programming, Outdoor Adventure and Extreme Sports and Nature Centers. Bringing these teams together under one division was important for cohesive planning of education programming and the expansion of facilities beyond Bluebonnet Swamp Nature Center which seeks to provide Conservation Education Centers (CECs) in accessible parks around the parish.

The CORE Division is directed by an Assistant Director who reports directly to the Assistant Superintendent of Recreation. Each manager under the Assistant Director is responsible for managing activities related to their specific expertise such as conservation programming, nature centers and outdoor adventure programming. These managers are further assisted by specialists in carrying out their tasks. Figure 3 shows an organizational chart of the CORE Division within the Recreation Department.

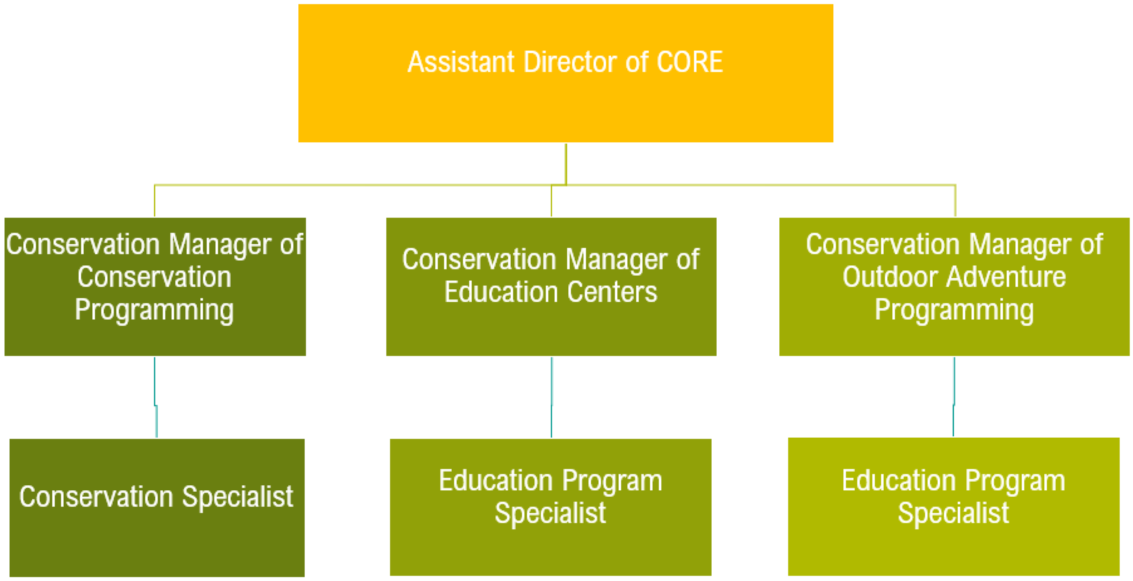


Figure 3. CORE Division organizational chart (Source: BREC staff).

1.4 Plan Structure

BREC's Natural Resource Management Plan is divided into seven main sections which provide an overview of the benefits of conservation, BREC's natural resources, data collection techniques, planning protocols, management strategies and a brief overview of programming and public outreach. The plan is designed to provide information on the natural resources BREC currently operates and how the NRM division plans to manage them. The last section, the Action Plan, outlines measurement metrics and the necessary actions required to achieve them.

1. Introduction
2. Benefits of Conservation
3. East Baton Rouge Existing Conditions
4. BREC Conservation Areas and Amenities
5. Resource Planning and Management
6. Conservation Programming and Public Outreach
7. Action Plan

There are 50 measurable metrics which make up the Action Plan Dashboard. Metrics include measurable objectives or goals which will ensure BREC fulfills its Level of Service Standards and Strategic Plan Directions. The actions associated with each metric include the necessary tasks that staff, volunteers and partners must undertake to inventory, plan, protect, and manage BREC's natural resources while fostering a strong conservation ethic in patrons around the parish. Although programming and public outreach is mentioned in this plan it is not the focus and additional information can be found in the Recreation Program Plan and the Interpretive Plan once completed.

1.5 Implementation

Implementation of the Natural Resource Management Plan follows annual department goals, as well as SMART goals directed by BREC's Strategic Plan, and Level of Service Standards. The Action Plan, included in Section 7, is a work plan directly tied to BREC's Conservation Goals with measurable metrics designed to monitor BREC's LOS Standard achievements and progress toward those goals. NRM staff will report on the status of measurement metrics annually in the Annual Report and the NRM Plan will be reviewed by Natural Resource Management Staff annually to ensure no updates or changes need to be made.

Carrying out the duties of the Action Plan will fall directly on the Natural Resource Management Division, although other BREC departments, divisions, volunteers, and partners, will be needed. Without this collaboration, it is not likely that BREC could achieve all its natural resource management goals. For example, due to the limited staff size of the NRM Division, hiking trails and pollinator gardens, amongst other objectives, could not be adequately maintained without the help of volunteers.

The NRM plan is designed to be updated as management techniques are adapted to changing conditions and successful and/or unsuccessful outcomes are monitored. Although the plan outlines threats and issues facing BREC's natural resources today, as the needs of the parish shift, so may the stressors that impact BREC parks. New and innovative management solutions may address these while providing new ways that BREC parks can benefit parish residents. The approach of consistently monitoring and updating management strategies as needed is referred to as Adaptive Resource Management (ARM), which is further discussed in Section 5. In addition, as management techniques and existing conditions are assessed, public and stakeholder needs should be as well. It is our hope that other landowners in the parish will join BREC's efforts to protect the parish's resources and changes to city infrastructure guidelines and permitting procedures will make these efforts more common place. BREC strives to set an example in conservation and resource management not only in the parish but throughout the region with this NRM Plan helping guide the way.

2 Benefits of Conservation

It is widely recognized that natural resources provide valuable ecosystem benefits to both humans and the environment (Pimental et al., 1997). Natural resources provide habitat for fish and wildlife, recreational opportunities such as hiking, hunting, and fishing, and ecosystem services such as filtering water, cleaning air, protecting communities from extreme weather, and stabilizing the climate. Although there are many benefits of conservation, the following are examples that BREC natural resources provide to East Baton Rouge Parish. These benefits align with BREC Natural Resource Management Division’s goals of conserving, restoring, and expanding ecosystem services for the benefit of residents, as well as preserving biodiversity and reducing the loss of species.

2.1 Air Quality

As a significant part of the urban landscape, parks can improve air quality by reducing air pollution, air temperature, and the amount of carbon dioxide in the atmosphere (Nowak & Heisler, 2010). The ability of parks to improve air quality however varies by the ecosystem, season, and species present. Both anthropogenic and natural factors can pollute the air including vehicular emissions, industrial emissions (Figure 4), wildfires, and other extreme weather events.

Figure 4. Baton Rouge industry as seen from the Louisiana State Capitol Building (Source: https://www.theadvocate.com/baton_rouge/news/environment/article_7f32138c-14b1-11e7-853a-8bfab0f5a5c4.html).

2.1.1 Air Pollution

Air pollution, including ozone, nitrogen oxide, sulfur dioxide, mercury, carbon monoxide, and other particulate and airborne fine particles can have significant impacts on both human and ecosystem health. Human health problems include respiratory and cardiovascular disease, especially in people with pre-existing conditions such as heart disease or asthma, as well as impacts on learning, memory, and behavior (Nowak & Heisler, 2010). Air pollution can also affect the environment in both aquatic and terrestrial ecosystems (Lovett et al., 2009). In aquatic systems, air pollution can lead to the acidification of lakes, eutrophication of water bodies, and mercury bioaccumulation in aquatic food webs. In terrestrial systems, air pollution can lead to soil acidification, changes in biogeochemical cycling, and changes in species composition. While mortality is often only seen when air pollution is extreme, most effects are seen in combination with other stressors such as drought, freezing, or pathogens.

Trees in parks can decrease the amount of air pollution in the atmosphere both directly by removing air pollutants in the atmosphere and indirectly by cooling the surrounding area, causing a decrease in the use of air conditioners, and thus reducing emissions (Nowak & Heisler, 2010). Overall, the amount of air pollution that trees remove depends on current conditions of the area i.e., the amount of air pollution currently present, and the amount and size of vegetation. For example, healthy trees greater than 30 inches in diameter can remove approximately 60 to 70 times more air pollution than trees less than 3 inches in diameter (Nowak et al., 2006).

The ability of parks to remove air pollution is particularly important for the residents of EBR. The American Lung Association's 2020 'State of the Air' report ranked Baton Rouge 44th for the most polluted city for ozone, and 46th for particle pollution, each of which can affect healthy individuals but is particularly dangerous for young children, older adults, and residents with pre-existing conditions. As was seen in a recent BREC report at Independence Community Park, BREC parks can improve air pollution in EBR. Based on a 2020 tree survey at this park, and the use of iTree, a USDA Forest Service software program that provides urban forestry and benefits analysis, it was found that Independence Community Park removes 1,475 pounds of air pollution per year. Of this, pollution removal was greatest for ozone, followed by nitrogen oxide, particulate matter, carbon monoxide, and sulfur dioxide. As was done at Independence Community Park, BREC's NRM team has also conducted tree surveys at Goodwood Neighborhood Park, Greenwell Springs Neighborhood Park and Manchac Park, and have plans on continuing elsewhere to quantify the benefits of BREC's trees and educate the residents of EBR as to their importance.

2.1.2 Air Temperature (Urban Heat Island Effect)

The urban heat island effect occurs when urban areas experience warmer temperatures than the surrounding area. Structures such as buildings, roads, and other infrastructure absorb the sun's heat more than natural areas such as forests, grasslands, and waterbodies. Due to the slow release of heat from development such as concrete, heat islands often build throughout the day. Human activities also contribute to the Heat Island Effect from vehicle emissions and industrial activity. Urban areas where an abundance of infrastructure exists thus become 'islands' where the air temperature is higher (Heisler & Brazel, 2010).

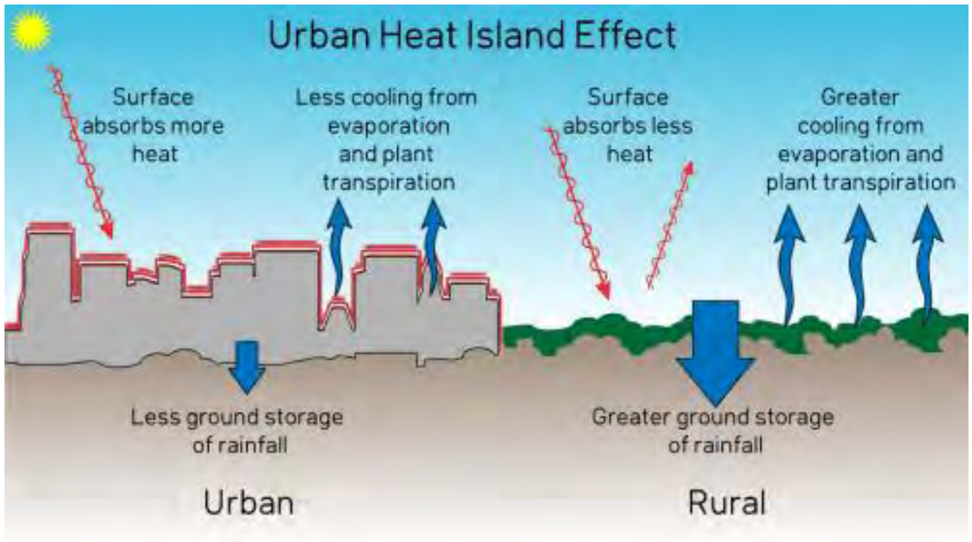


Figure 5. The Urban Heat Island Effect in Urban vs Rural Areas. (Source: https://dozr.com/blog/urban-heat-island)

Studies have found that the interior of parks can be as much as 13°F cooler than the surrounding area (Nowak & Heisler, 2010). Natural features such as vegetation and waterbodies lower surface temperatures by providing shade and by cooling the air through evapotranspiration, a natural process that converts liquid water into water vapor using heat (Figure 5). Parks can also influence the urban heat island effect by altering wind patterns. As parks cool at the end of the day an atmospheric pressure difference is created between parks and the surrounding area. As hot air from an urban area rises, it is replaced by cooler air from parks thus mitigating the urban heat island effect.

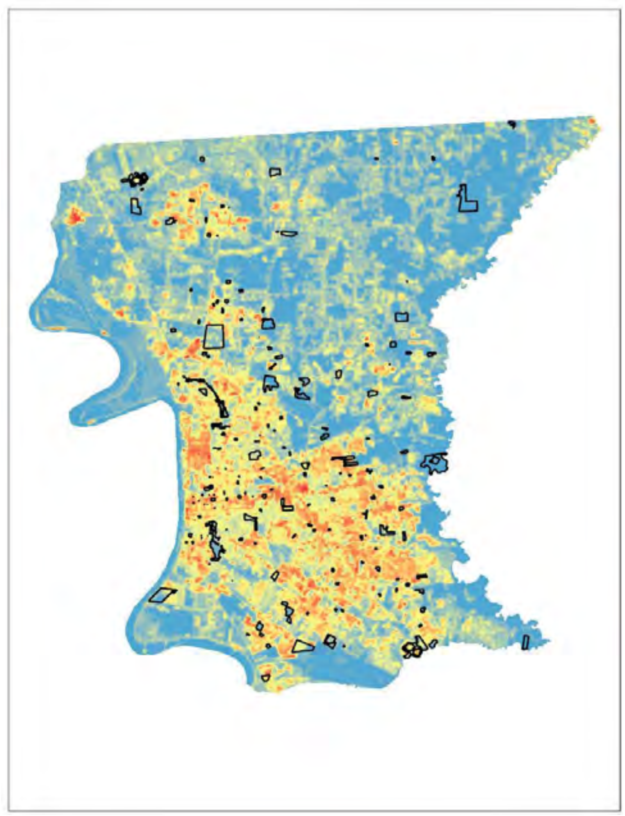


Figure 6. The urban heat island effect in EBR (Source: Landsat USGS).

Figure 6 shows the heat island effect in EBR, with blue representing cooler areas, yellow/red representing hotter areas, and black representing BREC park boundaries. As can be seen, the south-central part of the parish, where most of the development is located in EBR, is much hotter than the surrounding area. By comparing the average temperature of BREC parks to the average land surface temperature of urban areas within EBR, BREC has been able to estimate whether a park is having a cooling or heating effect. For example, Kendalwood Park, which is in the far southeast part of the parish and is primarily composed of tree cover and other natural surfaces, is 4.49 degrees cooler than the average land temperature of EBR, thus having a cooling effect.

2.1.3 Carbon Sequestration

Carbon Sequestration is the process of capturing and storing atmospheric carbon dioxide, the most common greenhouse gas in the atmosphere. Greenhouse gases are gases in the Earth's atmosphere that trap heat and increase surface temperature. This increase in surface temperature (global warming) has resulted in an increase in ocean temperature, melting of snow and ice, and rising sea levels. Trees and other vegetation in parks can reduce the amount of carbon dioxide in the atmosphere however through photosynthesis, a process that uses carbon (Nowak, 2000). Through this process trees can sequester and store significant amounts of carbon, although the amount depends on the size and species of tree. Trees can further enhance carbon sequestration by accumulating carbon in the soil. When forests and trees are removed however, this carbon will be released as carbon dioxide back into the atmosphere.

Based on the same tree survey discussed previously, Independence Community Park was found to store 830 tons of carbon in its trees and sequester approximately 30.85 tons of carbon per year. Of the species sampled, live oak trees stored and sequestered the most (64.6% of the total carbon stored and 59.2% of all sequestered carbon) followed by Nuttall oak, common crapemyrtle, slash pine, Shumard oak, American holly, water oak, spruce pine, bald cypress, and American elm. Overall, carbon storage by trees in U.S. parks is estimated at around 75 million tons, equivalent to saving $1.6 billion dollars (Nowak & Crane, 2002). Sustaining existing tree cover and long-lived healthy trees, along with increasing the number of healthy trees in BREC parks, can thus help reduce global warming, and should continue to be a goal within the BREC park system.

2.2 Water Quality

Clean water is important for the organisms that inhabit aquatic environments as well as for humans who use it for drinking water, food preparation, recreation, and other uses. Multiple factors can decrease water quality including pollution, improper land management practices, and hydrologic alteration. However, natural features such as wetlands, stream buffers, and other vegetation can affect water quality by filtering out pollutants such as metals, pesticides, nutrients, and sediment, and by regulating the flow of water thus preventing or minimizing the impacts of flooding and reducing erosion. The ability of natural features to regulate pollutants and alter water flow depends on several factors including species composition, slope, and soil type. The below sections highlight two processes that parks provide to improve water quality, water filtration and stormwater retention.

2.2.1 Water Filtration

Vegetation improves the quality of water by filtering out sediment and by absorbing pollutants washed off by the urban landscape during rain events. This type of pollution is often called non-point source pollution, and results from multiple sources including soil erosion, chemical fertilizers, soaps, oil leaks, pet waste, etc. Wetland soils and plants can also capture and store excess nutrients and pollutants and convert them to less harmful forms, in particular nitrogen and phosphorous, which are nutrients often used as fertilizers. Otherwise, these nutrients would have the potential to stimulate excess plant and algae growth which may produce toxic chemicals or prevent other vegetation from growing. One potential result of excess algal growth is a 'fish kill', an event where oxygen is depleted from a waterbody creating an unhealthy environment for fish and other aquatic organisms. These events result from an increase in nutrients from fertilizers, sewage, automobiles, and other sources, which can cause excess algae to grow. During the day excess algae produce oxygen through photosynthesis but at night the algae use that oxygen during respiration. During summer months when the water is hotter and thus holds less oxygen, the amount of dissolved oxygen in the water can reach critically low levels where it stresses aquatic life. In extreme cases this can lead to a 'fish kill' where an abundance of fish and other aquatic life lack oxygen to survive.

BREC parks contain a variety of green spaces, as well as wetland vegetation types, that can help improve water quality. Wetland vegetation types include Bottomland Hardwood Forests, Cypress Tupelo Swamps, Emergent Vegetation, etc. all of which are discussed in Section 3, EBR Parish Existing Conditions. Green infrastructure, which has been found to filter out as much as 95% of the major pollutants found in stormwater runoff and is discussed in Section 4, can also improve water quality by using natural features to mitigate stormwater runoff. Examples include rain gardens, bioswales, and green roofs.

2.2.2 Stormwater Retention

Stormwater retention is the reduction of surface water runoff by a structure or landscape, such as a pond or open space. Impermeable surfaces, such as buildings, parking lots, and other development, retain less runoff than permeable surfaces, such as grasslands or forests. Parks can greatly reduce the amount of surface runoff downstream. However, the amount of stormwater retention depends on the size of the park and the amount and type of vegetation present. Trees and shrubs, more so than other vegetation types, absorb water and promotes its infiltration in the soil. The amount of soil compaction also affects the ability of a surface to retain water. For example, well maintained lawns, which are mowed frequently, retain less water than forests where the soil is less compacted.

To assess the stormwater benefits of BREC's parks, BREC has incorporated the use of runoff coefficients. Impervious surfaces, like parking lots and buildings, are given higher runoff coefficients than pervious surfaces, like forests and grasslands. By mapping the different surface types in each park, BREC can calculate an overall runoff coefficient for each park. For example, Independence Park an urban park that contains parking lots, buildings, and well-maintained sports fields, has three times the runoff coefficient of Comite River Park, a park primarily composed of forested vegetation. While both are approximately 100 acres in size, Independence Park has an average annual runoff of approximately 110 Olympic size pools per year, while Comite River Park has an annual runoff of only 41 Olympic size pools per year. See Section 5 for more information on the use of runoff coefficients in BREC parks and how they are calculated.

Figure 7. August 2016 Flood in East Baton Rouge Parish. (Source: https://www.theadvocate.com/louisiana_flood_2016/article_3b7578fc-77b0-11e7-9aab-f7c07d05efcb.html)

Surface runoff is of particular concern to residents of EBR, especially after August 2016, when record rainfall ranging from 20 to 30 inches caused significant flooding and damage across the region (Figure 8). While flooding was widespread, damages could have been far worse without green spaces such as BREC parks. Overall, it was estimated that BREC parks stored more than 9.95 million gallons of floodwater during this event, enough to fill up the lower bowls of Louisiana State University's Tiger Stadium 71 times.

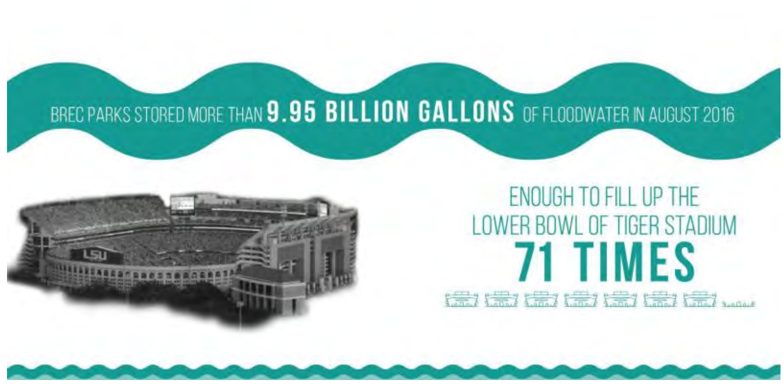


Figure 8. Amount of water held by BREC parks during August 2016 Flood event (Source: BREC Communications).

2.3 Biodiversity

Biodiversity refers to the diversity of living organisms and can be viewed at several scales. At the genetic scale, it can be viewed as the number of genes, or different inherited traits, within a population, whereas at the species level it can be viewed as the number of species, or organisms able to interbreed, in a particular area. Regardless of the scale, biodiversity is essential to the existence and proper functioning of all ecosystems on Earth. Biodiversity supports habitats for species to exist, and benefits humans in the form of food, medicine, fuel, pollination, nutrient recycling, recreation, etc. (Costanza et al., 1997; Diaz et al., 2006; Hooper et al., 2005).

Figure 9. Benefits of Biodiversity Conservation and common threats (Source: https://www.epa.gov/enviroatlas/enviroatlas-benefit-category-biodiversity-conservation).

Biodiversity is also important because it makes ecosystems less susceptible to disturbances. Ecosystems can typically withstand a certain amount of disturbance without losing its structure and function, but at a certain point they can lead to irreversible changes. In addition, native flora and fauna are typically more resilient to change than non-native invasive species. Non-native invasive species can outcompete and remove native species from their habitat forming monocultures where little biodiversity exists. Given that biodiversity leads to habitat resiliency, the threat of invasive non-native species is particularly concerning. Figure 9 summarizes the types of natural resources provided by biodiversity, including the habitats and rare ecosystems, the benefits they provide, and the drivers of change, including pollution and habitat alteration.

The Center for Biological Diversity estimates that more than 50% of the planet's species will be extinct by the end of the 21st century. Over 1 million species might already be extinct, which is 1,000 to 10,000 times faster than the pre-industrial rate (IPBES, 2019). While previous mass extinctions were caused by natural disturbances, the current extinction crisis is likely caused by humans. This loss is the result of land development, habitat loss, overexploitation, and pollution, amongst many others.

Using iNaturalist, an online platform developed by the California Academy of Sciences and the National Geographic Society, BREC is able to track the number of different species located in its parks and where they occurred. While Section 3 and 5 provide more details on the use of iNaturalist, as of June 2021 BREC staff and citizen scientists have documented approximately 2,352 species in its parks, including organisms in groups as diverse as plants, insects, fungi, birds, arachnids, reptiles, mammals, amphibians, mollusks, etc. Appendix 1 contains the current list of species found in BREC parks.

Parks play an important role in all of this by providing habitat and space for species to exist. In the United States, the estimated economic and environmental benefits from biodiversity is estimated at $319 billion per year (Pimentel et al., 1997). As development continues, parks will provide some of the last wildlife habitat available. It is important that we protect biodiversity and promote its conservation at all levels of organization which is why it remains one of our five leading goals as an agency.

2.4 Social-Economic Value

Parks play an important role in improving the health and well-being of communities. Parks have been proven to provide a connection with nature that can relieve stress and have other positive impacts on health. They provide a space to combat obesity and (Figure 10), provide enrichment opportunities that can improve community interactions, and can even improve property values.

Regarding obesity, physical activity in green spaces has shown to be more beneficial to health indicators such as blood pressure and heart disease than the same physical activity performed indoors (Pretty et al., 2005). As for mental health, time spent in green spaces has been shown to lower stress levels (Nutsford et al., 2013), improve memory (Bratman et al., 2015), emotional resilience (Balseviciene et al., 2014), and overall mood (Berman et al., 2012). Studies have found that people living more than 1 kilometer away from a green space have a 50 percent higher chance of experiencing stress than those living within 300 meters of a green space (Sallis et al., 2015). Furthermore, the more often people visited a green space, the less stress they experienced. Diagnoses of depression were found 66 percent less in residential areas with more green space than those without. Green spaces also provide opportunities for communities to interact together and socialize, thus improving trust and cooperation between neighbors. Urban areas with more green space have a greater sense of social safety and report fewer violent crimes (Kuo & Sullivan, 2001). It has even been found that just the presence of green space can promote community connection and neighborhood satisfaction (Wolf, 2016). Lastly, studies have shown that property values near green spaces can increase up to 20 percent for both retail and residential homes (Cicea & Pirlogea, 2011).

Figure 10. Green spaces have many socio-economic benefits including lowering stress levels (Source: https://www.nrpa.org/our-work/Three-Pillars/health-wellness/ParksandHealth/fact-sheets/parks-improved-mental-health-quality-life/).

BREC maintains over 180 parks across East Baton Rouge Parish providing the benefits explained above. These benefits fall in line with BREC's mission of contributing to a healthier, more vibrant community by providing exceptional parks, open spaces, and recreational experiences for all East Baton Rouge Parish residents. BREC will continue to provide these opportunities and spaces to the residents of EBR so the community can continue reaping these benefits.

3 East Baton Rouge Parish Existing Conditions

The following section describes the existing conditions of natural resources in East Baton Rouge Parish and within BREC's parks. It gives an overview of the setting, climate, geologic history, and biodiversity of the region. It also highlights threats and concerns regarding BREC's natural resources including pollution, climate change, and vandalism. Understanding the existing conditions will aid BREC in meeting its goals of protecting natural habitats, preserving biodiversity, and educating residents about the natural environment.

3.1 Setting

East Baton Rouge Parish falls within two major Level III ecoregions of the United States, the Mississippi Valley Loess Plain, which extends from the Ohio River in western Kentucky to Louisiana, and the Mississippi Alluvial Plain, which extends along the Mississippi River from southern Illinois to Louisiana (Figure 11; U.S. Environmental Protection Agency [EPA], 2013)

In EBR the Mississippi Alluvial Plain can be found along the historic floodplain of the Mississippi River in the western part of the parish (Figure 12). It has a flat topography, deep alluvial soils, poor drainage, and historically was dominated by Bottomland Hardwood Forests and Cypress Swamps. The Mississippi Valley Loess Plain covers the rest of EBR and consists primarily of irregular plains, gently rolling hills, and bluffs located near the Mississippi River in the

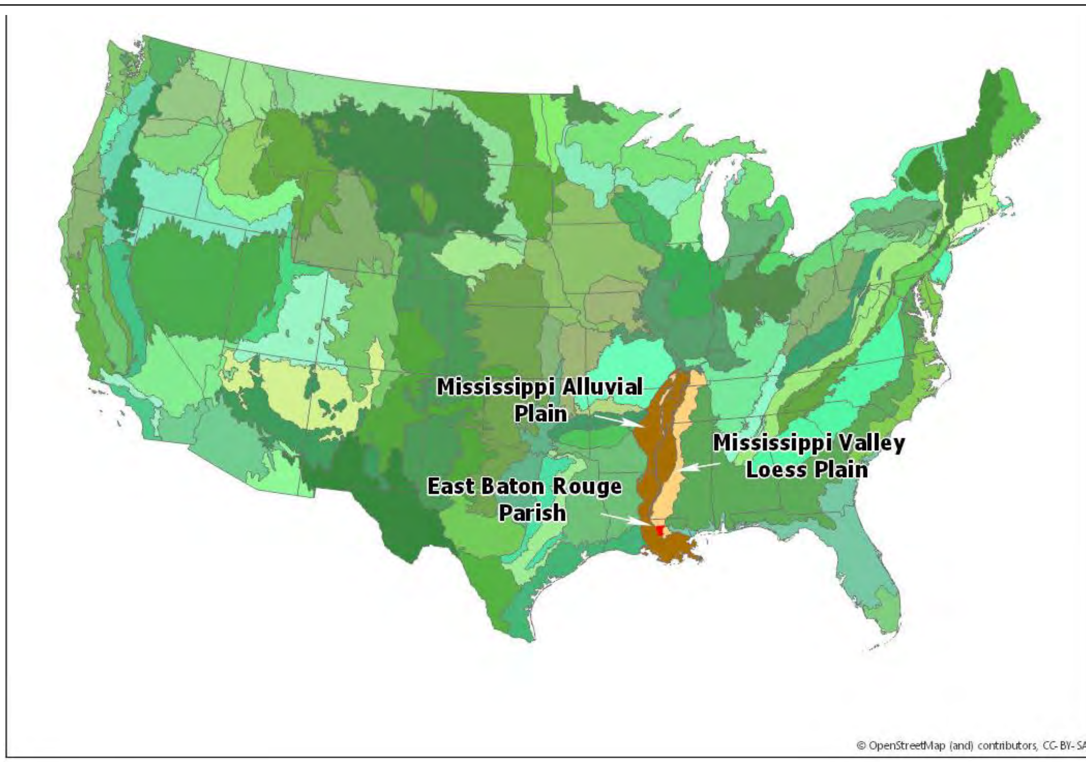


Figure 11. Map displaying the 182 Level III Ecoregions of the United States, with emphasis on the Mississippi Alluvial Plain and Mississippi Valley Loess Plain Ecoregions found in East Baton Rouge Parish (Source: BREC staff).

northwest part of the parish. The Mississippi Valley Loess Plain is composed of windblown loess soils and a variety of natural communities.

3.2 Climate

EBR has a subtropical climate characterized by long humid summers and short mild winters. Southerly winds contribute abundant moisture and rainfall throughout the year although rainfall is greatest between April and September. Summers consist of periodic intense showers while fall and winter months exhibit longer periods of rain resulting from slow moving cool fronts. Tropical Storms and Hurricanes often affect EBR in the form of heavy winds and rainfall. Annual rainfall averages 62.9 inches per year and is mostly the result of convective precipitation where large vertical cumulus clouds produce short intense downpours over small areas. The average annual temperature is 65° F, with the highest temperatures occurring in August and the lowest temperatures in December. Temperature is locally influenced however by abundant cloud cover and humidity, resulting in heat indices upwards of 105° F in the summer and sharp wind chill during winter cold fronts. On average there are 255-260 frost-free days in the year (Daigle et al., 2000). The first freeze usually occurs in late November while the last freeze is in late February.

Climate change poses a significant threat to EBR and has the potential to cause unknown changes in the coming future. Aside from rising temperatures, climate change is likely to result in changes in the severity of storms and droughts, rising sea levels, and increased flooding. Since 1958 the amount of precipitation has increased by 27 percent in the Southeast. In addition, the amount of rainfall in the Midwest is also increasing, further exasperating the risk of flooding in Louisiana (EPA, 2016).

3.3 Geology and Soils

Geology and soils play a large part in determining the natural resources found in East Baton Rouge Parish, including the types of vegetation, wildlife habitat, and drainage patterns. Soils are formed over time by the interaction of climate, living organisms, slope, and parent material. While the Mississippi River, as well as the Amite and Comite Rivers, have exerted a strong influence on the soils present in EBR, other factors, such as glaciation, sea level rise, and faulting have had a strong influence as well.

EBR is directly underlain by soils deposited over the last 2.5 million years during the Quaternary Period, the current and most recent of the three periods of the Cenozoic Era. Soils in the Mississippi Valley Loess Plain are older and were deposited in the Pleistocene Epoch between 2.5 million and 12,000 years ago, whereas soils in the Mississippi Alluvial Plain are newer and were deposited during the Holocene Epoch i.e., 12,000 years ago to present. In EBR, deposits of both the Mississippi Valley Loess Plain and the Mississippi Alluvial Plain are further underlain by sedimentary rocks of the Tertiary Period approximately 66 million to 2.5 million years ago (Meyer & Turcan, 1955).

Loess, which underlays the Mississippi Valley Loess Plain (Figure 12), is windblown sediment that was created by the grinding of continental ice sheets over bedrock and silt. As the ice sheets melted this sediment was transported downstream where it settled. During dry periods, strong winds transported this sediment as dust storms into the adjacent area. Over time this sediment created large deposits sometimes as great as 9 m thick. Within EBR, this loess ranges from 5 to 9 m thick in the western part of the parish to 1 to 3 m thick in the eastern part of the parish. Loess is easily eroded when wet and can form deep gullies, often observed throughout EBR. When dry however it can remain in place forming steep vertical bluffs (Heinrich, 2008).

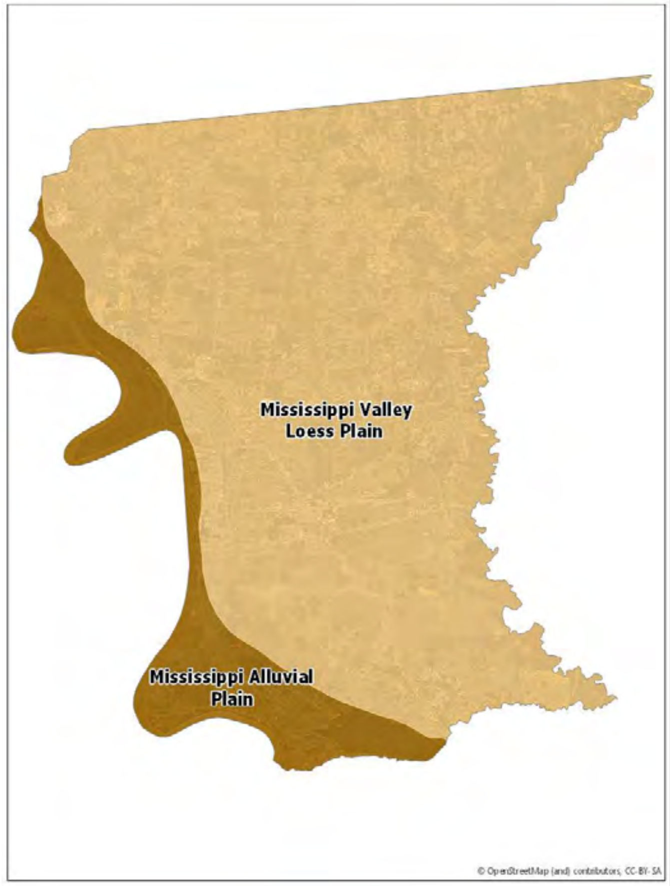


Figure 12. Level III Ecoregions of East Baton Rouge Parish (Source: BREC Staff).

The Mississippi Valley Loess Plain in EBR can be further broken into two sections, the Prairie Terrace, and the Montgomery Terrace, two areas formed during separate periods of sea level change. The Prairie Terrace is younger and forms the majority of EBR and slopes gently in a southeasterly direction at 3 ft per mile. The elevation of the Prairie Terrace ranges from about 120 ft above sea level in the northern part of the parish near Port Hudson to about 30 ft in the southern part of the parish near Bayou Manchac. The Montgomery Terrace is older and is located along the northern border of EBR. It is dissected into broad and narrow valleys forming ridges 20 – 30 ft high and slopes in a southeasterly direction at about 8 ft per mile. The elevation of the Montgomery Terrace ranges from about 140 ft in the northeastern part of the parish to 100 ft near the city of Zachary.

In comparison to the Mississippi Valley Loess Plain, the Mississippi Alluvial Plain is made up of alluvium, soil deposited by water, including gravel, sand, silt, and clay, forming distinct landforms such as floodplains, natural levees, and backswamps, each containing different amounts of these sediments. Organic material also accumulates in certain areas, most notably in wetlands, where it can constitute as much as 50 % of the sediment.

Faulting is another geologic feature observed in EBR, most notably along the Baton Rouge fault and the Denham Springs – Scotlandville fault, both of which bisect the parish and are recognizable as continuous long steep slopes. A fault is an area where two blocks of rocks move relative to one another. While these faults are still considered active, they do not produce earthquakes. It is currently estimated that the Baton Rouge fault moves a few inches per decade (McCulloh, 2001).

3.4 Watersheds and Wetlands

EBR has over 437 mi of rivers, bayous, streams, creeks, and canals, along with numerous ponds and lakes. These water bodies include some of the most defining natural features in EBR, such as the Mississippi River, which forms the western boundary of EBR, the Amite River, which forms the eastern boundary of EBR, and Bayou Manchac, which forms the southern boundary of EBR. Wetlands, areas that are inundated with water continually or at least for portions of the year, are present along each of these major waterways as well as throughout the parish and play an important role ecologically by providing wildlife habitat and filtering water.

3.4.1 Watersheds

Watersheds are basin-like formations that channel rainfall into streams and rivers and move water toward a common water body such as a lake or sea. Watersheds occur at many different scales and are divided and sub-divided into successively smaller units called Hydrologic Unit Codes (HUCs). EBR contains three major HUC units: (1) the Amite River (HUC 08070202), (2) Bayou Sara-Thompson (HUC 08070201), and (3) Lower Mississippi- Baton Rouge (HUC 08070100), which can be divided into twelve smaller HUC units including Bayou Braud – Bayou Manchac, Bayou Fountain – Bayou Manchac, Beaver Creek – Sandy Creek, Blackwater Bayou – Comite River, Clay Cut Bayou – Amite River, Cypress Bayou – Baton Rouge Bayou, Devils Swamp – Baton Rouge Bayou, Doyles Bayou – Redwood Creek, Hurricane Creek – Comite River, Jones Creek – Amite River, Kidds Creek – Amite River, Knighton Bayou – Comite River, Little Sandy Creek – Sandy Creek, Manchac Point, Mills Creek – Sandy Creek, Profit Island, Sandy Creek – Thompson Creek, Ward Creek – Bayou Manchac, and White Bayou – Comite River (Figure 13). The Amite River Watershed is in the central and eastern part of EBR and is the primary watershed of the parish. It is dominated by the Amite and Comite Rivers and drains into the Lake Pontchartrain Basin. The Lower Mississippi-Baton Rouge Watershed is found along the Mississippi River in the eastern part of the parish, while the Bayou Sara-Thompson Watershed is in the northwest part of the parish and contains some of the few tributaries that drain into the Mississippi River from the east.

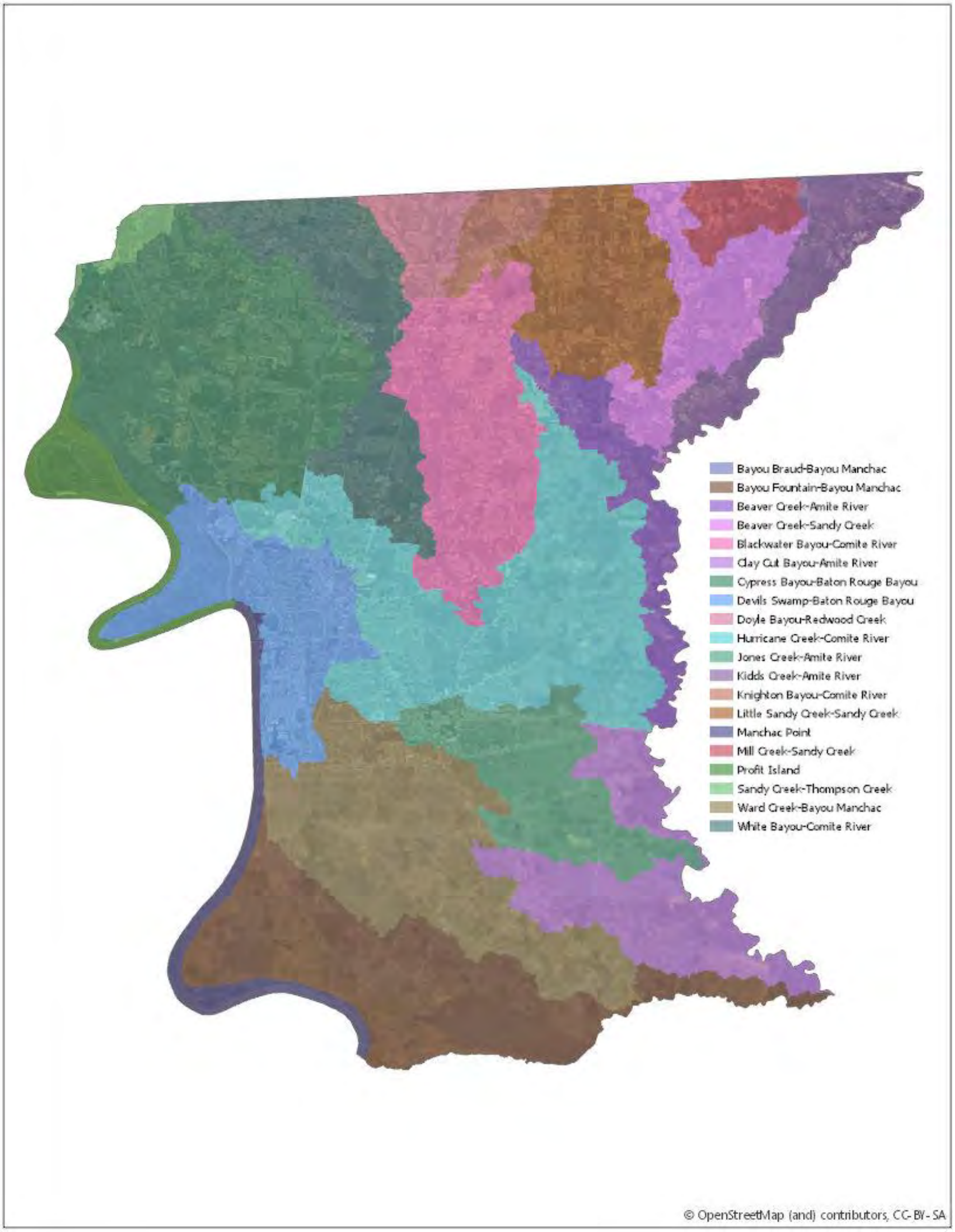


Figure 13. Watersheds of East Baton Rouge Parish (Source: BREC GIS).

3.4.2 Scenic Rivers Program

EBR contains a variety of rivers and streams ranging from one of the largest rivers in the world, the Mississippi River, to smaller intermittent streams that occur throughout the parish. Historically, the Mississippi River had a much larger influence on EBR, but with the construction of the levee system along its eastern bank, the influence of the Mississippi River on EBR, particularly from overbank flooding, has significantly decreased.

The Louisiana Department of Wildlife and Fisheries (LDWF) Scenic Rivers Program was created to preserve, protect, and enhance Louisiana's rivers and streams. Certain activities are prohibited in Scenic Rivers and some activities require a permit or the use of Best Management Practices (BMPs). Approximately 3,000 mi of water are currently designated as Scenic Rivers in Louisiana. Sections of two waterbodies in EBR, the Comite River and Bayou Manchac, are currently designated as Scenic Rivers. Figure 14 shows the extent of rivers and streams in EBR along with the location of its two Scenic Rivers as recognized by the LDWF, the Comite River and Bayou Manchac.

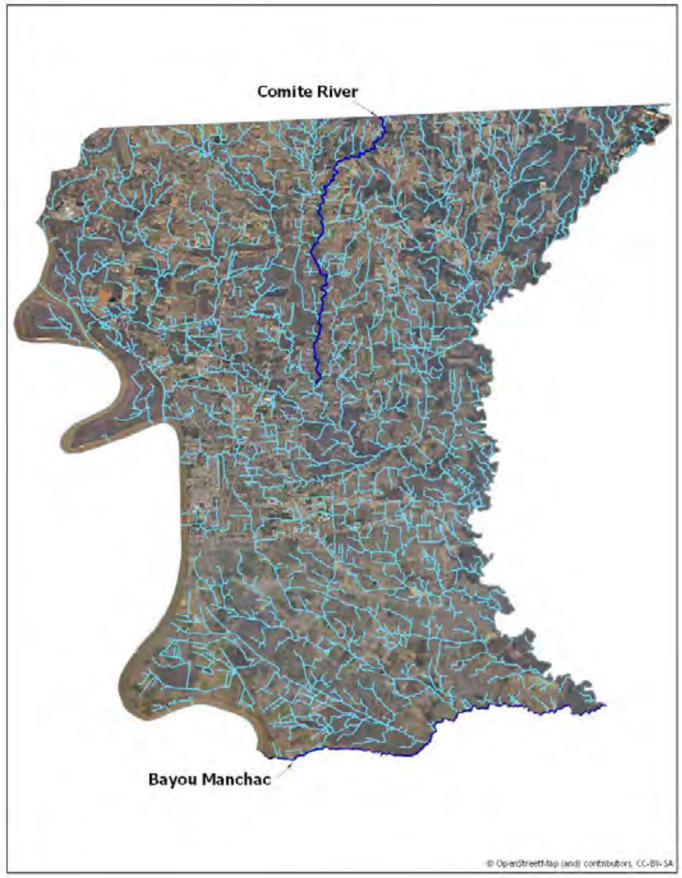


Figure 14. Rivers/Streams of East Baton Rouge Parish (Source: BREC GIS).

3.4.3 Wetlands

Wetlands are areas that are inundated or saturated by surface or ground water at a frequency or duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (United States Army Corps of Engineers [USACE], 1987). Wetlands are typically categorized by their landscape position and vegetation. Wetlands can be found throughout EBR and are delineated, per USACE standards, based on the presence of wetland adapted vegetation, hydric soils, and flooding or saturated hydrology. Since these characteristics are commonly associated with many natural communities of Louisiana, LDWF's Natural Heritage Program (LNHP) broadly defines such natural community types as wetlands, including Baldcypress Swamp, Bottomland Hardwood Forest, Emergent Vegetation, Small Stream Forest, and Wet Hardwood Flatwood (see Appendix 2). It should be noted that in some cases, natural communities listed as wetlands may be altered to such an extent (hydrologically) that these habitats may no longer meet USACE wetland standards. Many of these wetland habitats can be found in BREC parks and are often the dominant community type present.

Wetlands play an important role in ecosystems by cleansing polluted waters, recharging groundwater aquifers, storing carbon, and ameliorating the effects of floods by receiving stormwater. Wetlands also contain a rich diversity of unique plants and animals that have specific adaptations for living in wetland environments (Mitsch & Gosselink, 2000). For example, many wetland plants contain structural adaptations such as aerenchyma, which are air spaces in the roots and stems that allow oxygen diffusion from the emergent parts of the plant into the roots. In addition, some plants produce roots that extend to the aerobic environment, such as ‘cypress knees,’ which research suggests helps stabilize the tree and improve oxygen exchange to the root system.

Wetlands in the United States are regulated under Section 404 of the Clean Water Act (33 U.S.C. 1344) and Section 10 of the Rivers and Harbors Act (33 U.S.C. 403) and delineated in accordance with the 1987 USACE Wetland Delineation Manual and its regional supplements. Wetlands are identified through an analysis of aerial photography, soil information, and on-site field analysis. Wetlands that are mapped through this process must meet three specific criteria to be classified as a wetland, including the presence of hydric soils, hydrophytic vegetation, and evidence of hydrology. BREC is still in the process of mapping its wetland communities with GIS but our location in the Gulf Coastal Plain of the United States lends to an abundant presence of wetlands in our parks, including those currently identified by the USACE and large tracts of habitats considered wetlands by the LDWF Natural Heritage Program.

3.5 Natural Community Types

Natural communities are defined as landscapes or physical environments composed of groups of plants and animals that regularly occur in association with each other (LNHP, 2009). The LNHP has identified 68 natural community types within Louisiana. Some of these community types are widespread across the state while others are rare. Each of these natural communities is grouped within larger systems, including the Estuarine (tidal habitats and wetlands), Lacustrine (open water habitats such as lakes and ponds), Marine (the open Gulf of Mexico), Palustrine (non-tidal wetlands dominated by trees, shrubs, or persistent vegetation), Riverine (wetlands and deep-water habitats contained within a channel), Subterranean (caves), and Terrestrial (habitats that occur in uplands areas) systems. Of these, only four are found in EBR, the Lacustrine, Palustrine, Riverine, and Terrestrial systems. Within the Palustrine and Terrestrial systems, Smith (1999) identified fifteen natural communities that historically occurred in EBR. Nine of these are still recognized as occurring in the parish, while six are not. Table 1 lists the natural communities that historically occurred in EBR as well as those that are still present, along with their state and global rank. A description of each natural community is also given below.

3.5.1 Lacustrine

The Lacustrine system is composed of deep-water habitats lacking rooted vegetation and is generally greater than 6.6 ft deep and 20 ac in size. It is typically bound by wetlands along its shoreline dominated by trees, shrubs, or emergent vegetation, and sometimes contains floating or submerged vegetation across its surface.

3.5.1.1 Limnetic and Littoral Open Water

Limnetic or Littoral Open Water (i.e., lakes) are defined based on their origin. Limnetic Open Water habitats are lakes greater than 6 ft deep, while Littoral Open Water habitats are those less than 6 ft deep. Types of Limnetic Open Water habitats include oxbow lakes, bluff lakes, valley wall lakes, graben lakes, and solution lakes, while types of Littoral Open Water include marsh lakes and swamp lakes. Marsh lakes are often surrounded by wetland vegetation, while swamp lakes are surrounded by a swamp basin. BREC contains several natural and man-made lakes and ponds that range in size from a few acres such as Blackwater Conservation Area (Figure 15) to City Park Lake which is approximately 50 ac.

Figure 15. Man-made lake at Blackwater Conservation Area (Source: BREC Staff).

3.5.2 Palustrine

The Palustrine system includes all non-tidal wetlands dominated by trees, shrubs, or emergent vegetation. This system was developed to group the vegetated wetlands often referred to as swamp, marsh, wet prairie, etc. Palustrine system is often found on river floodplains or adjacent to lakes.

3.5.2.1 Floating Vascular Vegetation

Floating Vascular Vegetation are beds of floating vascular plants typically found in sheltered freshwater areas where there is little water movement. Floating vascular plants either float in the water column or on the water's surface and are easily moved by wind or water currents. This community type consists of mixtures of several dominant species and as the wetland fills with sediment it slowly transitions into a true marsh or forested wetland. Common species in this natural community include alligator weed (*Alternanthera philoxeroides*), water lily (*Nymphaea odorata*), southern naiad (*Najas guadalupensis*), and spatterdock (*Nuphar luteum*).

3.5.2.2 Emergent Vegetation

Emergent Vegetation consists of palustrine communities dominated by non-woody persistent emergents (> 30 % coverage) and is typically referred to as marsh, bogs, or fens. This community type might be found on the edges of lakes, river channels, or in isolated areas inland. Frequency and duration of flooding are the primary factors governing species distributions. Common species include spike sedges (*Eleocharis* spp.), rushes (*Juncus* spp.), sedges (*Carex* spp.), fragrant flatsedge (*Cyperus odoratus*), pickerelweed (*Pontedaria cordata*), and cattails (*Typha* spp.).

3.5.2.3 Scrub/Shrub Swamp

Scrub/Shrub Swamp consists of woody vegetation less than 20 ft tall. Soils are poorly drained and surface water is typically present. Scrub/Shrub Swamps are often referred to as successional in nature and are in transitional zones between emergent vegetation and upland areas. Species include true shrubs and young trees including buttonbush (*Cephalanthus occidentalis*), silvering (*Baccharis halimifolia*), dwarf palmetto (*Sabal minor*), wax myrtle (*Morella cerifera*), marsh elder (*Iva frutescens*), and swamp red maple (*Acer rubrum* var. *drumondii*).

3.5.2.4 Forested Wetlands

Forested Wetlands are transitional areas between uplands and open water where saturated soils influence the vegetation present. Forested Wetlands are distinguished from Emergent Vegetation by the presence of woody vegetation, primarily trees. Forested Wetlands can be identified by the type of vegetation present, the soil conditions, and the hydrology of the area. Forested wetlands described below include Bottomland Hardwood Forests (Figure 16), Cypress – Tupelo Swamps, Wet Hardwood Flatwoods, and Small Stream Forests.

Figure 16. Bottomland Hardwood Forest (Source: http://canps.weebly.com/historic-vegetation-of-ebr.html).

3.5.2.4.1 Bottomland Hardwood Forest

Bottomland Hardwood Forest can be found throughout EBR along floodplains of rivers and streams. Old growth examples of this habitat are rare and only 25-50% of this vegetation type remains in Louisiana. It occurs on alluvial deposits of sand, silt, and clay and is high in organic matter and nutrients. Hydrology plays an important role in this habitat and water levels often fluctuate between wet and dry periods. As a result, several subtypes occur depending on the level of soil saturation. Different types and species associations include Batture, Hackberry-American Elm-Green Ash Forest, Live Oak Forest, and Sweetgum-Water Oak Forest.

3.5.2.4.1.1 Batture

Batture can be found on the slope between rivers and streams and the adjacent natural levee. Batture is considered a pioneer community and is the first community to appear on newly formed river and stream margins. Soils are periodically saturated and often inundated during flood events. This natural community is considered secure in Louisiana. Primary species include black willow (*Salix nigra*) and cottonwood (*Populus deltoides*). Other species found include river birch (*Betula nigra*), American sycamore (*Platanus occidentalis*), hackberry (*Celtis laevigata*), swamp privet (*Forestiera acuminata*), American elm (*Ulmus americana*), and box elder (*Acer negundo*).

3.5.2.4.1.2 Hackberry-American Elm-Green Ash Bottomland Hardwood Forest

Hackberry-American Elm-Green Ash Forest occurs in the first bottoms of the floodplains of EBR's large river systems. Soils are often saturated but not as often as those of the lowest backwater areas. Common species include hackberry (*Celtis laevigata*; Figure 17), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), nuttall oak (*Quercus texana*), water oak (*Quercus nigra*), sweetgum (*Liquidambar styraciflua*), box elder (*Acer negundo*), swamp dogwood (*Cornus foemina*), and red maple (*Acer rubrum*).

Figure 17. Sugar Hackberry (*Celtis laevigta*) leaf and trunk at Greenwood Community Park (Source: BREC Staff).

3.5.2.4.1.3 Live Oak Forest

Live Oak Forest occurs on natural levees in Bottomland Hardwood Forests on sandy loams and clays and is an important wildlife habitat. Only 1 to 5 % of this vegetation type remains in Louisiana and it is no longer recognized by the LNHP as occurring in the parish. Common overstory species include live oak (*Quercus virginiana*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), water oak (*Q. nigra*), hackberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), and honey locust (*Gleditsia triacanthos*). Common midstory and understory species include green hawthorn (*Crataegus viridis*), red mulberry (*Morus rubra*), swamp dogwood (*Cornus foemina*), red bay (*Persea borbonia*), persimmon (*Diospyros virginiana*), and dwarf palmetto (*Sabal minor*).

3.5.2.4.1.4 Sweetgum – Water Oak Bottomland Hardwood Forest

Sweetgum - Water Oak Forest occurs on ridges in first bottoms of the floodplains of EBR's large river systems. Like the Hackberry-American Elm-Green Ash Bottomland Hardwood type, soils are often saturated but not as much as those of the lowest backwater areas. Common species include sweetgum (*Liquidambar styraciflua*), water oak (*Quercus nigra*), hackberry (*Celtis laevigata*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), deciduous holly (*Ilex decidua*), and dwarf palmetto (*Sabal minor*).

3.5.2.4.2 Cypress – Tupelo Swamp

Cypress – Tupelo Swamp (Figure 18) can be found in the floodplains of EBR's large river systems in the lowest back swamp depressions and swales. Only 25-50% of this vegetation type remains in Louisiana. Baldcypress swamps occur on mucks and clays, but also silts and sands with underlying clay layers. Soils are inundated or saturated during the growing season except during times of extreme drought. Baldcypress Swamp tends to be even aged since the seeds of bald cypress (*Taxodium distichum*) cannot germinate underwater and young seedlings cannot survive for long periods of submergence. Floristic diversity is also low due to the hydrologic regime of this habitat. Along with bald cypress, the overstory is dominated by water tupelo (*Nyssa aquatica*), with swamp blackgum (*Nyssa biflora*), green ash (*Fraxinus pennsylvanica*), water locust (*Gleditsia aquatica*), buttonbush (*Cephalanthus occidentalis*), black willow (*Salix nigra*), and Virginia willow (*Itea virginica*) also present.

Figure 18. Cypress Swamp at Frenchtown Conservation Area (Source: BREC Staff).

3.5.2.4.3 Wet Hardwood Flatwood

Wet Hardwood Flatwoods can be found in the central and western part of the parish on isolated poorly drained flats and depressions. Little is known about this vegetation type however and its current extent in Louisiana. It occurs on poorly drained silt loams and clays that often remain saturated into the spring. Common overstory species include oaks (*Quercus* spp.), shagbark hickory (*Carya ovata*), cedar elm (*Ulmus crassifolia*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), and hackberry (*Celtis laevigata*). Common midstory species included winged elm (*Ulmus alata*), snowbell (*Styrax americana*), planer tree (*Planera aquatica*), deciduous holly (*Ilex decidua*), and swamp privet (*Forestiera acuminata*). Dwarf palmetto (*Sabal minor*) is often the dominant understory species, but other common understory species include bulbous bitter cress (*Cardamine bulbosa*), sedges (*Carex* spp.), spider lily (*Hymenocallis liriosome*), small-flowered spiderwort (*Tradescantia occidentalis*) and dye bedstraw (*Gallium tinctorium*).

3.5.2.4.4 Small Stream Forest

all Stream Forest (Figure 19) can be found along streams and bottomland hardwood forests throughout EBR. Only 25 to 50% of this community type remains in Louisiana. The percentage of sand, silt, and clay is highly variable and has a significant effect on the species present. Common overstory species include southern magnolia (*Magnolia grandiflora*), beech (*Fagus grandifolia*), blackgum (*Nyssa sylvatica*), oaks (*Quercus* spp.), sweetgum (*Liquidambar styraciflua*), sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), and river birch (*Betula nigra*). Primary midstory and understory species include silverbell (*Halesia diptera*), ironwood (*Carpinus caroliniana*), arrow-wood (*Viburnum dentatum*), Virginia willow (*Itea virginica*), and sweetleaf (*Symplocos tinctoria*).

Figure 19. Small Stream Forest at Forest Community Park (Source: BREC Staff).

3.5.3 Riverine

The Riverine system contains all habitats contained within a channel i.e., landforms created naturally or artificially which periodically or continuously contains moving water (Langbein & Iseri, 1960). The Riverine system can be divided into two types, perennial and intermittent. Perennial streams are waterbodies that continuously contain water, while intermittent streams are those that sometimes are dry.

3.5.3.1 Rivers and Streams (Riverine Lower Perennial Channels)

Riverine lower perennial channels, or rivers and streams, are defined as channels that contain non-tidal intermittent or perennial moving freshwater. Rivers and streams of EBR are described as highly meandering sand bottom streams with extensive evidence of channel migration and changing morphology. While the larger rivers and streams continuously contain water, many of the smaller streams are intermittent and only contain water following rain events. Several community types are found within the riverine system, including the floating, free-swimming, or sessile organisms that occur in the moving water. Separate community types can also be found on the sand or gravel bars, or mud flats that are sometimes associated with rivers and streams.

3.5.4 Terrestrial

Terrestrial systems include natural communities that occur in upland areas and contain vegetative cover that is not hydrophytic (i.e., non wetland vegetation), soil that is non-hydric, and surfaces that are typically dry. Terrestrial types include Grasslands, Deciduous Forest, Evergreen Forests, and Mixed Deciduous Evergreen Forests.

3.5.4.1 Grassland
Grasslands are natural upland areas dominated by herbaceous species as opposed to woody vegetation. In Louisiana examples include grasslands and prairies. In EBR the only grassland system thought to occur is the Saline Prairie.

3.5.4.1.1 Saline Prairie
Saline Prairie is typically only a few acres in size and occurs on high sodium silt loams surrounded by woods. It is composed of a thick herbaceous layer interspersed with bare areas. The plant community is composed of drought-tolerant forbs, grasses, and grass-like plants. Only 10 to 25 % of this vegetation type remains in Louisiana, and it is no longer recognized by the LNHP as occurring in the parish. Common species include three-awn grasses (*Aristida* spp.), water hyssop (*Bacopa monnieri*), sedges (*Carex* spp.), spikegrass (*Chasmanthium latifolium*), alkali grass (*Distichlis spicata*), wet salines (*Fimbristylis castanea*), heliotropes (*Heliotropium curassivicum*), hibiscus (*Hibiscus* spp.), and rushes (*Juncus* spp.).

3.5.4.2 Deciduous Forest
Deciduous Forests are natural upland areas dominated by deciduous trees, trees that lose their leaves seasonally. Deciduous Forest types known to occur in EBR include Hardwood Slope Forest, Mesic Hardwood Flatwoods, Prairie Terrace Loess Forest, and Southern Mesophytic Forest.

3.5.4.2.1 Hardwood Slope Forest
Hardwood Slope Forest (Figure 20) occurs on slopes rising out of small stream floodplains and is dominated by hardwood species such as American beech (*Fagus grandifolia*), oaks (*Quercus* spp.), magnolias (*Magnolia* spp.), sweetgum (*Liquidambar styraciflua*), and hickories (*Carya* spp.). Loblolly pine (*Pinus taeda*) may be present, but it is infrequent. Common midstory and understory species include sourwood (*Oxydendrum arboreum*), bigleaf snowbell (*Styrax grandifolia*), sweetleaf (*Symplocos tinctoria*), silver bell (*Halesia diptera*), dogwood (*Cornus florida*), cherry laurel (*Prunus caroliniana*), Carolina holly (*Ilex ambigua*), and ironwood (*Carpinus caroliniana*). Only 25 to 50 % of this vegetation type remains in Louisiana

Figure 20. Hardwood Slope Forest at Bluebonnet Swamp Nature Center (Source: BREC Staff).

3.5.4.2.2 Mesic Hardwood Flatwood
Mesic Hardwood Flatwoods occur on low ridges with well-drained soils and are often found in association with Wet Hardwood Flatwoods. Common overstory species include mockernut hickory (*Carya alba*), black gum (*Nyssa sylvatica*), oaks (*Quercus* spp.), and sweetgum

(*Liquidambar styraciflua*). Common midstory species include flowering dogwood (*Cornus florida*), eastern hophornbeam (*Ostrya virginiana*), winged elm (*Ulmus alata*), and red maple (*Acer rubrum*). Common shrubs include tree huckleberry (*Vaccinium arboreum*), blueberry (*V. virgatum*), rusty blackhaw (*Viburnum rufidulum*), parsley hawthorn (*Crataegus marshallii*), red buckeye (*Aesculus pavia*), and pawpaw (*Asimina triloba*), with numerous herbaceous species present as well.

3.5.4.2.3 Prairie Terrace Loess Forest

Prairie Terrace Loess Forest can be found in the central and western part of EBR on flat to gently rolling terraces. Only 1 to 5 % of this community type remains in Louisiana. It occurs on silt loam soils overlying loess deposits. It has a high plant species diversity and shares many species with the Southern Mesophytic vegetation type. Common overstory species include oaks (*Quercus* spp.), southern magnolia (*Magnolia grandiflora*), American elm (*Ulmus americana*), yellow poplar (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), sweetgum (*Liquidambar styraciflua*) and pignut hickory (*Carya glabra*). Common understory and midstory species include dwarf palmetto (*Sabal minor*), pawpaw (*Asimina triloba*), silverbell (*Halesia diptera*), ironwood (*Carpinus caroliniana*), hop hornbeam (*Ostrya virginica*), red buckeye (*Aesculus pavia*), and wake robin (*Trillium foetidissimum*). A variety of vines and ferns are also present, along with mosses, lichens, and liverworts.

3.5.4.2.4 Southern Mesophytic Forest

Southern Mesophytic Forests develop on deep, fertile, circum-neutral to slightly alkaline loess soils. This soil type has eroded over thousands of years to form a well-dissected landscape of dry steep slopes, narrow ridges, and deep ravines which support a mosaic of microenvironments. Species typically found further north can be found in this community type creating a unique combination of species. Common overstory species include American beech (*Fagus grandifolia*), southern magnolia (*Magnolia grandiflora*), oaks (*Quercus* spp.), yellow poplar (*Liriodendron tulipifera*), Carolina basswood (*Tilia caroliniana*), American elm (*Ulmus americana*), and sugar hackberry (*Celtis laevigata*). Common midstory species include spice bush (*Lindera benzoin*), oak-leaf hydrangea (*Hydrangea quercifolia*), strawberry Bush (*Euonymus americanus*), red bud (*Cercis canadensis*), hop hornbeam (*Ostyra virginiana*), Paw (*Asimina triloba*), and Silverbell (*Halesia diptera*). Only 25% of this type remains in Louisiana, and it is no longer recognized by the LNHP as occurring in the parish.

3.5.4.3 Evergreen

Evergreen Forests are natural upland areas dominated by evergreen trees, trees that do not lose their leaves seasonally. Upland Longleaf Pine Forest is the only Evergreen Natural Community thought to have potentially occurred in EBR.

3.5.4.3.1 Upland Longleaf Pine Forest

Historically Upland Longleaf Pine Forest (Figure 21) could be found in the eastern part of EBR. Only 1 to 5 % of this vegetation type remains in Louisiana and it is no longer recognized by the LNHP as occurring in the parish. Frequent fire played a major role in this community type and prevented the encroachment of other species. Longleaf pine (*Pinus palustris*) is the dominant species present, with black gum (*Nyssa sylvatica*), post oak (*Quercus stellata*), shortleaf pine (*Pinus echinata*), and persimmon (*Diospyros virginiana*) also present. Common midstory and understory species include flowering dogwood (*Cornus florida*), deer berry (*Vaccinium stamineum*), dwarf huckleberry (*Gaylussacia dumosa*), wax myrtle (*Morella cerifera*), and yaupon (*Ilex vomitoria*), with common herbaceous species including asters (*Symphyotrichum* spp.), golden asters (*Chrysopis* spp.), elephant-foot (*Elaphantopus* spp.), and sneeze-weeds (*Helenium* spp.).

Figure 21. Upland Longleaf Pine Forest (Source: http://canps.weebly.com/historic-vegetation-of-ebr.html).

3.5.4.4 Mixed Evergreen/Deciduous Forest

Mixed Evergreen/Deciduous Forests are natural upland areas dominated by a mixture of deciduous and evergreen trees. Several types are known to occur in EBR including Mixed Hardwood-Loblolly Pine Forest, Shortleaf Pine/Oak-Hickory Forest, and Spruce Pine-Hardwood Flatwood.

3.5.4.4.1 Mixed Hardwood-Loblolly Pine Forest

Mixed Hardwood – Loblolly Forest can be found on stream slopes throughout its historic range, although it is no longer recognized as occurring in EBR parish. Fire plays an important role in this vegetation type with hardwoods dominating when fire is suppressed. Loblolly pine (*Pinus taeda*) comprises 20 % of the overstory, with hardwoods such as American beech (*Fagus grandifolia*), cherrybark oak (*Quercus pagoda*), white oak (*Q. alba*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), and sweetgum (*Liquidambar styraciflua*) comprising the rest. Common understory and herbaceous species include gallberry (*Ilex glabra*), flowering dogwood (*Cornus florida*), sourwood (*Oxydendrum arboreum*), deciduous holly (*Ilex decidua*), hawthorns (*Crataegus* spp.), huckleberries (*Vaccinium* spp.), blackberries (*Rubus* spp.), and violets (*Viola* spp.).

3.5.4.4.2 Shortleaf Pine/Oak-Hickory Forest

Shortleaf-Pine/Oak-Hickory Forest can be found on upper and mid-slopes of forests. Only 5 to 10 % of this vegetation type remains in Louisiana, and it is no longer recognized by the LNHP as occurring in EBR parish. Fire plays an important role in this community type with species composition varying depending on soil moisture. Shortleaf pine (*Pinus echinata*) historically was the dominant pine of this habitat with loblolly pine (*Pinus taeda*) currently the dominant pine present. Hardwoods, including oaks (*Quercus* spp.), black hickory (*Carya texana*), winged elm (*Ulmus alata*), black gum (*Nyssa sylvatica*), and red maple (*Acer rubrum*) typically compose greater than 50% of the canopy. Common shrubs include winter huckleberry (*Vaccinium arboreum*), chittum wood (*Bumelia lanuginosa*), rusty blackhaw (*Viburnum rufidulum*), and hawthorns (*Crataegus* spp.). Common herbaceous species include asters (*Symphyotrichum* spp.), rosin weeds (*Silphium* spp.), beggar ticks (*Desmodium* spp.), violets (*Viola* spp.), blazing stars (*Liatris* spp.), and goldenrods (*Solidago* spp.).

Figure 22. Spruce Pine Hardwood Flatwood at Baywood Park (Source: BREC Staff).

3.5.4.4.3 Spruce Pine-Hardwood Flatwood

Spruce Pine - Hardwood Flatwood (Figure 22) can be found in the eastern part of EBR. Only 10 % of this vegetation type remains in Louisiana. It occurs on hydric silt loam soils that are higher in nutrient levels than those supporting longleaf pine (*Pinus palustris*), likely restricting this species from this soil type. While spruce pine (*Pinus glabra*) is the defining component of this community type, hardwood species typically dominate. A wetland variant of this habitat also exists and can be found in small drainages and poorly drained depressions. Along with spruce pine, common overstory and midstory species include red maple (*Acer rubrum*), pignut hickory (*Carya glabra*), buttonbush (*Cephalanthus occidentalis*), swamp dogwood (*Cornus foemina*), mayhaw (*Crataegus opaca*), persimmon (*Diospyros virginiana*), Carolina ash (*Fraxinus caroliniana*), deciduous holly (*Ilex decidua*), American holly (*Ilex opaca*), Virginia willow (*Itea virginica*), wax myrtle (*Morella cerifera*), sweetgum (*Liquidambar styraciflua*), and switchcane (*Arundinaria gigantea*). Due to the often-thick canopy of Spruce Pine – Hardwood Flatwoods, the understory is usually sparse.

Table 1. Natural Communities of East Baton Rouge Parish and their global and state rankings

System	Sub-System	Natural Community	Plant Community Associates	Currently Found in Parish	Historically Found in Parish	Global Rank	State Rank
I. Lacustrine							
		1. Limnetic Open Water		Yes	Yes		S4
II. Palustrine							
	A. Emergent Vegetation			Yes	Yes		
	B. Floating Vascular Vegetation						
	C. Forested Wetland			Yes	Yes		
		1. Bottomland Hardwood Forest		Yes	Yes	G4 G5	S4
			a. Batture	Yes	Yes	G4 G5	S4 S5
			b. Hackberry-American Elm-Green Ash Bottomland Forest	Yes	Yes	G4 G5	S4
			c. Live Oak Forest	No	Yes	G2	S1
			d. Sweetgum – Water Oak Bottomland Forest	Yes	Yes	G4	S4
		2. Cypress – Tupelo Swamp		Yes	Yes	G3 G5	S4
		3. Small Stream Forest		Yes	Yes	G3	S2
		4. Wet Hardwood Flatwood		Yes	Yes	G2 G3	S2 S3
III. Riverine							
	A. Riverine Lower Perennial Channel						
IV. Terrestrial							
	A. Grassland						
		1. Saline Prairie		No	Yes	G1 G2	S2
	B. Deciduous Forest						
		1. Hardwood Slope Forest		No	Yes	G2 G3	S3
		2. Mesic Hardwood Flatwood		Yes	Yes	G1 G2	S2 S3

		3. Prairie Terrace Loess Forest		Yes	Yes	G2	S2
		4. Southern Mesophytic Hardwood Forest		No	Yes	G1 G2	S2
	C. Evergreen						
		1. Upland Longleaf Pine Forest		No	Yes	G1 G2	S1
	D. Mixed Evergreen/Deciduous Forest						
		1. Mixed Hardwood – Loblolly Pine Forest		No	Yes	G3 G4	S3
		2. Shortleaf Pine/Oak-Hickory Forest		No	Yes	G2 G3	S1
		3. Spruce Pine – Hardwood Flatwood		Yes	Yes	G1 G2	S2

Global Ranks:

G1: critically imperiled globally because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extinction.

G2: imperiled globally because of rarity (6 to 20 known extant populations) or because of some other factor(s) making it very vulnerable to extinction throughout its range.

G3: either very rare and local throughout its range or found locally even abundantly at some of its locations) in a restricted range (e.g., a single physiographic region) or because of other factors making it vulnerable to extinction throughout its range (21 to 100 known extant populations).

G4: apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery (100 to 1000 known extant populations).

G5: demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery (1000+ known extant populations).

State Ranks:

S1: critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some other factor(s) making it especially vulnerable to extirpation.

S2: imperiled in Louisiana because of rarity (6 to 20 known extant populations) or because of some other factor(s) making it very vulnerable to extirpation.

S3: rare and local throughout the state and found locally (even abundantly at some of its locations) in a restricted region of the state, or because of other factors making it vulnerable to extirpation (21 to 100 known extant populations).

S4: apparently secure in Louisiana with many occurrences (100 to 1000 known extant populations).

S5: demonstrably secure in Louisiana (1000+ known extant populations).

3.6 Native Plantings

A native planting is any strategically planned seeding or transplanting of Louisiana native plant species. At BREC, native plantings are used to help restore historically representative habitats of EBR parish, provide food for wildlife, promote native biodiversity, prevent erosion, and can even help manage stormwater as part of green infrastructure bioretention practices. Native plantings play a vital role in helping accomplish BREC NRM's goals of preserving biodiversity and reducing the loss of native species, as well as conserving, restoring, and expanding ecosystem services for the benefit of residents. Aside from native plantings used in green infrastructure, there are several types of native plantings that exist in the BREC park system.

3.6.1 Restoration Plantings

Restoration plantings are those plantings that aim to restore a degraded, damaged, or destroyed habitat back to its historical Louisiana Natural Community as well as restore any other natural processes that contribute to the area's productivity. Many restoration plantings involve research into current and historic biological, hydrological, and geological conditions of the site and its surrounding area. Restoration is important because so much of the natural habitat that existed in the United States prior to European colonization has been lost. Bottomland Hardwood Forests, for example, were estimated to have covered more than 24 million acres of the Lower Mississippi Alluvial Valley before Europeans arrived. By 1978, only 5.2 million acres (22%) remained (Macdonald et al., 1979) and even less remains today. While completely restoring a community back to its pre-settlement form can be very difficult and even impossible in many situations, BREC can at least restore the native biodiversity that would have existed and help see to it that the ecosystem is put back onto its natural trajectory, where it is able to reproduce, function, and maintain its native biodiversity on its own with minimal intervention.

3.6.1.1 Invasive Species Restoration Plantings

Invasive species restoration plantings are restoration plantings that take place directly after a localized invasive species removal effort. One of the primary goals of such a planting is to discourage the regeneration of the invasive species removed. This typically involves the planting of large, fast-growing trees and shrubs that will be able to compete with the invasive species or at least shade them out enough to slow down their spread in some cases, making long-term management easier. These plantings are monitored closely throughout the year.

3.6.1.2 Reforestation Plantings

Reforestation plantings are tree plantings that do not have any other goals aside from restoring the natural community of the area. In these types of plantings, diversity is typically preferred rather than focusing on planting large trees or species that will grow fast and compete well with invasive species. These plantings can range from very large plantings aiming to restore a forest in an area recently developed (Figure 23) or small-scale tree planting with Coastal Roots youth program that involves the planting of small, native tree species along a forest edge.

Figure 23. Beginning stage of restoration area at Bluebonnet Swamp Conservation Area where invasive paper mulberry was removed and native trees and shrubs were planted in March 2021 (left; Source: BREC staff); Planting at Forest Community Park restoration project in May 2021 (right; Source: BREC volunteer Jeffrey Dubinsky).

3.6.2 Pollinator Gardens

Pollinator Gardens (Figure 24) are native planting areas designed and constructed specifically for providing food and habitat to Louisiana native pollinators, which are insects and animals that help plants reproduce by spreading pollen from one flower to another. Pollinator gardens are more maintained that other types of plantings in the BREC park system: they are edged, mulched as needed, and weeded regularly to ensure that the garden stays maintained. Pollinator gardens are also one of the more interactive plantings since they are typically designed to have walkways that invite patrons into the garden, and/or sections with different themes to provide a cohesive aesthetic. Significant consideration is even given to architectural design with taller plants strategically placed near rear borders to serve as a backdrop with robust plants clumped throughout to serve as architectural elements and provide "fullness." Lastly, pollinator gardens are different than other types of plantings because its management and plant selection are dictated specifically by the needs of the pollinators. BREC pollinator gardens are pesticide-free and include host plants for

Figure. 24. Pollinator garden at BREC's Forest Community Park two weeks after it was expanded in March 2021 (Source: BREC staff).

developing butterfly and moth larvae, nectar plants for adult insects and hummingbirds, seed plants for songbirds and small mammals, and enough different species so that the garden provides food throughout the entire growing season.

Native pollinator gardens are important because habitat loss is one of the key drivers of the rapid decline of pollinators and native plantings, such as pollinator gardens provide much needed resources to animals and insects. The pollinators play a pivotal role worldwide in ecosystem stability as well as economic stability considering that many commercial crops such as blueberries, watermelons, grapefruit, coffee, and sunflowers which all rely heavily on pollinators for reproduction (Asare et al., 2017; Klein et al. 2006; Lundgren et al., 2017). Not only have many forests and grassland systems been developed or converted to agricultural fields, but the remaining wildflowers that persist along roadsides, fields, and forest edges are either mowed constantly or sprayed with pesticide, leaving little food and habitat behind for our pollinators. One of the most well-known examples of pollinators' dependency on native plants are the Monarch butterflies that depend solely on milkweed plants (*Asclepias* spp.) to reproduce. This monarch butterfly has declined by more than 80% over just the past two decades with widespread reduction in United States breeding habitat (i.e., larval food plants) being identified as a primary contributor to the decline (Brower et al., 2012). A lesser-known example is the two-spotted mining bee (*Andrena accpeta*) and its dependency on pollen from flowers in the family Asteraceae. This species can be found at BREC's Bluebonnet Swamp (Figure 25) where it relies primarily on pollen from muck sunflower (*Helianthus simulans*) that grows in Bluebonnet's pollinator garden and nearby meadow area. This species creates burrows underground where its larvae overwinter, and at the end of the season it packs the burrows with plenty of muck sunflower pollen for its larvae to feed on before emerging the next year.

Figure 25. Two-spotted mining bee on muck sunflower at BREC's Bluebonnet Swamp Conservation Area (Source: BREC volunteer John Hartgerink).

3.6.3 Wetland Plantings

Wetland plantings are plantings carried out in wet areas of a park that are difficult to manage and maintain with typical maintenance equipment like lawn mowers. In the BREC park system, there are often low-lying areas that flood frequently, such as drainage ditches and natural dips in the terrain. Maintaining such areas with a lawn mower or tractor can cause unsightly ruts that damage the property or can even cause equipment to become stuck or damaged. Instead of spending money to maintain those areas vigorously, BREC's NRM division plants native wetland plants that thrive in those wet habitat conditions. This helps to naturalize the area, providing food and habitat for wildlife while also providing a beautiful wetland aesthetic. Wetland plantings usually consist of primarily herbaceous plants such as irises, hibiscus, and aquatic milkweed, which are all showy plants that are important ecologically. Although some trees and shrubs are planted in these plantings, the goal is not for the area to succeed into a forest, so certain management techniques are considered to help maintain desired conditions.

Figure 26. Wetland planting area located at BREC's Manchac Park (Source: BREC staff).

3.7 Green Infrastructure

Green infrastructure is a widely used term that refers to a range of sustainable design practices. Most commonly it is defined as a stormwater management approach that mimics natural systems to protect and restore the natural water cycle. Green infrastructure does not just redirect storm water, it can filter and treat water, provide flow control, reduce the coverage of impervious surfaces (e.g., roads), reduce heat island effect, and will often use native plantings to provide native habitat, adding natural aesthetic as a secondary benefit. Green infrastructure is designed to reduce the workload of a city's grey infrastructure—man-made infrastructure such as damns, gutters, and storm pipes which often cause erosion, degrade habitat, carry contaminants, and prove inadequate in volume reduction during highwater events. For this reason, the implementation of green infrastructure in the BREC park system aligns directly with two of BREC NRM goals: (1) preserving biodiversity and reducing the loss of native species, and (2) conserving, restoring, and expanding ecosystem services for the benefit of residents. Green infrastructure manages stormwater through infiltration, filtration, storage, evaporation, and transpiration. Types of green infrastructure include bioretention practices which utilize native plantings, permeable pavement, rainwater harvesting, rooftop practices, and constructed wetlands. Some types of green infrastructure can already be found in the BREC park system and there are plans to incorporate others in the future. BREC's Resiliency Planning and Management Plan (Section 5) will guide the planning and management of green infrastructure in the BREC system.

3.7.1 Bioretention

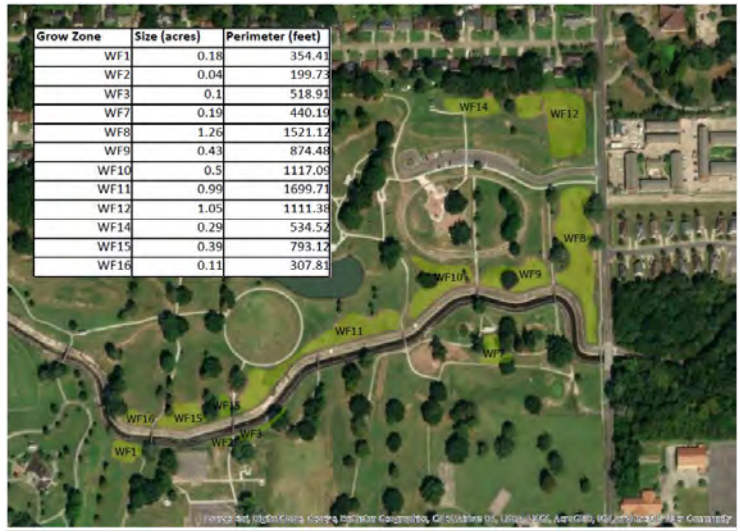
Bioretention is a green infrastructure practice that combines vegetation and water retention into an aesthetically pleasing design to aid in stormwater management. These can be as simple as a dense native planting, or a catchment basin combined with a vegetated planter box. Bioretention is designed to reduce impact on grey infrastructure by slowing water down, retaining it for short periods of time and filtering it as it moves through the system. Not only can vegetation help retain water and filter it to increase water quality, the use of plants in green infrastructure also creates habitat for wildlife and provide a natural aesthetic.

Figure 27. A field of wildflowers blooming in the grow zones at Howell Community Park (Source: BREC staff).

3.7.1.1 Grow Zones

Grow zones are areas seeded with Louisiana tallgrass prairie species and other Louisiana wildflower species to help reduce mowing costs while also mitigating storm water runoff, reducing erosion, enhancing the aesthetic of the landscape, and providing wildlife habitat. They are considered a green infrastructure practice because of the decreased stormwater runoff coefficient they provide compared to highly maintained invasive grass lawn areas or impervious surfaces. Grow zones, as the name implies, are areas that BREC lets grow throughout the year and that are not mowed regularly like other lawns in the BREC park system. Each grow zone has its own grow zone management plan, written by NRM staff, that outlines the specific strategies used to maintain these types of green infrastructure.

Management of the grow zones involves prescribed burning and coordination with park operations who helps mow the area one to three times annually.



Grow Zone	Size (acres)	Perimeter (feet)
WF1	0.18	354.41
WF2	0.04	199.73
WF3	0.1	518.91
WF7	0.19	440.19
WF8	1.26	1521.12
WF9	0.43	874.48
WF10	0.5	1117.09
WF11	0.99	1699.71
WF12	1.05	1111.38
WF14	0.29	534.52
WF15	0.39	793.12
WF16	0.11	307.81

Figure 28. Aerial map of the five acres of grow zone at Howell Community Park (Source**:** BREC Staff).

Grow zones are extremely important because these plantings help reduce BREC's largest expense while also aiding with storm water mitigation and erosion, an ongoing issue in EBR parish. There are 186 park sites and 6,500 acres in the BREC park system, which BREC has budgeted nearly $14 million dollars to maintain in 2021. Any maintenance expenses that can be alleviated is important as it saves money that can be spent elsewhere to better service the community. Grow zones implement a variety of native prairie grasses and wildflowers which have deep, prominent root systems that help stabilize the soil and absorb water, mitigating erosion and the amount of water that runs off into nearby drainage systems (Ford et al., 2016; Hernandez-Santana 2013). For example, Sideoats gramma (*Bouteloua curtipendula*), a grass species that can be found in the Howell Community Park Grow Zones, has a root system that develops more than 5-ft deep. This is drastic in comparison to the short root systems of typical turf grasses that are found in most community parks and neighborhood lawns (Figure 29).

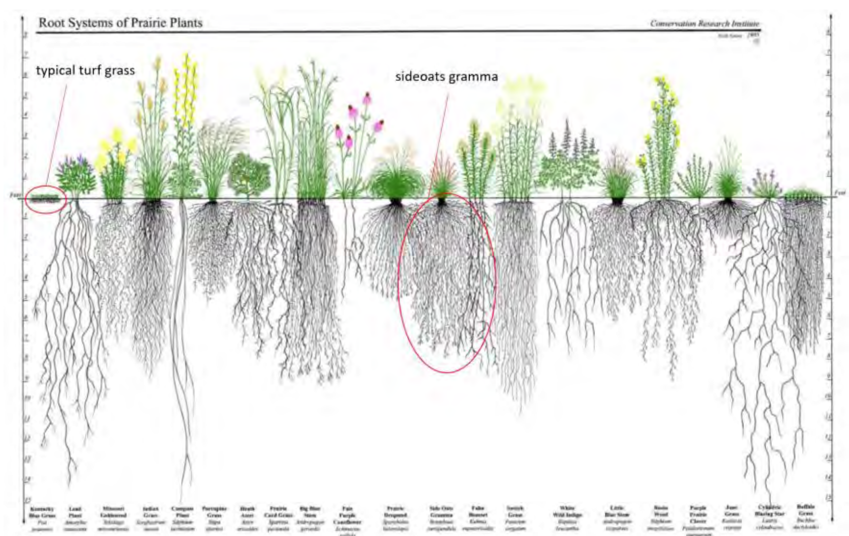


Figure 29. An illustration comparing the root system of native grassland species to that of typical turf grass species found in lawns (Source: Heidi Natura, Conservation Research Institute, 1995).

3.7.1.2 Bioswales

Bioswales are green infrastructure that uses native plants to absorb, filter, and slow runoff from impervious surfaces such as parking lots, buildings, and roads. Bioswales help purify non-point source pollution from runoff water and even helps recharge groundwater with runoff that would otherwise have drained away (Anderson et al., 2016; Xiao et al., 2017). Bioswales are extremely important in East Baton Rouge Parish where the average annual rainfall is about 63 inches per year, 25 inches higher than the national average. These vegetated swales are typically long, wide swales designed with slight (5%) elevations near the edges to help direct nearby storm water to the swale and prevent nearby parking lots or building from becoming flooded. These systems are often lightly mulched to help retain moisture during dry periods while also providing landscape aesthetics. The amount of stormwater a bioswale can divert and absorb is dependent on environmental factors such as soil type, but a bioswale that is 1% of the total area from which is it receiving storm water is typically sufficient. For larger parking lots and parks, multiple bioswales are ideal for maximum stormwater mitigation. The relative costs of bioswales installation and maintenance are also cheaper than that of traditional flood drainage systems and implementing bioswales in BREC parks helps save taxpayer dollars. Since bioswales are often planted in areas with mostly impervious surfaces, the vegetation in the swale must be able to deal with both drought and flooding, which makes plant selection a critical part of the planning and design process. Bioswales can be very complex systems that incorporate both green and grey infrastructure or they can just be simple systems that are merely vegetated swales that water is directed to.

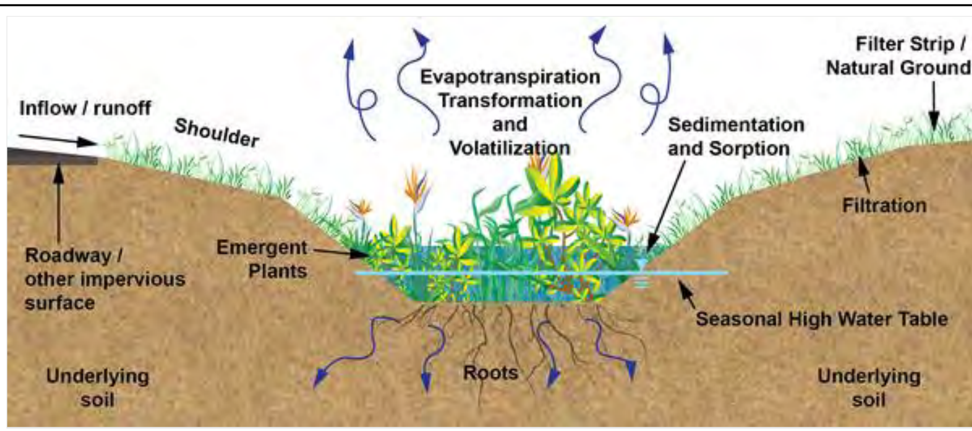


Figure 30. Example illustration of a typical bioswale design (Source: Ekka et al., 2020).

3.7.1.3 Rainwater Harvesting

Rainwater harvesting refers to the process of catching and storing rainwater with the goal of conserving water, removing it from grey infrastructure systems and providing environmental benefits. Other than just reducing the dependency on municipality water, storm water harvesting has many benefits that are important in the BREC park system. Harvesting water help can save money, provide a primary water source for regular activities (e.g., watering a planting during periods of drought), and can be a neat, ecofriendly education tool for patrons who may want to help conserve water too. Most importantly, harvesting rainwater is a great way to help reduce runoff. Heavy rainfall events are common in EBR parish, which often results in floods, oversaturation of soils, and erosion. Harvesting storm water helps reduce the amount of runoff, thus reducing potential for floods and erosion. Storm water harvesting can take many forms including simple water butts and water barrels that store water or more advanced gravity and pump-fed systems. Although BREC does not currently have any stormwater harvesting systems, there are currently plans to install rain barrels at Bluebonnet Conservation Area and to incorporate these systems into other parks. As a leader in the community, BREC could help encourage other patrons to harvest rainwater too, extending its benefits well beyond just the BREC park system.

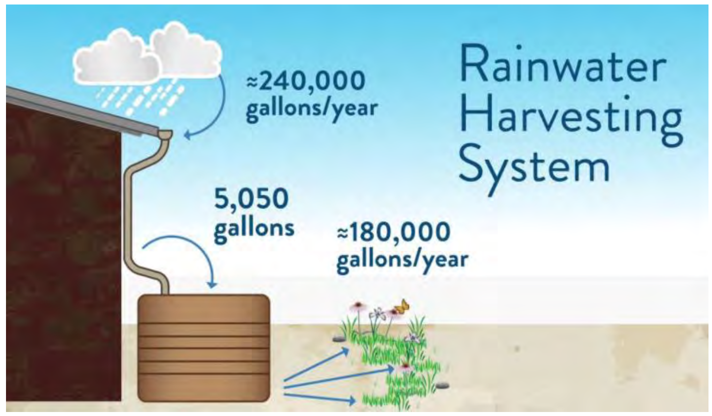


Figure 31. Illustration of a rainwater harvesting system designed to slow runoff, which gives the surrounding plants more ability to absorb access water (Source: https://www.youtube.com/watch?v=w0Z2o5d9ZAI).

3.7.1.4 Constructed Wetlands

Constructed wetlands are artificial wetlands designed using wetland vegetation, soil, and microbial assemblages to treat water in an area while also providing a natural aesthetic and wildlife habitat (Figure 32). Constructed wetlands are built on higher elevation areas where a natural wetland would not occur and typically also include grey infrastructure such as the installation of water control structures that help establish flow patterns. Like a natural wetland, constructed wetlands slow down water and allows the wetland plants and microorganisms to filter out suspended solids, take up pollutants or neutralize them, and absorb access nutrients such as nitrogen and phosphorus from fertilizers and manure that enter water system from nearby areas. These types of green infrastructure are particularly important in areas that are nearby or associated with effluent water sources or other water sources with known pollutants.

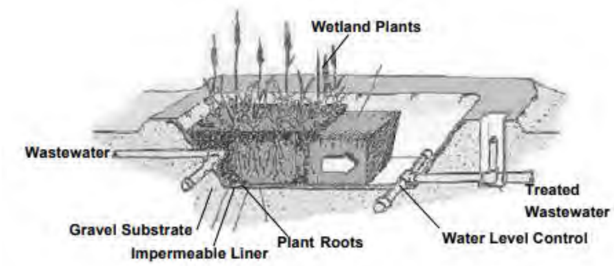


Figure 32. Illustration of typical constructed wetland design (left) (Source: https://nepis.epa.gov/Exe/ZyPDF.cgi/30005UPS.PDF?Dockey=30005UPS.PDF); An example of a constructed wetland (right) (Source: Hoffmann et al., 2011).

3.8 Fish and Wildlife

BREC's parks host a wide variety of organisms including fish, mammals, birds, reptiles, amphibians, and invertebrates, each of which is discussed in this section. Each group plays an important part ecologically and is found in a wide range of habitats. Each group also faces a wide range of threats, some of which are similar, while others are specific to each group. While habitat loss is the greatest threat to fish and wildlife, invasive species and pollution are also causes for the loss of species. While the below descriptions provide a broad overview of each group of organisms, Appendix 1 contains a current list of species found in BREC parks.

3.8.1 Fish

Figure 33: Channel Catfish (*Ictalurus punctatus*) stocked at Burbank Soccer Complex fishing pond (Source: BREC staff).

Approximately 170 species of freshwater fish occur in Louisiana (Douglas & Jordan, 2002) and are concentrated in five dominant families: Catostomidae (suckers, buffalo fish, and redhorses), Centrarchidae (bass, sunfish, and crappie), Cyprinidae (minnows, chubs, and shiners), Ictaluridae (catfish and madtoms), and Percidae (perch and darters). This diversity is largely the result of Louisiana's diverse freshwater habitats including large rivers, small streams, and natural and man-made lakes. Due to physiological and behavioral adaptations (Helfman et al., 2009; Lucas & Baras, 2001) fish can be found in a variety of locations within these systems. Fish not only provide a source of recreation through sport fishing (Figure 33), but also play an important role in freshwater systems including nutrient cycling, trophic dynamics, and productivity (Mota et al., 2013). Some of these roles are direct, such as predation, while others are indirect and can result in trophic level cascades, where the absence of one trophic group, such as a predator, causes a change in another trophic group, such as an herbivore. Threats to fish diversity are many, but include overexploitation, flow modification, habitat loss and fragmentation, invasive species, climate change, and pollution (Dudgeon et al., 2006).

Using BREC's aquatic REAP survey, which is discussed in Section 4 of this document, BREC's NRM division hopes to better quantify the number and types of fish in the BREC system. Fish, including native species such as largemouth bass and channel catfish, and non-native species such as rainbow trout and triploid carp, are routinely stocked in BREC's fishing ponds, details of which are also discussed in Section 4 of this document. BREC ponds also contain other native species, including a variety of bream, shiners, and minnows. Of particular importance, and an annual occurrence which draws visitors to the City Park Lake, is the presence of the American White Pelican (*Pelecanus erythrorhynchos*), which migrates during the winter from their breeding grounds in the northern United States and Canada and feed on a specific species of fish located in the lake, Gizzard Shad (*Dorosama cepedianum*).

3.8.2 Mammals

Approximately 70 species of mammals occur in Louisiana, most of which are represented in EBR (Lowery, 1974). Notable taxonomic orders include Artiodactyla (even-toed ungulates including white-tailed deer and pigs), Carniviora (racoons, otters, skunks, coyotes, bobcats, and foxes), Chiroptera (bats), Cingulata (armadillos), Didelphinimorphia (opossums); Lagomorpha (rabbits), Rodentia (rodents including beavers, mice, rats, voles, and squirrels), and Sirenia (the West Indian Manatee).

Mammals can be found in a variety of habitats, both terrestrial and aquatic. In the terrestrial environment, some live primarily underground, such as moles and shrews, while most live aboveground, such as deer, racoons (Figure 34), bats, etc. In the aquatic environment some live primarily in water, such as the West Indian manatee, while others inhabit both the aquatic and terrestrial environment, such as beavers and otters.

Mammals play an important role as both predators and herbivores, as well as ecosystem engineers, or organisms whose alteration of the physical environment can affect other parts of the community. As predators, mammals can also have far reaching effects by causing behavioral changes in other organisms (Roemer at al., 2009). In cases where these effects are disproportionate to a species abundance, the species is considered a keystone species, a species whose presence has a significant impact on the structure and function of the entire ecosystem (Lacher et al., 2019). Threats to mammals include habitat loss, habitat degradation, invasive species, and overexploitation (Davidson et al., 2017; Shipper et al., 2008).

Common mammals seen in BREC parks include the Fox Squirrel (*Sciurus niger*), Eastern Gray Squirrel (*Niger bachman*), Swamp Rabbit (*Sylvilagus aquaticus*), Racoon (*Procyon lotor*), Nine-banded Armadillo (*Dasypus novemcinctus*), and Virginia Opossum (*Didelphis virginiana*). Less common, but present in BREC parks, are the Red Fox (*Vulpes vulpues*), Coyote (*Canis latrans*), White-Tailed Deer (*Odocoileus virginianus*), and Bobcat (*Lynx rufus*), one of which was recently caught on camera at BREC's Bluebonnet Swamp Nature Center. Furthermore, while the American Black Bear (*Ursus americanus*) has not been seen in a BREC park, one was euthanized by LDWF in Baton Rouge as recently as June 2020.

Figure 34. Raccoons (*Procyon lotor*) at BREC's Bluebonnet Swamp Nature Center (Source: John Hartgerink).

3.8.3 Birds

More than 470 bird species have been recorded in Louisiana (LA Audubon Society, 2020), largely a result of Louisiana's location in the Mississippi Valley Migratory Flyway, but also due to the diverse habitats and temperate climate of the region (Griep & Collins, 2013; Lowery, 1974). The Mississippi Flyway starts in Canada and ends at the Gulf of Mexico following the Mississippi, Missouri, and Ohio Rivers (Figure 35). Approximately 325 species of bird use the flyway, which is roughly 40% of the birds in North America. While some species occur in Louisiana throughout the year, other species are found seasonally during the fall and spring migration periods. As for Baton Rouge, the fall migration is typically larger than the spring migration. In the spring, migrant birds from Central and South America will take advantage of the strong southerly winds and bypass Baton Rouge. Notable taxonomic orders include: Accipitriformes (osprey, hawks, eagles, and kites), Anseriformes (ducks, geese, and waterfowl), Apodiformes (hummingbirds), Cathartiformes (vultures), Coraciiformes (kingfishers), Falconiformes (falcons), Gaviiformes (loons), Gruiformes (rails, gallinules, and coots), Passeriformes (perching birds and songbirds), Pelecaniformes (pelicans, herons, egrets, and ibises), Piciformes (woodpeckers), Podisipediformes (grebes), Strigiformes (owls), and Suliformes (anhingas and cormorants).

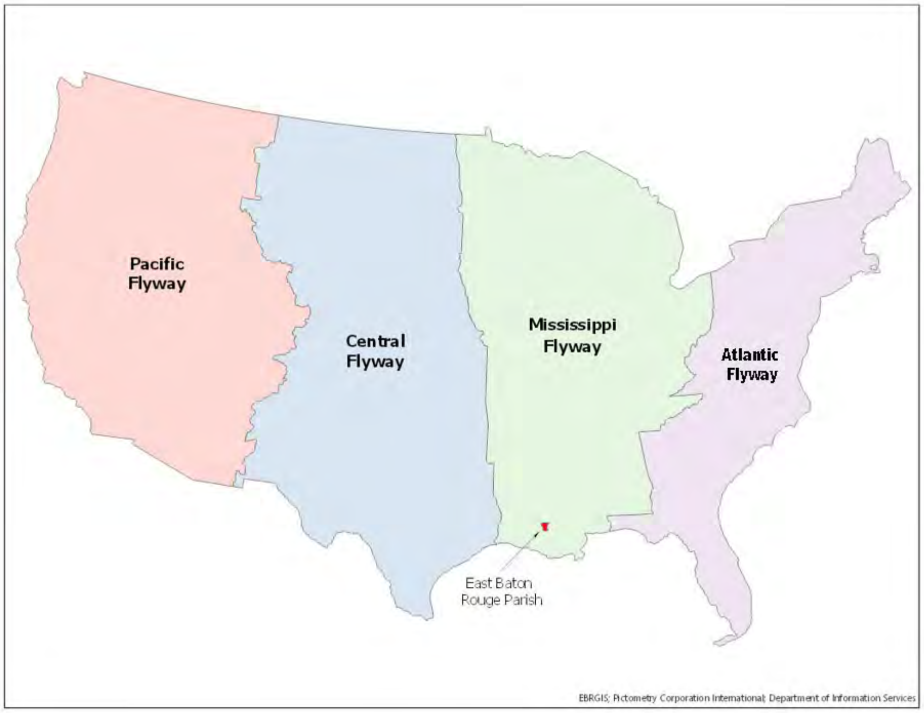


Figure 35. East Baton Rouge Parish within the Mississippi Flyway (Source: BREC GIS).

The distribution of birds is the result of local features such as habitat composition, structural diversity, and successional stage, as well as landscape features such as habitat patch size, edge length, and adjacent land-use. Limits to population size include food availability, nest sites, predation, nest depredation, parasites and pathogens, and brood parasitism (Koenig, 2016). Habitat loss poses the greatest threat to bird diversity, although habitat fragmentation, direct exploitation, chemical toxins, and pollution, introduced diseases, and climate change are also major threats (Fitzpatrick & Rodewald, 2016). As for invasive species, it is estimated that domestic cats kill at least one billion birds every year in the United States (Dauphine & Cooper, 2009). Regarding climate change, it has been documented that bird distributions are shifting northwards, and earlier spring

Figure 36. Great Egret (*Ardea alba*) at City Park Lake (Source: BREC Staff).

arrival and nesting dates are occurring (Parmesan & Yohe, 2003; Thomas & Lennon 1999).

Popular birding locations in EBR parish include City Park Lake, Blackwater Conservation Area, Frenchtown Conservation Area, and Bluebonnet Swamp Conservation Area, amongst many others (Gibbons et al., 2013). At City Park Lake one can often see Double-crested Cormorants (*Phalacrocoracida auritus*), which roost amongst cypress trees, and a mix of herons, egrets, and ibises, along with the American White Pelicans mentioned earlier. Blackwater Conservation Area, which is north of Baton Rouge attracts less urban tolerant species including a variety of sparrows and warblers, Wood Ducks (*Aix sponsa*), Green Herons (*Butorides virescens*), etc. Frenchtown Conservation Area, BREC's largest Conservation Area, contains some of the species of most concern, including the Prothonotary Warbler (*Protonotaria citrea*), Swainson's Warbler (*Limnothylpis swainsonii*), Kentucky Warbler (*Geothlypis formosa*), Hooded Warbler (*Setophaga citrina*), and Wood Thrush (*Hylocichla mustelina*). Concerning Swainson's Warbler, Frenchtown Conservation is their closest known breeding site to Baton Rouge, making it of particular concern. Bluebonnet Swamp Conservation Area, located in the middle of Baton Rouge and surrounded by urban development, also contains a unique mixture of species including the Barred Owl (*Strix varia*), Red-bellied Woodpecker (*Melanerpes carolinus*), Acadian Flycatcher (*Empidonax virescens*), and Yellow-throated Warbler (*Setophaga dominica*).

BREC parks are also a popular location for bird research. For example, an ongoing study by the Louisiana Audubon Society at the Bluebonnet Swamp Nature Center and Frenchtown Conservation Area has been monitoring Prothonotary Warblers using a variety of band types including very high frequency (VHF) radio signal nanotags that can track the bird's migration patterns. In addition, bird bands have also been used by a research group at LSU, where the movement and behavior of Barred Owls is being examined.

3.8.4 Reptiles and Amphibians

Reptiles and amphibians, although grouped in separate taxonomic classes, the Reptilia and Amphibia respectively, are often discussed together and referred to as herpetofauna. Louisiana contains a high diversity of reptiles and amphibians, largely due to the temperate, climate and various habitats of the state. Reptiles include turtles (Figure 37), snakes, lizards, and alligators, while amphibians are composed of frogs, toads, and salamanders.

Both groups are ectothermic, meaning that they cannot internally regulate their body temperature, and are thus highly affected by outside temperatures. However, they differ in many other ways. Reptiles are covered in scales, have dry skin, and lay eggs with shells or give birth to live young who share the same body form as adults. In contrast, amphibians are not covered in scales but have moist, porous skin, and mainly deposit eggs in water. Eggs hatch into larvae that remain in water and metamorphose into adults.

Reptiles and amphibians are found in most Louisiana habitat types, including both terrestrial and aquatic environments. While some species are restricted to the terrestrial environment, others occur in both. For example, many amphibians are born in aquatic environments but spend their adult life on land. Reptiles and amphibians play an important role in ecosystems as both predators and prey. More so than other groups of organisms, reptiles and amphibians are reflective of the health of ecosystems and some species are often referred to as bioindicators. Many species in this group are highly susceptible to pollution, such as amphibians whose skin is porous. Pollutants that threaten amphibians include heavy metals, herbicides, and pesticides which can cause deformities or other abnormalities. Furthermore, due to the various habitat types required throughout the life cycles of some amphibians, habitat destruction and fragmentation can also pose threats to herpetofauna. Other threats include non-native species, climate change, and UV radiation (Marks et al., 2006).

Figure 37. An Eastern Box Turtle (*Terrapene carolina*) found at Jones Creek Park (Source: BREC staff).

Wet areas, including ponds, streams, and wetlands, are common areas to find reptiles and amphibians due to their affinity for those habitat types. Common amphibians include Fowler's Toad (*Anaxyrus fowleri*), Gulf Coast Toad (*Incilius nebulifer*), Green Tree Frog (*Hyla cinera*), Green Frog (*Lithobates clamitans*), Cope's Gray Tree Frog (*Hyla chrysoscelis*), Three-lined Salamander (*Eurycea guttolineata*) and Marbled Salamander (*Ambystoma opacum*), while common reptiles include Common Slider (*Trachemys scripta*), Common Snapping Turtle (*Chelydra serpentina*), Eastern Mud Turtle (*Kinosternon subrubrum*), Banded Watersnake (*Nerodia fasciata*), Northern Cottonmouth (*Agkistrodon piscivorous*), Western Ribbon Snake (*Thamnophis proximus*), Broad-headed Skink (*Plestiodon laticeps*) and Green Anole (*Anolis carolinensis*). Less common, but known to occur in BREC parks, are the American Alligator (*Alligator mississippiensis*), Alligator Snapping Turtle (*Macrochelys temminckii*), and Four-Toed Salamander (*Hemidactylium scutatum*), a species of special concern as designated by the Louisiana Department of Wildlife and Fisheries and known to occur in BREC's Palomino Neighborhood Park.

3.8.5 Invertebrates

Invertebrates contain a wide variety of taxonomic groups and compose over 80% of described multicellular organisms on Earth (Brusca & Brusca, 2002). The largest taxonomic group of invertebrates fall within the Phylum Arthropoda, but other notable larger taxonomic groups include the Nematoda (roundworms), Annelida (earthworms), and Mollusca (snails and mussels). The class Insecta is the largest group within the Arthropoda and contain notable orders such as Coleoptera (beetles), Diptera (flies), Hemiptera (true bugs), Hymenoptera (bees, ants, and wasps), Lepidoptera (moths and butterflies), Odonata (dragonflies and damselflies), and Orthoperta (grasshoppers and crickets).

Invertebrates can be found in a variety of habitats including both terrestrial and aquatic environments. While some are restricted to one of these two habitats, some inhabit both during separate phases of their life history. For example, many invertebrates including damselflies, dragonflies, mayflies, stoneflies, and caddisflies spend the majority of their life underwater in their larval stage, only to emerge as adults in terrestrial habitats to reproduce.

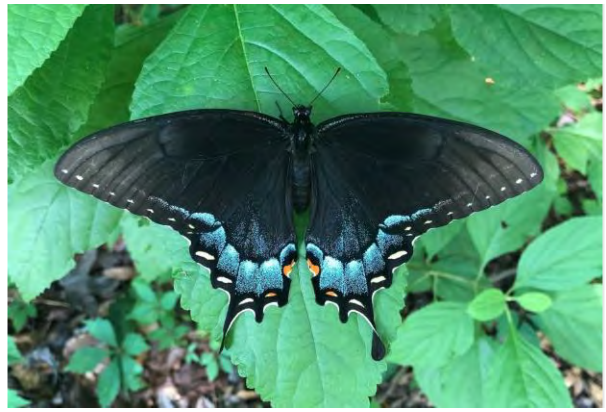


Figure 38. Eastern Tiger Swallowtail (*Papilio glaucus*) at Bluebonnet Swamp Nature Center (Source: BREC Staff).

Invertebrates play an important role in ecosystems and provide several ecosystem services. Within a food web context, invertebrates often form important links as both predators and prey. For example, invertebrates that consume plants or detritus convert primary production into energy that is critical for organisms at higher trophic levels (Polis & Strong, 1996). From an ecosystem services perspective, invertebrates also play a variety of roles including pollination (National Research Council, 2007), seed dispersal (Kremen et al., 2007), decomposition (Wallace & Webster 1996), nutrient cycling (Derourard et al., 1997), and habitat formation (Jones et al., 1994). Threats to the diversity of invertebrates include habitat loss, habitat fragmentation, pollution, non-native species, and climate change (Prather et al., 2012; Wagner & Driesche, 2010). Loss of invertebrate species is particularly concerning given the number of ecosystem services they provide (Isaacs et al., 2009).

Common insects in EBR include butterflies and moths such as the Eastern Tiger Swallowtail (*Papilo glaucus*), Carolina Satyr (*Hermeuptychia sosybius*), and Buck Moth (*Hemileuca maia*), dragonflies and damselflies such as the Great Blue Skimmer (*Libellula vibrans*), Eastern Pondhawk (*Erythemis simplicicollis*), and the Ebony Jewelwing (*Calopteryx maculata*), and bees and wasps such as the Eastern Carpenter Bee (*Xylocopa virginica*), Southern Yellow Jacket (*Vespula squamosa*), and European Honey Bee (*Apis mellifera*). Notable species include the Two-lined Spittlebug (*Prosapia bicincta*), the nymphs of which are commonly seen feeding on grasses within a layer foam, the Eastern Lubber Grasshopper (*Romalea microptera*), a grasshopper also known as a 'Devil Horse' and can reach 4 in. in length, and the Six-spotted Tiger Beetle (*Cicendela sexguttata*), a local beetle found in forests known for its bright green color.

3.9 Rare, Threatened, and Endangered Species of EBR

Rare, threatened, and endangered species are identified through a variety of mechanisms. On a federal level, the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) are responsible for designating federal protection status under the Endangered Species

Act of 1973 (ESA), whereas on a state level the Louisiana Department of Wildlife and Fisheries (LDWF) is responsible for designating state protection status for rare, threatened, and endangered species. In addition, NatureServe assigns global ranks to all species, ranking them on a scale from common (G5) to critically imperiled (G1).

Under the ESA, endangered species are defined as species in danger of extinction throughout all or a significant portion of its range, whereas threatened species are defined as species likely to become endangered within the foreseeable future. Species can also be listed as “candidate” threatened or endangered species if the USFWS has enough information to warrant proposing them for listing. Currently the USFWS lists 2,362 threatened or endangered species worldwide, 1,667 of which are in the U.S. and three of which are known to have occurred in East Baton Rouge Parish. Two of these species are listed as threatened, the West Indian manatee (*Trichechus manatus*) and the inflated heelsplitter (*Potamilus inflatus*), and one is listed as endangered, the pallid sturgeon (*Scaphirhynchus albus*) by both the USFWS and LDWF.

Under the LDWF state ranking system, species are ranked on a scale of secure (S5) to those that are critically imperiled in Louisiana because of extreme rarity (five or fewer known extant populations) or because of some other factor making it extremely vulnerable to extirpation (S1). Within East Baton Rouge Parish eight species are given a state rank of S1: the Alabama Shad (*Alosa alabamae*), Four-toed Salamander (*Hemidactylium scutatum*), Inflated Heelsplitter, Low Ground Orchid (*Platythelys querceticola*), Pallid Sturgeon, Southeastern Crowned Snake (*Tantilla coronate*), Suckermouth Minnow (*Phenacobius mirabilis*), and West Indian Manatee. While all of these have a state rank of S1, only one has a global rank of G3 or lower, the Alabama Shad, meaning on a global level it is also vulnerable to extinction.

In addition, the LDWF recognizes Species of Greatest Conservation Need, species that includes threatened and endangered species as well as uncommon species that rely on imperiled habitats for survival. LDWF’s Wildlife Diversity Program maintains a geospatial database of these species and habitats and uses it to determine potential adverse impacts by proposed construction projects. LDWF continuously updates this database and has compiled a list of more than 10,000 occurrences of rare, threatened, and endangered species, unique natural communities, and other distinct elements of natural diversity.

Table 2. LDWF Rare and Endangered Species of East Baton Rouge Parish

Common Name	Scientific Name	Element Type	Global Rank	State Rank	Federal Status	State Status	Habitat
Alabama Shad	*Alosa alabamae*	Fish	G2 G3	S1			Rivers, and Streams
Alligator Snapping Turtle	*Macrochelys temminckii*	Reptile	G3 G4	S3		Restricted	Rivers, Lakes, Swamps
Bald Eagle	*Haliaeetus leucocephalus*	Bird	G5	S3	Delisted	Delisted	Nests in cypress trees near open water
Clear Chub	*Hybopsis winchelli*	Fish	G5	S3			Rivers, and Streams
Common Rainbow Snake	*Farancia erytogramma*	Reptile	G4 T4	S2			Aquatic Habitats
Creole Pearly-eye	*Lethe creola*	Insect	G4	S3			Moist or Wet Bottomland Woods
Dusted Skipper	*Atryonopsis hianna*	Insect	G 4G5	S3			Grasslands, Prairies, Old Fields
Dwarf Filmy Fern	*Trichomanes petersii*	Plant	G4 G5	S3			Small Stream Forests
Eastern Glass Lizard	*Ophisaurus ventralis*	Reptile	G5	S3			Moist Woods
Eastern Harvest Mouse	*Reithrodontomys humulis*	Mammal	G5	S3			Abandoned Fields, Marshes, Wet Meadows
Elliott's Sida	*Sida elliotti*	Plant	G4 G5	SH			
Four-toed Salamander	*Hemidactylium scutatum*	Amphibian	G5	S1			Hardwood and Pine Forests; Temporary Pools (larvae)
Gulf Chub	*Macrhybopsis sp. 3*	Fish	GNR	SNR			Rivers and Streams
Hybrid Wood Fern	*Dryopteris x australis*	Plant	GNA	SH			Swamp Forests
Inflated Heelsplitter	*Potamilus inflatus*	Mollusk	G1 G2Q	S1	Threatened	Threatened	Rivers and Streams
Lace-winged Roadside-Skipper	*Amblyscirtes aesculapius*	Insect	G3 G4	S3			Moist Woods
Little Metalmark	*Calephelis virginiensis*	Insect	G4	S4			Open Pine Woods, Savannah
Long-tailed Weasel	*Mustela frenata*	Mammal	G5	S3		Restricted	Near Water
Low Ground Orchid	*Platythelys querceticola*	Plant	G3 G5	S1			Swamps and Hardwood Forests
Monarch	*Danaus plexippus*	Insect	G4	S5			Open Fields and Meadows
Pallid Sturgeon	*Scaphirhynchus albus*	Fish	G2	S1	Endangered	Endangered	Large Rivers
Powdery Thalia	*Thalia dealbata*	Plant	G4	S2 S3			Wetlands

Pygmy Rattlesnake	*Sistrurus miliarius*	Reptile	G5	S2			Flatwoods and Mixed Forests
Rainbow Darter	*Etheostoma caeruleum*	Fish	G5	S2			Rivers and Streams
Rainbow Snake	*Farancia erytrogramma*	Reptile	G4	S2			Sand and Gravel Streams
Rayed Creekshell	*Strophitus pascagoulaensis*	Mollusk	GNR	S2			Rivers
Saddleback Darter	*Percina vigil*	Fish	G5	S3			Rivers and Streams
Silky Camellia	*Stewartia malacodendron*	Plant	G4	S2 S3			Moist Woods
Smooth Softshell	*Apalone mutica*	Reptile	G5	S3			Rivers, Streams, Lakes
Southeastern Crowned Snake	*Tantilla coronata*	Reptile	G5	S1			Pine Forests
Southeastern Shrew	*Sorex longirostris*	Mammal	G5	S2			Moist Forests
Southern Hickorynut	*Obovaria arkansasensis*	Mollusk	GNR	S1 S2			Rivers and Streams
Southern Pocketbook	*Lampsilis ornata*	Mollusk	G5	S3			Rivers and Streams
Southern Rainbow	*Villosa vibex*	Mollusk	G5	S2			Rivers and Streams
Southern Shield Woodfern	*Dryopteris ludociviana*	Plant	G4	S2			Swamps and Moist Woods
Square-stem Monkeyflower	*Mimulus ringens*	Plant	G5	S2			Stream Banks and Wet Meadows
Suckermouth Minnow	*Phenacobius mirabilis*	Fish	G5	S1			Small to Medium Rivers
Swallow-tailed Kite	*Elanoides forficatus*	Bird	G5	S1 S2B			Bottomland and Swamp Forests
West Indian Manatee	*Trichechus manatus*	Mammal	G2	S1N	Threatened	Threatened	Rivers
Wolf's Spike Sedge	*Eleocharis wolfii*	Plant	G3 G5	S3			Saline Prairies and Flatwoods

Global Ranks:

G1: critically imperiled globally because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extinction.

G2: imperiled globally because of rarity (6 to 20 known extant populations) or because of some other factor(s) making it very vulnerable to extinction throughout its range.

G3: either very rare and local throughout its range or found locally even abundantly at some of its locations) in a restricted range (e.g. a single physiographic region) or because of other factors making it vulnerable to extinction throughout its range (21 to 100 known extant populations).

G4: apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery (100 to 1000 known extant populations).

G5: demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery (1000+ known extant populations).

State Ranks:

S1: critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some other factor(s) making it especially vulnerable to extirpation.

S2: imperiled in Louisiana because of rarity (6 to 20 known extant populations) or because of some other factor(s) making it very vulnerable to extirpation.

S3: rare and local throughout the state and found locally (even abundantly at some of its locations) in a restricted region of the state, or because of other factors making it vulnerable to extirpation (21 to 100 known extant populations).

S4: apparently secure in Louisiana with many occurrences (100 to 1000 known extant populations).

S5: demonstrably secure in Louisiana (1000+ known extant populations).

Federal and State Protection Status:

Endangered: species at risk of extirpation or extinction. Take or harassment of these species is a violation of state and federal laws.

Threatened: species at risk of becoming endangered. Take or harassment of these species is a violation of state and federal laws.

Threatened/Endangered: imperiled species with populations of conflicting protection status. Take or harassment of these species is a violation of state and federal laws.

Prohibited: possession of these species is prohibited; no legal harvest or possession allowed without valid Scientific Research and Collecting Permit issued by LDWF.

Restricted Harvest: restrictions regarding the take and possession of these species.

3.9.1 EBR S1 Species Descriptions

The below species descriptions provide a brief background about each of the state S1 listed species in EBR. These species are highlighted in accordance with BREC's goal to preserve biodiversity and reduce the loss of native species.

3.9.1.1 Alabama Shad (Alosa alabamae)

The Alabama shad is a small freshwater fish that can be found along sand and gravel bars in medium to large rivers in EBR. It spends much of its life in the Gulf of Mexico however, migrating into freshwater rivers in early summer to spawn. Reasons for its decline include habitat degradation, particularly in its breeding sites, and blocked migration routes.

3.9.1.2 Four-toed Salamander (Hemidactylium scutatum)

The four-toed salamander (Figure 39) is a small salamander that inhabits boggy wetlands of mature hardwood and pine forests under logs, moss, and rocks as adults, and slowly flowing water or temporary pools with moss or sedges lacking predators such as fish as larvae. It can be identified by the presence of only four toes on each hind foot, as opposed to five which other salamanders have. It occurs throughout the Midwest and east coast, but only in isolated populations. In Louisiana it has been found in four parishes, including EBR, and within BREC's park system it has been found at Palomino Park. Reasons for decline include deforestation, drainage of wetlands, development, and agricultural runoff of pesticides and fertilizers.

Figure 39. Four Toed Salamander (Source: http://www.louisianaherps.com/four-toed-salamander-hemida.html).

3.9.1.3 Inflated Heelsplitter (Potamilus inflatus)

The inflated heelsplitter (Figure 40) is a large freshwater mussel that is found in the bottoms of rivers embedded into sediment with the "wing" of its shell pointed upward, extracting plankton and detritus by filter feeding water being pumped through its body. Threats include sand and gravel mining, and other channel alteration, such as impoundments that can impede movement of its host fish, the freshwater drum (*Aplodinotus grunniens*). The inflated heelsplitter historically occurred in the Amite, Tangipahoa, and Pearl Rivers in Louisiana, and the Tombigbee and Black

Figure 40. Inflated Heelsplitter (Source: https://www.fws.gov/BatonRouge/freshwater-mussels.html).

Warrior Rivers in Alabama, but it is now restricted to a 25-mile stretch of the Amite River just southeast of EBR (Brown & Daniel, 2014).

3.9.1.4 Jug Orchid (Platythelys querceticola)

The jug orchid is a type of orchid whose distribution ranges from Central and South America to its northern limit in the southeast US. It occurs in swamps, floodplains, and hardwood forests. While it is secure outside of the US, it is considered highly rare in Mississippi and Louisiana. In Louisiana it has been found in three parishes including EBR.

3.9.1.5 Pallid Sturgeon (Scaphirhynchus albus)

The pallid sturgeon (Figure 41), the only federally endangered species known to occur in EBR, is a large cylindrical fish with a shovel-shaped head that inhabits large turbid rivers of the southeast US with strong currents and firm sandy bottoms. Threats include changes in habitat and water quality that have either blocked or eliminated spawning habitat. In Louisiana it occurs in large rivers including the Red, Atchafalaya, and Mississippi Rivers.

Figure 41. Pallid Sturgeon (Source: https://www.fws.gov/mountain-prairie/es/pallidSturgeon.php).

3.9.1.6 Southeastern Crowned Snake (Tantilla coronate)

The southeastern crowned snake (Figure 42) is a small, slender snake that can be found in a variety of habitats, normally under rocks, logs, etc., but are most common in dry pine forests and sandhills. It is found throughout the Coastal Plain of the US but is uncommon. In Louisiana it is known to occur in seven parishes, one of which is EBR.

Figure 42. Southeastern Crowned Snake (Source: https://www.louisianaherps.com/southeastern-crowned-snake-.html).

3.9.1.7 Suckermouth Minnow (Phenacobius mirabilis)

The suckermouth minnow is a small bottom feeding fish that prefers shallow areas with gravel and rubble in small to medium rivers. It is found throughout the Mississippi and Lake Erie drainages, but in Louisiana it is only found in eight parishes, one of which is EBR. Reasons for decline include pollution and siltation of habitat.

3.9.1.8 West Indian Manatee (Trichechus manatus)

The West Indian manatee (Figure 43) is a large, docile aquatic mammal that inhabits rivers, estuaries, and occasionally saltwater, feeding on a variety of aquatic plants. Threats include collisions with boats, poaching, habitat loss, and pollution. While West Indian Manatees are primarily found in Florida, this species can also be found throughout Louisiana. Between 1929 and 1994, 19 sightings were reported in Louisiana, one of which was in the Amite River (Wilson, 2003). Sightings have increased since then, especially in the Pontchartrain Basin (Cloyed et al., 2019).

Figure 43. West Indian Manatee (Source: https://www.fws.gov/southeast/wildlife/mammals/manatee/).

3.9.2 Considerations in Park Planning and Management

On a federal level, once a species is listed as threatened or endangered it receives special protection from the federal government, including restrictions from being taken or transported, the development of a recovery plan, the authority to purchase important habitat, and Federal aid to State agencies. Similarly, on a state level, once a species is listed as threatened or endangered it also receives special protection, in particular restrictions from being taken, transported, or harassed. The LDWF also maintains the Natural Areas Registry Program, a program that locates the best examples of Louisiana's natural areas to restore and protect them. The program not only identifies areas within state and federal properties, but private properties as well.

Within BREC, the designation of a species or habitat as threatened or endangered can impact its park designation, planning within the park, or visitor use restrictions. BREC park types whose main purpose is the protection of biodiversity or ecological and geomorphic features include Nature Reserves and Conservation Areas. Additionally, other park types can include managed tracts of natural resources referred to as Conservation Management Units. The designation of a park, or sub-unit, as one of these types can thus impact it current use or future use during the planning process as the impact on the resource should be weighed when planning future amenities. Additionally, areas that contains rare or sensitive communities can be designated as Sensitive Habitat Zones which will carry the highest level of protection, requiring a buffer from outside influences and preventing future development or land use changes. See Section 4 of this document for further descriptions of BREC Conservation Areas, Amenities, land designations and the various protections that they carry.

3.10 Biodiversity

In accordance with BREC's goal to preserve biodiversity and reduce the loss of species, BREC continually monitors and updates a list of species that exist in BREC parks (see Appendix 1) for current list). BREC currently uses iNaturalist, an online platform developed by the California Academy of Sciences and the National Geographic Society, to monitor this list, along with species lists submitted through BREC's Research Permit process, both of which are further discussed in Section 5 of this document. Through this process, BREC monitors its biodiversity by organism type as well as by park. As of June 2021, 2,352 species of organisms have been documented within BREC parks, with Greenwood Community Park containing the most at 1039 species. Table 3 shows the species count by organism type, while Table 4 shows a partial list of species by park. Only through understanding the species that currently exist in BREC's parks can our goal to preserve biodiversity and reduce the loss of species be attained. It is our hope that by creating a baseline of species present, we can monitor future populations and manage potential impacts and threats.

Table 3. Species count in BREC parks, based on taxonomic group.

Organism Type	Species Count
Plantae	916
Insecta	741
Fungi	258
Aves (Birds)	170
Arachnida	89
Reptilia	37
Mammalia	33
Amphibia	27
Mollusca	22

Table 4. Species count for each BREC park with greater than 300 species observed.

Park	Species Count
Greenwood Community Park	720
Frenchtown Conservation Area	632
Forest Community Park	587
Bluebonnet Swamp Conservation Area	546
Hooper Road Park	473
Blackwater Conservation Area	445
Kendalwood Conservation Area	411
Sandy Creek Community Park	394

Zachary Community Park	344
Manchac Park	321

3.11 Current Threats to Natural Resources

Although many threats exist to BREC's natural resources, the below highlights a few of these including land use change, pollution, climate change, invasive species, vandalism, and lack of resources. By understanding these threats, BREC can better meet its goal of protecting habitats, preserving biodiversity, and managing natural resources adaptively. BREC continues to examine these threats and manage them accordingly which is more thoroughly described in the Action Plan (Section 7).

3.11.1 Land Use Changes

The largest single threat to natural resources and biodiversity is the destruction of habitat, including habitat degradation and habitat fragmentation (Meffe et al., 1997). The destruction of habitat leads to a loss of biodiversity by eliminating the physical environment upon which species depend. Even when some suitable habitat remains, populations may still decline if the habitat is altered. For example, habitat fragmentation, or the breakup of extensive habitats into smaller patches, also leads to a loss of biodiversity, through the creation of smaller populations, altering dispersal mechanisms, and the creation of edge effects. Smaller populations are more prone to extinction, certain species require larger intact habitats to disperse and survive, and edge effects minimize the amount of interior habitat required by some organisms. BREC protects its properties from land use change through conserving its resources for park use only and restricting develop in natural and sensitive areas. However, BREC does not have control over what occurs on adjacent and surrounding properties to BREC parks. When the land use is altered near a park it can have just as severe an effect on the habitat as if it was impacted directly. Changes to hydrology from land clearing and addition of impervious surfaces can flood habitats, resulting in an increased sediment load and affecting the local microclimate. These changes can push out wildlife, invite invasive species and ultimately alter the recreational goals of the park. Protective buffers around sensitive areas and BREC parks will be increasingly more important as Baton Rouge development increases. Looking forward, changes to permitting and development restrictions will be necessary at the city and parish level to assist BREC in this goal.

Figure 44 shows the current land use of EBR including Agriculture, Commercial, Industrial, Institutional, Open Space, Parks, Residential, and Undeveloped Land. The south-central portion of the parish contains most of the developed land in the parish, with the surrounding area containing the majority of undeveloped and agricultural land.

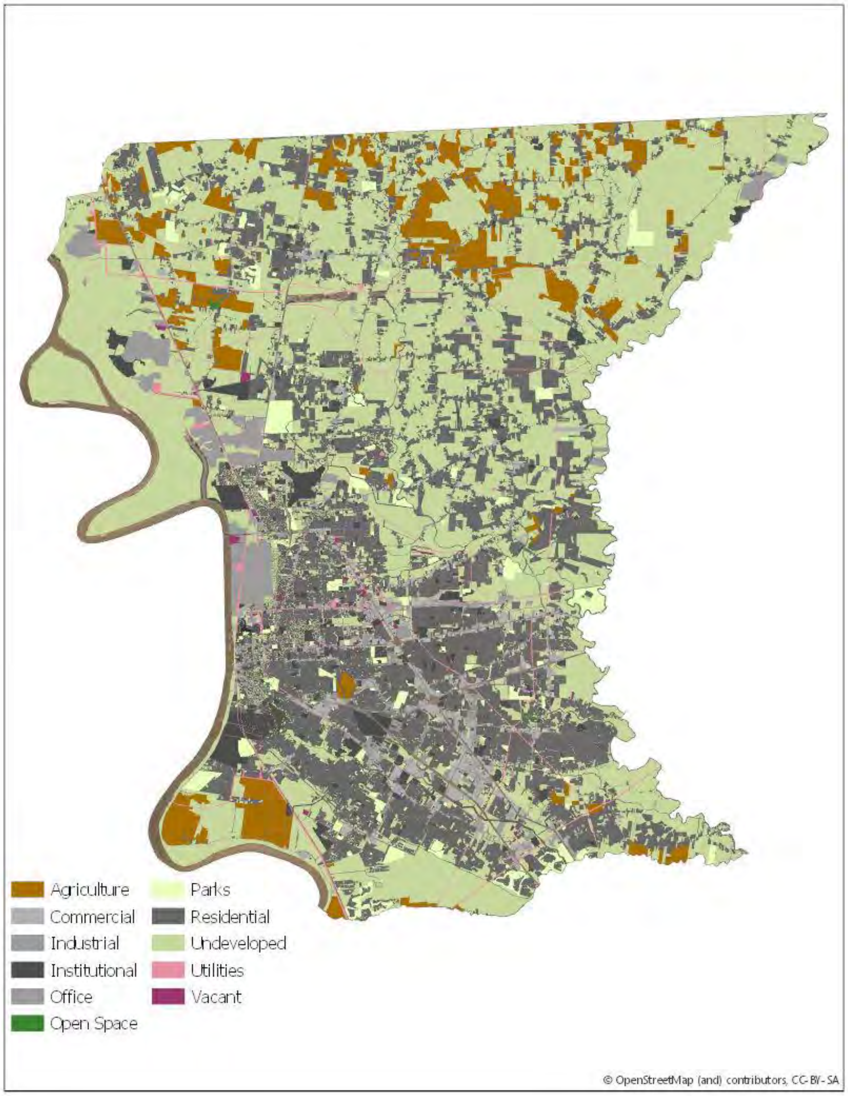


Figure 44. Existing land use distributions of EBR (Source: BREC GIS).

3.11.2 Pollution

Pollution includes a variety of substances and comes in several forms including air, water, soil, and even light and noise. Air pollution includes dust, smoke, and gases, which may come from multiple sources whether it be industrial, agricultural, or domestic activities. While air pollution is largely associated with human health, studies have shown that it can also have large effects on ecosystems as well (Lovett et al., 2009). Notable air pollutants include Sulfur, Nitrogen, Ozone, and Mercury. Sulfur and Nitrogen are primarily released from fossil fuel combustion and can lead to acid precipitation (Driscoll et al., 2001), although Nitrogen can also be released from agricultural activities. Ozone is another pollutant found in the atmosphere, and aside from being harmful to human health, has shown to reduce photosynthesis in plants and cause foliar lesions (United States Environmental Protection Agency [EPA], 2006). Mercury is released primarily through coal combustion and is a known neurotoxin that can accumulate in the highest trophic levels of food chains (Evers et al., 2005).

Figure 45. Trash along the shoreline at City Brooks Community Park (Source: BREC Staff).

In aquatic settings, most pollution comes from nonpoint sources, i.e., pollution caused by the runoff of water from land such as agricultural fields, forestry areas, construction sites, and urban areas. In contrast, point source pollutants enter a waterbody directly from a source, such as a pipe. Point and nonpoint pollutants include sediment caused by soil erosion, eutrophication, or the input of nutrients, and urban runoff such as heavy metals, oil, and oxygen consuming wastes (Laws, 2017).

Pollution in the form of trash (Figure 45) is also a problem, as litter can build up in waterbodies and not only harm wildlife but can be an eyesore for patrons as well. According to 'Keep Louisiana Beautiful,' Louisiana's 'Keep America Beautiful' affiliate, it costs $11.5 billion every year to clean up litter in the US. In addition, an estimated $40 million in Louisiana taxpayer dollars are spent each year on litter removal, abatement, education, and enforcement. To reduce the amount of litter in the state LDWF, which is the leading litter enforcement agency in the state, issues penalties ranging from $150 to $10,000, including the possibility of community service, a one-year driver's license suspension, and up to 30 days in jail.

Some of EBR's major waterways, including the Amite River, Comite River, Bayou Manchac, Bayou Fountain, and Dawson's Creek, border BREC parks and can significantly influence them during high rain events. Not only do the parks flood, but litter carried by these waterbodies are deposited in the parks when the water subsides. Through BREC's Bayous By You Initiative, BREC is attempting to educate citizens about EBR waterways and how to protect them. The initiative's mission is to cultivate a basic understanding of watershed management and flood stages, including causes of pollution, ways to reduce pollution, and how these subjects relate to the landscape, as well as providing volunteer opportunities where participants can take meaningful action. Ways to reduce litter pollution include disposing of litter in the proper location, recycling, securing items to ensure they do not escape, and using biodegradable materials (e.g., biodegradable soaps).

3.11.3 Climate Change

Climate change is the change in global and regional climate patterns and temperature attributed to human activities, particularly the burning of fossil fuels, over the past century. Evidence of climate change can be seen in rising sea levels, the loss of ice at the Earth's poles and in glaciers, and changes in the frequency and severity of extreme weather (Figure 46). The expectation of an increase in flooding and adapting to accommodate additional stormwater and manage the effect of more destructive storms is a near future reality. There is potential for a loss of old-growth trees and the shifts in canopy structure that will follow such changes. Additionally, climate change can alter natural resources through shifts in species distribution, species behaviors, or changes in population sizes (Williams et al., 2008). As the climate changes, species must adapt, move, or face extinction (Berg et al., 2010). When species ranges shift, alterations can also occur throughout the entire community in complex and unforeseen ways (Zarnetske et al., 2012). The redistribution of species can also affect humans, as many species provide goods and services such as pollination, food, and clothing.

Figure 46. August 2016 Flood in EBR Parish (Source: https://www.theadvocate.com/louisiana_flood_2016/article_b6aae68c-6952-11e6-9dd9-dfb229b90b79.html).

3.11.4 Invasive Species

Invasive, non-native species are exotic species that aggressively spread and outcompete native species (Figure 47). Once established, invasive species can degrade the newly invaded environment. Invasive species impact food availability and habitat quality for native species, decrease species diversity, increase habitat fragmentation, and weaken the ecosystem's ability to defend against natural disasters and other sudden catastrophic events (Chapin III et al., 2000; Mack et al., 2000; Pimentel et al., 2000; Simberloff & Rejmánek, 2011). Invasive species not only impact our ecosystems, but they also have far-reaching consequences that impact industrial, agricultural, commercial, and private business sectors (Mehta et al., 2007). Pimental et al. (2000) even calculated that invasive species in the U.S. cause more than $138 billion annually in environmental damages and losses.

As discussed in Section 2, invasive species also alter the capacity of ecosystems to deliver the goods and services they provide and to mitigate anthropogenic and environmental stresses without losing resilience (Simberloff & Rejmánek, 2011). These losses can include, but are not limited to, degradation in number of cattle a field can support due to unpalatability of invasive plants, loss of recreation due to congested waterways, damaged or clogged filtration or cooling lines due to invasive mollusks, increased natural disaster risk after the loss in biodiversity, and an increase in maintenance costs due to damage caused by vines or an increase in mowing frequency due to rapid growth rate of invasive grasses. Currently, all parks in the BREC system contain invasive species in varying levels of distribution and abundance. Their effects can never be fully measured as some have been present for an extended period of time, such as the water hyacinth, while others are just now arriving, such as the Apple Snail. BREC has a relatively aggressive adaptive management approach for the most threatening species to local habitats, but the reality is that these invaders have become a part of our natural systems that moving forward will always be a factor in resource management and habitat health.

Figure 47. Water Hyacinth, an invasive species, covering the lake at Blackwater Conservation Area (Source: BREC Staff).

3.11.5 Vandalism and Misuse of Resources

Vandalism is the deliberate damage to property and poses a large threat to BREC's natural resources. Vandalism includes actions directed towards BREC's signage and amenities but also includes the destruction/alteration of fences and basic furnishings, like trash cans, restrooms and even parking lot and trail surfaces.

Similarly, the misuse of park resources also poses a large threat to BREC's natural resources. Hunting has been observed in BREC parks and can result not only in the illegal taking of wild game, but also poses a threat to park visitors who might be nearby (Figure 48). Illegal all-terrain vehicle (ATV) and

Figure 48. An illegal deer hunting stand at Forest Community Park (Source: BREC Staff).

motorized bike use has also been observed in BREC parks which often results in the destruction or damage of trails and can also be a threat to park visitors who might be using those trails. Additionally, the unauthorized cutting of vegetation to create paths, creation of fire rings and campfires in undesignated locations, after-hours activity, drinking, and the release of domesticated and/or wild animals on BREC property are all examples of resource misuse which can impact local ecosystems and result in a decreased level of enjoyment for others visiting parks and properly using resources. These issues pose a particular problem in BREC parks that are remote and lack staffed presence on a routine basis. To combat vandalism and the misuse of park resources a variety of tactics must be used, including the presence of BREC staff, appropriate signage to deter illegal activity, volunteer and community engagement and assistance from local law enforcement. Additional information about enforcement and the strategies BREC employs can be found in Section 5.

3.11.6 Lack of Resources

One of the major challenges to natural resource management is the availability of resources, including staff, equipment, and funding. To effectively manage natural resources, all of these are required. In developing a natural resource management strategy, the availability of resources must be considered. The use of volunteers is one way to mitigate a lack of resources. BREC's NRM division uses the Green Force, a BREC volunteer group, to assist with a variety of natural resource management strategies including invasive species removal, seed dispersal, and tree plantings. Additional information about BREC's Green Force Volunteer program can be found in Section 5. BREC's NRM division also reaches out to partners and professionals, such as biologists at LDWF and researchers at LSU, who not only provide guidance on natural resource management, but sometimes assist with habitat surveys and volunteer at BREC events and public outreach opportunities.

4 BREC Conservation Areas and Amenities

BREC is dedicated to protecting habitats, conserving resources, reducing species loss, and promoting recreational and education opportunities for residents. In order to achieve these goals, it is important that BREC oversee and manage properties within the parish which contain unique and historically represented habitats which benefit the community. The unique attributes of each park must be considered to determine in which ways it will most benefit the public and achieve conservation goals. Currently BREC is the largest landowner in the parish with over six thousand acres set aside for the residents of East Baton Rouge Parish. It is important that each park has a clear goal and plan for its use to ensure proper development and management over time.

In addition to protecting land and the resources within parkland, BREC also enhances resources to provide access for recreational enjoyment. This requires accessibility, trails, and amenities such as fishing ponds, mountain bike trails, beach access, campgrounds, etc. The below list defines BREC's general park type designations which is then further subdivided and defined for conservation area designations for the purpose of this plan. For additional information about BREC's Park and Facility Classifications and Definitions see BREC's Planning and Engineering Project Development Manual and Standard Operating Procedures. For a better understanding of land acquisition protocols and level of service standards as they pertain to conservation land and amenities, please see Section V. Resource Planning and Management.

4.1 Park Classifications

The following classification definitions are built off BREC's original park types as defined in the 1995 Natural Resource Management Plan with some modifications to account for moving away from the hub and spoke planning strategy for conservation areas. Conservation park types are now defined by level of development allowed and resource preservation policies. Each park type serves a unique purpose in the community and is tied into BREC's Level of Service Standards for the community.

Table 5. BREC Park Classifications

Name	Definition
Community Park	Community Parks serve a broader purpose than Neighborhood Parks and focus on meeting a wide variety of community-based recreation needs. These are large and complex parks that serve a large geographic area. Community Parks are designed to engage patrons for an entire day with several diverse activities and amenities. These parks range in size from a desired 40 acre minimum to well over 100 acres. Ideally, each affords natural features with varied physiographic interests and are used as tools to preserve natural resources as part of the urban environment.

	These parks are designed to serve a population of 80,000 to 200,000 in a 5-mile service radius. **Amenities** Community Parks will have a blend of natural and built environments. It is essential to have good access, adequate parking, buffers from neighboring residential zones, and a variety of recreational opportunities. Amenities can include picnic areas, fishing ponds, general open green space, informal fields and lighted athletic fields, a recreation center, playground(s), an aquatic feature, sport courts, parking, lighting, walkways, and trails for walking/hiking/biking, and other features unique to each park.
Neighborhood Park	Neighborhood Parks are the basic unit of the BREC park system and serve the day-to-day social, recreational, and open space needs of neighborhoods throughout EBR. Focus is on informal (non-programmed) activity, programmed activity, passive recreation, and community cohesion. The size of a neighborhood park can range in size from a tenth of an acre to dozens of acres – but are typically less than 10 acres. Some neighborhood parks are very large and almost serve as quasi special use facilities, conservation areas or community parks while there are other neighborhood parks that remain undeveloped. Most parks in the BREC system are neighborhood parks. They serve approximately a 1-mile radius for a population of 3,500 to 6,000. **Amenities** Neighborhood Parks provide relief from the built environment. They may offer a range of facilities/amenities and passive or active (programmed or unprogrammed) recreation in response to demographic and cultural characteristics of surrounding neighborhoods, with opportunities for interaction with nature. Facilities may include multi-use open/green space with provision for informal field games, multi-use court games, playground areas, picnic areas, natural settings, and/or a recreation center. Un-programmed lawns primarily for passive recreation are common. Examples of some amenities include benches, paths, drinking fountains, playground, restrooms, picnic areas and more.
Special Use Facility	Special Use Facilities are parks or facilities within a park, that are typically devoted to one unique recreational or cultural opportunity. These facilities draw citizens from throughout the

	parish and surrounding region. The acreage varies from a few acres to over 100 acres based on the needs and focus of each park. These facilities are regional in function and require high visibility and ease of access from major streets. **Amenities** Amenities will also vary widely and will be built/enhanced to accommodate the recreational focus of the facility. The recreational focus of the facility may be determined by the site location and existing conditions such as a culturally significant feature or ideal native habitat. Amenities can include nature centers, water parks, equestrian centers, museums, plantations and more.
Conservation Area	Conservation Areas are planned land areas that are protected from human use to conserve biodiversity, ecosystems and their functions and serve to maintain natural resources in the parish. Conservation Areas serve a double purpose of also providing recreational and interpretive opportunities to the public in order to connect people to resources with as little impact as possible. Although some of these parks will be chosen for their unique resources, high ecological value, or interpretive potential, some may be chosen for their location or ecosystem services. The size of these parks will vary depending on the park's purpose but typically these are 50 acres or more and can be upwards of 500+ acres. Larger tracts are more desirable to provide necessary habitat buffers and combat fragmentation. **Amenities** Some of these areas will be enhanced to provide recreational access to resources while balancing conservation goals. The level of human use will be site-specific depending on the sensitivity of its habitats and the overall goals of the park and should focus on interpretation of resources and accommodating activities which promote education and engagement with the resource with as little impact as possible. Amenities may include hiking trails, parking, restrooms, potable water access, benches, outdoor classrooms, pavilions, boat launches and more.
Nature Reserve	Nature Reserves are tracts of land protected from all but light human use to preserve biodiversity, geomorphic features and the ecosystem services which benefit the community such as, stormwater retention, carbon sequestration and more. These can include conservation management research areas which are used to study and practice restoration and survey techniques but

	typically will not be open to the public recreationally as their goal is only to serve the public with its ecosystem services. It can include flood zones designed to hold water and most will provide some level of natural habitat, buffers, or wildlife corridors. The size of these parks will vary depending on location and the main ecosystem services they provide. **Amenities** Protection of resources and preserving land and ecosystem functions is the highest priority of these areas so access and amenities will be limited, and development prohibited. Amenities will only include access for research and management purposes.
Undeveloped	Park Land that has not yet been developed. If natural resources of the land include environmental sensitivity, or contain significant areas of ecological value, land will be evaluated by BREC's Natural Resource team and the Land Planning and Development Decision Making Framework which is used to determine if it should be considered a Conservation Area, Nature Reserve; or whether some or all of the land could be developed for recreational use as a park or other recreation facility. If the land is of no recreational, economic, or special environmental value and meets other criteria for obsolete land, it may be declared obsolete by the Commission and advertised for sale.

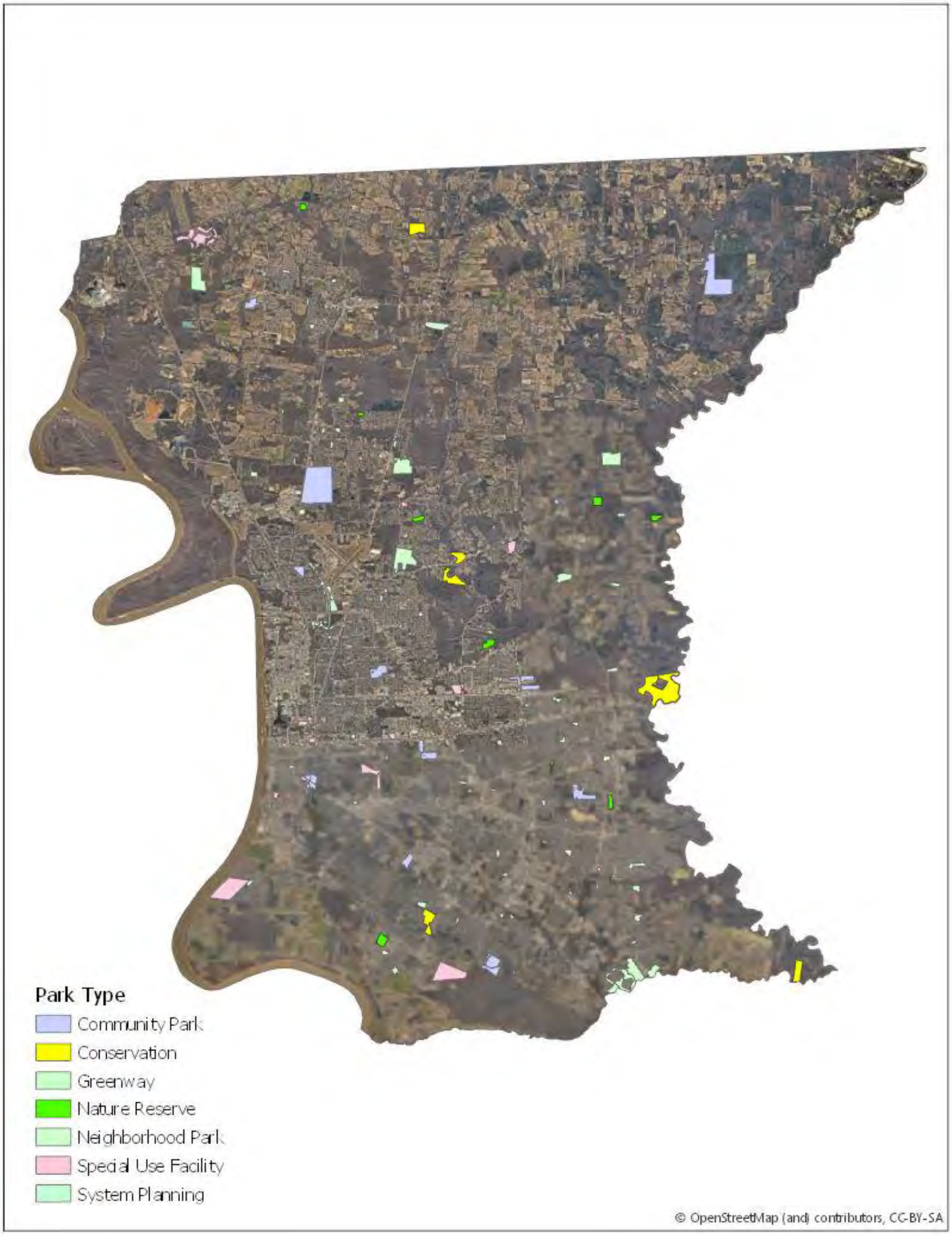


Figure 49. BREC Park Designations (Source: BREC GIS).

4.1.1 Conservation Area Protections

East Baton Rouge Parish is a growing community facing a variety of pressures from increases in development, changing climate and frequent flooding. Parks which serve the community are more important than ever and it is equally as important for BREC to protect these areas from surrounding pressures and potential development. BREC must balance the recreational needs of the community with preserving the ecosystem functions of its natural areas and to do so certain protections and policies must be in place. These protections do not just apply to parks designated as Conservation Areas or Nature Preserves but also apply to areas within Community Parks, Neighborhood Parks, and Special Facilities (Table 5; Figure 49), that have been identified as important to conserve. Such areas hold internal conservation designations. For instance, an amphibian breeding ground located within a Community Park may be designated internally as a Sensitive Habitat Zone to protect it from recreational development and provide a protective buffer from outside uses. Table 6 more clearly defines which protection levels are associated with the different park types and conservation unit designations. These designations ensure BREC staff are aware of these areas and the importance they serve. These classifications will be backed by scientific data and surveying which will be covered in Section 5, Resource Planning and Management.

Table 6. BREC Conservation Area Protections

Conservation Classification	Definition	Protections
	Conservation Park Classifications	
Conservation Area	Areas and/or tracts of land that are protected from human use to conserve the biodiversity and functioning ecosystem services within the park and serve to maintain natural places in the parish. In conjunction with conserving resources, these parks will also be used for nature appreciation activities and education to increase the public's understanding of the natural world and foster their conservation ethics.	The level of human use allowed will be site-specific varying depending on the ecological value of the habitats and will be determined by BREC Natural Resource Management staff after surveys are completed during the Management Plan process. Amenities will vary and should focus on interpretation of the resource and public education and engagement with the least amount of impact possible. Examples of potential amenities includes trails, nature and education centers, bird blinds, tree walks, interpretive signage, restrooms, boards walks, boat docks/launches, etc.
Nature Reserve	Areas and/or tracts of land protected from all but light human use to preserve biodiversity, geomorphic features, and the ecosystem services which benefit the community including stormwater retention, carbon sequestration and more. This can include conservation management research areas which are used to study and practice restoration and survey techniques. It can also include flood zones designed to hold water and provide natural habitat, buffers, or wildlife corridors.	These areas will be restricted from all human disturbance outside of scientific study; environmental monitoring and education based on the discretion of BREC Natural Resource Staff. These areas will not be developed or include modern infrastructure such as restrooms, structures or running water save for modestly developed access points for staff to park.
	Internal Conservation Management Unit Type	
Conservation Management Unit	Areas of land which hold high conservation value but are within or part of an existing Community, Neighborhood or Special Use Park. They will be protected from a certain degree of human use and	The level of human use allowed will be site-specific depending on the ecological value of habitats, interpretive potential of the property and demand within the community for outdoor recreation outlets.

	development to conserve the biodiversity and ecosystems within the park. In conjunction with conserving resources, these areas have the potential to be used for nature appreciation activities, programming, and education to increase the public's understanding of the natural world and foster their conservation ethics.	Area should be assessed via REAP or Biodiversity Survey prior to any development activity and the Resource Decision Making Framework should be used to determine the ecological and economic value of the area the unit type designation. All surveys should be conducted by BREC Natural Resource Management team.
Sensitive Habitat Zone	These are areas with the highest ecological value based on REAP and Biodiversity Surveys and can be part of an existing Community, Neighborhood or Special Use Park or Conservation Area. Areas evaluated to receive this ranking must be located within one of the above conservation area classifications to ensure there is a necessary buffer around the area. For example, if the sensitive area is within a Community Park there should be a conservation management unit designated around it to help preserve the Sensitive Habitat Zone. These areas include rare and threatened habitats or areas that sensitive species or habitats occur and must be protected to ensure its survival (e.g., rookery).	These areas hold the highest level of protection and development of any kind is not allowed within the designated buffer radius of these zones. BREC's NRM team should be consulted when planning in or near these areas to ensure buffers are maintained. Research and monitoring in these areas will be allowed if the impact to the resource is not too great. Monitoring should ensure protection measures are working and management strategies do not need to be modified.

4.2 BREC Conservation Areas

BREC's Natural Resource Management team is still in the early years of its inception and although the process of surveying parks and determining their classification has started, it is far from complete. As more park land is surveyed and the needs of the community change, this list will also change and should be updated annually when this document is reviewed. According to current records, BREC oversees a total of 6,565.33 acres of land within the parish. Of those acres, 2,951.58 acres, are managed and protected for conservation (Table 7). As an example of how the conservation management units are structured, Figure 50 shows the Sensitive Habitat Zones contained with the Conservation Management Units of Forest Community Park. To ensure this land continues to be protected, it is important that it be surveyed and designated. This data will eventually be housed in BREC's Geographic Information System (GIS) Geodatabase which will be accurate and easy to access. More information about how GIS will be utilized in resource planning can be found in Section 5, Resource Planning and Management**.**

Figure 50. Map of Forest Community Park showing its overall park boundary, Conservation Management Unit, and Sensitive Habitat Zones (Source: BREC Staff).

Table 7. BREC Conservation Parks

Conservation Classification Type	Park Name	Acreage	Management Plan	Biodiversity Assessment
Conservation Area	Frenchtown Conservation Area	501.37		
	Blackwater Conservation Area	57.48	X	
	Kendalwood Conservation Area	85.12		
	Bluebonnet Swamp Conservation Area	102.75		
	Comite River Conservation Area	100.4		
Total Conservation Area Acreage		847.12		
Nature Reserve	Cohn Nature Reserve	15.59		
	Burbank Nature Reserve	58.18		
	Quarterhorse Nature Reserve	21.93		X
	Jones Creek Nature Reserve	11.69		X
	South Harrell's Ferry Nature Reserve	29.29		
	Kinchloe Lloyd Baker Nature Reserve	32.6		
	Tristian Nature Reserve	10		
	Jacob Kornmeyer Nature Reserve	40		
	Wray Nature Reserve	47.38		
Total Nature Reserve Acreage		266.66		

Conservation Management Unit	Forest Community Park	64.9		
	Highland Community Park	39.5		
	Hooper Rd. Park	192.9		
	Howell Community Park	8.5		
	Greenwood Community Park	244.9		
	Zachary Community Park	20.1		
	Sandy Creek Community Park	403.1		
	Baywood Park	24.0		X
	Ben Burge Park	14.2		X
	Cedar Ridge Park	5.2		
	Doyle's Bayou Park	93.9		
	Burbank Soccer Complex	92.7		
	Central Sports Park	18.6		
	Flanacher Rd. park	84.2		
	Hartley Vey Sports Park	2.1		
	Lovett Rd. Park	30.7		
	Manchac Park	41.5		
	Mayfair Park	20.3		
	North Sherwood Forest Community Park	34.8		
	Palomino Park	143.7		
	Perkins Rd. Community Park	1.2		

	Plank Rd. Park	44.9		
	T.D. Bickham Park	152.5		
	City-Brooks Community Park	59.4		
Total Conservation Management Unit Acreage		1,837.8		

Table 8. Sensitive Habitat Zones

Sensitive Habitat Zone	Park	Protection Reason
SHZ-FRST-1	Forest Community Park	Rare Species: Small-mouthed and Marbled Salamander Breeding Ground
SHZ-FRST-2	Forest Community Park	Rare Species: Small-mouthed, Marbled and Dwarf Salamander Breeding Ground
SHZ-FRST-3	Forest Community Park	Rare Community: Small Stream Forest
SHZ-PALO-1	Palomino Park	Rare Species: Four-toed Salamander
SHZ-GRNWD-1	Greenwood Community Park	Rare Community: Prairie Terrace Loess Forest
SHZ-GRNWD-2	Greenwood Community Park	Rare Community: Prairie Terrace Loess Forest
SHZ-FRCTWN-1	Frenchtown Conservation Area	Rare Community: Spruce Pine Hardwood Flatwood
SHZ-FRCTWN-2	Frenchtown Conservation Area	Rare Community: Hardwood Slope Forest
SHZ-FRCTWN-3	Frenchtown Conservation Area	Rare Community: Sand Bar (Amite Beach)
SHZ-FRCTWN-4	Frenchtown Conservation Area	Rare Community: Sand Bar (Comite Beach)
SHZ-FRCTWN-5	Frenchtown Conservation Area	Rare Community: Sand Bar (Confluence)

SHZ-KNDLWD-1	Kendalwood Conservation Area	Rare Community: Spruce Pine Hardwood Flatwood Habitat
SHZ-AIRHWY-1	Airline Highway Community Park	Unique Feature: Largest cypress in the parish
SHZ-AIRHWY-2	Airline Highway Community Park	Rare Species: Snow squarestem
SHZ-AIRHWY-3	Airline Highway Community Park	Rare Species: Snow squarestem
SHZ-BAYWD-1	Baywood Park	Rare Community: Small Stream Forest
SHZ-BAYWD-2	Baywood Park	Rare Community: Spruce Pine Hardwood Flatwood
SHZ-BLKWTR-1	Blackwater Conservation Area	Rare Community: Small Stream Forest and Prairie Terrace Loess Forest

4.3 Conservation Resources, Facilities and Amenities

4.3.1 Trails

Connectivity, engagement with natural resources and non-vehicular mobility throughout the parish are important needs of the community that BREC is committed to providing. BREC offers a variety of trails ranging from large multipurpose Greenway paths used for commuting and connectivity, to narrow, natural-surface hiking trails which provide an intimate experience in nature. Since the early 1990's the residents of EBR have identified trails as a necessary resource they want access to in the parish and each year BREC adds additional opportunities. Hiking, nature, and mountain biking trails are under the responsibility of BREC's Natural Resource Management team, whereas BREC's Greenways fall under the Urban Trails planning team and Park Operations for maintenance.

Figure 51. Imashaka primitive hiking trail at Kendalwood Conservation Area (Source: BREC Staff).

4.3.1.1 Trail Types

BREC currently offers five types of trails to the public. Each caters to a different user group and provides access for varying range of activities. These trails include nature trails, primitive trails, park trails, greenways, blueways, and maintenance trails.

4.3.1.1.1 Nature Trails

Figure 52. Nature Trail at Blackwater Conservation Area (Source: Jordan Heffler).

Nature trails are more hiking trails within Conservation Areas and parks which allow a wide variety of users to experience nature one on one. These trails are more developed than primitive hiking trails and are often wider with more even surfaces. Boardwalks and bridges provide ease of access over wet areas or streams. Trails are unpaved with varied sources but often provide interpretive signage contained insights about the parks natural or cultural history. These trails tend to be located within parks with amenities such as bathrooms, drinking fountains and shelter from the elements in case of bad weather. These trails are typically planned by BREC's Planning and Engineering Department and are co-managed by Park Operations and the Natural Resource Management team.

4.3.1.1.2 Primitive Trails

Primitive trails allow hikers and, in some instances, mountain bikers, to experience nature within BREC parks. These trails are dirt or natural surface, often uneven footing, relatively narrow and primitively developed with minimal directional signage. Trails may require small creek or ditch crossings and can be muddy in wet conditions. Bridges are often provided at larger water or wetland crossings. These trails are typically offered at conservation areas but can also be found in Community and Neighborhood Parks with a wide range of amenities like restrooms, pavilions, and water access. Rules will also vary by park as mountain bikes and dogs are prohibited on some trails and some trails will be directional between hikers and bikers. These trails are planned and managed by BREC's Natural Resource Management team and maintenance assisted by Green Force Volunteers.

4.3.1.1.3 Park Trails

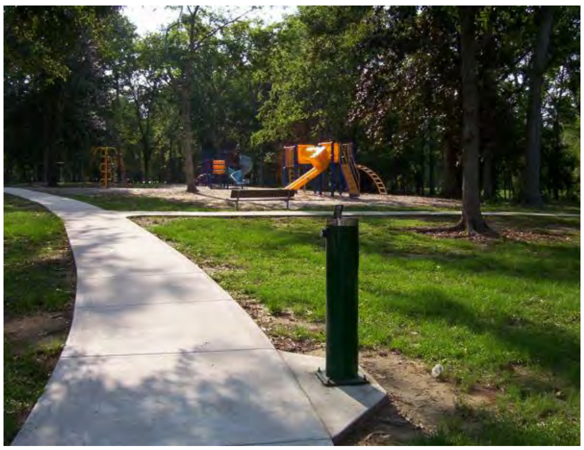


Figure 53. Park Trail at Old Hammond Park (Source: BREC Staff).

A Park Trail is a paved path that is in a park that is not part of the BREC Greenway Trail system. These paths are various widths typically ranging between 4 to 12 ft wide and facilitate various recreational activities that are typical in parks. These paths provide a smooth, accessible route and most feature amenities such as benches, receptacles and drinking fountains while providing connectivity within and throughout a park or parking lot. These trails are most common in Neighborhood and Community Parks, are planned by BREC's Planning and Engineering Department and managed by BREC's Park Operations Department.

4.3.1.1.4 Greenways

A Greenway is a rail or road along a strip of undeveloped land, often near an urban area, set aside for recreational use or environmental protection. They are 10 to 16 ft wide, multi-use (bicycle/pedestrian) trails that have minimal interaction with vehicular roadways and connect people to parks, businesses, workplaces, and essential amenities. Typical amenities include benches, waste receptacles, water fountains, exercise stations, trailheads, and bike repair stations. Greenways

Figure 54. Greenway at Perkins Community Park (Source: BREC Staff).

may or may not be located on BREC property but the Greenway itself is considered public right of way.

4.3.1.1.5 Blueways

Blueways, also known as water trails, are routes on navigable waterways such as rivers, creeks, canals, and coastlines for recreational use. Launches are located at Blueway trailheads located in both urban and natural environments. BREC Blueway launches allow access to waterways for non-motorized paddle craft. Launch sites may or may not be located on BREC property but the Blueway itself is considered public right of way. As public right of ways, Blueways may cross multiple political jurisdictions and rules and regulations for permitted watercrafts and use may vary. Only non-motorized vehicles are to be used at BREC Blueway Launches.

Figure 55. BREC Blueway Launch Trailhead at Highland Community Park leading to the Bayou Fountain Blueway (Source: BREC Staff).

4.3.1.1.6 Emergency Access – Maintenance Trails

Maintenance Trails are internal use only trails which provide access to other trails or amenities and sometimes require access via a utility vehicle. The main purpose of these trails is to provide quick and reliable access to BREC trails and amenities for maintenance and emergency purposes. These trails are typically wide enough for an all-terrain or utility vehicle to access but are typically primitive in nature otherwise as they do not contain directional signage or amenities, like benches.

4.3.1.2 Trail Amenities/Features

BREC trails contain a variety of amenities and features including boardwalks, bog bridges, foot bridges, and benches. Amenity type is determined by the main trail usage, overall park and trail goals and funding sources. In addition to the basic amenities of trails below, there are other potential park amenities which may be accessed by trails such as outdoor classrooms which are discussed in the following sections.

4.3.1.2.1 Bridges and Boardwalks

Boardwalks are used to span areas that hold water for extended periods, such as swamps, and are typically 12 to 36 inches above ground or water surface level. Due to the high installation and maintenance costs associated with boardwalks, they are typically only put in at locations with high visitor use requiring long spans or where other crossings or trail surfaces will not be successful. Because elevation and slope can be controlled with an elevated boardwalk, they are a good choice for trails that must be ADA accessible. Boardwalks must have a handrail if raised more than 48 inches off the ground or if there are two or more stair risers or on ramps with a rise of 6 inches or more used to access the boardwalk. Areas on a boardwalk where handrails are not required must include a toe rail or curb. See up-to-date ADA requirements for most updated requirements. To reduce maintenance costs, boardwalks made of more durable materials such as cement or UV resistant plastic can be used. Due to the involved nature of installation, boardwalks will be designed by BREC's Planning and Engineering staff or a consultant and will be installed by BREC's Capitol Construction Division (CCD) or a contractor.

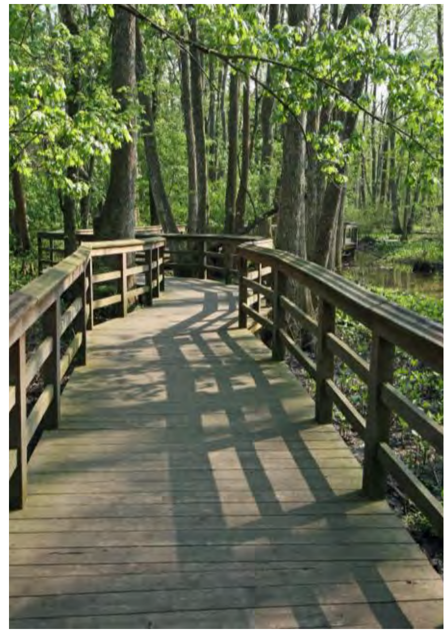


Figure 56. Boardwalk at Bluebonnet Swamp Nature Center. (Source: John Hartgerink)

In contrast, bog bridges are used to span low-lying areas that hold water only temporarily and are designed to hover just above ground surface a few inches. While boardwalks can span extensive distances, bog bridges are typically no more than 20-50 ft in length although some may be longer if needed. Bog bridges are relatively low cost and maintenance and are preferred for remote locations with limited access. Bog bridge width can vary depending on the requirements of use (mountain bike, pedestrian, ATV, ADA, etc.). Bog bridges are easier to install and minimally invasive in wet areas as they do not require setting concrete footers or posts to install. Base boards are sunk into ground surface and then secured with steel rebar. Toerail can be added for ADA style bog bridges. Bog bridges are typically designed and installed by BREC's NRM team.

Figure 57. Bog bridge for hiking pedestrians at Kendalwood Conservation Area (Source: BREC Staff).

Foot bridges are another bridge type provided, and are used to span ravines, creeks, or wetland drainages. They should be added pre-emptively where erosion may occur at crossings or where hikers are finding crossing difficult and adding their own devices to make the crossing. Whenever possible, erosion control measures should be added during bridge installation to prevent future issues. There are several different types of footbridges used in the system depending on the trail use and maintenance access requirements. Some bridges are designed to hinder unauthorized trail use by reducing the width and adding a restrictive handrail. Bridges crossing a span with a fall height of 48 ft or more must have a double-sided handrail and discretion should be used to determine handrail requirements for lower bridges. If no handrail is used and the trail is ADA accessible, a toe rail or curb must be present. Although spans and designs should be checked by Planning and Engineering, most footbridges can be designed and installed by NRM. Larger bridges with difficult spans may require a consultant to design and BREC's CCD crew or a contractor to install.

Figure 58. Examples of different footbridges used throughout the BREC hiking trail system (Sources: BREC Staff and Jordan Heffler).

4.3.1.2.2 Blueway Launch

Blueway launches are the trailheads of the public blueway, or water trail, system. Those designed and managed by BREC include a way to access the waterway via non-motorized boat whether that be a stationary ramp/stair system which accommodates varying water levels or a floating dock which will rise and fall with the waterway. These launches are designed for kayaks and canoes and try to accommodate loading and unloading near the launch site whenever possible. Designs of these features will be a joint effort between NRM, Urban Trails and Planning and Engineering. Signage will include basic informational kiosks, wayfinding and ideally, interpretive signs about the waterway. Although blueway trails are not on BREC property or under BREC management, BREC partners with organizations who assist with keeping the waterways clear for travelers and have close ties with the Green Force Volunteer Program in which hours are given towards these efforts. It is BREC's goal to provide ADA accessible launches in a few strategic locations throughout the parish to provide the opportunity to paddle in a variety of habitats and waterways.

4.3.1.2.3 Tree Canopy Walk

Tree canopy walks are a new amenity to the BREC trail system and is essentially an elevated trail designed to make the hiker feel like they are hiking through the tree canopy. Using elevation and mature forest locations, these walkways are currently proposed at several BREC parks. Due to the engineering requirements and high-risk factor, these amenities will typically be designed by consultants. Tree Canopy Walks are a fun an engaging way to allow visitors to interact with the resource which is unique and not found at many parks across the nation.

Figure 59. Example Tree canopy walk in Gatlinburg, TN used in Frenchtown Conservation Area Master Plan (Source:https://i.pinimg.com/originals/0c/73/7b/0c737b60d8384b827df5edba01e3d0f5.jpg).

4.3.1.2.5 Benches and Photography Blinds

Benches are provided on trails where visitors may desire a rest or near a scenic location. Bench locations can also be used as wildlife viewing locations as many are situated near wetland overlooks or stream crossings. These amenities provide a quiet place to rest that are sometimes even immersed in the habitat. They could also be used as nature journaling, photography, or painting locations. Benches are cemented in place using concrete footers and should not be placed too close to riverbanks where severe flooding or erosion typically occur. Benches can be installed by BREC's Construction or Park Operations crew or by Natural Resource Management.

Photography Blinds, like benches, provide the user the opportunity to be fully immersed in the resource. However, blinds also provide the opportunity to be camouflaged and are typically used less for rest and relaxation and more for wildlife viewing and photography. Previously only temporary bird blinds were used in BREC parks but several more permanent structures are planned for future installation. Designs can vary from a single wall with an opening for viewing to full structures which have 3-4 sides. Designs will depend heavily on the habitat and existing conditions to ensure viewers can see the intended area while still blending in. Photography Blinds would most likely be designed by BREC's Planning and Engineering or a consultant with input from the Natural Resource Management and CORE Divisions. Installation would be by either a contractor, BREC construction team or NRM depending on the scale of construction.

Figure 60. Example Photography Blind from Fort Kearney Recreational Area. (Source: https://i.pinimg.com/564x/a4/37/e8/a437e8cea68313cccf7246a431e52679.jpg)

4.3.1.3 Trail Management Techniques

General maintenance as well as thoughtful planning and design that utilizes the natural landscape is essential to help keep BREC's primitive hiking trails in peak condition and accessible throughout the year. Most general maintenance involves pushbacks when the trail becomes overgrown and clearing trees that have fallen onto the trail after weather events. At other times, more involved and thought-out management techniques, such as those for preventing erosion, are necessary.

4.3.1.3.1 Corridor Maintenance

An important part of trail management includes corridor maintenance, concentrated efforts to widen and clear obstructions along the corridor of primitive hiking trails. This includes tree limbs and overgrown vegetation on the forest floor. These '"push-backs" are carried out quarterly and are particularly important in the summer months, the peak growing season when vegetation is growing most rapidly. During push-backs, trail corridors and trail heads are cleared to a height of 7 ft and a width of at least 3 ft so that pathways and signage are open and visible, per BREC standards. Some parks have wide, gravel pathways along the trail, such as Blackwater Conservation Area and Bluebonnet Swamp Conservation Area. In these instances, the vegetation is cleared to about 2-3 ft from the main gravel path on either side of the trail. In addition to seasonal pushbacks, trails are assessed after any major weather events, such as severe tropical storms or hurricanes, and cleared accordingly. Managing the trail coridors and after major weather events involves several hand and power tools such as loppers, sling blades, hand saws, hatchets, chainsaws, weed eaters, brush cutters, and pole saws. For larger trees that cannot be taken care of by NRM staff or volunteers alone, the BREC tree crew or an outside agency is contacted for assistance.

Figure 61 An overgrown trail that is due for a pushback (left) and a trail that was just recently pushed back (right; Source: BREC Staff).

4.3.1.3.2 Erosion Control and Drainage

BREC trails are at the mercy of high precipitation and frequent flooding events due to EBR's climate and landscape position, which means higher potential for erosion and the need for management strategies that help stabilize trail tread and facilitate efficient drainage. Most erosion prevention begins in the planning and design phase of trail construction with informed decision-making after referencing topographic, soil, and hydrologic maps in tandem with knowledge of existing conditions of a trail. For example, wetlands, natural waterways, and other areas with surface water are avoided when possible and routes with higher elevation that minimize such crossings are always sought out. It is also important to visit a site during or immediately after a heavy rain event so that an understanding of the landscape and potential erosion problems can be accounted for preemptively. Soils that are compact and soils with high mineral content will absorb less water and have higher runoff, whereas soils that are not compact and soils with high organic content will absorb more water and will have a greater chance of becoming muddy and impassable. Steeper slopes will result in higher velocity runoff during rain events, thus higher impact erosion on or along the trail. Whether it be during the planning phase of trail construction or when unforeseen problems arise on an existing trail, BREC uses a handful of trail techniques to help deal with erosion issues and are continually working to implement more techniques that will help further prevent erosion in our parks.

Figure 62. Erosion of a BREC trail following a heavy rain event (Source: BREC Staff).

4.3.1.3.2.1 Native Plantings and Vegetation Buffers

The implementation of native plantings is an effective way to stabilize the soil and minimize erosion. Research shows that areas with vegetation erodes slower than areas with bare soil surfaces since plant roots help to anchor and stabilize the soil in place and contributes to a significant uptake of water that would otherwise runoff and contribute to erosion. When planning a trail, especially trails down slope, it is important that the vegetation of the area be considered. If building a trail near or along a bare soil area is unavoidable, an effort should be made to redirect any runoff that is passing along the bare surface or to vegetate the area using seeds, small trees, or herbaceous ground cover. When a trail is built near a wetland or a sensitive body of water, vegetation buffers are considered. Vegetation buffers are typically placed between a trail and a wetland which allows for runoff traveling off the trail to be filtered before entering the wetland. This also always any sediment that is carried with runoff to be dumped prior to reaching the wetland or waterway, thus preventing the sedimentation of a wetland area or the blockage of natural water flow.

4.3.1.3.2.2 Sediment Barriers, Retaining Walls, and Reverse Grades

Steep slopes and edges of an elevated trail are often susceptible to erosion. Use of temporary sediment barriers and stabilizers such as haybales and silt fences can be used in areas where temporary sediment retention is needed until, perhaps, vegetation can be established to prevent erosion long-term. For more permanent solutions or where vegetation alone will not suffice to prevent erosion, retaining walls are built. Retaining walls are usually made of rock or rip rap and help keep soil in place that would otherwise erode during rain events or high impact use. When a trail is built along a slope, it is important to consider the angle of the cross slope of the trail, which should be between 5 and 10 degrees, with the lowest point allowing for water to gently roll across and away from the trail. If necessary, elevated sections of a trail, known as reverse grades, that utilize the natural terrain of the trail, can be effective in redirecting excess runoff and preventing erosion.

Figure 63. Retaining wall built along trail at Frenchtown Conservation Area to help stabilize trail and prevent erosion (left) and a retaining wall built with rock for stabilizing trail and stream channel along the Poplar Pine Loop trail at Forest Community Park (right; Source: BREC Staff).

4.3.1.3.2.3 Reinforced Pathways

The use of reinforced pathways, also known as hardeners, is another important technique that can be used to help prevent erosion. This type of erosion control is especially important where a trail crosses a wet area where a construction crossing would block water flow such as a small natural stream channel. Areas with high organic content or high use can also be considered for a reinforced pathway. Concrete steps and steppingstones are great examples of a reinforced pathway, which help protect the soil while also keeping hikers out of the mud. Reinforced pathways also help prevent erosion in areas with channel crossing where a waterway would otherwise continue to widen, deepen, or become filled with sedimentation (Figure 64).

Figure 64. Reinforced pathway made of steps where trail crosses a small stream channel at BREC's Frenchtown Conservation Area. (Source: BREC staff)

4.3.1.3.2.4 Culverts, Waterbars, and Turnpikes

Cross water techniques that help direct water under or across a trail such as culverts and waterbars are important for drainage and helps prevents erosion on the trail. A culvert is simply a pipe that is laid beneath the tread of the trail and allows for water to flow or drain underneath the trail rather than on top the trail. Culverts are commonly made of plastic but can be made of other materials, including cement or metal. A waterbar is a structure stone or earthen structure built into and across a trail that acts like a wall or barrier, diverting water running down the trail to a more suitable location across and off the lower edge of the trail where it can recharge groundwater or be absorbed by vegetation (Figure 65). Waterbars are especially important along steep

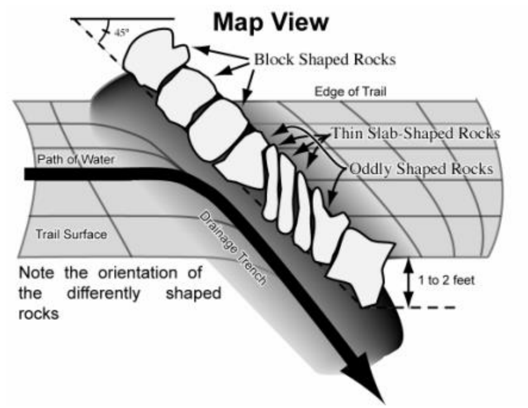


Figure 65. Reinforced waterbar along nature trail at Bluebonnet Swamp Conservation Area (left) and diagram depicting how a waterbar works to redirect runoff (right). (Source: BREC staff and https://www.iceagetrail.org/wp-content/uploads/Trail-Plumbing-Booklet.pdf)

slopes where water is running off with higher velocity. This drainage system can be prone to clogging so must be checked regularly. If multiple waterbars are installed, distance between waterbars is dependent on the slope of the trail.

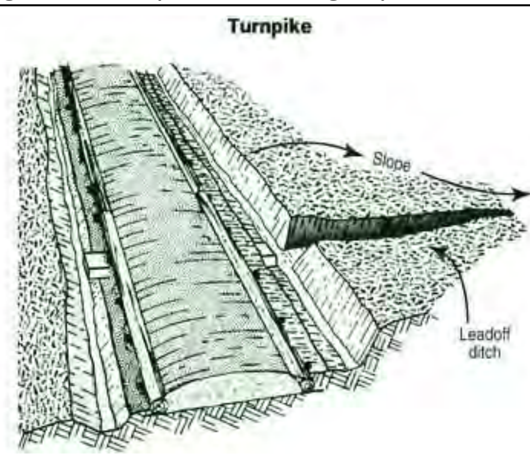


Figure 66. Turnpike illustration (Source: https://www.fs.fed.us/t-d/pubs/htmlpubs/htm00232839/page08i.htm)

Turnpikes are another popular strategy used for drainage and erosion control, particularly in flat and low-lying areas where it helps remove water from saturated soils and areas prone to erosion. Turnpikes are created by digging trenches along one side or both sides of the trail and using the dug material to build up the trail. The lead-off ditch is dug along the lower slope of the trench, which diverts the excess water. If the soil material dug from the trenches contains lots of organic matter and is not suitable for building up the trail, other native material can be brought in. Log or rocks can also be used to reinforce the tread of the trail if necessary.

4.3.2 Fishing Ponds

BREC provides over 296 acres of fishing access over 16 fishing ponds across EBR (Figure 67). University Lake at Milford Wampold Memorial Park contains the largest ponds, at 195 acres while Doyle's Bayou Park has the smallest at 0.5 acres. Most ponds range in size between 1 to 3 acres although the Greenwood Community Park pond is 18 acres and City Park Lake is 50 acres. Fishing ponds contain a variety of species including bluegill, redear sunfish, and various shiners and minnows, and are routinely stocked with native species such as channel catfish and largemouth Bass specifically for recreational fishing. Fish are not only stocked for BREC's 'Fishing Rodeos' but by the LDWF as well. For example, in 2020 Over 1,000 lbs. of adult channel catfish were stocked in BREC ponds prior to the October Geaux Fish Rodeo, and over 250 individual largemouth bass fingerlings and over 2,000 channel catfish fingerlings were stocked by LDWF throughout the year. Rainbow trout are also stocked but only in the winter since they require cold water to survive. In 2020 BREC stocked over 1,400 lbs. of rainbow trout in its ponds. In some cases, triploid carp, carp that are unable to reproduce and thus do not pose a threat to native species, are also stocked in an attempt to control vegetation. In 2019, over 500 individual triploid carp were stocked in City Park Lake to control aquatic vegetation. Most of BREC's smaller ponds maintain a small population of triploid carp to manage vegetation and are restocked periodically with the help of LDWF as the fish mature or are fished out accidentally by the public.

Figure 67. BREC fishing ponds in EBR (Source: BREC GIS)

BREC NRM staff routinely treat invasive plant species such as alligator weed, which can form mats up to 3-4 ft from the shoreline, and water hyacinth, which can quickly cover an entire pond, with herbicides to improve fishing access. BREC also employs artificial structures, such as that at Perkins Community Park (Figure 68) to improve habitat complexity, which is beneficial for developing a productive fishery. Depth is also considered when constructing and managing BREC's fishing ponds, as variable depths provide habitat for different species.

Fishing is allowed not only along the banks of most fishing ponds, but on fishing piers that are provided at several parks as well. Motorized boats are not allowed in BREC's fishing ponds, although non-motorized boats, such as canoes and kayaks, are allowed. BREC patrons must follow all state fishing rules and regulations as determined by LDWF.

Figure 68. Artificial Reef installed at Perkins Community Park to improve fish habitat. (Source: BREC staff)

Table 9. List of BREC fishing ponds and their corresponding sizes.

Park	Pond Size (acres)	Fishing Piers
Blackwater Conservation Area	8.5	Yes
Burbank Soccer Complex	4	Yes
Central Community Sports Park	2.1	Yes
City-Brooks Community Park	50	Yes
Doyle's Bayou Park	0.5	No
Flanacher Road Park	1	Yes
Forest Community Park	1.5	Yes
Greenwood Community Park	18.1	Yes
Hooper Road Park	2.5	No
Howell Community Park	3.26	Yes
Milford Wampold Memorial Park	195	Yes
N. Sherwood Forest Community Park	2.7	No
Oak Villa Sports Park	2.8	No
Palomino Drive Park	1.2	No
Perkins Community Park	1.3	Yes
Zachary Community Park	2.5	Yes

4.3.2.2 Fishing Piers and Monofilament Recycling Stations

Figure 69. Fishing pier at Blackwater Conservation Area (Source: BREC staff).

Amenities that are provided at BREC's fishing ponds include fishing piers and monofilament recycling stations. Fishing piers, such as those constructed at Blackwater Conservation Area (Figure 69) allow visitors easier access to the interior of the pond as well as the shoreline where vegetation may be present. Fishing piers are built in a variety of sizes. Some are long and narrow, such as those at Blackwater Conservation Area, while others are more rectangle in shape.

Figure 70. Monofilament recycling station at Doyles Bayou Park (Source: BREC staff).

BREC also provides Monofilament Recycling Stations where fishing monofilament line can be placed once it is used or if it is found along the shoreline as trash (Figure 70). Monofilament fishing line poses a significant threat to many organisms, in particular birds, where it can become entangled around their body and in some cases even cause death. BREC will collect this monofilament line where it can be shipped and recycled at another location.

4.3.3 Overlooks and Decks

Overlooks and decks are common amenities throughout the BREC park system and are positioned at strategic locations to provide unique and memorable opportunities. Overlooks are typically well-marked, provide signage, and may contain additional amenities as well such as benches or tables. Examples include the Amite River overlook at Frenchtown Conservation Area (Figure 71) and the Bayou Manchac overlook at

Figure 71. Amite River Scenic Overlook at Frenchtown Conservation Area. (BREC Staff)

Kendalwood Conservation Area. Decks are typically constructed out of wood and built large enough to provide access for groups. Examples include the observation deck at Frenchtown Conservation Area (Figure 72) and the overlook deck at the Bluebonnet Swamp Conservation Area.

Overlooks and decks can be used for a variety of reasons, including wildlife viewing, resting, and even enjoying a picnic. The deck at Frenchtown Conservation Area is a great spot to rest and enjoy a picnic after a long hike, while the overlook deck at Bluebonnet Swamp Conservation Area is a great spot to observe wildlife in the swamp. Overlooks and decks are planned at several BREC parks, including one at Blackwater Conservation Area where it will be placed along the Comite River. This overlook deck will provide a great spot to view the Comite River, one of the major waterways in East Baton Rouge Parish, as well as a potential meeting spot for groups such as BREC summer camps, school groups, or non-profit organizations.

Figure 72. Deck at Frenchtown Conservation Area (Source: BREC staff).

4.3.4 Campgrounds

Currently BREC has one RV campground located at Farr Park Equestrian Center. However, there are plans to offer a variety of camping options in more natural settings such as Frenchtown Conservation Area. Staff presence and site management has been the limiting factor when determining where and when to install campgrounds in BREC parks. Very few locations are fully staffed and would have the ability to oversee and manage paid campsites to ensure rules are enforced, the sites are maintained, and that money is paid appropriately. However, public surveys have indicated the public desires these amenities and so plans to incorporate them into conservation area master plans are underway with Frenchtown being the first. There are two proposed campsite types, described below.

4.3.4.1 Primitive Campsites

Primitive campsites would only be accessible by foot and would have minimal amenities and higher restrictions to use. A permit would be required to use these sites and to reduce impact to the area, most likely an elevated camping pad would be provided for tent locations. Primitive campsites would be located remotely within natural areas to be difficult to access via vehicle or from adjacent properties. Fires would most likely be prohibited in these sites to reduce denuding the landscape and to prevent fire rings from requiring maintenance.

4.3.4.2 Accessible and Group Campsites

Accessible campsites would be located near a road allowing the site to be accessed by a vehicle, commonly known as car camping. Due to the more convenient nature of accessible sites, they would need to be monitored at a higher level than primitive sites and would require more maintenance. Elevated camping pads and fire rings would be provided to minimize impact to the surrounding area and a permit or pass would be required to use the sites. At least some of the car accessible sites should also be ADA accessible. Water access may or may not be provided at accessible campsites.

Group campsites would be designed with the thought that they could be rented by groups like scouts, church groups, schools, etc. Individual tent pads would be designed around a centralized community gathering point and a fire ring. Group sites could potentially include other features like covered pavilions and outdoor classrooms.

Figure 73. Example of primitive (left) and accessible (right) campsites with elevated tent pads (Source: https://live.staticflickr.com/4621/25174115587_63f71d6076_b.jpg; https://media-cdn.tripadvisor.com/media/photo-s/04/b0/17/b5/lake-o-hara.jpg).

4.3.5 Adventure Trails

Adventure trails are interactive hiking trails which offer a wide variety of activities for youth to engage with the resource and step outside of their comfort zone. These hiking trails will typically include interactive elements like ziplines, rope courses, climbing walls, elevated log crossings, etc. They can be designed to require staff assistance or to be completed without staff supervision. Ideally, they would be open to the public to interact without staff supervision considering limited or nonexistent staffing at BREC parks and conservation areas. A certain aspect of controlled risk is anticipated with such features and warnings would be provided. These trails are common in other countries and have similar elements to nature playgrounds but are designed in a linear format typically with a start and finish.

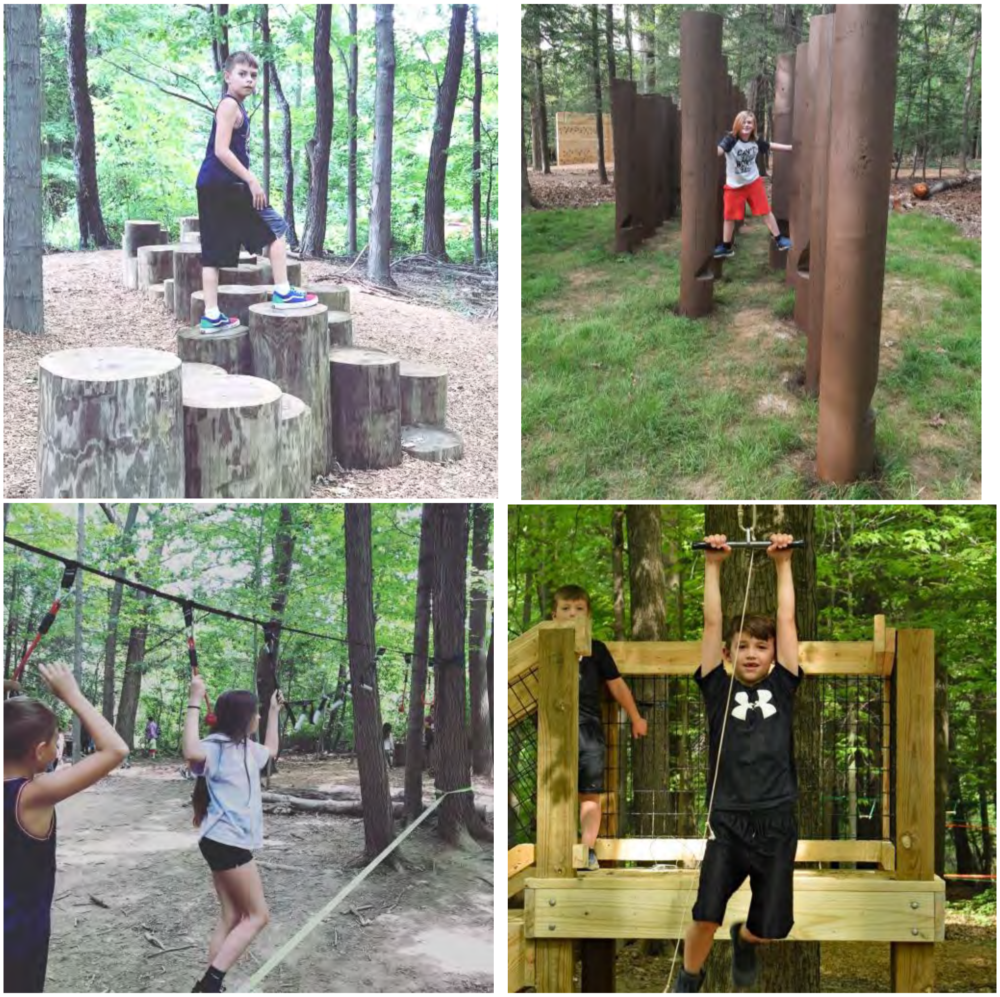


Figure 74. Example adventure trail elements from Jordan Creek Park, FL (Source: facebook.com/jordancreekpark).

4.3.6 Outdoor Pavilions

Outdoor pavilions are covered shelters of various sizes and purposes located in BREC parks. On a most basic level, an outdoor pavilion can simply include a roof for park visitors to get out of the elements with a bench or a picnic table. However, some outdoor pavilions may be built for more specialized purposes such as outdoor education classes which would be designed to hold 20-50 people and include elements allowing for better teaching such as storage of materials, hearth or campfire area, dry erase, or chalk boards, etc. These pavilions should have few immovable structures for maximum "per-activity" layout flexibility and could include a water source, a prep counter, and a large sink basin. These larger pavilions meant for activity longer in duration must be constructed near restrooms. Smaller pavilions with minimal features, like Swamp pavilion, may be placed more remotely. Pavilions can be used as revenue generating amenities which are not only used internally for programs and camps but also rented out for weddings, birthday parties, field trips, etc.

Figure 75. Example Outdoor Pavilion styles including a standard design (left) and a design geared towards group outdoor education (right). (Source: https://www.ncarb.org/sites/default/files/Blog/2021%20Blog/Linden_Waldorf_Pavilions_2.jpg ; BREC staff)

4.3.7 Outdoor Classrooms

Outdoor Classrooms are features placed at key locations typically along hiking trails, to facilitate meaningful group discussion or ceremony, or pop-up interpretation. Outdoor Classrooms can be utilized as first-come, first-serve spaces or be used for revenue generation and require reservation. Outdoor classrooms, as defined in the BREC system, are typically uncovered, open areas which provide seating for groups and a stage or podium for speakers and group leaders. These classrooms can include locked storage for programming staff and/or a chalkboard or white board. Size can vary but typically will accommodate groups ranging from 10 to 30 individuals.

Figure 76. Example Outdoor Classroom (Source: https://www.roxburylatin.org/wp-content/uploads/2019/07/zoom_news960891_987375-1024x683.jpg).

4.3.8 Conservation Education Centers

Conservation Education Centers (CECs) include the various indoor facilities used for the sole purpose of conservation education. This includes the facilities associated with BREC's Nature Centers such as Exhibit and Education buildings and BREC's Nature Stations and Field Offices where conservation camps or programs are held. CECs are designed to service a large population throughout the parish but are limited in where they can be located as they typically must be accompanied by natural resources that can accommodate outdoor programming (e.g., hiking trails, ponds and high quality or unique habitats). The resources and staff required to manage each of these stations also dictates the service model as Nature Centers requires day-to-day staff presence, a facility manager, multiple programming staff and seasonal staff for camps and events. The current delivery service model for CECs includes a hub and spoke design in which residents are anticipated to travel to the one premiere Nature Center centrally located within the parish and then auxiliary Nature Stations are provided around the parish at different habitat types. However, Nature Stations not having the same resources and staff as Nature Centers typically will not offer the same service level resulting in a different user experience.

4.3.8.1 Nature Center

Nature centers are meant to be destination locations which include natural, artifact-based, photographic, or other interactive displays and interpretive exhibits coupled with live animal enclosures/tanks meant to connect people to the site's cultural and natural history. Nature centers are open to the public year-round for general visitation for posted, regular hours. Nature centers are to be staffed sufficiently for year-round programming and large event formats with ample office and storage spaces. Nature centers should also possess walking paths that facilitate observation of key site interpretive elements and can also feature outdoor classroom areas and pavilions of various sizes for various purposes to facilitate group activities, gatherings, and rental opportunities. Although typically nature centers will be located in Conservation Areas, they can be located in other park types which have a focus on natural resources and conservation and provide ample habitat and opportunities to interact with the resource such as hiking trails, outdoor classrooms, blueway launches, etc.

Figure 77. BREC's Bluebonnet Swamp Nature Center and exhibits (Source: BREC Staff).

4.3.8.2 Nature Station

Unlike a nature center, nature stations are not open to the public year-round and are open only at limited posted times (i.e., seasonally, or only for certain times on certain days, for certain programs at posted times, etc.). Operations can be like nature centers as to educate and interpret but are smaller in scope and can be completed with minimal staff. Nature stations can also serve to temporarily house a research team, having minimal but adequate overnight accommodations. Nature stations may or may not house year-round staff (only if adequate office and storage space is provided). These facilities may house a few live animals, but generally, the exhibition is non-biotic and meant to enhance interpretive programs as props/tangibles. Nature stations should feature a large group meeting space to facilitate seasonal or temporary activity, and potential small break-out areas or classrooms to accommodate field trips or group break-out sessions. Nature stations will have a variety of areas that are revenue generating and rented out for weddings, conferences, field trips, birthday parties, etc. Nature stations will typically be located in conservation areas but can be located in other park types which include the necessary natural resources for outdoor education opportunities or at a minimum, high quality or unique habitats.

Figure 78. Rendering of Frenchtown Education Building which is an example of a nature station currently in construction at Frenchtown Conservation Area (Source: Fusion Architects).

4.3.8.3 Conservation Field Office

Field offices include smaller facilities that are used as a hub for conservation programming, and which may include program staff office space. Field offices can be in a variety of areas within the BREC system that makes sense to offer conservation programming and therefore must have adequate space and resources.

4.4 Conservation Signage

Signage is an important part of park design and has a wide range of uses including keeping visitors safe, heading in the right direction, and interpreting the resource. In 2019 BREC developed signage standards which help to ensure signage is consistent and parks are appropriately branded. When entering conservation areas, visitors should get a sense of the park they are in from identification signage and then directional and regulatory signage should prepare them for their visit, providing a sense of what to expect and how to use the resource safely. Interpretive signage assists with providing a more engaging experience for users looking to learn more about a particular subject and hopefully instills a sense of ownership and empathy towards the resource described. The signs discussed in this section are for exterior outdoor use only. For information about interior signs or for more detailed information about signage used in BREC parks, including design standards please see BREC's Signage Standard Manual.

4.4.1 Identification Signage

Identification signs are designed to notify park users where they are, label what park they are in, what type of park it is and potentially even where they are within that park (e.g., a certain facility or amenity within the park). Conservation Areas and Nature Reserves follow the conservation style signs located in the signage manual. Identification signs are going to include any signs that label a park, facility, or amenity such as Park Entrance Signs (CONS.ID.1-2) placed at park entrances and parking lots along major roadways and Destination Identification Signs (CONS.DEST.ID.1-3) which would be placed in front of a building, pavilion, or garden to indicate the name of a destination within a park.

Figure 79. Identification sign examples including an Entrance Sign at Kendalwood Conservation Area (left; CONS.ID.1) and destination Identification Sign at the Manchac Wetland Planting Area (right; CONS.DEST.ID.3; Source: BREC Staff).

4.4.2. Information Signage

Information signs are intended to provide information to the park user that allows them to properly use the park. This can include trailhead kiosks (CONS.KIOSK.1-3A) which have maps, rules, and regulations and some which provide a space to advertise upcoming events and programs or trail maintenance and closure information. Additionally, information signs can include safety information that park users should know to stay safe and properly use the park such as high-water or slippery when wet signs (CONS.PAN.1-2A).

Figure 80. Information Sign examples. Large Kiosk at Frenchtown Conservation Area (left; CONS.KIOSK.1) and Small modified kiosk at Manchac Park (right, CONS.KIOSK.2A; Source: BREC Staff).

4.4.3 Directional Signage

Directional signs are those which inform patrons where to go and what direction takes them to a desired location. This can range from directional pillar signs and trail markers on trails (CONS.TRAILDIR.1-3A), to signs along park or public roads that direct travelers how to get to the park (CONS.VEHDIR.1 -4; GEN.BIKEDIR.1-2). Directional signage is short, to the point and typically includes colors and graphic arrows pointing to the direction of travel.


Figure 81. Directional Sign examples: Large Trail Pillar sign at Frenchtown Conservation Area (left; CONS.TRAILDIR.1) and Pedestrian Directional sign at Bluebonnet Swamp Nature Center (right; CONS.PEDDIR.2; Source: BREC Staff)

4.4.4 Enforcement/Regulatory Signage

Enforcement and Regulatory signage are designed to inform users of BREC rules and policies so that they can have a safe park experience where they use amenities and resources properly. In effect, these signs protect not only the park user, but also the resources within the park. Enforcement and Regulatory signage can also assist with providing liability coverage to BREC as an organization ensuring that patrons are properly informed.

Figure 82. Enforcement/Regulatory Sign examples. No Hunting Signs (left; CONS.HUNT.1), Surveillance and No Dogs Allowed Signs at Frenchtown Conservation Area (right; CONS.REG.1; Source: BREC Staff)

4.4.5 Interpretive Signage

Interpretive Signage are designed to facilitate a deeper understanding of the resource and ultimately connect with the resource. Employing infographics, pictures and sometimes interactive components, these signs provide information about the cultural and natural history

Figure 83. Interpretive Sign example at Forest Community Park (CONS.INTERP.1; Source: BREC Staff).

of the park to foster a relationship between park users and the resource and nurture a conservation ethic. Interpretive signs can come in a variety of shapes and sizes and the design can be modified as needed to accommodate the interpretive theme and educational goals of the sign. Table 10 displays the standard angular panel signs that are most often used along trails.

Table 10. Conservation Signage descriptions

Conservation Signage				
Sign Category	**Sign Type**	**Sign Manual Code**	**Location Description**	**Installation Type**
Identification Signage				
	Entrance Signs	CONS.ID.1	Conservation Area and Nature Reserve Entrances	CCD or Contractor
		CONS.ID.2	Conservation Area and Nature Reserve Entrances	CCD or Contractor
	Destination Identification Signs	CONS.DEST.ID.1	Facilities or amenities at parks with conservation theme	CCD or NRM
		CONS.DEST.ID.2	Facilities or amenities at parks with conservation theme	CCD or NRM
		CONS.DEST.ID.3	Grow zones, small amenities with conservation theme	CCD or NRM
	Trail Identification Signs	BLUE.TRAIL.ID.1	Blueway Trailheads	CCD or NRM
Information Signage	Trailhead Kiosks	CONS.KIOSK.1	Major Hiking or Mtn Biking Trailheads in parks with conservation theme	CCD or Contractor
		CONS.KIOSK.2	Trail junctions or trailhead of smaller trail system in parks with conservation theme	CCD or NRM
		CONS.KIOSK.2A (2-sided “v”)	Trail junctions, trailhead of smaller trail systems or amenity centers in parks with conservation theme	CCD or NRM
		CONS.KIOSK.3 (2-sided “v”)	Large Interpretive Centers near amenities or at trail junctions in parks with conservation theme	CCD or Contractor
		CONS.KIOSK.3A (3-sided triangle)	Large Interpretive Centers near amenities or at trail junctions in	CCD or Contractor

			parks with conservation theme	
	Informational Panel Signs	CONS.PAN.1 (Medium panel 16x20)	Parking lots, trailheads, amenities, and other misc. locations that need further information at park with conservation theme	CCD or NRM
		CONS.PAN.1A (Sm panel 12x18)	Parking lots, trailheads, amenities, and other misc. locations that need further information at park with conservation theme	CCD or NRM
		CONS.PAN.2 (Lg Pillar/Bridge Sign)	Large Trailhead posts or bridges on hiking or mtn biking trails	NRM
		CONS.PAN.2A (Sm Pillar/Bridge Sign)	Small trail posts or bridges on hiking or mtn biking trails	NRM
	Pavilion Rental Sign	GEN.PAVILION.1	Rental pavilions or outdoor classroom spaces	CCD or Contractor
Directional Signage	Trail Directional Signs	CONS.TRAILDIR.1 (Large pillar)	Trailheads or trail start of major trails in parks with conservation theme	CCD or NRM
		CONS.TRAILDIR.2 (Small pillar)	Hiking and nature trail junctions, decision points, overlooks or strategically along trail	NRM
		CONS.TRAILDIR.2A (Fiber glass pillar)	Mountain biking trail junctions, decision points, overlooks or strategically along trail in conservation themed parks	NRM
		CONS.TRAILDIR.3 (metal markers)	Hiking and mtn bike trails within parks with a conservation theme	NRM
		CONS.TRAILDIR.3A (plastic markers)	Hiking and mtn bike trails within parks with a conservation theme	NRM
	Vehicular Directional Signs	CONS.VEHDIR.1 (73x84”)	Conservation Areas or conservation themed parks along park roads	CCD, NRM or Contractor
		CONS.VEHDIR.2	Conservation Areas or conservation themed parks along roads	CCD, NRM or Contractor
		GEN.VEHDIR.3 (24x110”)	Public roads 25 mph or less	CCD, Contractor or City
		GEN.VEHDIR.4 (39.25x148”)	Public roads with speeds above 25mph	CCD, Contractor or City

	Pedestrian Directional Signs	CONS.PEDDIR.1 (10x74")	Conservation Areas or parks with a conservation theme at major trail junctions, amenities, sidewalks, or pathways	CCD, NRM or Contractor
		CONS.PEDDIR.2 (30x56")	Conservation Areas or parks with a conservation theme at major trail junctions, amenities, sidewalks, or pathways	CCD, NRM or Contractor
		CONS.PEDDIR.3 (20x23")	Conservation Areas or parks with a conservation theme at amenities, sidewalks, or pathways	CCD, NRM or Contractor
	Bicycle Directional Signs	GEN.BIKEDIR.1	Conservation Areas or parks with a conservation theme along roadways/bike paths.	CCD or Contractor
		GEN.BIKEDIR.2	Conservation Areas or parks with a conservation theme along roadways/bike paths.	CCD or Contractor
Enforcement/ Regulatory Signage	No Hunting Signs	CONS.HUNT.1	Conservation Areas or other park type boundaries where hunting is a concern. Typically mounted on trees.	NRM or Park Operations
	Regulatory Signs	CONS.REG.1 (12x18")	Conservation Areas or other park types where needed	NRM, CCD or Park Operations
		CONS.REG.1A (16x24")	Conservation Areas or other park types where needed	NRM, CCD or Park Operations
		CONS.REG.2 (20x30")	Conservation Areas or other park types where needed	NRM, CCD or Park Operations
Interpretive Signage	Interpretive Signs	CONS.INTERP.1	Conservation Areas or other park types where needed	CCD, NRM or Eagle Scout
		CONS.INTERP.1A (wide version)	Conservation Areas or other park types where needed	CCD, NRM or Eagle Scout
		CONS.INTERP.1B (hand rail version)	Conservation Areas or other park types where needed and where there is a boardwalk or bridge with a handrail	CCD or NRM

5 Resource Planning and Management

5.1 System-Wide Planning

BREC's Natural Resource Management Division is in BREC's Planning and Engineering Department for good reason. Sustainable, innovative management of resources starts with sustainable and innovative planning and design practices. As an agency, BREC is the largest landowner in the parish. It is important that BREC not only properly manage what is currently in the BREC system, but also that we plan to prepare East Baton Rouge Parish for a more resilient future. This can include acquiring new property, designing more resilient landscapes, creating new ways of assessing our resources and very importantly, spending taxpayer dollars wisely. The following section outlines BREC's planning strategies as they relate to natural resources and sustainability.

5.1.1 Level of Service Standards

Level of Service (LOS) standards are guidelines that define what parks, amenities and facilities BREC provides to the public based on needs assessments and are determined by desired outcomes based on population, resource availability, equity, sustainability and more. The 1995 Natural Resource Management Plan contained its own LOS standards for Conservation Areas and was based on a three-part formula which considered the parish population size and the amount of urbanized land in the parish. This formula was tentative and based on the accepted understanding that there was an equation to determine how much land to provide based on per capita population alone. The level of service standards for natural resources has since been updated to better reflect the resources within the parish, current management strategies and community needs.

In response to BREC's 2014 *Imagine Your Parks* 10-year strategic plan, BREC initiated the development process for system-wide LOS standards to monitor the progress of the report's strategic plans. A Needs Assessment was conducted as a baseline to provide an overview of the community's needs and desires around the parish. The Assessment Report, reported a high priority for many natural focused amenities such as fishing areas and natural areas/conservation area, both of which ranked as high priorities that residents felt BREC should invest in. Walking and biking trails ranked the highest in terms of priority and when asked what type of trails were desired, 38% of respondents indicated they were looking for nature trails, which are defined as moderately developed, soft surface paths for walking/hiking with educational signage (Figure 84). Additionally, 13% indicated they wanted more primitive hiking trails and 6% wanted more mountain biking trails. Furthermore, it was found that household needs for outdoor adventure, adult continuing education and nature programs/environmental education were the most desired, yet unmet program categories.

Overall, the public needs assessment clearly indicated the public's interest in having natural resources in the parish and recreational opportunities based in nature. Since it is BREC's mission to provide these resources and opportunities to the public and use their money equitably throughout the parish, these needs, along with desired future conditions based on scientific research and management goals are what we have used to determine our level of service standards for BREC's conservation related items. The following standards shall serve as a guide and should be used in conjunction with situational judgement and appropriate responses to shifting habitat conditions and threats.

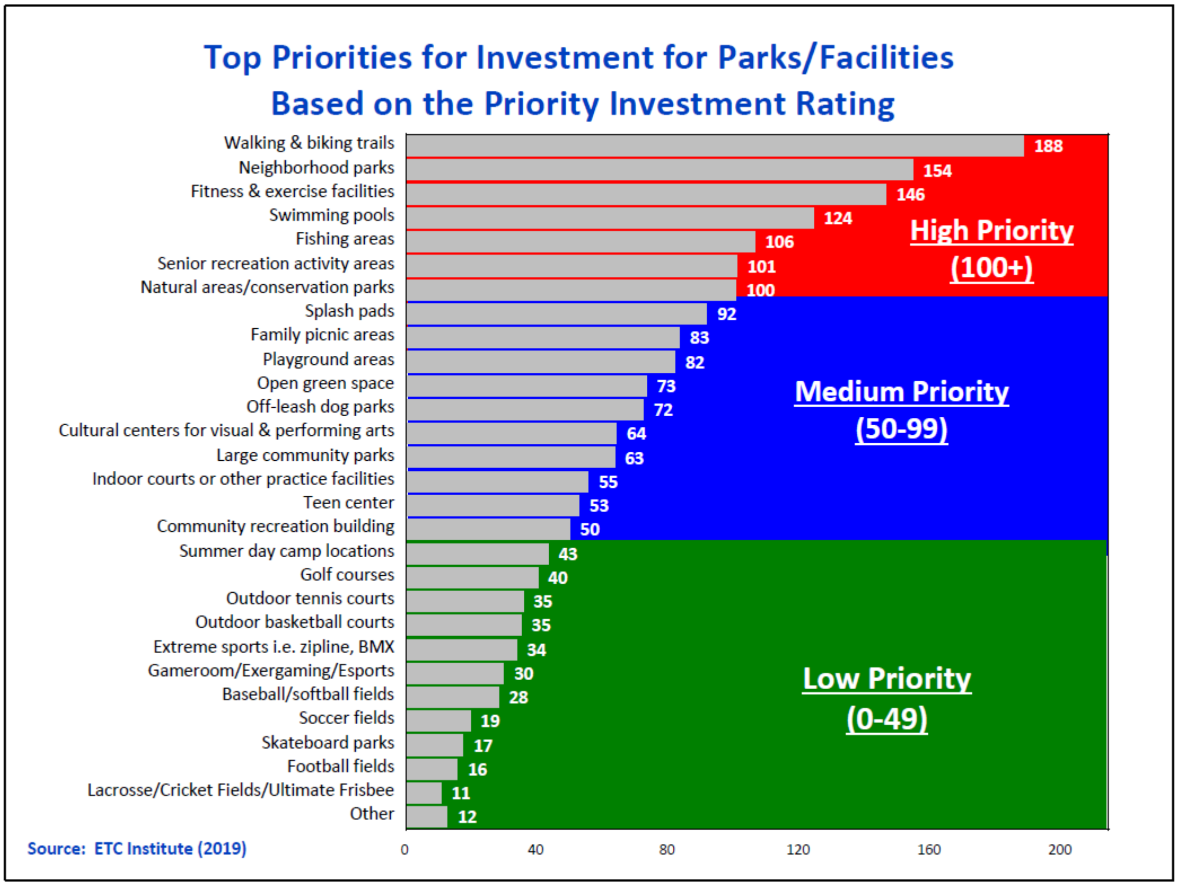


Figure 84. 2019 BREC Needs Assessment showing areas the public believes BREC should invest in most (Source: ETC Institute, BREC 2019 Community Interest and Opinion Survey).

5.1.1.1 Conservation Desired Future Conditions and Indicators of Success

The level of service standards for conservation areas, amenities, facilities, and management are based on the five overarching conservation goals outlined in Section 1. These goals are the driving force behind what we want to achieve as an agency in conservation and help to define the desired future conditions we are trying to achieve. Desired future conditions describe the desired objectives and outcomes from acquisition, development, restoration, and management activities based on BREC's objectives and standards of accreditation and planning. Desired Future Conditions reflect the expected condition of the amenity, facility, or ecosystem when conservation objectives are met. The Desired Future Conditions are measured by established indicators of success. The indicators of success are measurable outcomes that can assess progress towards desired future conditions. Ideally, these can be compared to existing conditions and can be adjusted accordingly to the achieve the desired objectives. The indicators of success are measurable metrics which will help guide annual work plans and are discussed further in the Section 7, Action Plan. Section 7 ties in the below desired future conditions to measurable indicators of success through monitoring protocols and indicates how BREC plans to achieve these objectives.

Table 11. BREC Conservation Goals and Desired Future Conditions

Goal	**1. Promote recreational and educational activities focusing on appreciation and understanding of the natural environment.**
Desired Future Conditions:	Facilities and amenities provide equitable opportunities for access to nature which is defined by: ○ ADA accessibility to provide equivalent experience ○ Well-maintained and managed to facilitate recreation ○ Safe and accessible parking ○ Variety of opportunities within reasonable driving distance ○ Some opportunities with bus, bike, or pedestrian access ○ Recreation opportunities in a variety of habitats ○ Safe and secure facilities with appropriate signage
Goal	**2. Protect and restore unique, healthy, and historically representative habitats.** **3. Preserve biodiversity and reduce the loss of native species.**
Desired Future Conditions:	Unique, healthy, and historically representative habitats preserved in the system; protected from development, misuse, and outside pressures.
	Manage habitats to be high functioning, healthy systems that support and foster native biodiversity.
Goal	**4. Conserve, restore and expand ecosystem services for the benefit of local residents.**
Desired Future Conditions:	Parks which benefit the public through enhanced infrastructure which increases or preserves the park's ability to retain stormwater, decrease urban heat index, sequester carbon, and improve air quality.
Goal	**5. Manage resources adaptively using innovative approaches.**
Desired Future Conditions:	Have the necessary resources to proactively manage conservation land and amenities.
	Utilize the most up to date technology to efficiently and accurately map and monitor resources and management strategies.
	Management Plan and strategies are monitored and evaluated to ensure the most effective, innovative are prescribed and employed.

5.1.2 Land Acquisition and Planning

5.1.2.1 Land Acquisition Policies and Procedures

Land acquisition is essential to fulfill BREC's Natural Resource Management goals of protecting unique and historically representative habitats of East Baton Rouge Parish and protecting species diversity. The Planning and Engineering Department follows Commission-approved policies and procedures and Louisiana State Law regarding land acquisition. The NRM team assists in this process as necessary to collect data and complete rubrics to inform decisions. For BREC's full Land Acquisition policy and procedures see the Planning and Engineering Project Development Manual and Standard Operating Procedures.

5.1.2.1.1 Land Acquisition Rubric

All potential land acquisitions are valuable to the BREC park system, but it is important for BREC to prioritize acquisitions and provide justification for each. The BREC land acquisition rubric is one step of a larger process that assists in guiding BREC staff through surveys and analysis to an informed decision based on community needs, level of service gaps and ecological importance. The land acquisition rubric is meant to be filled out by BREC professionals who understand the process and park system, but it is important to use the rubric as a guide and not completely disregard park planning professionals' judgement who have the vision for long-term growth of the BREC park system.

The BREC Land Acquisition Rubric evaluates land acquisition opportunities using a numeric system based on a set of eight criteria that was developed using information provided in the 2019 Community Interest and Opinion Survey, 2019 Resiliency Strategy to assist with flood control, and the Future BR Plan. The Land Acquisition Rubric can be found in Appendix 2; the eight criteria evaluated in the rubric answer the following questions,

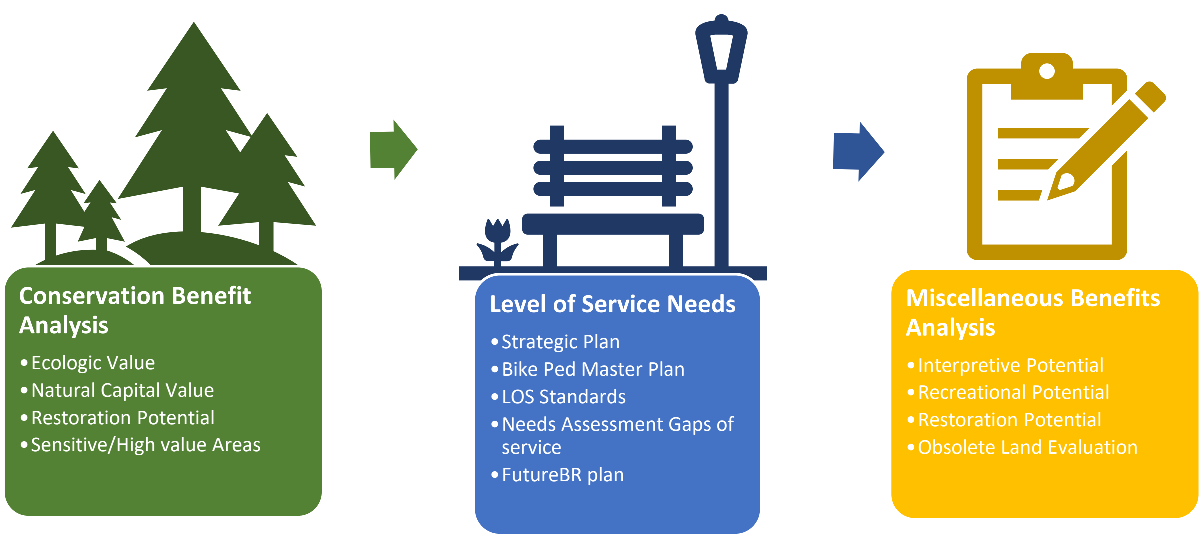
- Is the subject property adjacent to an existing BREC property?
- Is the subject property identified as a strategic direction or master plan goal?
- Is the subject property needed to fulfill a level of service gap, community need or for future expansion of BREC programs?
- Does the subject property support high biodiversity of East Baton Rouge Parish and/or does the property have high ecological value?*
- Does the subject property protect or provide access to unique features, landmarks, or cultural resources?*
- Does the subject property provide benefits to the surrounding community and residents of East Baton Rouge Parish resulting in a positive impact on the local economy as defined by the Natural Capital Rubric?*
- Does the subject property increase the ecological, economic, or recreational value of an existing BREC property?*
- Was the subject property donated or is the cost of purchase below appraised value or previously budgeted?

Values with an asterisk* are those values that should be assigned by BREC Natural Resource Management staff who will score these criteria using professional experience, GIS data, and biodiversity assessment reports.

5.1.2.2 Land Planning and Development Decision Making Framework

Once a property is acquired by BREC, it is important that it serve a purpose to the people of East Baton Rouge Parish. BREC operated land should be evaluated to determine what that purpose is, how it best serves the community and ultimately how it should be designated in the system. This process will be completed by a variety of BREC departments and divisions and the Land Planning and Development Decision Making Framework (LPDDMF) should be used as a guide to assist in the assessment process along with Level of Service Standards, Strategic and Master Plans, Community Needs Assessments, etc. The framework, which can be found in Appendix 3, ensures that ecological value is assessed for all properties and the benefits of ecosystem services are evaluated. Only when this data has been collected and assessed can it be weighed against recreational priorities to determine the best path forward.

The LPDDMF is broken into three sections, and each assesses a different aspect of the land to walk planners through the data. Section 1, Conservation Benefits, assess the ecological value and natural capital value of the land. Section 2, Level of Service Needs, determines which gaps in service or standards the land might potentially fill considering all of BREC's strategic planning documents. By the end of Section 2, many parks will receive a designation and the remainder of the framework does not need to be filled out. Section 3, Miscellaneous Benefits, should be filled out for any parks not designated in Section 2, and explores other potential uses or benefits the park may provide the public. It is important that in sections 2 and 3, Park Operations and Recreation Departments are consulted to evaluate operational expenses and recreation/interpretive programming potential. Most other parks will receive a designation in Section 3, however, there is potential that the value the park provides the community, does not outweigh the operational expenses. In this case, the land would best serve the community if sold and resources reallocated, according to the LPDDMP.



There are three rubrics found within the LPDDMP which provide the necessary data to complete the Framework and they are explained in further detail in the following sections.

5.1.2.2.1 Ecologic Value Rubric

The Ecological Value Rubric is intended to be a rapid ecological assessment to calculate an ecological value of the park being examined. This rubric can be used in a variety of applications and provides data for the Land Acquisition Rubric and the LPDDMF. The Ecological Value Rubric should be completed by BREC Natural Resource Management staff scientists and will include a variety of data collection techniques including field visits, government databases, GIS mapping and aerial and historical imagery. The assessment parameters were chosen to reflect BREC's Conservation Goals focusing on habitat health, uniqueness, wildlife value and increasing or preserving biodiversity. These parameters are not all that could be considered but those which data was available and were measurable with the resources available.

The rubric evaluates twelve total criteria, each of which are scored and then tallied for an overall park score. Parks are then rated High, Medium, or Low based on score. The full rubric can be found in Appendix 4.

1. Undeveloped Land Status
2. Undeveloped Land Size
3. Floristic Quality Index
4. Hydrologic Condition
5. Wildlife Habitat: Habitat Fragmentation
6. Wildlife Habitat: Natural Communities
7. Rare, Threatened or Endangered Species
8. Rare, Threatened or Endangered Natural Communities
9. Wetlands
10. Unique Ecological Features
11. Invasive Species Threat
12. Negative Influences

5.1.2.2.2 Natural Capital Rubric

The Natural Capital Rubric is designed to be an assessment tool for evaluating the economic impact of a park's ecosystem services or natural capital. Ecosystem services are the positive benefits that an ecosystem may provide to the local community and residents of East Baton Rouge Parish and can include but are not limited to stormwater management, increased air quality, carbon sequestration, increased property value, reduction in health care costs and more. According to the National Recreation and Park Association (NRPA), parks are essential public services just as water, sewer and public safety and are vitally important to establishing and maintain the quality of life in a community. Section 2 of this plan goes into further details on the benefits that parks provide. This Natural Capital Rubric assists BREC in calculating this value in a way which can be used to justify planning and development decisions. It can be used in a variety of applications including Land Acquisition Rubric, the LPDDMF and some calculations can be used to interpret park benefits to the public.

The Natural Capital Rubric evaluates six categories that are guided by BREC's Conservation Goals, and each is assigned a ranking which is then tallied to provide an overall Park Natural Capital rating. The Natural Capital Rubric should be filled out by BREC staff in the Planning and Engineering Division and will require collecting data through a variety of sources including but not limited to GIS data, field surveys, aerial imagery, and open-source data platforms. The full Natural Capital Rubric can be found in Appendix 5.

1. Stormwater Benefit (Runoff Reduction Coefficients)
2. Urban Heat Island Effect
3. Carbon Sequestration
4. Air Quality (Pollution)
5. Real Estate Impact (Property value)
6. Physical Health Benefits (Health Care Cost Reduction)

5.1.2.2.3 Interpretive Potential Rubric

Interpretation is the process of communicating with the public about park resources in a way that fosters a deeper understanding and appreciation. Interpretation can include formal interpretation guided by staff through programming but for the purposes of the Interpretive Potential Rubric, will mainly include informal interpretation through signage, displays and the appropriate amenities required to facilitate and enhance the user experience. The intent of the rubric is to provide an assessment tool which assists in evaluating the interpretive potential of park. Interpretive potential can span a wide range of meanings including but not limited to the presence of unique features which may be of interest to the public, gaps in service for local interpretive opportunities, proximity to underserved populations which would directly benefits from highly interpreted sites such as a school or densely populated urban neighborhoods and the feasibility of developing the site to facilitate said interpretive opportunities.

The Interpretive Potential Rubric evaluate seven categories providing a ranking for each which are then tallied for an overall Interpretive Potential rating for the park. The rubric should be filled out collectively by BREC's Planning and Engineering Department, CORE and Special Facilities Divisions based on expertise. The Interpretive Potential Rubric can be found in Appendix 6.

1. Unique Cultural or Historical Features
2. Unique Natural Features
3. Unique Habitat
4. Proximity to Other Interpretive Opportunities
5. Park Accessibility
    a. Park Access Development Costs

    b. Park Access Development Impacts
6. Interpretive Development Budget
    a. Potential Interpretive Development budget
7. Potential Interaction Level/Community Impact

5.2 Natural Resource Planning and Management

5.2.1 Guiding Strategies

BREC's NRM division uses a variety of innovative, adaptive management strategies to meet its goals of protecting and restoring unique, healthy, and historically representative habitats, preserving biodiversity, and reducing the loss of native species, and conserving, restoring, and expanding ecosystem services for the benefit of local residents. To meet these goals BREC uses the Adaptive Resource Management approach, or ARMS, in managing its natural resources (Figure 85). ARMS is a structured, iterative process of improving management strategies in the face of uncertainty by learning from management experimentation and outcome. Uncertainty is a critical component of ARMS, as natural systems are dynamic and subject to random events associated with climate, human disturbance, and population fluctuation. Additionally, societal

Figure 85. The Adaptive Resource Management System.

attitudes and behaviors associated with natural systems evolve over time. For these reasons, experimentation is critical to gain knowledge and update management strategies as lessons are learned. ARMS requires ongoing monitoring to acquire baseline data and assess changes over time, which led to the development of BREC's Rapid Ecological Assessment Protocol (REAP). The REAP, discussed later in this section, outlines NRM's standardized survey techniques for collecting forest inventory and floristic quality data in BREC parks. Since these methods are repeatable and conducted annually, it will allow NRM to monitor the effectiveness of management strategies and other changes over time.

5.2.2 NRM and Conservation Plans

To meet BREC's NRM goals, the following individual plans have been or will be created in the near future. Individual plans are needed due to number of parks the NRM division manages, the variety of habitats and ecosystems in those parks, and the variety of issues the NRM division encounters. Some plans are not meant to be all inclusive for all BREC properties, and external references should be checked when planning management strategies for a specific property. These plans should be reviewed regularly to ensure they remain relevant and up to date.

5.2.2.1 Individual Park Natural Resource Management Plans

Individual Park Natural Resource Management Plans are park specific plans that provide both an in-depth historical introduction to a particular park of focus, past and present management strategies used to manage the park's natural resources, and any future directions. These plans include information ranging from habitat designations and cultural impacts to interpretative considerations, threats, and management prescriptions. Individual Park Management Plans are produced in partial fulfillment of action items in the 'Imagine Your Parks Strategic Plan,' which requires the development of management plans as part of a holistic approach to managing natural resources. The primary objective of these inventories is to understand what natural resources are currently held within the park system so that we can plan accordingly to achieve the five NRM conservation goals. Writing individual park plans requires vigorous collection of field data via REAP surveys, ideally over the course of an entire field season (March-November). The use of REAP allows us to obtain quantifiable data that, in turn, allows us to make more empirical assertions about the park, such as natural communities present. Currently, only Blackwater Conservation Area has received an Individual Park Management Plan (Figure 86) and Forest Community Park is currently undergoing the data collection process.

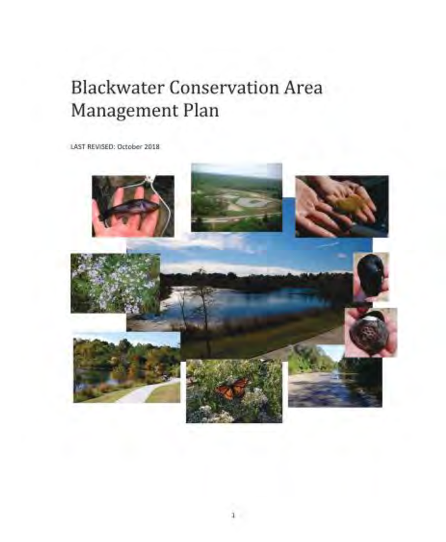


Figure 86. Blackwater Conservation Area Management Plan (Source: BREC Staff).

5.2.2.2 Biodiversity Assessment Reports

Biodiversity assessment reports are written following the conduction of a Biodiversity Survey, discussed later in this section, and help provide an initial overview of the surveyed park's natural, recreational, and cultural resources as well other information such as park misuse (For example report, see Appendix 7). Biodiversity Assessment reports are essential to park planning and development as they allow BREC staff to understand the current conditions of the park and make informed decisions regarding park designation classification and the planning of trails or other recreational amenities. A typical Biodiversity Assessment Report includes six sections: (1) summary of findings, (2) threats and management concerns, (3) property description, (4) methods, (5) detailed assessment, and (6) NRM recommendations. In addition to the six sections are multiple appendices that contain species lists, field images, relevant historical documents, and a variety of GIS maps displaying the location of unique features (Figure 87), potential natural communities, elevations, flood zones, soils, hydrologic conditions, GPS tracks, etc. Links to the surveyed park's iNaturalist page where all photos of species observed are uploaded, is also provided near the top of the report with the other heading information like surveyed property name, address, coordinates, survey date, survey staff, property size, area traversed, and soils present. The Biodiversity Assessment Report gives a detailed overview of almost everything there is to know about a park, making it a vital reference tool for BREC planners and for sharing information about a park with internal and external personnel or agencies.

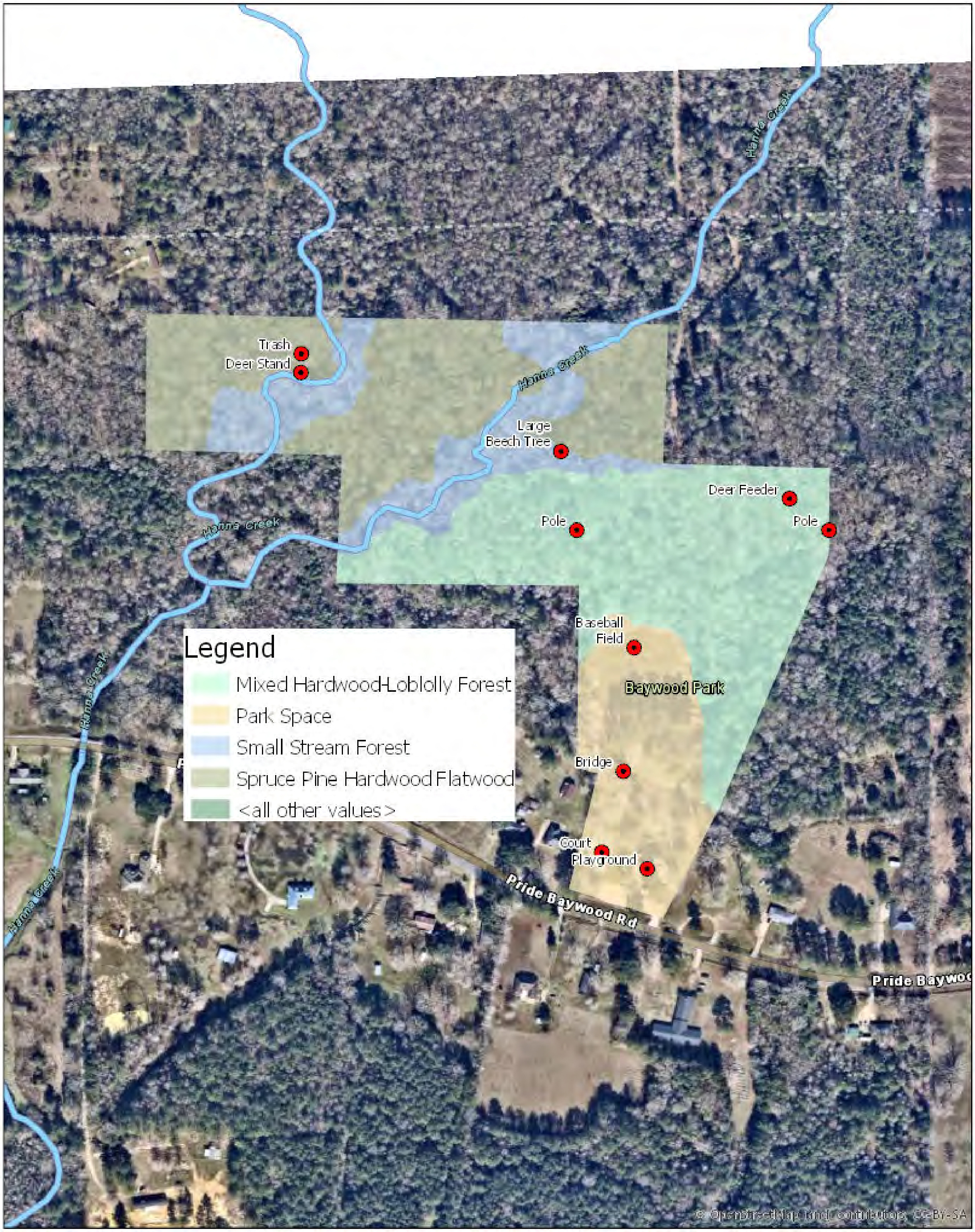


Figure 87. A map of BREC's Baywood Park displaying potential boundaries of natural communities present as well as unique natural or cultural features observed during the Biodiversity Survey (Source: BREC staff).

5.2.2.3 Invasive Species Management Plan

BREC's Invasive Species Management Plan was completed in 2019 and was created to help guide the NRM division in managing invasive species in BREC's parks. The Invasive Species Management Plan is meant to provide an overview of the most common invasive species found in BREC parks and those species that or currently an issue or may become an issue in the future. The plan outlines ways to prevent the invasion of these species and currently accepted methods for their removal, based on established research. It provides characteristics of invasive species, characteristics of habitats that are susceptible to being invaded, as well as dispersal mechanisms of both invasive animal and invasive plant species.

Invasive species are species that aggressively spread and out-compete native species, which can significantly alter natural communities and negatively affect the ecosystem. Invasive species impact food availability and habitat quality for native species, decrease species diversity, increase habitat fragmentation, and weaken the ecosystem's ability to defend against natural disasters and other catastrophic events. Invasive species are widespread and are one of the greatest threats to Louisiana ecosystems and BREC's goal of protecting unique and historically representative habitats and reducing the loss of native species. The threat of invasive species continues to expand but can be addressed with preventative measures as well as monitoring and control of existing populations. Some invasive species that currently threaten BREC's parks include plants such as Water Hyacinth, Chinese Privet, Chinese Tallow and Water Lettuce, as well as animals such as Apple Snails, Feral Hogs, and Feral Cats.

Figure 88. BREC's Invasive Species Management Plan.

5.2.2.4 Aquatic Management Plan

The Aquatic Management Plan has not been created but will be used as a guide to manage BREC's aquatic natural resources. A large portion of BREC's parks contain natural aquatic systems such as ponds, streams, and wetlands. These aquatic resources are used for a variety of activities including fishing, paddling, and wildlife viewing. These resources also provide ecosystem benefits in the form of stormwater management, nutrient cycling, and wildlife habitat. This plan is used to ensure these resources are managed consistently and effectively with best practices by both natural resource management and park operations. The Aquatic Management Plan will outline the current aquatic resources located in BREC's parks, including the importance of the Amite River, Comite River, notable smaller bayous and streams, various ponds, and wetlands. It will also outline issues seen within these systems including pollution, erosion, and invasive species, and will discuss important management strategies including pond creation, pond maintenance, and fish stocking. Lastly, it will highlight the 16 fishing ponds BREC's NRM division currently manages, and the unique issues each one faces.

5.2.2.5 Restoration and Resiliency Management Plan

The Restoration and Resiliency Management Plan (RRMP) has not yet been finalized and approved by the commission. This plan will highlight several strategies used to restore natural habitats including the creation and management of grow zones, erosion control strategies, our Native Planting List, and flood abatement/stormwater management strategies. See below for details on each of these sections.

5.2.2.5.1 Grow Zone Management Strategies

As detailed in section 3, Grow Zones are a type of BREC green infrastructure that involves naturalizing large areas in our parks through seeding and other native plantings. Part of the RRMP will include Grow Zone management strategies which will outline the importance of these areas, justify their existence both economically and ecologically, detail general management procedures used to maintain these areas, and identify current and future grow zone areas in BREC parks.

5.2.2.5.2 Erosion Control Strategies

The Erosion Control Strategies portion of the RRMP will outline the strategies used to prevent the loss of land due to natural processes including wind and water. Erosion can not only be a structural issue but can degrade habitats by increasing the turbidity of a waterbody, thus harming fish and other aquatic organisms. Strategies include the use of vegetation, whose roots and structure keep land intact, or the placement of a structure such as rock, whose presence keeps the land intact. Erosion control structures can be used along the bank of a water body, or further inland as a riparian buffer.

5.2.2.5.3 Native Planting List

BREC's NRM division has developed a native planting list that will be used as an important reference tool for planning native plantings in the BREC Park system and will be incorporated into the RRMP. The native planting list is currently compiled in a shared, Excel spreadsheet and includes over 300 Louisiana native plant species, all of which have been used in native plantings already or are known to be available in local nurseries, thus having potential to be used in a BREC native planting. The plant list provides information concerning plants' habit and management that are important in the planning, designing, and maintenance of a successful, planting project. This includes information like scientific and common names, wetland indicator status, plants' preferred habitat conditions (soil, water, sunlight), bloom colors and bloom periods, management notes, known susceptibilities, height and spread, and many other characteristics. If BREC staff is looking for a tree with edible fruit that would do well in a parking lot planting, the native planting list allows you to sort the plants by those characteristics, helping you easily select plants that meet those criteria without spending hours researching online. Additional tabs in the spreadsheet provide a glossary for plant terminology, links to online resources, and a list of vendors that includes contact information and notes about each. The native planting list is a working document that is continually updated with new garden information as it is picked up over time by NRM staff or other departments at BREC who want to add information based on their own knowledge and experiences, and the list is also updated with new native plants as they become available in local nurseries. This list is used for all BREC NRM plantings including green infrastructure plantings, pollinator gardens, and restoration plantings.

5.2.2.5.4 Flood Abatement/Stormwater Management Strategies

Flood Abatement/Stormwater Management is still being developed but will outline our strategies in preventing excess runoff into natural or man-made waterbodies. Excess runoff can not only cause structural damage through flooding, but can cause environmental damage by carrying pollutants, eroded soil, or other chemicals and bacteria. Like Erosion Control Strategies, vegetation can be used along with other bioretention techniques.

5.2.2.5.5 Prescribed Burn Strategies

BREC's NRM division anticipates using prescribed burn, the controlled application of fire to naturally produced on-site vegetative, as a management tool for maintaining and restoring ecosystems in the BREC park system. For this reason, NRM will be developing a prescribed burn strategies document that outlines the standard operating procedures related to prescribed burning in the BREC park system and how these procedures relate to our management goals. Such management strategies will strictly adhere to burn management procedures outlined by the Louisiana Department of Agriculture and Forestry LA state law (LA Rev Stat § 3:17) which includes prescribed fire certified personnel being present as well as the writing and following of a prescribed burning plan. Prescribed burns will be a useful management tool for BREC since many ecosystems in southeastern United States, including Louisiana, are historically dependent on fire such as pine savannahs, coastal prairies, marshes, and possibly other plant communities. Target ecosystems in the BREC park system that are known to benefit from prescribed burn include tallgrass prairie, which are not naturally occurring in the park system but are present through the Grow Zone green infrastructure projects implemented by NRM, and Longleaf Pine Forests which is another fire dependent natural community that has potential to occur in the park system through restoration efforts.

5.2.2.6 Interpretive Plan

According to the National Association for Interpretation (NAI), "Interpretation is a communication process that forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resource" (Brochu & Merriman, 2000). Interpretation of resources is crucial to taking park patrons through a journey of deeper understanding and appreciation of BREC's natural and cultural resources. As stated by Tilden, "Through interpretation, understanding; through understanding, appreciation; through appreciation, protection" (Tilden, 1967). To have the support of the public in protecting resources, they must understand and ultimately appreciate their value first. For this reason, it is important that BREC have a guiding document to facilitate accomplishing this throughout the park system. BREC's interpretive plan will outline the agency's interpretive themes and how those themes will be interpreted actively and passively throughout the system. It essentially guides how BREC tells our story of space to actively engage the public in the resources in which they recreate. The plan should be created through a strategic process that allows input from all of BREC's departments to define the overall interpretation and education goals of the system which will guide the goals of each individual park.

5.2.2.7 Other BREC plans

5.2.2.7.1 Resilience Strategy

BREC's Resilience Strategy was developed in 2019 and outlines its strategy in building parks to respond to floods, climate change, and other natural or man-made hazards (Figure 89). The plan not only emphasizes the multifunctionality of parks and their role in resilience, flood mitigation, and improvement of air and water quality, but also emphasizes the use of new, innovative methods for resiliency focused planning, design, and management.

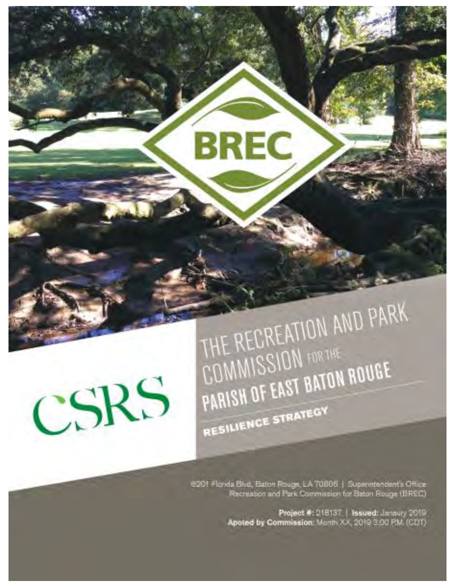


Figure 89. BREC's 2019 Resilience Strategy (Source: BREC).

The flood of August 2016 provided evidence that BREC's largest parks and open spaces can hold and store stormwater that otherwise would otherwise contribute to higher water levels in surrounding neighborhoods. The flood also provided evidence that BREC must adapt. Rather than just responding to natural or man-made hazards, BREC must be proactive in building resilience for East Baton Rouge Parish.

Along with recognizing and recommending the use of resiliency strategies, the plan also identifies high, medium, and low watershed risk zones in East Baton Rouge Parish and provides action items for representative parks in these three risk types. For example, Howell Community Park is in a high watershed risk zone, and experienced significant flooding in 2016. Action items include short-term efforts such as constructing grow zones that can absorb stormwater, to long-term efforts such as re-naturalizing Hurricane Creek.

5.2.2.7.2 Environmental Sustainability Policy

BREC's Environmental Sustainability Policy was developed in 2014 with the purpose of ensuring a comprehensive environmentally sensitive and sustainable approach across all planning, programming, and operations to realize the organizations commitment to responsible growth and environmental stewardship.

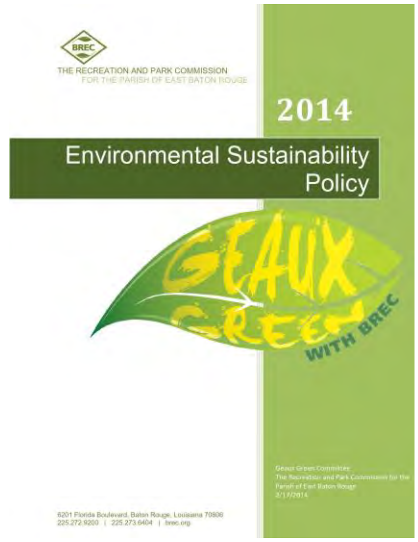


Figure 90. BREC's 2014 Environmental Sustainability Policy (Source: BREC).

The Environmental Sustainability Policy provides information on the benefits of environmental stewardship, outlines the establishment of a Geaux Green Committee, the Mission and Vision of the Committee, and the Strategic Goals of the Committee, which include:

1) Environmental Stewardship
2) Environmental Education and Interpretation
3) Recycling
4) Energy Conservation
5) Water Conservation and Water Quality Protection
6) Sustainable Design and Construction of Facilities
7) Environmentally Preferable Purchasing
8) Monitoring and Tracking

5.2.2.7.3 Recycling and Zero Waste Plan

The Recycling and Zero Waste Plan outlines how BREC can reduce the amount of waste it produces through reducing the number of materials it uses, reusing materials when feasible, and recycling (Figure 91). It provides information on recycling guidelines and procedures, special waste materials, environmentally preferred purchasing, challenges, and next steps. Objectives include:

Figure 91. BREC's Recycling and Zero Waste Plan (Source: BREC).

1) To reduce the amount of waste that is produced through sustainable purchasing practices and operational guidelines which eliminate waste production.
2) To identify materials which can be consistently re-used to prevent their entering the waste stream.
3) To provide recycling opportunities to both staff and the public wherever feasible.
4) Increase the amount of environmentally friendly materials and substances used to not only reduce the

amount of toxins that enter the environment but also reduce the impact their production has on the environment.

5.2.2.7.4 Historic and Cultural Resources Management Plan

The Historic and Cultural Resources Management Plan was developed for eleven properties including Anna T. Jordan Community Park, City-Brooks Community Park, Convention Street Park, Frenchtown Conservation Area, Greenwood Community Park, Highland Community Park, Magnolia Cemetery, Magnolia Mound Plantation, North Sherwood Forest Community Park, Sandy Creek Community Park, and Webb Park (Figure 92). Although the plan only provides information on the history and cultural resources of these parks, its recommendations could be applied to all BREC properties. The plan also provides information on laws and regulations regarding these resources, as well as previous investigations, recommended future investigations, the protection of cultural resources, and stewardship education.

Figure 92. BREC's Historical and Cultural Resources Management Plan (Source: BREC)

5.3 Use of GIS in Resource Planning and Management

Geographic Information System (GIS) is a mapping platform used by BREC to capture and analyze geospatial data. BREC currently uses Environmental Systems Research Institute's (ESRI) ArcGIS program as its mapping platform and is developing its own geodatabase to inventory, plan, and manage the BREC park system. Information will be collected on BREC amenities such as playgrounds, benches, ball courts, etc., as well natural features such as natural communities, trees, and invasive species. BREC ultimately plans to incorporate this data into the BREC website where it can be viewed and analyzed with other park features in a fully interactive park system map. ESRI provides a variety of software programs that BREC uses including ArcGIS Enterprise, ArcGIS Online, ArcGIS Pro, and ArcGIS apps, all of which are discussed below.

5.3.1 ArcGIS Enterprise and ArcGIS Online

ArcGIS Enterprise and ArcGIS Online are the two main ESRI platforms that BREC uses to map, analyze, manage, and share its geospatial data. While each product can be used on its own, they can provide additional benefits and a wide range of capabilities when used together. The main difference between the two platforms is how the data is stored and managed. ArcGIS Online is ESRI's web-based mapping software program and is hosted on ESRI's servers, while ArcGIS Enterprise is hosted on BREC's servers giving BREC more control on how its data is managed and organized. Both platforms operate around a central website however and give users the ability to share information with select groups, both within and outside of BREC. Both platforms also provide users access to templates and apps that can be used both in the office and the field. Administrators can even customize these sites updating users, adjusting privileges, and setting advanced settings.

5.3.2 ArcGIS Pro

ArcGIS Pro is ESRI's desktop application that gives users the ability to map, analyze, and share geospatial data through both ArcGIS Enterprise and ArcGIS Online. Within ArcGIS Pro, projects are created where related data can be stored and managed in a single location. Users are given a user-friendly interface as well as access to a variety of templates, layers, and maps to help visualize and analyze data. Through ArcGIS Enterprise and ArcGIS Online these projects can later be shared with others in the BREC organization as well as the public. ArcGIS Pro is used within BREC's NRM division to map a variety of features including natural communities, trails, trees, invasive species, etc. While this information can be saved as a project within ArcGIS Pro, some of it will ultimately be stored in BREC's geodatabase where it can be visualized with other features both within and outside the BREC park system. For example, using aerial imagery, natural communities such as ponds, forests, and streams can be drawn and stored in BREC's geodatabase where they can later be viewed with other BREC amenities such as benches, picnic tables, etc., as well as outside features such as roads, buildings, and other infrastructure. This information can not only help BREC visualize the location of its benches and picnic tables near its natural communities, but also determine where additional amenities should be built.

5.3.3 ArcGIS Apps

ArcGIS apps are a collection of applications provided by ESRI that can be used in the office on a desktop or in the field on a mobile device to collect and visualize geospatial data. These applications not only help streamline data collection in the field but also help visualize data collection as well. These applications have the potential to increase productivity, reduce errors, and save money. ArcGIS Apps that BREC currently uses or plans on using include ArcGIS Collector, ArcGIS Survey123, ArcGIS Dashboard, and ArcGIS StoryMaps. Other ArcGIS Apps that are available include ArcGIS Navigator, ArcGIS Workforce, and ArcGIS QuickCapture, just to name a few.

5.3.3.1 ArcGIS Collector

ArcGIS Collector is an ArcGIS app that gives users the ability to visualize and collect data in the field on maps enabled for editing. Maps are created in the office that support specific field workflows which can be opened in the field data for data collection. Data collected can include line, point, and polygon features, each of which can be predetermined prior to any field activity. For example, a polygon feature can be created to mark the location of a pond, or a point feature can be created to mark the location of a bench. Data can be collected on needed features as well. For example, a point feature can be created to mark the location of a needed picnic table, or a line feature can be collected to mark the potential location of a new trail.

5.3.3.2 ArcGIS Survey123

ArcGIS Survey123 is another ArcGIS app used to collect data in the field, but rather than using a map to collect data, it uses a survey to collect data. For example, BREC's NRM division created a tree survey in ArcGIS Survey123 to collect information on individual trees including their location, type, size, and health. Surveys can not only help streamline data collection in the field but can also minimize office work post collection. Settings can also be adjusted to ensure that all questions are answered prior to leaving a field site and photos can be taken to provide more information on an amenity. In addition to the tree survey, BREC's NRM division has also created a survey to capture information on the location and amount of invasive species, a survey to map trail maintenance needs, and a survey to capture information on the location and condition of receptacles. BREC's NRM division will also use ArcGIS Survey123 to collect REAP data, a rapid field survey that collects information on vegetation present, as well as the overall ecological integrity, which is discussed later in Section 5.4.

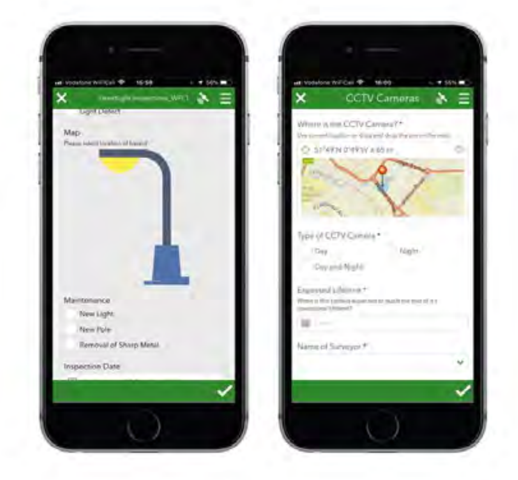


Figure 93. Example of using ArcGIS Survey123 Application on a smartphone. (Source: https://resource.esriuk.com/blog/our-1-2-3-guide-to-survey123/)

5.3.3.4 ArcGIS Dashboards

ArcGIS Dashboards are an ArcGIS app that helps users visualize and analyze geospatial data on a single web page, termed 'Dashboard,' on a desktop computer. This dashboard can then be used to make decisions, visualize trends, monitor the status of resources, and inform the public. For example, BREC's NRM division created a dashboard to mark the location and length of trails in its Conservation Areas. The dashboard not only shows the location of trails, but also their length, trail type, and surface construction type. BREC's NRM Division is currently working on a species Dashboard which will provide information on the amount of biodiversity in BREC parks, as well as a Tree Dashboard for BREC's Park Operations Tree Crew.

Figure 94. BREC Conservation Dashboard showing parks, trails, fishing ponds and other useful data at a glance. (Source: BREC GIS).

5.3.3.5 ArcGIS StoryMaps

ArcGIS StoryMaps are an ArcGIS app that allows users to present maps in an informative and inspiring way. Rather than presenting information on a single page however as in ArcGIS Dashboard, information is presented in a series of pages in ArcGIS StoryMaps. Text, photos, and videos can also be added to enhance the project. While BREC's NRM division currently does not have any ArcGIS Story Maps created, StoryMaps on trails, natural communities, and other natural resource features are planned in the future.

5.4 Surveys and Monitoring

Monitoring of natural resources allows managers to determine existing conditions as well as changes over time. It also provides information that helps evaluate and justify management decisions. BREC's NRM division uses a variety of techniques and surveys to evaluate its natural resources, depending on the situation. BREC not only uses its own surveys, such as Biodiversity Surveys and Rapid Ecological Assessments (REAP), but online applications such as iNaturalist and eBird, as well as Citizen Scientists during the annual Bioblitz and Green Force Volunteers throughout the year. All data collected will be managed using BREC's ArcGIS database. Data will be collected using ArcGIS apps (Figure 94), as previously discussed, and stored in BREC's GIS database.

5.4.1 BREC Survey Types

BREC's NRM division has developed its own surveys for assessing BREC's natural resources including the Aquatic Conditions Survey, the Biodiversity Survey, Invasive Species Survey, Terrestrial and Aquatic REAP Surveys, and Tree Surveys.

Figure 95. BREC NRM staff using Trimble GPS during a Biodiversity Survey at Ben Burge Park (Source: BREC staff).

5.4.1.1 Aquatic Condition Survey

Aquatic Condition Surveys are done to assess the condition of BREC's aquatic resources including its lakes, ponds, and streams. Currently BREC's NRM division uses a YSI ProDSS Multiparameter Water Quality Meter to collect this data. Water temperature, pH, dissolved oxygen, and specific conductance are collected, all of which provide information on the quality of the water. Temperature is important as many aquatic organisms are sensitive to high and low temperatures. Temperature is also linked to many other parameters, in particular Dissolved Oxygen. Dissolved Oxygen typically decreases with increased temperatures and is an important part of many chemical processes including cellular respiration. Oxygen originates in water either naturally through diffusion from the atmosphere, or artificially using aerators, machines that disturb water at its surface increasing the process. Plants and algae also produce oxygen as a byproduct of photosynthesis, although these organisms also use oxygen during cellular respiration. Since photosynthesis takes place only during the day when sunlight is available, and respiration takes place continuously, oxygen levels typically increase during the day and decrease at night. Salinity can also influence dissolved oxygen, although it is typically very low in freshwater ponds thus minimizing its impacts in EBR. Another important parameter monitored is pH which measures the amount of hydrogen ions present (i.e., how basic or acidic a solution is) and can be indicative of the amount of pollution in a waterbody. The quality of the water is important not only for aesthetic purposes but for the aquatic organisms that inhabit these systems. Data is typically taken at multiple locations within a waterbody when conducting an aquatic conditions survey to ensure no bias is involved in the survey.

5.4.1.2 Biodiversity Survey

BREC NRM's Biodiversity Surveys are quick, initial surveys of a BREC property, or potential property, to identify and document the species present, potential natural communities present, the condition of those natural communities, threats and management concerns, and recreational opportunities. Prior to a Biodiversity Survey, a preliminary investigation is done where imagery, soil types, flood plain status, and topography are examined. The site is then visited by NRM staff and large transects are traversed along which the presence of species and other notable features are documented (Figure 96). These transects are planned in such a way that each soil type, land use type, hydrologic feature, or any other natural/cultural feature identified in the preliminary investigation is surveyed so that all unique areas are represented during the survey. Any plant species that cannot be identified readily in the field is brought to BREC headquarters where it can be further examined and identified. Images are taken of each species observed if possible, and then uploaded to the iNaturalist platform. A biodiversity assessment report is then generated that contains a summary of the findings, a list of species present, photos, maps, and management suggestions.

Figure 96. Results of Biodiversity Survey at Jones Creek Park (Source: BREC Staff)

5.4.1.3 Invasive Species Survey

Invasive Species Surveys are simple, user-friendly plot surveys that can be conducted by NRM staff or trained Green Force Volunteers to capture the location and abundance of invasive species. Data for BREC's Invasive Species Survey is collected via iPad, smartphone, or other applicable device using ArcGIS Survey123. As discussed previously, invasive species are exotic species that aggressively spread and outcompete native species. Invasive species not only impact our ecosystems, but they also have far-reaching consequences that impact industrial, agricultural, commercial, and private business sectors (Mehta et al., 2007).

During an Invasive Species Survey plot data is collected that captures information on the identification of the invasive species, the size of the plot, the percentage of the species in the plot, as well as photo documentation. A plot can be taken on its own, either randomly or predefined (Figure 97), or along a transect where multiple plots are taken. Transect data is typically done where the location and abundance of an invasive species over a large area is needed. Following an Invasive Species Survey a report is typically generated which describes the site, the methods used in the survey, the results of the survey, and management recommendations.

Figure 97. Predefined plot locations at Zachary Community Park for an Invasive Species Survey (Source: BREC GIS).

5.4.1.4 REAP (Rapid Ecological Assessment Protocol)

Rapid ecological assessments are standardized, repeatable surveys developed by natural resource management agencies for assessing the health and quality of ecosystems/habitats in a quick and cost-effective manner. BREC's Rapid Ecological Assessment Protocol (REAP) was created to assess the quality of BREC's terrestrial and aquatic habitats through a relatively quick and repeatable assessment tool. Separate survey methods have been developed for assessing terrestrial (Terrestrial REAP) and aquatic (Aquatic REAP) ecosystems. The REAP outlines the methodology for both surveys and the justification for collecting the selected variables, based on established research.

REAP surveys for a target park are conducted throughout an entire year, with data from each plot being collected at least once during each season so that all organisms present in the ecosystem are represented, regardless of seasonal occurrence. Though data collected during the REAP surveys are primarily for BREC internal use, the variables selected for REAP were chosen with partner agencies and local scientific researchers in mind and the understanding that these data may benefit ongoing research activities on BREC properties or spark new scientific interest in BREC parks and conservation areas. A variety of tools are required to conduct a terrestrial REAP survey including dbh tape, a go-no-go diameter class board, a densiometer, and a horizontal cover board cloth (Figure 98).

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Appendix 2. Equipment Checklist

☐GPS with coordinates
☐Azimuth Compass with local declination
☐Open Reel Measuring Tape (100ft)
☐Chaining pins/flagging
☐Fluorescent String
☐Go-no-go diameter class board
☐Clipboard
☐Sharpened pencils or weatherproof pens
☐Metric Diameter at Breast Height tape
☐Data sheets, cheat sheets, and maps
☐Horizontal cover board cloth
☐Densiometer
☐Garden Knife
☐Pruning shears 4
☐Collection bags for plants
☐Ice chest and Ice packs (if applicable)

Figure 98. Variety of sampling equipment used during a REAP survey.

Upon completion of a REAP survey, a report is generated that includes an introduction to the site, the methods used, the results of the survey, and management recommendations. The REAP report along with the raw data collected, which is stored in GIS, will be used to:

1) Monitor changes to ecosystem quality and health through time and space.

2) Identify immediate stressors to the habitat that may guide management priorities.
3) Provide baseline data for future modifications from natural or man-made activities.
4) Determine conservation value of land for future prioritization.
5) Determine historic landcover types and potential for restoration projects.

5.4.1.4.1 Terrestrial

BREC's Terrestrial REAP is used for the evaluation and long-term monitoring of terrestrial natural communities such as forests, wetlands, and open grasslands. It consists of a general forest inventory for monitoring and a Floristic Quality Analysis (FQA) using species richness data. The Terrestrial REAP is based primarily on vegetation since plants are relatively stable, static indicators of biological communities and because vegetation data are more readily accessible than that of other organisms (Bedford 1996, Niemi & McDonald, 2004). Forest inventory data collected during the Terrestrial REAP includes course woody debris, horizontal cover, canopy cover, ground cover, invasive species cover, tree diameter at breast height, tree regeneration, vascular plant species richness, animal species richness, percent slope microtopography, and primary/secondary stressors.

A Floristic Quality Assessment (FQA) is also built into the Terrestrial REAP survey, which utilizes plant species richness data collected during the REAP to assess the floristic quality of the habitat. FQA's are based on a Coefficients of Conservatism (C-value) framework that ranks plant species based on their affinity to natural, remnant habitats and their tolerance to degradation. C-values are typically ranked on a scale from 0-10 with highly conservative species assigned the highest values (8-10) and the least conservative species assigned the lowest value (0-3). Highly conservative species are those that are only found in pristine, unaltered habitat conditions, whereas species considered the least conservative are those common in habitats with high levels of natural or human-induced disturbance (mudslide, dredging, urban development, etc.) that inhibit mid and high-ranked species from occurring there. C values are assigned to all species within an ecological or geographic region with non-native species typically assigned a 0.

C-value datasets are usually developed for a specific geographic or ecologic region, but currently there is not a dataset appropriate for FQA of all ecosystems found on BREC properties, which includes bottomland hardwood forests, cypress swamps, hardwood slope forests, and mixed pine hardwood flatwoods, to name a few. BREC's Natural Resource Management Division is currently developing its own C-value dataset for internal use only. The BREC dataset is a custom dataset that uses coastal plains ecoregion c-values derived from Gianopulos' *Coefficient of Conservatism Database for Wetland Plants Occurring in the Southeastern United States* (2015). The coastal plains dataset includes values for most species found in BREC parks except for a handful of nonnative plants, some wetland plants, and does not include any non-wetland plants (i.e., species do not have a wetland indicator status of obl, facw, or fac). Species are continually added to the BREC custom dataset as they are encountered during Biodiversity and REAP surveys and these values as well as existing values are vetted by BREC staff and regional botanists. The Terrestrial REAP Protocol can be found in Appendix 8.

5.4.1.4.2 Aquatic

BREC's Aquatic REAP is in the preliminary stages of its development but will be used for evaluating open water natural communities such as lakes, ponds, and streams. The Aquatic REAP will involve collection of general geomorphic data associated with the habitat as well as macroinvertebrate sampling. Variables currently being considered for assessing our aquatic habitats include canopy cover, surface temperature, bank height, root depth, root density, bank angle, riparian buffer condition, and visual channel alteration.

5.4.1.5 Tree Survey

BREC's Tree Survey was developed to capture information about individual trees in BREC's parks as well as the ecosystem benefits that those trees provide. BREC's Tree Survey was created using ArcGIS Survey123 with the intention of using i-Tree, a software suite from the USDA Forest Service that provides urban and rural forestry analyses and benefits assessment tools. Data is collected on trees by NRM staff and entered into i-Tree software that outputs the forest structure and ecosystem benefits of the defined area. Although iTree is used to analyze some of the data collected, all information is stored in BREC's GIS database where information on induvial trees can be viewed (Figure 99).

i-Tree offers several desktop and web-based applications, which provides managers with tools to evaluate trees at multiple scales. BREC NRM uses i-Tree Eco, which is designed to collect data on single trees, either in a complete inventory, where every tree is sampled within a defined area such as a park, or plot-based, where trees are only sampled if they fall in pre-determined random plots. Plot-based sampling is typically used in forested areas where it is not possible to collect information on every tree, while complete inventories typically occur in neighborhood or community parks where it is possible to collect information on every tree.

Tree data collected includes the species ID, diameter at breast height (DBH), crown size, crown health, and crown light exposure. In addition, for plot data, percent tree cover, percent shrub cover, and the ground cover types and percentages are also recorded. This data is then entered into i-Tree where a report is generated that provides an analysis on structural composition (species condition and distribution, leaf area, biomass, etc.), species importance values, diversity indices and relative importance, and functional composition (i.e., pollution removal, human health impacts, carbon sequestration and storage, hydrology effects, tree bio-emissions, avian habitat suitability, and uv-radiation tree effects).

Figure 99. Map displaying the location of trees surveyed at Independence Community Park (Source: BREC GIS)

5.4.2.1 BREC Bioblitz

BREC's annual Bioblitz is an intense period of biological surveying to record all of the living species present within a designated area. Groups of scientists, naturalists, and volunteers conduct an intensive field study over a continuous period, usually 24 hours. BREC hosts a Bioblitz annually, each year at a different park.

While the Bioblitz is meant to engage the public through hands-on exploration and citizen science, it is also used to provide baseline data to BREC on the distribution of species present on BREC property. BREC's NRM division also uses the Bioblitz to focus future field surveys and gather information for our natural resource management plans. During the Bioblitz BREC encourages participants to use iNaturalist or eBird, although paper forms are also accepted. Guided hikes are given, surveys are performed, and demonstrations are given, where participants can engage in citizen science.

5.4.2 BREC's Research Permit Program

BREC encourages the use of its public parks for research as it is vital to helping us protect and manage our natural resources. All research taking place on property owned by BREC requires a permit. No fee is required but permits must be submitted to the NRM division where it will be reviewed. The permit review process takes two weeks or less, where the benefits of the project, both to BREC and the larger scientific community, along with potential negative impacts, both to BREC property and visitors, are all taken into consideration. Submission of an application does not necessarily guarantee that it will be approved. Annual progress reports are required along with copies of reports and publications. If applicable, data is incorporated into BREC's species database. Otherwise, the reports are kept for future reference if necessary.

5.4.3 Citizen Science Data Collection Resources

5.4.3.1 iNaturalist

iNaturalist is a joint venture between the California Academy of Sciences and the National Geographic Society that allows users to record and share species observations using a free mobile app. It is not only an effective tool to connect people to nature, but it generates scientifically valuable biodiversity data that can be used for a variety of purposes including recording your own observations, getting help with identifications, collaborating with others to collect information for a common purpose, such as a Bioblitz, or by observing data collected by other iNaturalist users. Once a species is entered into iNaturalist other users can verify the identification or provide suggestions. Photos can be added to each observation along with the location that it was seen to aid in identification. Data can also be downloaded where it can be used for educational or research purposes. Projects or places can be created within iNaturalist that allow viewers to see observations at specific locations and even during specific timeframes. All of BREC's parks are currently in iNaturalist making it easy to search and filter observations in our parks. BREC's NRM division has used iNaturalist during its annual Bioblitz to observe and track the number of kind of species observed. It has also been used by LSU's School of Renewable Natural Resources, in collaboration with BREC, to track species observations for particular classes.

5.4.3.2 eBird

eBird is a free mobile app that is managed by the Cornell Lab of Ornithology. Users can submit a list of bird species seen at a particular location during a specific timeframe. Data collected through eBird allows users to track bird distribution, abundance, habitat use, and trends. When entering sightings, users are given a list of likely species. When unusual sightings are observed, or abnormal counts are entered, other users are able to review these records and provide feedback. Hotspots are a useful application of eBird in that it allows users to track bird sightings over time at a specific location. It also allows users to find birding locations in their area. Hotspots are typically small, well defined, public birding areas that allow multiple users to enter data into a shared location. Users can suggest a new Hotspot by submitting a new location along with a bird checklist to eBird. BREC currently has several parks that are listed as Hotspots where users can submit new data or find new locations to search for birds.

BREC's NRM division uses eBird to track bird sightings in BREC parks. It is used during the Bioblitz as well as by LSU's RNR classes that collaborate with BREC's NRM division. BREC encourages users to submit data into BREC's Hotspots so that bird sightings in BREC's parks can be tracked more easily.

5.5 Enforcement

Several threats exist that pose significant risk to BREC's natural resources. As discussed previously these include not only habitat degradation, invasive species, and climate change, but anthropogenic threats as well such as vandalism and the misuse of resources. To combat these anthropogenic threats BREC uses a variety of tactics including security, signs, gates, cameras, etc. BREC's Park Rangers are also called upon given the circumstance but are limited in their ability to respond to certain situations, so BREC also relies on a strong relationship with local law enforcement.

BREC's Behavior/Trespassing/Banning Policy was developed to ensure that BREC's recreation and park facilities are safe, welcoming, and provide equitable access to programs and services for all system users. BREC park facilities are considered public property and any actions that do not further the mission, interests, security, safety, and trust of BREC may be considered disruptive and prohibitive. Local authorities are called upon depending on the circumstance, including the City Police or the local Sherriff's Office for illegal activity, or the Louisiana Department of Wildlife and Fisheries for illegal hunting.

While BREC is forced to use the previously mentioned tactics in enforcing the safety, security, and conservation of its parks and natural resources, BREC's NRM division also strives to educate the value of its natural resources to the public. It is well publicized that people with knowledge of the value of natural resources make an effort to conserve those natural resources. Over the 20th century this conservation ethic has expanded, from one in which wildlife was believed to exist primarily for the benefit of humans, to one in which wildlife is viewed as worthy of care and compassion (Manredo et al. 2020). BREC's NRM division educates through a variety of methods including signage, guided hikes, guest lectures, social media, etc. to name a few.

5.5.1 Security

Security provides the first line of defense against the misuse of park resources. Security is provided not only by BREC park rangers, but the local authorities as well. The presence of BREC staff and law enforcement offices discourages the misuse of park resources and is then available to limit the misuse of park resources through enforcement. It should be noted that BREC parks are visited on a rotating basis by BREC Park Rangers and local law enforcement but currently no BREC sites have fully staffed security officers outside of the Baton Rouge Zoo. Other methods of enforcement are therefore necessary to mitigate the misuse of park resources.

5.5.2 Signs

Signs provide a significant strategy to mitigate the misuse of park resources. Signs are typically located at the entrance of parks, on kiosks, at trailheads, and along trails. Signs are used to convey a variety of park regulations and rules to the public about park restrictions. For example, the entrance sign to the Bamboo Loop at Frenchtown Conservation Area contains rules and regulations such as no motorized vehicles, no hunting, no camping or fires, and no collecting (Figure 100). Signs can also be found along the perimeter of park boundaries. For example, no hunting signs are typically placed along the boundaries of parks where illegal hunting has been observed.

Figure 100. Signage at Frenchtown Conservation Area showing rules and regulations. (Source: BREC Staff)

5.5.3 Gates

Gates are another strategy used to mitigate the misuse of park resources. Gates are typically placed at the entrance of locations where misuse has been observed and are used to prevent access. For example, All-Terrain-Vehicles (ATVs) have been observed at several BREC parks including Forest Community Park, Frenchtown Conservation Area, and Hooper Road Park. ATVs are not allowed in BREC parks and often damage trails. For this reason gates have been placed at the entrance of trails where ATV use has been observed (Figure 101).

Figure 101. ATV gate at the entrance to the Poplar Pine Loop at Forest Community Park. (Source: BREC Staff)

5.5.4 Cameras

Cameras are another method used to mitigate the misuse of park resources. Cameras not only provide evidence of the misuse of park resources but are used to discourage the misuse of park resources as well. Cameras are typically placed at locations where misuse has been observed including parking lots, along trails, and even moveable ones in forests. Cameras have not only been used where BREC property has been damaged or stolen, but areas where illegal activity has occurred as well including hunting. Images are often given to the appropriate authorities to aid in any investigation necessary. Cameras are limited in their capacity to prevent illegal activity because they capture incidents happening in the park which is then viewed after the fact by staff. Reaction times are not quick enough for unstaffed facilities to curb the unauthorized activity as it is caught on camera unless it is a security service monitoring and can call the authorities immediately. The best security cameras for conservation areas are those that capture license plates so the authorities are able to follow up with enforcement and track down individuals after events have taken place.

5.6 Volunteers

BREC utilizes volunteers in a variety of ways to fulfill its mission of providing parks and recreational opportunities to the citizens of East Baton Rouge Parish. Volunteers contribute greatly by improving the safety, aesthetics, and natural values of the parish's parks, as well as enriching and expanding recreational programs offered by BREC. The purpose of using volunteers is not only to help BREC, but to provide opportunities for EBR residents to meet like-minded people and learn about BREC's natural resources. Using Volunteers falls in line with BREC's NRM goals of promoting educational activities focused on appreciation and understanding of the natural environment, as well as protecting and restoring historically representative habitats, and managing resources adaptively using innovative approaches.

5.6.1 Green Force

The Green Force Volunteer Program was created to help preserve and protect BREC's natural resources, as well as to provide an outlet for volunteers dedicated to creating healthier and more natural areas within East Baton Rouge Parish. Green Force Volunteers are needed due to the limited staff available in proportion to the amount land managed, as well as the number of programs hosted by BREC's NRM and Conservation divisions. Green Force volunteers are used for program and public outreach, special projects and events, invasive species management, trail construction and maintenance, native plantings, etc. Green Force members are required to attend a full-day training course to enter the program (Figure 102), and a shorter 3-hour recertification course annually to remain in the program. To qualify for the 3-hour recertification course however Green Force members must volunteer for a minimum number of hours per year.

BREC's NRM division has developed a Green Force Manual that is updated annually and provides information on the Green Force, including expectations, perks, volunteer opportunity types, BREC Conservation areas, tools, techniques, etc. The manual also includes contact information, accident and incident forms, and Green Force Volunteer Waivers which must be signed by each new member. The number of Green Force members and the number of Green Force volunteer hours are also tracked, including its monetary value. As can be seen in Table 12 the number of Green Force members has increased steadily since 2017. In addition, the number of volunteer hours and its monetary value has also increased, excluding 2020 due to COVID

Figure 102. 2021 Green Force Training at Manchac Park (Source: BREC staff).

restrictions.

Table 12. Number of Green Force members, volunteer hours, and monetary value by year (2017-2020).

Year	Number of Green Force Members	Green Force Volunteer Hours	Monetary Value
2017	28	224	$5,530.56
2018	52	853.25	$21,698.15
2019	75	2803.9	$76,266.08
2020	107	1636	$46,691.44

5.7 Partnerships and Collaboration

Partnerships and collaboration play an important role in fulfilling BREC's mission to provide a healthier, more vibrant community for East Baton Rouge Parish. BREC's NRM division partners and collaborates with outside organizations for a variety of reasons including research, education, and outreach. Examples include volunteer groups, high school classes, LSU graduate students, and Eagle Scouts.

Due to the size and location of BREC's parks in East Baton Rouge Parish, BREC's NRM division also partners with local entities in making land development strategies and resiliency planning. BREC's parks include some of the remaining intact forests in East Baton Rouge Parish, as well as open grasslands in the parish, and thus provides several ecosystem benefits, such as stormwater retention, that are beneficial to the entire parish.

5.7.1 Planning Partnerships and Collaborations

Natural resource planning can have a significant impact on a community and sometimes planning efforts will need to span multiple agencies and political jurisdictions. To accomplish large-scale goals like resiliency planning across the parish, agencies and partners must work together. The following section investigates potential collaborative planning strategies to address existing issues facing parish residents and partners which could assist in achieving these goals.

5.7.1.1 Resiliency Planning Strategies

In 2019, BREC adapted a Resilience Strategy which provided some introductory insight into how BREC can help to make East Baton Rouge parish more resilient to extreme weather, environmental degradation, and threats to public health. It recognized the important role that parks play in strengthening a city's ability to withstand and rebound after tragic events and outlined how BREC parks already serve this function. However, with additional planning efforts and intentional design and maintenance, BREC can expand these services to the public. The Resiliency Strategy identified 15 System-wide recommendations and Action Items, one of which is to partner with the city-Parish government in the development of a parish-wide or watershed -wide flood risk assessment and identify flood risk reduction projects that rely on BREC facilities to perform stormwater retention and detention. This is the first step to moving towards a more educated and ultimately strategic approach to stormwater management in the parish where the green infrastructure in parks is considered part of the city's stormwater retention foundation. The retention capacity of parks can be increased with innovative design practices, but this development can be costly up front and must be viewed as an essential city system like sewers, storm drains and electricity. It will take cooperation, communication and integration between BREC and city planners to ensure the Parish's plan for Stormwater Management is comprehensive and utilizes the 6,500 acres of park greenspace.

Land use and development can significantly impact a community's ability to rebound from extreme weather events which is why planning, building coding, zoning and development standards are also a crucial component to resiliency planning. Currently, East Baton Rouge Parish does not have a program which requires developers to avoid high flood risk areas, or which protects environmental systems which protect the land from flooding. The focus is more on ensuring the development can withstand the flood to protect life and property and to offset development, opposed to restricting or preventing it. There are also currently no incentives which encourage green infrastructure within developments. There are a variety of ways in which these strategies could be approached, and which BREC could partner with the city, grass-roots organizations, and local business to help foster these initiatives. Below is a non-comprehensive list of potential initiatives that BREC and the City-Parish should consider exploring in the future.

- Incorporate into EBR City-Parish Unified Development Code the importance of protecting undeveloped land to maintain flood storage capacity and ecosystem services.
- Establish Resilience Districts which limit development not only within established flood zones but also in other high-risk areas where undeveloped land provides significant benefit to residents during floods
- Zoning Ordinances which discourage development or redevelopment within flood hazard areas and buffers.
- Zoning ordinances which prohibit development within or filling of wetlands, floodways, and flood plains.
- Planning regulations which require conservation easements, land donations or mitigation banking to offset development impacts.
- Incentive programs which reward green infrastructure development and conservation easements.
- Stormwater Management fee residents pay which funds the planning, design and development of green infrastructure or conservation land purchases in the parish
- Establish a Stormwater Management Committee which includes members from City-Parish DPW, DOTD, Planning Commission, BREC, local organizations, and stakeholders and even planning and community leaders from adjacent parishes.

5.7.1.2 Political Stakeholders

BREC is an entity of the City-Parish but not a division thereof and therefore does not have jurisdiction outside of BREC managed and operated lands or facilities. Partnerships with other agencies and City-Parish divisions is crucial to achieving any of the above-mentioned initiatives. Below is a summary of potential stakeholders and how we may partner with them to better East Baton Rouge Parish.

City- Parish Planning Commission

The Planning Commission is a nine-member board that advises elected officials on growth and development issues for the City of Baton Rouge and Parish of East Baton Rouge. It is the Commission's mission to be a driving force which supports the development and implementation of the comprehensive plan, providing guidance for growth, development, and restoration, while recognizing the importance of maintaining healthy, diversified neighborhoods, encouraging increased access to economic, opportunity, and enhancing the quality of life for all residents of EBR parish. The Planning Commission helps oversee the Unified Development Code, a combination of development regulations including zoning and subdivision regulations, sign and floodplain regulations, historic preservation provisions, and the administrative and hearings procedures required for approvals. BREC currently receives notice of property development near and adjacent to BREC parks to provide comments but there is potential for BREC to serve a more involved role as advisor regarding these land use changes. BREC could also assist in developing a more robust zoning code and/or an incentive program through the commission for conservation easements.

City-Parish Metropolitan Council

The Metropolitan Council is a legislative branch of the City of Baton Rouge and Parish of East Baton Rouge which consists of twelve members elected from single-member districts. The Council acts as a governing authority over City and Parish General Funds, all districts created by the Metropolitan Council, the Greater Baton Rouge Airport District, the EBR Parish Sewerage Control Commission, and the Greater Baton Rouge Parking Authority. They act as official policymakers for all of the above in order to provide for the continued growth of East Baton Rouge Parish through establishment of zoning policy and regulations. BREC could partner with the metro council to ensure there are protections in existing city ordinances restricting development in certain areas and could player a larger advisory role to land development matters overseen by the Council.

City-Parish Mayor-President

The Mayor-President is the Chief Executive Officer of the City of Baton Rouge and Parish of East Baton Rouge. The Mayor-President supervises and directs administration of all departments, offices, and agencies of the government. This position keeps the Metropolitan Council informed of the financial condition of the government, makes recommendations for action, submits the annual budget to the Council and performs other duties as prescribed by the plan of government, ordinances, and resolutions. BREC already works with the Mayor-President to aid in initiatives and this relationship can be expanded as the focus on stormwater management increases.

Baton Rouge Area Chamber (BRAC)

BRAC is an investor-driven organization leading development in the nine-parish Capitol Region. The Chamber leads Economic Development in EBR parish along-side the Mayor-President by assisting existing businesses and recruiting new ones, securing victories for critical public policy reforms, and serving as an instrument of economic progress. BRAC is funded by dedicated Capital Region businesses that choose to invest in the organization.

City-Parish Engineering Division

The Engineering division is located within the Department of Transportation and Drainage and oversees the planning, designing, and constructing of public transportation and drainage improvements. This includes support for construction of capital improvements projects and flood control measures among other responsibilities. BREC already works closely with the City-Parish DPW division and in the future BREC could work with them to collaborate green infrastructure projects that span outside of BREC parks and advise in drainage plans near BREC parks.

Louisiana State Representatives and Senators

Locally elected House of Representatives and Senators make up a portion of the Louisiana State Legislature established by the Louisiana Constitution. Elected officials assist in determining general policy for the state and for the residents of the state through the enactment of laws. They also oversee the actions of the executive in administering state programs. To gain interest for initiatives listed above, it is important to have the support of local political figures to share the message with their constituents and aid with campaigns and gaining federal and state funding for stormwater management projects.

Land Trusts

A land trust is a legal entity that takes ownership of, or authority over, a piece of property at the behest of the property owner for a variety of reasons. Conservation land trusts are tasked with the management of undeveloped land to maintain natural resources, historical sites, and public recreational areas for future generations. The most well-known land trust in the Baton Rouge area is The Nature Conservancy. The Nature Conservancy's mission is to protect the land and water on which all life depends. There are a variety of other land trusts throughout the region, such as the Land Trust for Louisiana and some are designed with a more specific purpose such as restoration after disaster events like Hurricane Katrina. There are opportunities for BREC to partner with local and national land trust organizations in order to steward donated or acquired land to ensure proper management and ultimately preserve ecological functions.

5.7.2 Conservation Outreach/Management

BREC's NRM division collaborates and partners with several local organizations and non-profit groups in order to fulfill its mission to promote recreational and educational activities focusing on appreciation and understanding of the natural environment. Some groups, such as the Baton Rouge Audubon Society, use BREC's parks for research purposes, while others, such as the Louisiana Master Naturalists of Greater Baton Rouge (LMNGBR) use it for educational purposes as well as conservation outreach. Others, such as LSU's Coastal Roots Program, collaborates with local high schools to educate the importance of trees, but also how to grow and plant them. Below is a list of local organizations that collaborate with BREC's NRM division and their use of BREC's parks.

Figure 103. High school students participating in the Coastal Roots Program at Hooper Road Park. (Source: BREC Staff)

Below is a list of local organizations that collaborate with BREC's NRM division and their use of BREC's parks.

Table 13. Local organizations that collaborate with BREC NRM.

Organization	About	Collaboration and Partnership
Baton Roots	Part of the Walls Project, a community development organization located in Baton Rouge	Use of Howell Park as an urban farm to promote and educate best practices in sustainable agriculture
Baton Rouge Audubon Society	Local chapter of the National Audubon Society. Dedicated to protecting birds, wildlife, and their habitat.	Use of Bluebonnet Swamp and Frenchtown Conservation Areas to research Prothonotary Warblers
Baton Rouge Community College (BRCC)	Local community college located in Baton Rouge, LA.	Collaboration with BREC at the Bioblitz.
Boy Scouts of America	Youth program that encourages community service and character development.	Collaboration with BREC NRM to fulfill Eagle Scout Requirements. Examples include construction of educational signs at Forest Park, Howell Park, and North Sherwood Park.
Capital Area Native Plant Society	Local society whose mission is to educate about the importance of native plants in landscaping and other settings.	Collaboration with BREC NRM including pollinator gardens and grow zones.
Girl Scouts of America	Youth program the encourages community service and character development.	Collaboration with BREC on volunteer projects.
Louisiana Amphibian and Reptile Enthusiasts (LARE)	Local organization whose mission is to educate citizens about local reptiles and amphibians.	Collaboration with BREC on the Bioblitz.
Louisiana Conservation Corps (LACC)	Organization that provides at-risk young adults with opportunities for success through job skills training with emphasis on conservation and projects that benefit the community.	Collaboration with BREC NRM in building bridges along nature trails, installing pillar signs, and improving other trail features.

Louisiana Department of Environmental Quality (LDEQ)	Government agency responsible for ensuring the health of Louisiana's ecosystems.	Collaboration with BREC with a storm-water non-point source pollution project.
Louisiana Department of Wildlife and Fisheries (LDWF)	Government agency responsible for managing and protecting Louisiana's natural resources.	Stock fish in BREC ponds including Burbank Park, Perkins Road, etc. for recreational purposes. Also stocking of freshwater carp for management purposes to control unwanted aquatic vegetation growth.
Louisiana Master Naturalists of Greater Baton Rouge (LMNGBR)	Local organization of the Master Naturalist Program which is dedicated to conservation education and service within their communities.	The LMNGBR group has used BREC parks such as Blackwater Conservation Area to educate its members on ecology topics. Have also held volunteer projects to promote conservation in BREC's parks including managing invasive species at Frenchtown Conservation Area.
LSU – Coastal Roots	An educational outreach project for the Louisiana Sea Grant College Program. Part of the LSU School of Education in partnership with the LSU School for Plant, Environmental, and Soil Sciences, and the LSU AgCenter.	Collaboration with local high schools to grow tree seedlings and plant them in BREC parks such as Hooper Road, Blackwater Conservation Area, and Doyle's Bayou.
LSU – School of Renewable Natural Resources (RNR)	A division of the LSU College of Agriculture. Offer a B.S. in Natural Resource Ecology and Management.	Use of BREC parks for educational purposes as well as research.
Louisiana Stormwater Coalition (LSC)	A grass-roots organization focused on reducing litter in waterways around the parish and stormwater management planning	Collaboration with BREC by donating a boom and funding for maintenance in order to reduce litter in a local waterway.

Paddle BR	A local group whose mission is to promote awareness of local waterways.	Collaboration with BREC NRM in collecting trash in local waterways in BREC parks, as well as improve launch access.
Southern University	Public university located in Baton Rouge, LA.	Collaboration with BREC on tree surveys.
The University Lakes Improvement and Preservation Association (TULIPA)	Local organization whose mission is to improve and preserve the University Lakes and surrounding area.	Collaboration with BREC NRM on volunteer events.

6 Conservation Programming and Public Outreach

Conservation programming, outreach and environmental education are the foundation of how the public interacts with BREC's natural resources and advances their experience in nature to the next level. Through programming and events, patrons expand their horizons by visiting parks they have never been to, exploring new trails, learning something new about nature or learning a new recreational skill. For almost 25 years BREC has been the leading conservation programming entity in the parish using Bluebonnet Swamp Nature Center as a hub of activity for hikes, events, summer camps, toddler programs, bird walks and more. In the last 10 years BREC has expanded conservation program offerings to include outdoor adventure activities like kayaking and archery and has expanded hikes and camps to locations outside of Bluebonnet Swamp to offer a wide range of experiences to residents and non-local visitors alike.

Research has shown that children that participate in recreational programs in parks perform better academically, have improved health, and have positive changes in self-perception with reduced stress (Trust for Public Land, 1994). Taken a step further, programs which interpret resources to the public are found to trigger an increased appreciation of the park, make attendees more aware of cultural heritage and environmental issues and concerns and would be more likely to donate to the park they attended the program (Powell, Robert & Stern, et al, 2011). Having facilities and amenities available to guide programs and plan events is crucial to BREC attaining its goal of promoting recreational and educational activities focusing on appreciation and understanding of the natural environment; however, the programs themselves ensure patrons have a safe, educational, and enjoyable experience while deepening their connection with the resource.

Most of BREC's conservation programming is done by CORE or general recreation staff with NRM staff also facilitating public outreach and volunteer programming. Because the focus of this document is Natural Resource Management, BREC's programming goals can be found in a separate document discussed further below.

6.1 Recreation Program Plan

BREC's Recreation Program Plan details the authority, responsibilities, goals, objectives, and structure of the Recreation Department. BREC's Recreation Department's mission is to provide all patrons with the highest level of customer service, facilities, and program opportunities that cultivate positive, meaningful experiences. CORE (Conservation, Outdoor Recreation, and Environmental Education), a section within the Recreation Department, seeks to connect citizens of EBR Parish to their natural resources through educational and experiential programming and services that inspire sustainable usage of our outdoor spaces. At the plan's foundation are CAPRA standards for program and facility planning which ensure what is offered by BREC is well-suited for the community. The plan outlines the nine divisions within the Recreation Department, listed below, and how they collectively can help BREC achieve its programming goals.

1. Athletics
2. Aquatics
3. Community Events
4. Enrichment Programs and Activities
5. CORE
6. Health and Wellness
7. BREC on the Geaux
8. Adaptive Recreation
9. Special Use Facilities

The Recreation Program Plan helps to determine what programs should be offered where in the system, LOS standards for cost recovery and inclusive programming and outlines how a program should be developed. The Action Plan consists of eight main categories of goals directed by BREC Imagine Your Parks II Strategic Plan (IYP2). The Recreation Program Plan can be found online at iam.brec.org.

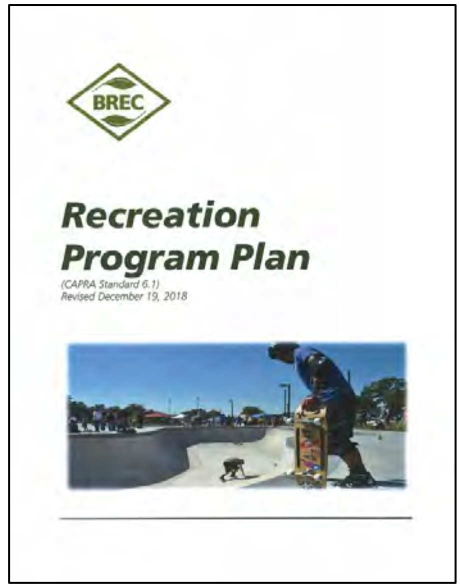


Figure 104. BREC's Recreation Program Plan

6.2 Interpretive Principles

As discussed in Section 5.2.2.6, Interpretive Plan, interpretation of resources is a crucial component to BREC fulfilling its goal of promoting outdoor recreation activities which foster a deeper understanding and appreciation of nature. Although general recreation programming is important for a variety of reasons, the communication and connection that occurs during interpretation can significantly impact a patron's views of natural systems, environmental problems and ultimately BREC parks. Interpretation can range from a very basic level of making the patrons feel more comfortable and safer in a natural environment, to understanding how environmental systems work on a scientific level and ultimately being able to relate to those systems and resources on a personal level. In the end, connections with the resource have been proven to result in positive affective responses which ultimately drive an individual's appreciation for that resource and their conservation ethic (Tilden, 1967). Through this process, BREC is engaging a more informed and conscientious community which supports the protection of resources.

The Interpretive Plan will ultimately guide BREC's efforts in interpretation system-wide and this will include core interpretive principles or themes that will thread throughout all facilities, signage, programs, and events. Below is an un-inclusive list of interpretive principles which are currently used in BREC programs and signage which the foundation could be based.

- BREC parks protect a host of unique and native ecosystems which represent Southern Louisiana ecology.

- Biodiversity is important and should be protected and enhanced to ensure ecosystems are strong and resilient.
- BREC parks work for the residents of EBR Parish by providing ecosystem services which protect homes from floods, keep the air and water clean and reduce urban heat index.
- The history of EBR Parish is closely tied to its ecology and both humans and ecosystems are impacted and respond to each other through time.
- Many historically present habitats in EBR Parish are now rare or threatened due to urbanization and land use changes.
- The residents of EBR Parish can help protect ecosystems and wildlife and reduce or negate existing environmental impacts.
- All living things in BREC parks are connected to natural systems and play an important role in the ecosystem, large or small.

The way that BREC can interpretive these principles both formally through guided programs or informally through passive recreation experiences will be covered more in-depth in both the Recreation Program Plan and Interpretive Plan. The following section will provide a brief overview of current CORE program offerings.

6.3 CORE Programs and Events

6.3.1 Nature Centers

Bluebonnet Swamp Nature Center (BSNC) is currently BREC's only staffed Nature Center and has been providing programs to the parish for over 20 years. BSNC provides the means for people to make meaningful, lasting connections to nature through environmental education and recreation opportunities while also exploring the relationship between people and Bluebonnet Swamp Conservation Area landscapes and how they have and continue to influence each other. Long-term program modification through analysis and development have resulted in diverse and well-attended programs and events. Utilizing the nearly 100-acre Cypress – Tupelo Swamp on the property, BSNC provides all ages a personal experience by either hiking the boardwalks or interacting with live animals in the housed in one of the 2 buildings on site. The primary groups that have participated in BSNC's educational programs have been schools, camps, and other youth groups, but a significant portion of visitation is from area and non-local patrons visiting the site as a tourist destination. Attendance over the past five years has averaged just over 20,000 and has grown steadily for the last four years. The following is summary of the many of the offerings at BSNC.

6.3.1.1 Camps

Summer camps are the foundation of BREC programming across the parish and BSNC hosts a variety of options for children ages 5 to 17 years covering content from basic nature exploration through introduction to recreational and environmental careers. Additionally, seasonal holiday camps coinciding with traditional breaks throughout the school year provide options for exploration of nature's cycles year-round. Summer camps at BSNC are an immersive experience where youth participants have opportunities for learning about BSNC's cultural and natural history while engaging in hands-on activities alongside peers and mentors. Summer camp sessions are weeklong ventures and often include field trips to other nature-based destinations including BREC conservation areas or other locations in and out of the parish. Holiday camps are structured up to 3 days and feature seasonally relevant content.

Figure 105. BREC's Bluebonnet Swamp Summer Camp fills up quickly ever year and often has a waitlist of participants. (Source: BREC Staff)

6.3.1.2 Guided Hikes

Guided hikes are components of several programs including school or other youth group tours, nighttime experiences, and by-request outings for special occurrences. Guided Hikes are either general survey in nature or of a narrower focus to address targeted content, often by request. A significant turnover of part time staff (who often cover group tours) in comparison with request volume and frequency have been a challenge to establishing technical or interpretive content consistency; however, most recently, tour structuring has further taken shape and will progress to incorporate more interpretive delivery techniques with time.

6.3.1.3 Large Events

As BSNC developed in its first decade as one of several sites within the Special Facilities section of the Recreation Department, large events developed to incorporate specialty-themed opportunities for hands-on interaction balanced with extensive recreational opportunities attractive to a general audience – as was the intent of large events at other special interest sites across the parish. The emphasis was on large attendance and site- or program-specific components were found to balance out an entire event to offer diverse opportunities for diverse attendance. These components generally include a trail component, crafts, carnival type games, table vendors, demonstrations/exhibits, and other event-specific features like Rockin' at the Swamp's rock wall, the Haunted Maze at Swamp Haunted Hikes, and Duck Duck Goose Day's jump house (aka "The Duck House"). Live animal encounters are used where appropriate as they are always welcome by event participants.

6.3.1.4 Off-site Outreach

With an expanded educational team, over time, BSNC was able to establish some independent outreach offerings; however, most outreach participation came by invitation to participate in large public events like Louisiana Earth Day, Ocean Commotion, and school science fairs. Otherwise, an off-site encounter structure saw infrequent but successful employment prior to the formation of CORE Conservation's team with an intended mobile, parish-wide jurisdiction.

6.3.1.5 Birthday Parties and Rentals

Due to the demand for specialty birthday and rental experiences, BSNC has options for both. With the opening of the education building, a dedicated programming space outside of the public exhibit building became available for facilitation of birthday parties. This more isolated space created a better landscape to meet the social and educational needs of this type of program while not interfering with general public visitation to the exhibit building. BSNC has long-established rental offerings aligning somewhat with those offered at other BREC special interest facilities. Weddings, receptions, meetings, and other private events are generally scheduled late August through mid-May when not in conflict with routine programming or large event preparation or takedown.

6.3.1.6 Live Animal Encounters and Field Trips

The live animal collection housed at BSNC is one of the most significant attractants on site. Ranging from reptiles to small mammals and at times even birds, the "in-house residents" of BSNC are the means by which some of the most unforgettable visitor moments happen. Facilitating live animal encounters instantly captivates audience members of all ages and allows for a stage from which sensation and experiencing can lead to understanding and appreciation. Live animal encounters play a pivotal role in how staff connect with visitors and are a part of every tour and often impromptu engagement when staff are able.

Group tours range in scope from basic to more comprehensive. The Swamp Exploration Tour includes exhibition viewing and a live animal encounter, leaving the duration and extent of self-guided trail exploration up to the group coordinators. The Swamp Expedition Tour builds on the Exploration Tour with the addition of staff-guidance on the trails. The Swamp Immersion Tour is composed of more intensive staff involvement orchestrating more complex content or activity along with live animal encounters and guided hikes. Community Tours are regularly scheduled opportunities for the public to sign up individually or in small groups to participate in the group-tour experience without having to be a part of a reserved tour group. The frequency of Swamp Community Tour offerings is dependent on time of year and staff availability. At times, the program is limited to once a week or less due to limited staffing. With ideal staffing, the goal is to schedule Swamp Community Tours daily (Tuesday through Sunday).

Figure 106. Live animals at the swamp allow staff to do encounters both on and off site. (Source: BREC Staff)

6.3.1.7 Toddler and Youth programs

Trail Time for Toddlers (TTT) is one of the longest running programs at BSNC. Conceived and launched in the fall of 2000, it serves as a quality introduction to nature and socializing venue highly valued by parents of young participants aged 2 to 5 years. The connections made to nature as well as to the site are often lasting with many TTT "graduates" remaining involved through program participation and volunteerism (including Counselors-in-Training) to eventually join the ranks as employees. This lifelong dedication to the site attests to the creation of stewardship and advocacy through quality programming for all ages. To extend its reach further into the community, BSNC has begun offering English-as-a-Second-Language versions of TTT. Trail Time for Toddlers – Translated sessions have been offered in Mandarin, Spanish, and American Sign Language. Additionally, with a growing homeschool population in and around EBR Parish, Swamp School was developed to provide experiential learning opportunities similar in structure to TTT specifically for homeschool students ages 6-10 years.

6.3.2 CORE Conservation

CORE Conservation promotes and facilitates educational and recreational activities that foster an appreciation, understanding, and sustainable use of the natural environment in EBR Parish. Parish-wide Conservation programming (not affiliated with Bluebonnet Swamp) originated within a separate department in 2013 and has steadily grown since. Now as a part of the Recreation Department, CORE Conservation is tasked with providing conservation programs and events at any location within the parish when it aids in meeting their mission or that of BREC. This can include Conservation Areas, Neighborhood and Community Parks, as well as non-BREC locations, depending on the program objectives, desired audience, and necessary facilities/amenities. Conservation programming at BREC began with the introduction of guided hikes around the parish and has grown to include a popular summer camp, innovative citizen science events and urban nature experiences for the public. The following is an example of some of the programs and events provided by the CORE Conservation team.

6.3.2.1 Summer Camps

Conservation staff created Nature Explorer Summer Camp in 2015 to meet a growing demand for nature-minded enrichment geared toward children ages 7 to 13 years. The launch of Nature Explorers Summer Camp paralleled the expansion of conservation programming within BREC and focusing on Conservation Areas as a whole. Initially headquartered at the Independence Café, in 2021, Nature Explorers Camp officially migrated to the newly christened "Conservation Field Office" at Palomino Drive Park in Central. This move allowed for a base of operations that includes a fishing pond, open spaces for nature exploration, and areas to expand the depth and breadth that CORE Conservation can offer campers. This location also allows for a northerly-centric nature camp option in closer proximity to the Central, Baker, and Zachary areas. 2021 saw the introduction of a Counselor-in-Training program (paralleling a well-established program at BSNC) and the development of a Nature Explorers Holiday Camp to launch in the fall.

6.3.2.2 Guided Hikes

Guided hikes are the major focus for CORE Conservation's public programming because it allows for interpreted, hands-on experiences to aid in connecting people to Conservation Areas, Community Parks, and even other BREC sites. CORE Conservation's flagship program is the Woods Walk Series which prioritize in-depth interpretive hikes covering topics related to Conservation Areas. Night Hikes provide a similar experience with expanded lessons related to nocturnal adaptations of select species. These curated experiences have proven popular to curious hikers who want to know more about BREC's conservation properties during the daytime and at night.

Figure 107. Participants enjoy a guided Woods Walk hike (left) and a Night Hike at Manchac Park led by Conservation Programming staff (right). (Source: BREC Staff)

6.3.2.3 Birds and Beyond Paddling

The Birds and Beyond paddling program is a collaborative between CORE Conservation and the Outdoor Adventure teams with the goal of providing interpretation and birding while paddling the by natural spaces bordering the waterways of EBR Parish. Offered seasonally during migration, CORE Conservation staff lead the bird-centric program to educate patrons about spotting and identifying resident and seasonal birds as well as explaining the benefit of protecting natural waterways of the parish. Currently, we are prioritizing Bayou Fountain at Highland Community Park and intending to expand to other waterways as additional blueway launches come online in the future.

6.3.2.4 Urban Hikes

Introduced in 2020, the Urban Hike program was created to bring nature hikes into more populated areas to encourage new and diverse audiences to explore conservation themes and connect to nature. The goal is to provide shorter outdoor walks while presenting more general nature topics during weekday evenings at Community and Neighborhood Parks to better reach individuals and groups that have been historically underrepresented at other guided hike programs. Through highlighting natural spaces throughout the BREC system, our ultimate goal is to build both conservation stewardship throughout the parish and to expand enthusiasm for conservation advocacy into new communities. As another avenue for expanding the Urban Hike program, CORE Conservation is researching opportunities to offer hikes in conjunction with the Urban Trails and Greenways System to further our reach to new park users with nature-based programming.

6.3.2.5 Large Events

Currently, the CORE Conservation team's largest events are the Geaux Fish Catfish Rodeos. Offered bi-annually, these rodeos allow Conservation staff to highlight BREC's fishing ponds at various locations in the parish. Through providing educational experiences to novice anglers and providing outlets for veteran anglers to test their skills through prize-based competitions, fishing opportunities are available for all skills and ages. Additionally, CORE Conservation and NRM host an annual BioBlitz, a 24-hour event that combines nature-based talks, hikes, and activities in conjunction with surveying and identifying key flora and fauna used to assess natural resources at specific BREC Parks. BioBlitz events engage citizens in the process of

Figure 108. Participants learn about macroinvertebrates at Bioblitz 2021 (left) and Participants at Geaux Fish Catfish Rodeo shows their catch (right). (Source: BREC Staff)

documenting as many species as possible at a site to create a comprehensive inventory of species at that site. This information is key in assessing the current or establishing the future management required to protect and preserve the natural resources of the sites.

6.3.2.6 Outreach

Similar to that of BSNC, CORE Conservation's outreach opportunities include events like Ocean Commotion, Louisiana Earth Day, and many other nature-related events in EBR Parish. With the solidification of the division of labor within CORE, the main public outreach arm for BREC as it pertains to environmental and conservation education will be CORE Conservation's team, leaving BSNC's team to focus on further developing on-site interpretation.

6.3.2.7 Toddler and Youth Programs

Toddler and Youth programming has accelerated as a priority in the spring of 2021 with the introduction of the Nature Pioneers program (at the Palomino Field Office location) focusing on 3- to 6-year-olds and starting them down the path to become Nature Explorers. Each program includes a nature story time, guided outdoor exploration, and nature-based craft. CORE Conservation's next area of program growth is toward expanding youth based educational programming throughout the parish. With plans of hitting both public and private schools as well as homeschool groups, CORE Conservation staff want to make BREC Conservation areas inviting, hands-on venues for connecting classroom science concepts to real world application.

6.3.3 Outdoor Adventure

BREC's Outdoor Adventure (OA) aims to make EBR Parish a better place to live by removing barriers and creating access allowing our citizens greater opportunities to participate in active outdoor experiences. The OA program started initially with a grant intended to support the development and facilitation of introductory paddling programs to residents with the purpose of also providing opportunities for skill progression along varying degrees of increasing difficulty. The Paddle Up program was very successful and resulted in the eventual development of the OA division originally administered under Community Recreation. Expanding beyond paddling programs to a more global scope of outdoor adventure programming, the OA team became a strong force in connecting people to parks through active engagement via opportunities related to camping, archery, and mountain biking. Progressive programming designed to introduce skills and then push toward advanced skill building proved to be an effective way to build a community of OA fans. OA programs have a strong following of patrons in part because they allow participants to try a sport without having to invest in their own equipment and can learn proper techniques utilizing a hands-on format from a skilled instructor. The OA programs attract a community of like-minded participants enabling an atmosphere for socializing while recreating together.

OA manages the Greenwood Boathouse, operating generally during the summer season (and sometimes into the fall) for public boat rentals. Target sport ranges (for archery and air gun shooting) exist within the parish in a few locations but are limited with a significant potential for expansion. Mountain bike trail systems exist currently at two BREC parks with enough sustained interest to warrant investigation of locations in the southern part of the parish at which a third site could feature additional mountain bike trails.

Because of the similarities in skills and facilitation of recreational opportunities pertaining to mountain biking and BMX genres, BREC's Extreme Sports genres (encompassing not only BMX but also skating, scooting, cycling, and disc golf) are managed in tandem with the OA program. There is substantial opportunity to build out both the OA as well as Extreme Sports divisions. Expansion of staff, facilities, and budget resources will be necessary to achieve this in order to realize any potential growth. Below is an example of some of the programs offered by BREC's Outdoor Adventure team.

6.3.3.1 Camps

After hiatus from reorganization amid the pandemic, the OA team brought back a summer camp program showing a strong following due to the attractiveness of the outdoor-centric programming. The camp focuses on sampling OA genres at several venues to give campers an array of experiences enabling them to try out new skills and exposing them to the wide scope of outdoor activities offered by the BREC OA program. Activities include not only paddling, archery, and mountain biking, but also learning about outdoor survival skills and Leave No Trace principles for camping and fishing.

6.3.3.2 Paddling Programs

Paddling programs span from traditional boating activity (canoeing and kayaking) to contemporary water activities such as stand-up paddleboarding. Combining recreational activities and social opportunities has been trending, resulting in such offerings as SUP Yoga and Kayaks & Coffee. These program renditions may or may not last, but the OA teams seek to keep a fresh spin on traditional paddling activities to remain popular on social media. As the OA team advances in knowledge and capabilities, interpretation of area waterways will become a more significant part of program delivery. Additionally, the OA team will take the lead in watershed education initiatives that are currently under development.

Figure 109. BREC patrons on the water during the Pumpkin Paddle Parade (left) and patrons at the Kayak Fishing Workshop (right). (Source: BREC Staff)

6.3.3.3 Archery Programs

BREC currently offers one outdoor archery range that is open to the public; without lighting and a shelter, it is only available for use during daylight hours when the weather is favorable. A mobile archery program is available for deployment; however, limited staff resources have continually thwarted mobile archery program facilitation. This is an area, too, that has a significant potential for build out. Archery is extremely popular right now. An indoor archery range could generate both instruction and rental based revenue without the interference of weather extremes.

6.3.3.4 Camping Programs

Camping program offerings are also challenged by limited staff resources. There is a substantial gap in programming in this area. In the fall, the Great Family Campout offers an overnight camping experience for families and other participants in a large event format. Attended by dozens of patrons, it has proven to be a popular program when not thwarted by inclement weather. More in-depth camping skills-based programming could be offered more extensively with the capability of camping equipment rental. This would require a facility at which camping and other OA gear could be offered for public rental. Rental approval could be offered in conjunction with program attendance to ensure participants are properly instructed and meet certain skill level criteria to demonstrate the proper knowledge of the use of such equipment.


Figure 110. The Great Family Campout provides families a close-to-home camping experience where equipment is provided as needed (left) and activities are planned to keep the entire family engaged (right). (Source: BREC Staff).

6.3.3.5 Mountain Biking

Mountain biking based recreational activities are limited to Comite River and Hooper Road parks where the riding trails are used extensively by both area residents and non-local patrons, many of whom are members of the Baton Rouge Area Mountain Biking Association. BRAMBA members and administrators remain active year-round to aid in the policing and maintenance of these trail systems. Introductory mountain biking programs are offered periodically to aid in sustaining the growth of the mountain biking community. The most significant hindrance to maintaining mountain bike-based recreation is inadequate funding and the lack of qualified, capable staff required for proper trail construction and repair. Continued partnering with BRAMBA will be critical to keep up with periodic inadequate staffing circumstances. Poorly maintained trails lead to potentially extensive erosion and degradation of the areas impacted by continued use without proper fortification or foundation. This becomes problematic with a dependence on the NRM and Park Ops teams to attempt to make repairs in a timely, efficient, and effective manner.

7 Action Plan

The Action Plan is an important component of the Natural Resource Management Plan as it defines what NRM staff needs to do to accomplish goals and how those actions will be measured over time. BREC's Natural Resource Management goals are the driving force behind the Desired Future Conditions, the standards we would like our parks, amenities and planning and management techniques to hold. The figure below relays how BREC NRM goals, Desired Future Conditions, and Indicators of Success relate to one another and drive the Action Plan and corresponding Annual Work Plans. BREC's NRM Action Plan is a component of BREC's larger Level of Service Standards which ensure, as an agency, BREC provides equitable, inclusive recreational opportunities throughout the parish that reflect the resident's needs.

Figure 111. Action Plan Workflow

7.1 Desired Future Conditions

The Desired Future Conditions (DFCs) proposed in Section 5 apply to all parks, facilities and amenities managed for conservation purposes and are the end results that we are ultimately working toward achieving. Each DFC is tied directly to one or more of BREC's NRM goals. The DFCs set a standard of what BREC would like to achieve as an agency in natural resource management to ensure we provide equitable and safe parks, facilities and amenities while protecting resources and managing for high biodiversity and healthy native habitats. The Indicators of Success relate directly to each desired future condition. For example, the DFC related to BREC's first goal of promoting recreational and educational activities is that all facilities and amenities provide equitable opportunities for access to nature (e.g., ADA accessibility, and parks and amenities within a reasonable driving distance.; Table 11).

7.2 Indicators of Success

Indicators of success (IOS) are measurable metrics which allow NRM staff to track progress toward each Desired Future Condition. For example, the IOS associated with BREC's Desired Future Condition of facilities and amenities being safe and accessible, is that BREC provide adequate, accessible, and safe parking areas at CEC facilities and trailheads. These IOS have been used to create the Action Plan Dashboard which drives each year's Annual Work Plan. Not all IOS are directly reflected in each year's Annual Work Plan as some IOS require preliminary metrics to be completed before the progress monitoring of the next IOS can begin. As DFCs are achieved, IOS will also change to reflect that progress. It is important that conditions be monitored regularly to assess status and update the annual work plan each year. There are a total of 39 indicators of success and 50 corresponding monitoring metrics.

Goal 1. Promote recreational and educational activities focusing on appreciation and understanding of the natural environment.

Desired Future Condition: Facilities and amenities provide equitable opportunities for access to nature which is defined by:

- **Distance**: Variety of opportunities within reasonable driving distance
- **Barrier Free:** Welcoming, inclusive, and free of physical barriers (ADA accessibility to provide equivalent experience)
- **Facility and Amenity Maintenance**: Well-maintained and managed to facilitate recreation
- **Facility and Amenity Design:** Safe and accessible with appropriate signage and are attractive, inclusive, and flexible
- **Connectivity and Walkability:** Some opportunities with bus, bike, or pedestrian access
- **Affordability:** Residents have equal opportunity to visit or participate regardless of the ability to pay
- **Capital Investment:** Capital investment is distributed evenly on a per capita bases both parish-wide and within neighborhoods or districts.
- **Inequities:** Capital investment is prioritized in historically disinvested communities
- **Needs Assessments:** Needs assessments are conducted regularly to identify residents' needs and facilities and amenities provided reflect these needs

Indicators of Success for Conservation Amenities and Conservation Education Centers (CEC)
Facilities and amenities are well-maintained.
BREC provides ADA accessible which provide equivalent experience.
Safe visiting experience.
Amenities and furnishings assist to maintain recreational access 75% of the year.

Hiking opportunity, CEC, and fishing pond within 10-minute drive of most residents of East Baton Rouge Parish
Amenities provide opportunities for educational programming such as outdoor classrooms, breakout spaces, etc. and in a variety of habitats.
Interpretive signage is used to interpret the resource and educate patrons on how to properly care for their parks and nature.
Access to facilities is affordable and basic amenities are free and open to the public during reasonable hours.
Community needs are evaluated regularly, and facilities and amenities provided reflect these needs.

Goal 2. Protect and restore unique, healthy, and historically representative habitats.
Goal 3. Preserve biodiversity and reduce the loss of native species.

Desired Future Condition: Unique, healthy, and historically representative habitats preserved in the system; protected from development, misuse, and outside pressures.

Indicators of Success
Protect habitats and biodiversity as Conservation Areas, Nature Reserves, Conservation Management Units and Sensitive Habitat Zones.
BREC managed land is surveyed and important conservation features such as Natural Communities, management units, survey plots, wetland, etc. are mapped in GIS.
Rare, Threatened Species or Species of Greatest Conservation Need and Communities in BREC parks are surveyed and mapped.
Acquire properties to serve as buffers or which contain desirable natural communities.
Misuse and public degradation instances are low and those that do occur do not degrade the ecological, recreational, or cultural resource values.

Desired Future Condition: Manage habitats to be high functioning, healthy systems that support and foster native biodiversity.

Indicators of Success
Enhance existing habitats through native planting or seeding.
Exotic plant species are controlled through removal or treatment.
Exotic animal species are controlled through education and partnerships, so they do not impact the ecological integrity of the habitat.
BREC properties which contain conservation land have management plans or biodiversity assessments.
Parks are surveyed by scientists and staff using the following surveys: biodiversity assessment, REAP, tree, invasive species and others as needed.
Volunteers assist with habitat management projects.
Prescribed burns are used as a management prescription to increase habitat health and diversity.
Species are documented in BREC parks to be monitored over time.

Goal 4. Conserve, restore and expand ecosystem services for the benefit of residents.

Desired Future Condition: Provide parks which benefit the public through enhanced infrastructure which increases or preserves the park's ability to retain stormwater, decrease urban heat index, sequester carbon, and improve air quality.

Indicators of Success
The Resiliency and Restoration Management Plan is used to guide green infrastructure and sustainable design practices, erosion control and native planting restoration techniques.
Ecosystem services for each BREC park or managed property is calculated using the Natural Capital Rubric.
BREC's stormwater coefficient average decreases across the agency.
Green infrastructure is incorporated into park planning projects to increase stormwater management capacity of BREC parks.
Canopy coverage, % of impervious surfaces, # undeveloped acres of BREC parks is measured and monitored to be used in ecosystem service calculations.
Trails and ponds contain erosion control measures and best management practices which protect the recreational resource for the enjoyment of patrons.

Goal 5. Manage resources adaptively using innovative approaches.

Desired Future Condition: Have the necessary resources to proactively manage conservation land and amenities.

Indicators of Success
Adequate number of staff to successfully manage conservation land, facilities, and amenities.
Staff hours worked on specific goals and projects is tracked.
Green Force Volunteer Program is fostered and expanded to assist in management and maintenance goals and to assist with programming and outreach.
A percentage of management and construction projects are aided by outside partners and funding.

Desired Future Condition: Utilize the most up to date technology to efficiently and accurately map and monitor resources and management strategies.

Indicators of Success
BREC GIS Geodatabase is used to map and track management techniques, survey data and trails, signage, and amenities.
Apps and online software which crowd-source citizen science data are utilized to collect and monitor data.

Desired Future Condition: Management Plans and Strategies are monitored and evaluated to ensure the most effective, innovative are utilized.

Indicators of Success
Management Plans are reviewed annually, updated as necessary and align with CAPRA standards

Management techniques are evaluated, and new strategies developed as needed
Enhanced restoration management areas are surveyed for plant success
Green infrastructure installations are monitored quarterly and maintained as needed
Staff receive continuing education to learn most innovative approaches

7.3 Action Plan Dashboard

The following dashboard provides a quick glace of the indicators of success listed as monitoring protocols with corresponding target metrics. As stated above, not all the IOS listed can be achieved immediately and require a progressive approach. The anticipated timeline provided lists what year it is anticipated that the monitoring protocol be started. Each IOS has the potential to be monitored differently and therefore each one contains the frequency of when the target will be assessed and reported on. The data source provides an idea of what format the data will be in and where it will be pulled from such as BREC's GIS Geodatabase or BREC's Masterworks Project management software.

Table 14. Action Plan Dashboard

NRM Goal	Desired Future Condition	Performance Indicators (measurable metrics)	Target	Timeframe	Frequency of Monitoring and Reporting	Data Source
1. Promote Activities	**Facilities and amenities provide equitable opportunities for access to nature**	1. Percentage of primitive hiking and nature trails maintained annually.	100%	Short term (0-5 years)	Annually	BREC GIS Trail Layer
		2. Percentage of ponds stocked annually for population maintenance	30%	Short term (0-5 years)	Annually	BREC GIS
		3. Percentage of primitive hiking and nature trails that are ADA compliant and provide an equivalent experience to other trails in the system.	TBD	Long term (5-10 years)	3 years	BREC GIS
		4. Percentage of nature centers or stations which are ADA accessible or provide areas which are ADA accessible that provide equivalent experience for users.	100%	Long term (5-10 years)	5 years	BREC GIS & ADA Transition Plan
		5. Percentage of fishing ponds which provide ADA accessible fishing opportunities	50%	Long-term (5-10 years)	3 years	BREC GIS
		6. Percentage of trails with amenities that help maintain accessibility 75% of the year.	100%	Short term (0-5 years)	Annually	BREC GIS
		7. Acceptable percentage of resident of EBR parish without hiking opportunity within 10-minute drive.	10%	Short term (0-5 years)	Annually	BREC GIS
		8. Acceptable percentage of population without a BREC fishing pond within 10-minute drive	10%	Short term (0-5 years)	3 years	BREC GIS

		9. Acceptable percentage of the population that does not have a nature center within 10-minute drive	20%	Long term (5-10 years)	3 years	BREC GIS
		10. Percentage of conservation related parks/facilities which contain interpretive signage	75%	Short term (0-5 years)	Annually	BREC GIS
		11. Percentage of trails with complete directional signage compliant with signage standards	100%	Short term (0-5 years)	Annually	BREC GIS
		12. Percentage of conservation related parks/amenities which contain amenities that provide opportunities for educational programming	75%	Short term (0-5 years)	Annually	BREC GIS
		13. Percentage of parks/facilities available to residents free of charge	75%	Short term (0-5 years)	Annually	Annual Report
2/3. Protect and Restore Habitats/Preserve Biodiversity	**Unique, healthy, and historically representative habitats preserved in the system; protected from development, misuse, and outside pressures**	14. Number of acres protected as conservation areas and nature reserves.	N/A	Short term (0-5 years)	Annually	BREC GIS
		15. Number of acres protected as conservation management units and sensitive habitat zones.	N/A	Short term (0-5 yeas)	Annually	BREC GIS
		16. Percentage of BREC acres surveyed, and natural communities mapped in GIS	100%	Short term (0-5 years)	Annually	BREC GIS
		17. Percentage of BREC parks with mapped and/or delineated wetlands	100%	Long term (5-10 years)	3 years	BREC GIS
		18. Number of Rare, Threatened Species or Species of Greatest Conservation Need observed and mapped in BREC parks.	Annual increase	Short term (0-5 years)	Annually	BREC GIS
		19. Number of Rare, Threated Natural Communities are observed and mapped in BREC parks	Annual increase	Short term (0-5 years)	Annually	BREC GIS
		20. Number of acres identified for potential acquisition to serve as buffers, or which contain desirable natural communities	N/A	Long term (5-10 years)	3 years	BREC GIS
		21. Number of incidents of misuse/public degradation issues which impact the resource throughout the year	0	Short term (0-5 years)	Annually	Park Ranger Reports
		22. Acres enhanced through native planting and seeding	Annual increase	Short term (0-5 years)	Annually	BREC GIS

	Manage habitats to be high functioning, healthy systems that support and foster native biodiversity.	23. Acres of exotic plant species, listed as target species, removed, or treated annually	N/A	Short term (0-5 years)	Annually	Invasive Species Management Table
		24. Allowable percentage of parks with uncontrolled exotic target animal species which impact the ecological integrity of the habitat	5%	Long term (5-10 years)	Annually	BREC GIS Invasive Species Survey
		25. Percentage of BREC managed properties with management plans or biodiversity assessments	100%	Long term (5-10 years)	Annually	Management Plans
		26. Acres surveyed for baseline conditions (biodiversity assessment, reap, tree, invasive species)	Annual increase	Short term (0-5 years)	Annually	BREC GIS
		27. Acres burned	100% of target acreage	Short term (0-5 years)	Annually	BREC GIS
		28. Number of unique species documented in BREC parks	Annual increase	Short term (0-5 years)	Annually	BREC GIS
		29. Number of habitat restoration project man hours completed by volunteers	Annual increase	Short term (0-5 years)	Annually	Good Samaritan Software
4. Ecosystem Services	**Provide parks which benefit the public through enhanced infrastructure which increases or preserves the park's ability to retain stormwater, decrease urban heat index, sequester carbon, and improve air quality.**	30. Complete Resiliency and Restoration Management Plan	Completed Plan	Short term (0-5 years)	Annually	Plan
		31. Percentage of parks with calculated ecosystem services	100%	Long term (5-10 years)	Annually	BREC GIS
		32. Percent decrease of stormwater coefficient average across agency	Annual decrease	Long term (5-10 years)	3 years	BREC GIS
		33. Number of parks with green infrastructure	Annual increase	Short term (0-5 years)	Annually	BREC GIS
		34. Acres of grow zones and low mow zones managed annually	Annual increase	Short term (0-5 years)	Annually	BREC GIS
		35. Percentage of trails with erosion control measures	100%	Short term (0-5 years)	Annually	BREC GIS
		36. Percentage of ponds with erosion control measures	100%	Short term (0-5 years)	Annually	BREC GIS
5. Manage resource adaptively	**Have the necessary resources to proactively manage conservation land and amenities.**	37. Acres of land managed per staff member	250 acres/staff	Short term (0-5 years)	Annually	Annual Report
		38. % of hours staff worked on specific goals/projects is tracked	100%	Short term (0-5 years)	Annually	Masterworks Project Management

		39. Number of active members of the Green Force Volunteer Program	Annual increase	Short term (0-5 years)	Annually	Good Samaritan Software
		40. Number of volunteer hours for management, programming, and outreach related projects	Annual increase	Short term (0-5 years)	Annually	Good Samaritan Software
		41. Percentage of projects aided by outside partners	25%	Short term (0-5 years)	Annually	Annual Report
		42. Percentage of projects which received funding from outside sources.	15%	Short term (0-5 years)	Annually	Masterworks Project Management
	Utilize the most up to date technology to efficiently and accurately map and monitor resources and management strategies.	43. Percentage of annual inventory surveys conducted in GIS	100%	Short term (0-5 years)	Annually	BREC GIS
		44. Percentage of trails and amenities mapped in GIS	100%	Short term (0-5 years)	Annually	BREC GIS
		45. Number of species tracked in BREC parks with iNaturalist and eBird	Annual increase	Short term (0-5 years)	Annually	iNaturalist/eBird
	Management Plans and Strategies are monitored and evaluated to ensure the most effective, innovative are utilized.	46. Percentage of Management Plans reviewed annually and updated as necessary	100%	Long term (5-10 years)	Annually	Annual Report
		47. Percentage of growth success in planted/seeded species		Long term (5-10 years)	Annually	BREC GIS
		48. Percentage of green infrastructure monitored quarterly.	100%	Short term (0-5 years)	Annually	Annual Report
		49. Percentage of management strategies that were not successful and require reevaluation	10% maximum	Short term (0-5 years)	Annually	Annual Report
		50. Number of continuing education hours received annual per staff member.	5 minimum	Short term (0-5 years)	Annually	NeoGov

7.4 Annual Work Plans and Reporting Procedures

Annual work plans are how NRM staff will interact with the above listed desired future conditions and indicators of success on a day-to-day basis to achieve goals and monitor progress. The Action Plan Dashboard will drive each year's annual goals to ensure the appropriate metrics are reported and status provided per the monitoring schedule listed in the table. Half-way through the year a mid-year report will be generated with status updates from the first and second quarters to ensure progress corresponds with goals and metrics are being tracked appropriately.

Monitoring procedures will vary depending on the data source. As most things will be tracked using BREC's GIS Geodatabase, that data will be displayed either as maps or tables pulled directly from the system. Additionally, BREC has several other software systems which assist with budgeting, project tracking and managing the volunteer program. Data derived from these systems will be in the form of a report driven directly from the system or the raw data will be used to write the Annual Report using external tables or text to display the data.

The below Annual Work Plan ensures metrics are not forgotten for fundamental projects completed throughout the year but is not an all-inclusive list of the metrics that will be reported in the Annual Report, the full list of which will be reflected in the annual goals.

Table 15. Annual Work Plan

Tasks	Data Tracked							
Trail Maintenance	Staff hours	Volunteer hours	Miles maintained					
Construction Projects	Staff hours	Volunteer hours	Date Completed	Funding Source	Cost	Partners	CCD/NRM/ Contractor	Park
Invasive Species Management	Staff hours	Volunteer hours	Acres managed	Funding Source	Cost	Partners	Park	
Biodiversity Reports	Staff hours	Park	Completion Status	Acres assessed				
Management Plans	Staff hours	Park	Completion Status	Acres assessed				
Planting/Seeding Projects	Staff hours	Volunteer hours	Park	Acres seeded/ planted	Number of plants/ lbs. of seeds	Number of species	% success	
Invasive Species Surveys	Staff hours	Volunteer hours	Park	Acres surveyed	% species coverage estimated			
Tree Surveys	Staff hours	Volunteer hours	Park	Acres surveyed	Number of trees	Number of species	iTree report generated	Completion Status

References

Anderson, B. S., Phillips, B. M., Voorhees, J. P., Siegler, K., & Tjeerdema, R. (2016). Bioswales reduce contaminants associated with toxicity in urban storm water. *Environmental Toxicology and Chemistry*, *35*(12), 3124–3134. https://doi.org/10.1002/etc.3472

Asare, E., Hoshide, A. K., Drummond, F. A., Criner, G. K., & Chen, X. (2017). Economic risk of bee pollination in Maine Wild Blueberry, *Vaccinium angustifolium*. *Journal of Economic Entomology*, *110*(5), 1980–1992. https://doi.org/10.1093/jee/tox191

Balseviciene, B., Sinkariova, L., Grazuleviciene, R., Andrusaityte, S., Uzdanaviciute, I., Dedele, A., & Nieuwenhuijsen, M. (2014). Impact of residential greenness on preschool children's emotional and behavioral problems. *International Journal of Environmental Research and Public Health*, *11*(7), 6757–6770. https://doi.org/10.3390/ijerph110706757

Bedford, B. L. (1996). The need to define hydrologic equivalence at the landscape scale for freshwater wetland mitigation. *Ecological Applications*, *6*(1), 57–68. https://doi.org/10.2307/2269552

Berg, M. P., Kiers, E. T., Driessen, G., van der Heijden, M., Kooi, B. W., Kuenen, F., Liefting, M., Verhoef, H. A., & Ellers, J. (2010). Adapt or disperse: Understanding species persistence in a changing world. *Global Change Biology*, *16*(2), 587–598. https://doi.org/10.1111/j.1365-2486.2009.02014.x

Berman, M. G., Kross, E., Krpan, K. M., Askren, M. K., Burson, A., Deldin, P. J., Kaplan, S., Sherdell, L., Gotlib, I. H., & Jonides, J. (2012). Interacting with nature improves cognition and affect for individuals with depression. *Journal of Affective Disorders*, *140*(3), 300–305. https://doi.org/10.1016/j.jad.2012.03.012

Bratman, G. N., Daily, G. C., Levy, B. J., & Gross, J. J. (2015). The benefits of nature experience: Improved affect and cognition. *Landscape and Urban Planning*, *138*, 41–50. https://doi.org/10.1016/j.landurbplan.2015.02.005

Brochu, L., & Merriman, T. (2015). *Personal interpretation: Connecting your audience to heritage resources*. InterpPress.

Brower, L., Taylor, O. R., Williams, E. H., Slayback, D., Zubieta, R. R., & Ramirez, M. I. (2012). Decline of monarch butterflies overwintering in mexico- is the migratory phenomenon at risk? Insect Conservation and Diversity (2012) 5, 95–100. https://doi.org/10.1111/j.1752-4598.2011.00142.x

Brown, K. M., & Daniel, W. M. (2014). The population ecology of the Threatened Inflated Heelsplitter, *Potamilus inflatus*, in the Amite River, Louisiana. *The American Midland Naturalist*, *171*(2), 328–339. https://doi.org/10.1674/0003-0031-171.2.328

Brusca, R.C., Brusca, G.J. 2002. Invertebrates. Second Edition. Sinauer Associates, Sunderland.

Chapin III, F. S., Zavaleta, E. S., Eviner, V. T., Naylor, R. L., Vitousek, P. M., Reynolds, H. L., Hooper, D. U., Lavorel, S., Sala, O. E., Hobbie, S. E., Mack, M. C., & Díaz, S. (2000). Consequences of changing biodiversity. *Nature*, *405*(6783), 234–242. https://doi.org/10.1038/35012241

Cicea, C. & Marinescu, C. (2011). Green spaces and public health in urban areas. Theoretical and Empirical Researches in Urban Management. 6. 83-92.

Cloyed, C. S., Hieb, E. E., Collins, M. K., DaCosta, K. P., & Carmichael, R. H. (2019). Linking use of ship channels by west Indian manatees (*Trichechus manatus*) to seasonal migration and habitat use. *Frontiers in Marine Science*, *6*. https://doi.org/10.3389/fmars.2019.00318

Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., & van den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Nature*, *387*(6630), 253–260. https://doi.org/10.1038/387253a0

Daigle, J. J., Griffith, G.E., Omernik, J. M., Faulkner, P. L., McCulloh, R. P., Handley, L. R., Smith, L. M., and Chapman, S. S. (2006). Ecoregions of Louisiana. United States Geological Survey.

Dahl, T.E. (1990). Wetlands – Losses in the United States, 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 13 pp.

Dance, R. E., Griffis, B. J., Nutt, B. B., White, A. G., Lytle, S. A., and Seaholm, J. E. (1968). Soil Survey of East Baton Rouge Parish, Louisiana. United States Department of Agriculture.

Dauphine, N., Cooper, R. J. (2009). Impacts of free-ranging domestic cats (*Felis catus*) on birds in the United States: A review of recent research with conservation and management recommendations. *Proceedings of the Fourth International Partners in Flight Conference: Tundra to Tropics* 205-219.

Davidson, A. D., Shoemaker, K. T., Weinstein, B., Costa, G. C., Brooks, T. M., Ceballos, G., Radeloff, V. C., Rondinini, C., & Graham, C. H. (2017). Geography of current and future global mammal extinction risk. *PLOS One*, *12*(11). https://doi.org/10.1371/journal.pone.0186934

Derouard, L., Tondoh, J., Vilcosqui, L., & Lavelle, P. (1997). Effects of earthworm introduction on soil processes and plant growth. *Soil Biology and Biochemistry*, *29*(3-4), 541–545. https://doi.org/10.1016/s0038-0717(96)00035-1

Díaz, S., Fargione, J., Chapin, F. S., & Tilman, D. (2006). Biodiversity loss threatens human well-being. *PLOS Biology*, *4*(8). https://doi.org/10.1371/journal.pbio.0040277

Douglas, N. H., Jordan, R. J. (2002) “Louisiana’s Inland Fishes: A Quarter Century of Change,” Southeastern Fishes Council Proceedings: No. 43.

Díaz, S., Fargione, J., Chapin, F. S., & Tilman, D. (2006). Biodiversity loss threatens human well-being. *PLoS Biology*, *4*(8). https://doi.org/10.1371/journal.pbio.0040277

Dudgeon, D., Arthington, A. H., Gessner, M. O., Kawabata, Z., Knowler, D. J., Lévêque, C., Naiman, R. J., Prieur-Richard, A. H., Soto, D., Stiassny, M. L., & Sullivan, C. A. (2006). Freshwater biodiversity: importance, threats, status and conservation challenges. *Biological reviews of the Cambridge Philosophical Society*, 81(2), 163–182. https://doi.org/10.1017/S1464793105006950

Dundee, H. A., & Rossman, D. A. 1989. The Amphibians and Reptiles of Louisiana. Louisiana University Press.

Dunn, A. M., Torchin, M. E., Hatcher, M. J., Kotanen, P. M., Blumenthal, D. M., Byers, J. E., Coon, C. A., Frankel, V. M., Holt, R. D., Hufbauer, R. A., Kanarek, A. R., Schierenbeck, K. A., Wolfe, L. M. & Perkins, S. E. (2012). Indirect effects of parasites in invasions. *Function Ecology*. (26) 1262-1274. https://doi.org/10.1111/j.1365-2435.2012.02041.x

Ekka, S. A., Rujner, H., Leonhardt, G., Blecken, G.-T., Viklander, M., & Hunt, W. F. (2021). Next generation swale design for stormwater runoff treatment: A comprehensive approach. *Journal of Environmental Management*, *279*, 111756. https://doi.org/10.1016/j.jenvman.2020.111756

Evers, D. C., Burgess, N. M., Champoux, L., Hoskins, B., Major, A., Goodale, W. M., Taylor, R. J., Poppenga, R., & Daigle, T. (2005). Patterns and interpretation of mercury exposure in freshwater avian communities in Northeastern North America. *Ecotoxicology*, *14*(1-2), 193–221. https://doi.org/10.1007/s10646-004-6269-7

Fitzpatrick, J. W., & Rodewald, A. D. (2016). Bird Conservation. in I. J., Lovette & Cornell University (3rd Eds.), *The Cornell Lab of Orrnithology Handbook of Bird Biology* (pp. 559 – 640). Wiley.

Ford, H., Garbutt, A., Ladd, C., Malarkey, J., & Skov, M. W. (2016). Soil stabilization linked to plant diversity and environmental context in coastal wetlands. *Journal of Vegetation Science*, *27*(2), 259–268. https://doi.org/10.1111/jvs.12367

Frankson, R., Kunkel, K., & Champion, S. (2017). Louisiana State Climate Summary. NOAA Technical Report NESDIS 149-LA, March 2019 Revision, 4 pp.

Gianopulos, K. (2014). Coefficient of Conservatism Database Development for Wetland Plants Occurring in the Southeast United States. North Carolina Dept. of Environment & Natural Resources, Division of Water Resources: Wetlands Branch. Report to the EPA, Region 4.

Gibbons, R., Breedlove, R., & Lyon, C. (2013). A Birder's Guide to Louisiana. American Birding Association.

Heinrich, P. V. (2008). Loess Map of Louisiana. Public Information Series No. 12. Louisiana State University.

Heisler, G. M., & Brazel, A. J. (2010). The Urban Physical Environment: Temperature and Urban Heat Islands. In Aitkenhead-Peterson and A. Volder, eds. *Urban Ecosystem Ecology (Agronomy Monograph)*. Soil Science Society of America, Madison, WI. 29-56.

Helfman, G. S., Collette, B .B. Facey, D. E., & Bowen, B. W. (2009). *The diversity of fishes* (2nd edition). Wiley-Blackwell.

Hernandez-Santana, V., Zhou, X., Helmers, M. J., Asbjornsen, H., Kolka, R., & Tomer, M. (2013). Native Prairie filter strips reduce runoff from hillslopes under annual row-crop systems in Iowa, USA. *Journal of Hydrology*, *477*, 94–103. https://doi.org/10.1016/j.jhydrol.2012.11.013

Hoffmann, H., Platzer, C., von Münch, E., Winker, M. (2011). Technology review of constructed wetlands - Subsurface flow constructed wetlands for greywater and domestic wastewater treatment. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Eschborn, Germany

Hood, D. R., Patrick, D. M., & Corcoran, M. K. (2007). Fluvial instability and channel degradation of Amite River and its tributaries, Southwest Mississippi and Southeast Louisiana. U.S. Corps of Engineers. ERCD/GSL TR-07-26.

Hooper, D. U., Chapin, F. S., III, Ewel, J. J., Hector, A., Inchausti, P., Lavorel, S., Lawton, J. H., Lodge, D.M., Loreau, M., Naeem, S., Schmid, B., Setälä, H., Symstad, A.J., Vandermeer, J. and Wardle, D.A. (2005), Effects of biodiversity on ecosystem functioning: a consensus of current knowledge. Ecological Monographs, 75: 3-35. https://doi.org/10.1890/04-0922

IPBES (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Brondizio, E. S., Settele, J., Díaz, S., & Ngo, H., T. (editors). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673

Isaacs, R., Tuell, J., Fiedler, A., Gardiner, M., & Landis, D. (2009). Maximizing arthropod-mediated ecosystem services in agricultural landscapes: The role of native plants. *Frontiers in Ecology and the Environment*, *7*(4), 196–203. https://doi.org/10.1890/080035

Jones, C. G., Lawton, J. H., & Shachak, M. (1994). Organisms as ecosystem engineers. *Ecosystem Management*, 130–147. https://doi.org/10.1007/978-1-4612-4018-1_14

Kaller M., Collier, B., Achberger, E., & Barry, O. (2016). Detection of feral hog impacts to water quality and wildlife. A report submitted to the Louisiana Department of Wildlife and Fisheries.

Klein, A.-M., Vaissière, B. E., Cane, J. H., Steffan-Dewenter, I., Cunningham, S. A., Kremen, C., & Tscharntke, T. (2006). Importance of pollinators in changing landscapes for world crops. *Proceedings of the Royal Society B: Biological Sciences*, *274*(1608), 303–313. https://doi.org/10.1098/rspb.2006.3721

Koenig, W. D. (2016). Ecology of Bird Populations. In I. J. Lovette & Cornell University (3rd edition) *The Cornell Lab of Ornithology Handbook of Bird Biology* (pp. 537 – 578). Wiley.

Kremen, C., Williams, N. M., Aizen, M. A., Gemmill-Herren, B., LeBuhn, G., Minckley, R., Packer, L., Potts, S. G., Roulston, T., Steffan-Dewenter, I., Vázquez, D. P., Winfree, R., Adams, L., Crone, E. E., Greenleaf, S. S., Keitt, T. H., Klein, A.-M., Regetz, J., & Ricketts, T. H. (2007). Pollination and other ecosystem services produced by mobile organisms: A conceptual framework for the effects of land-use change. *Ecology Letters*, *10*(4), 299–314. https://doi.org/10.1111/j.1461-0248.2007.01018.x

Kuo, F. E., & Sullivan, W. C. (2001). Environment and crime in the inner city. *Environment and Behavior*, *33*(3), 343–367. https://doi.org/10.1177/0013916501333002

Laws, E. A. (2018). *Aquatic pollution: An introductory text*. Wiley.

National Audubon Society. (2018, July 5). *Birds*. Audubon Louisiana. https://la.audubon.org/LaBirds.

Louisiana Natural Heritage Program (2009). The Natural Communities of Louisiana. Louisiana Department of Wildlife and Fisheries.

Lovett, G. M., Tear, T. H., Evers, D. C., Findlay, S. E. G., Cosby, B. J., Dunscomb, J. K., Driscoll, C. T., & Weathers, K. C. (2009). Effects of air pollution on ecosystems and biological diversity in the Eastern United States. *Annals of the New York Academy of Sciences*, *1162*(1), 99–135. https://doi.org/10.1111/j.1749-6632.2009.04153.x

Lowery, G. H. Jr. (1974). The mammals of Louisiana and its adjacent waters. Louisiana University Press.

Lucas, M. C., & Baras, E. 2001. Migration of Freshwater Fishes. Oxford, UK: Blackwater Science. 412 p.

Lundgren, R., Totland, Ø., & Lázaro, A. (2016). Experimental simulation of pollinator decline causes community-wide reductions in seedling diversity and abundance. *Ecology*, *97*(6), 1420–1430. https://doi.org/10.1890/15-0787.1

MacDonald, P. O., Frayer, W. E., Clauser, J. K., Forsythe, S. W., & U.S. Fish and Wildlife Service. (1979). *Documentation, chronology, and future projections of bottomland hardwood habitat loss in the lower Mississippi Alluvial Plain.* Washington, D.C.: Ecological Services, Fish and Wildlife Service, U.S. Dept. of the Interior.

Mack, R. N., Simberloff, D., Lonsdale, M. W., Evans, H., Clout, M., & Bazzaz, F. A. (2000). Biotic invasions: Causes, epidemiology, global consequences, and control. *Ecological Applications*, *10*(3), 689–710. https://doi.org/10.1890/1051-0761(2000)010[0689:bicegc]2.0.co;2

Manfredo, M. J., Teel, T. L., Don Carlos, A. W., Sullivan, L., Bright, A. D., Dietsch, A. M., Bruskotter, J., & Fulton, D. (2020). The changing sociocultural context of wildlife conservation. *Conservation Biology*. 34(6), 1549–1559. https://doi.org/10.1111/cobi.13493

Marks, C. (2018). Butterflies of Louisiana: a guide to identification and location. Louisiana State University Press.

Marks, R., Pauline, R., Rewa, C., Anderson-Cruz, J., Weir, L., Herringoton, B., Jenkins, C., Peterson, C., Babb, R. (2006). Amphibians and Reptiles. Fish and Wildlife Habitat Management Leaflet. No. 35.

McCulloh, R. P. (2001). Active faults in East Baton Rouge Parish. U.S. Geological Survey. June 2001 Public Information Series No. 8.

Meffe, G.K., & Carroll, C.R. (Eds.) (1997). Principles of Conservation Biology (2nd ed). Sunderland, Massachusetts: Sinauer Associates Inc.

Mehta, S. V., Haight, R. G., Homans, F. R., Polasky, S., & Venette, R. C. (2007). Optimal detection and control strategies for invasive species management. *Ecological Economics*, *61*(2-3), 237–245. https://doi.org/10.1016/j.ecolecon.2006.10.024

Meyer, R. R., &Turcan Jr. A. N. (1955). Geology and Groundwater resources of the Baton Rouge Louisiana Area. Geological Survey Water Supply Paper 1296. United States Department of Interior. https://doi.org/10.3133/wsp1296

Mitsch, W. J., & Gosselink, J. G. (2000). Wetlands (3rd edition). Wiley.

Mota, M., Sousa, R., Araújo, J., Braga, C., & Antunes, C. (2014). Ecology and conservation of freshwater fish: Time to act for a more effective management. *Ecology of Freshwater Fish*, *23*(2), 111–113. https://doi.org/10.1111/eff.12113

National Research Council. 2007. Status of Pollinators in North America. Washington, DC: The National Academies Press. https://doi.org/10.17226/11761.

Niemi, G. J., & McDonald, M. E. (2004). Application of ecological indicators. *Annual Review of Ecology, Evolution, and Systematics.* 35(1), 89-111. https://doi.org/10.1146/annurev.ecolsys.35.112202.130132

Nowak, D. J. (2000). The interactions between urban forests and global climate change. In Abdollahi, K., Ning, Z. H., & Appearing, A. (Eds). *Global climate change and the urban forest*. GCRCC and Franklin Press, pp. 31–44.

Nowak, D. J., & Crane, D. E. (2002). Carbon storage and sequestration by urban trees in the USA. *Environmental Pollution*, *116*(3), 381–389. https://doi.org/10.1016/s0269-7491(01)00214-7

Nowak, D. J., Crane, D. E., & Stevens, J. C. (2006). Air pollution removal by urban trees and shrubs in the United States. *Urban Forestry & Urban Greening*, *4*(3-4), 115–123. https://doi.org/10.1016/j.ufug.2006.01.007

Nowak, D. J., & Heisler, G. M. (2010). Improving air quality with trees and parks. Research Series Monograph. Ashburn, VA: National Recreation and Parks Association Research Series Monograph. 44p.

Nutsford, D., Pearson, A. L., & Kingham, S. (2013). An ecological study investigating the association between access to urban green space and mental health. *Public Health*. 127 (11): 1005-1011.

Olaya-Arenas, P., Scharf, M. E., Kaplan, I., & Lewis, O. (2020). Do pollinators prefer pesticide-free plants? an experimental test with monarchs and milkweeds. *The Journal of Applied Ecology*, 57(10), 2019-2030.

Parmesan, C., & Yohe, G. (2003). A globally coherent fingerprint of climate change impacts across natural systems. *Nature*. 421: 37-42. https://doi.org/10.1038/nature01286

Pimentel, D., Lach, L., Zuniga, R., & Morrison, D. (2000). Environmental and economic costs of nonindigenous species in the United States. *Bioscience*. 50(1):53–66. https://doi.org/10.1641/0006-3568(2000)050[0053:EAECON]2.3.CO;2

Pimentel, D., Wilson, C., McCullum, C., Huang, R., Dwen, P., Flack, J., Tran, Q., Saltman, T., & Cliff, B. (1997). Economic and environmental benefits of biodiversity. *BioScience*, *47*(11), 747–757. https://doi.org/10.2307/1313097

Polis, G. A., & Strong, D. R. 1996. Food web complexity and community dynamics. *American Naturalist*. 147, 813-846. https://doi.org/10.1086/285880.

Powell, R., Stern, M., & Cook, C. (2011). The benefits of live interpretive programs to Great Smoky Mountains National Park. *Park Science*. 27. 56-60.

Prather, C. M., Pelini, S. L., Laws, A., Rivest, E., Woltz, M., Bloch, C. P., Del Toro, I., Ho, C.-K., Kominoski, J., Newbold, T. A., Parsons, S., & Joern, A. (2012). Invertebrates, ecosystem services and climate change. *Biological Reviews*, *88*(2), 327–348. https://doi.org/10.1111/brv.12002

Pretty, J., Peacock, J. Sellens, M., & Griffin, M. (2005). The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research.* 15(5), 319-337. https://doi.org/10.1080/09603120500155963

Roemer, G. W., Gompper, M. E., & Van Valkenburgh, B. (2009). The ecological role of the mammalian mesocarnivore. *BioScience*, *59*(2), 165–173. https://doi.org/10.1525/bio.2009.59.2.9

Rustad, L., Campbell, J., Dukes, J. S., Huntington, T., Lambert, K. F., Mohan, J., & Rodenhouse, N. (2012). Changing climate, changing forests: The impacts of climate change on forests of the northeastern United States and eastern Canada. Gen. Tech. Rep. NRS-99. U.S. Department of Agriculture, Forest Service, Northern Research Station. 48 p. https://doi.org/10.2737/NRS-GTR-99.

Sallis, J. F., Spoon, C., Cavill, N., Engelberg, J. K., Gebel, K., Parker, M., Thornton, C. M., Lou, D., Wilson, A. L., Cutter, C. L., & Ding, D. (2015). Co-benefits of designing communities for active living: An exploration of literature. *International Journal of Behavioral Nutrition and Physical Activity*, *12*(1). https://doi.org/10.1186/s12966-015-0188-2

Schipper, J., Chanson, J. S., Chiozza, F., Cox, N. A., Hoffmann, M., Katariya, V., Lamoreux, J., Rodrigues, A. S., Stuart, S. N., Temple, H. J., Baillie, J., Boitani, L., Lacher, T. E., Jr, Mittermeier, R. A., Smith, A. T., Absolon, D., Aguiar, J. M., Amori, G., Bakkour, N., Baldi, R., … Young, B. E. (2008). The status of the world's land and marine mammals: diversity, threat, and knowledge. *Science*. 322(5899), 225–230. https://doi.org/10.1126/science.1165115

Simberloff, D., & Rejmánek, M. (2011). Encyclopedia of Biological Invasions (1st edition). University of California Press. 203–209. http://www.jstor.org/stable/10.1525/j.ctt1pnxn0.

Smith, L. (1999). Historic vegetation types of the Florida Parishes. Louisiana Natural Heritage Program. Louisiana Department of Wildlife and Fisheries.

The Trust For Public Land (1995). Healing America's cities: how urban parks can make cities safe and healthy. *Children's Environments*, 12(1), 65–70. www.jstor.org/stable/41514966. Accessed 3 Aug. 2021.

Thomas, C. D., & Lennon, J. J. (1999). Birds extend their ranges northwards. *Nature*, *399*(6733), 213–213. https://doi.org/10.1038/20335

Tilden, F. (1967). Interpreting Our Heritage. Rev. ed. Chapel Hill, NC: University of North Carolina Press.

Trani, M. K., Ford, W. M., & Chapman, B. R. (2007). The Land Managers Guide to Mammals of the South. United States Department of Agriculture Forest Service and The Nature Conservancy.

United States Army Corp of Engineers (2010). Ecosystem Restoration Report and Environment Assessment: Comite River at Hooper Road, East Baton Rouge Parish, Louisiana.

United States Environmental Protection Agency (2006). Air quality criteria for ozone and related photochemical oxidants. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-05/004aF-cF, 2006.EPA 600/R-05/004aF.

United States Environmental Protection Agency (2013). Level III ecoregions of the continental United States: Corvallis, Oregon. U.S. EPA – National Health and Environmental Effects Research Laboratory.

United States Environmental Protection Agency (2016). What Climate Change Means for Louisiana. EPA 430-F-16-020.

Wagner, D. L., & Van Driesche, R. G. (2010). Threats posed to rare or endangered insects by invasions of nonnative species. *Annual Review of Entomology*, *55*(1), 547–568. https://doi.org/10.1146/annurev-ento-112408-085516

Wallace, J. B., & Webster, J. R. (1996). The role of Macroinvertebrates in Stream ecosystem function. *Annual Review of Entomology*, *41*(1), 115–139. https://doi.org/10.1146/annurev.en.41.010196.000555

Weindorf, D. (2008). Louisiana Soil Classification. LSU AgCenter.

Wilcove, D. S., Rothstein, D., Bubow, J., Phillips, A., & Losos, E. (1998). Quantifying threats to imperiled species in the United States. *Bioscience*. (48) 8, 607–615.

Williams, S. E., Shoo, L. P., Isaac, J. L., Hoffmann, A. A., & Langham, G. (2008). Towards an integrated framework for assessing the vulnerability of species to climate change. *PLOS Biology*, *6*(12). https://doi.org/10.1371/journal.pbio.0060325

Wilson, J. W. (2003). Manatees in Louisiana. Louisiana Conservationist. Louisiana Sea Grant.

Wilson, D. E., & Ridder, D. M. (2005). Mammal species of the world. A taxonomic and geographic reference (3rd ed.). John Hopkins University Press.

Wolf, K. L. (2016). Nature's riches: the health and financial benefits of nearby Nature. University of Washington and The Nature Conservancy.

Xiao, Q., McPherson, E., Zhang, Q., Ge, X., & Dahlgren, R. (2017). Performance of two bioswales on urban runoff management. *Infrastructures*. *2*(4), 12. https://doi.org/10.3390/infrastructures2040012

Zarnetske, P. L., Skelly, D. K., & Urban, M. C. (2012). Biotic multipliers of climate change. *Science*, *336*(6088), 1516–1518. https://doi.org/10.1126/science.1222732

Appendix 1: Native Species List

Name	Common name	Rank	ICON Taxa Name
Actinopterygii (fish)			
Ameiurus natalis	Yellow Bullhead	species	Actinopterygii
Ammocrypta beanii	Naked Sand Darter	species	Actinopterygii
Aphredoderus sayanus	Pirate Perch	species	Actinopterygii
Carassius auratus	Goldfish	species	Actinopterygii
Cyprinella venusta	Western Blacktail Shiner	species	Actinopterygii
Cyprinus carpio	European Carp	species	Actinopterygii
Dorosoma cepedianum	American Gizzard Shad	species	Actinopterygii
Fundulus chrysotus	golden topminnow	species	Actinopterygii
Fundulus notatus	Blackstripe Topminnow	species	Actinopterygii
Fundulus olivaceus	blackspotted topminnow	species	Actinopterygii
Gambusia affinis	Western Mosquitofish	species	Actinopterygii
Heterandria formosa	Least Killifish	species	Actinopterygii
Labidesthes sicculus	Brook Silverside	species	Actinopterygii
Lepisosteus oculatus	Spotted Gar	species	Actinopterygii
Lepomis cyanellus	Green Sunfish	species	Actinopterygii
Lepomis gulosus	Warmouth	species	Actinopterygii
Lepomis macrochirus	Bluegill	species	Actinopterygii
Lepomis macrochirus — microlophus	Bluegill — Redear Sunfish	hybrid	Actinopterygii
Lepomis marginatus	Dollar Sunfish	species	Actinopterygii
Lepomis microlophus	Redear Sunfish	species	Actinopterygii
Micropterus punctulatus	Spotted Bass	species	Actinopterygii
Micropterus salmoides	Largemouth Bass	species	Actinopterygii
Notemigonus crysoleucas	Golden Shiner	species	Actinopterygii
Notropis longirostris	Longnose Shiner	species	Actinopterygii
Notropis texanus	Weed Shiner	species	Actinopterygii
Percina nigrofasciata	Blackbanded darter	species	Actinopterygii
Poecilia latipinna	Sailfin Molly	species	Actinopterygii
Amphibia (amphibians)			
Acris blanchardi	Blanchard's Cricket Frog	species	Amphibia
Acris crepitans	Northern Cricket Frog	species	Amphibia
Acris gryllus	Southern Cricket Frog	species	Amphibia
Ambystoma opacum	Marbled Salamander	species	Amphibia
Ambystoma talpoideum	Mole Salamander	species	Amphibia
Ambystoma texanum	Small-mouthed Salamander	species	Amphibia
Amphiuma tridactylum	Three-toed Amphiuma	species	Amphibia
Anaxyrus fowleri	Fowler's Toad	species	Amphibia
Eleutherodactylus campi	Rio Grande Chirping Frog	species	Amphibia
Eurycea guttolineata	Three-lined Salamander	species	Amphibia
Eurycea paludicola	Western Dwarf Salamander	species	Amphibia
Gastrophryne carolinensis	Eastern Narrow-mouthed Toad	species	Amphibia
Hyla avivoca	Bird-voiced Tree Frog	species	Amphibia
Hyla chrysoscelis	Cope's Gray Tree Frog	species	Amphibia
Hyla cinerea	Green Tree Frog	species	Amphibia
Hyla squirella	Squirrel Tree Frog	species	Amphibia
Incilius nebulifer	Gulf Coast Toad	species	Amphibia
Lithobates catesbeianus	American Bullfrog	species	Amphibia
Lithobates clamitans	Green Frog	species	Amphibia
Lithobates sphenocephalus	Southern Leopard Frog	species	Amphibia
Macrochelys temminckii	Alligator Snapping Turtle	species	Amphibia
Notophthalmus viridescens	Eastern Newt	species	Amphibia
Plethodon mississippi	Mississippi Slimy Salamander	species	Amphibia
Pseudacris crucifer	Spring Peeper	species	Amphibia
Pseudacris fouquettei	Cajun Chorus Frog	species	Amphibia
Scaphiopus holbrookii	Eastern Spadefoot	species	Amphibia
Siren intermedia	Lesser Siren	species	Amphibia
Other Animalia			
Abacion		genus	Other Animalia
Armadillidium vulgare	Common Pill Woodlouse	species	Other Animalia
Auturus louisianus		species	Other Animalia
Caecidotea	American Waterslaters	genus	Other Animalia
Creaserinus fodiens	Digger Crayfish	species	Other Animalia
Daphnia	Water-fleas	genus	Other Animalia
Eleutherodactylus planirostris	Greenhouse Frog	species	Other Animalia
Entomobryidae	Slender Springtails	family	Other Animalia
Haemopidae		family	Other Animalia
Hemiscolopendra marginata	Eastern Bark Centipede	species	Other Animalia

Lacunicambarus ludovicianus	Painted Devil Crayfish	species	Other Animalia
Ligidium	Rock Slaters	genus	Other Animalia
Narceus americanus	American Giant Millipede Complex	complex	Other Animalia
Pachydesmus		genus	Other Animalia
Palaemon paludosus	Eastern Grass Shrimp	species	Other Animalia
Parajulidae	Parajulid millipedes	family	Other Animalia
Pectinatella magnifica	Magnificent Bryozoan	species	Other Animalia
Placobdella parasitica	Smooth Turtle Leech	species	Other Animalia
Polydesmus		genus	Other Animalia
Porcellionides virgatus	Oak Woodlouse	species	Other Animalia
Procambarus clarkii	Red Swamp Crayfish	species	Other Animalia
Procambarus vioscai	Pinelands Creek Crayfish	species	Other Animalia
Scolopocryptops		genus	Other Animalia
Arachnida (spiders, ticks, mites, etc.)			
Acalitus ferrugineum		species	Arachnida
Aceria campestricola		species	Arachnida
Aceria caryae		species	Arachnida
Aceria parulmi	Elm Finger Gall Mite	species	Arachnida
Aceria theospyri	persimmon leaf blister gall	species	Arachnida
Aculops rhois	Poison Ivy Leaf Mite	species	Arachnida
Aculus tetanothrix	Willow Bead Gall Mite	species	Arachnida
Agelenidae	Funnel Weavers	family	Arachnida
Amblyomma maculatum	Gulf Coast Tick	species	Arachnida
Anasaitis canosa	Twin-flagged Jumping Spider	species	Arachnida
Argiope aurantia	Yellow Garden Spider	species	Arachnida
Argyrodes	Dewdrop Spiders	genus	Arachnida
Castianeira amoena	Orange Ant-mimic Sac Spider	species	Arachnida
Castianeira trilineata		species	Arachnida
Cheiracanthium mildei	Northern Yellow Sac Spider	species	Arachnida
Colonus sylvanus	Sylvan Jumping Spider	species	Arachnida
Cyclosa caroli		species	Arachnida
Dermacentor variabilis	American Dog Tick	species	Arachnida
Dictynidae	Meshweavers	family	Arachnida
Dolomedes albineus	White-banded Fishing Spider	species	Arachnida
Dolomedes scriptus	Striped Fishing Spider	species	Arachnida
Dolomedes tenebrosus	Dark Fishing Spider	species	Arachnida
Dolomedes triton	Six-spotted Fishing Spider	species	Arachnida
Eriophora ravilla	Tropical Orbweaver	species	Arachnida
Eris militaris	Bronze Jumping Spider	species	Arachnida
Eumesosoma roeweri		species	Arachnida
Eustala anastera	Humpbacked Orbweaver	species	Arachnida
Florinda coccinea	Black-tailed Red Sheetweaver	species	Arachnida
Frontinella pyramitela	Bowl-and-doily Spider	species	Arachnida
Gasteracantha cancriformis	Spinybacked Orbweaver	species	Arachnida
Gladicosa gulosa	Drumming Sword Wolf Spider	species	Arachnida
Hamataliwa grisea	Bark Lynx Spider	species	Arachnida
Hentzia mitrata	White-jawed Jumping Spider	species	Arachnida
Hentzia palmarum	Common Hentz Jumping Spider	species	Arachnida
Hibana gracilis	garden ghost spider	species	Arachnida
Hogna		genus	Arachnida
Holocnemus pluchei	Marbled Cellar Spider	species	Arachnida
Ixodes scapularis	Eastern Black-legged Tick	species	Arachnida
Kukulcania hibernalis	Southern House Spider	species	Arachnida
Latrodectus geometricus	Brown Widow	species	Arachnida
Latrodectus mactans	Southern Black Widow	species	Arachnida
Leiobunum flavum		species	Arachnida
Leiobunum vittatum	Eastern Harvestman	species	Arachnida
Leucauge argyrobapta	Mabel Orchard Orbweaver	species	Arachnida
Leucauge venusta	Orchard Orbweaver	species	Arachnida
Loxosceles	Recluse Spiders	genus	Arachnida
Lyssomanes viridis	Magnolia Green Jumping Spider	species	Arachnida
Mangora placida	Tuft-legged Orbweaver	species	Arachnida
Mecynogea lemniscata	Basilica Orbweaver	species	Arachnida
Menemerus bivittatus	Gray Wall Jumping Spider	species	Arachnida
Metaltella simoni	South American Toothed Hacklemesh Weaver	species	Arachnida
Micrathena gracilis	Spined Micrathena	species	Arachnida
Micrathena sagittata	Arrow-shaped Orbweaver	species	Arachnida
Misumenoides formosipes	white-banded crab spider	species	Arachnida

Misumessus		genus	Arachnida
Neoscona arabesca	Arabesque Orbweaver	species	Arachnida
Neoscona domiciliorum	Red-femured Spotted Orbweaver	species	Arachnida
Parasteatoda tepidariorum	Common House Spider	species	Arachnida
Pardosa delicatula		species	Arachnida
Phidippus audax	Bold Jumping Spider	species	Arachnida
Phidippus putnami	Putnam's Jumping Spider	species	Arachnida
Philodromus marxi	Metallic Crab Spider	species	Arachnida
Pholcus phalangioides	Long-bodied Cellar Spider	species	Arachnida
Phylloneta pictipes		species	Arachnida
Pisaurina dubia		species	Arachnida
Platycryptus undatus	Tan Jumping Spider	species	Arachnida
Plexippus paykulli	Pantropical Jumping Spider	species	Arachnida
Pseudoscorpiones	Pseudoscorpions	order	Arachnida
Rabidosa rabida	Rabid Wolf Spider	species	Arachnida
Schizocosa	Brush-legged Spiders	genus	Arachnida
Steatoda triangulosa	Triangulate Combfoot	species	Arachnida
Tetragnatha		genus	Arachnida
Theridion frondeum	Eastern Long-legged Cobweaver	species	Arachnida
Tidarren		genus	Arachnida
Tigrosa annexa		species	Arachnida
Tigrosa georgicola		species	Arachnida
Tigrosa helluo	Wetland Giant Wolf Spider	species	Arachnida
Tmarus		genus	Arachnida
Trachelidae	Trachelid Spiders	family	Arachnida
Trichonephila clavipes	Golden Silk Spider	species	Arachnida
Trochosa		genus	Arachnida
Uloborus glomosus	Featherlegged Orbweaver	species	Arachnida
Ummidia		genus	Arachnida
Verrucosa arenata	Arrowhead Orbweaver	species	Arachnida
Vonones sayi		species	Arachnida
Wagneriana tauricornis		species	Arachnida
Wulfila		genus	Arachnida
Xysticus	Ground Crab Spiders	genus	Arachnida
Zygoballus rufipes	Hammer-jawed Jumping Spider	species	Arachnida
Aves (birds)			
Accipiter cooperii	Cooper's Hawk	species	Aves
Agelaius phoeniceus	Red-winged Blackbird	species	Aves
Aix sponsa	Wood Duck	species	Aves
Amazilia yucatanensis	Buff-bellied Hummingbird	species	Aves
Anas platyrhynchos		species	Aves
Anas platyrhynchos — Cairina moschata	Mallard — Muscovy Duck	hybrid	Aves
Anhinga anhinga	Anhinga	species	Aves
Anser albifrons	Greater White-fronted Goose	species	Aves
Anser anser	Greylag Goose	species	Aves
Anser cygnoides	Swan Goose	species	Aves
Antigone rubicunda	Brolga	species	Aves
Antrostomus vociferus	Eastern Whip-poor-will	species	Aves
Archilochus alexandri	Black-chinned Hummingbird	species	Aves
Archilochus colubris	Ruby-throated Hummingbird	species	Aves
Ardea alba	Great Egret	species	Aves
Ardea herodias	Great Blue Heron	species	Aves
Baeolophus bicolor	Tufted Titmouse	species	Aves
Baorangia bicolor	two-colored bolete	species	Aves
Battus philenor	Pipevine Swallowtail	species	Aves
Bombycilla cedrorum	Cedar Waxwing	species	Aves
Branta canadensis	Canada Goose	species	Aves
Bubo virginianus	Great Horned Owl	species	Aves
Bubulcus ibis		species	Aves
Bucephala clangula		species	Aves
Buteo jamaicensis	Red-tailed Hawk	species	Aves
Buteo lineatus	Red-shouldered Hawk	species	Aves
Buteo platypterus	Broad-winged Hawk	species	Aves
Butorides virescens	Green Heron	species	Aves
Cairina moschata	Muscovy Duck	species	Aves
Calcarius lapponicus	Lapland Longspur	species	Aves
Calidris alpina	Dunlin	species	Aves
Calidris minutilla	Least Sandpiper	species	Aves

Calidris subruficollis	Buff-breasted Sandpiper	species	Aves
Cardinalis cardinalis	Northern Cardinal	species	Aves
Cathartes aura	Turkey Vulture	species	Aves
Catharus guttatus	Hermit Thrush	species	Aves
Catharus minimus	Gray-cheeked Thrush	species	Aves
Catharus ustulatus	Swainson's Thrush	species	Aves
Chaetura pelagica	Chimney Swift	species	Aves
Charadrius vociferus	Killdeer	species	Aves
Cistothorus palustris	Marsh Wren	species	Aves
Cistothorus platensis	Sedge Wren	species	Aves
Coccyzus americanus	Yellow-billed Cuckoo	species	Aves
Colaptes auratus	Northern Flicker	species	Aves
Columba livia	Rock Pigeon	species	Aves
Contopus cooperi	Olive-sided Flycatcher	species	Aves
Contopus virens	Eastern Wood-Pewee	species	Aves
Coragyps atratus	Black Vulture	species	Aves
Corvus brachyrhynchos	American Crow	species	Aves
Corvus ossifragus	Fish Crow	species	Aves
Cyanocitta cristata	Blue Jay	species	Aves
Dendrocygna autumnalis	Black-bellied Whistling-Duck	species	Aves
Dryobates pubescens	Downy Woodpecker	species	Aves
Dryobates villosus	Hairy Woodpecker	species	Aves
Dryocopus pileatus	Pileated Woodpecker	species	Aves
Dumetella carolinensis	Gray Catbird	species	Aves
Egretta thula	Snowy Egret	species	Aves
Egretta tricolor	Tricolored Heron	species	Aves
Elanoides forficatus	Swallow-tailed Kite	species	Aves
Empidonax virescens	Acadian Flycatcher	species	Aves
Eudocimus albus	White Ibis	species	Aves
Euphagus carolinus	Rusty Blackbird	species	Aves
Falco columbarius	Merlin	species	Aves
Falco sparverius	American Kestrel	species	Aves
Fregata magnificens	Magnificent Frigatebird	species	Aves
Fulica americana	American Coot	species	Aves
Gallinago delicata	Wilson's Snipe	species	Aves
Gallus gallus	Red Junglefowl	species	Aves
Geothlypis formosa	Kentucky Warbler	species	Aves
Geothlypis trichas	Common Yellowthroat	species	Aves
Haemorhous mexicanus	House Finch	species	Aves
Haemorhous purpureus	Purple Finch	species	Aves
Haliaeetus leucocephalus	Bald Eagle	species	Aves
Helmitheros vermivorum	Worm-eating Warbler	species	Aves
Hirundo rustica	Barn Swallow	species	Aves
Hylocichla mustelina	Wood Thrush	species	Aves
Icteria virens	Yellow-breasted Chat	species	Aves
Icterus galbula	Baltimore Oriole	species	Aves
Icterus spurius	Orchard Oriole	species	Aves
Ictinia mississippiensis	Mississippi Kite	species	Aves
Lanius ludovicianus	Loggerhead Shrike	species	Aves
Larus delawarensis	Ring-billed Gull	species	Aves
Leiothlypis celata	Orange-crowned Warbler	species	Aves
Leiothlypis peregrina	Tennessee Warbler	species	Aves
Limnodromus scolopaceus	Long-billed Dowitcher	species	Aves
Limnothlypis swainsonii	Swainson's Warbler	species	Aves
Mareca strepera	Gadwall	species	Aves
Megaceryle alcyon	Belted Kingfisher	species	Aves
Megascops asio	Eastern Screech-Owl	species	Aves
Melanerpes carolinus	Red-bellied Woodpecker	species	Aves
Melanerpes erythrocephalus	Red-headed Woodpecker	species	Aves
Meleagris gallopavo	Wild Turkey	species	Aves
Melospiza georgiana	Swamp Sparrow	species	Aves
Mimus polyglottos	Northern Mockingbird	species	Aves
Mniotilta varia	Black-and-white Warbler	species	Aves
Molothrus ater	Brown-headed Cowbird	species	Aves
Myiarchus crinitus	Great Crested Flycatcher	species	Aves
Nyctanassa violacea	Yellow-crowned Night-Heron	species	Aves
Nycticorax nycticorax		species	Aves
Papilio cresphontes	Eastern Giant Swallowtail	species	Aves

Papilio glaucus	Eastern Tiger Swallowtail	species	Aves
Papilio palamedes	Palamedes Swallowtail	species	Aves
Papilio polyxenes	Black Swallowtail	species	Aves
Papilio troilus	Spicebush Swallowtail	species	Aves
Parkesia motacilla	Louisiana Waterthrush	species	Aves
Parkesia noveboracensis	Northern Waterthrush	species	Aves
Passer domesticus	House Sparrow	species	Aves
Passerculus sandwichensis	Savannah Sparrow	species	Aves
Passerella iliaca	Fox Sparrow	species	Aves
Passerina caerulea	Blue Grosbeak	species	Aves
Passerina ciris	Painted Bunting	species	Aves
Passerina cyanea	Indigo Bunting	species	Aves
Pavo cristatus	Indian Peafowl	species	Aves
Pelecanus erythrorhynchos	American White Pelican	species	Aves
Pelecanus occidentalis	Brown Pelican	species	Aves
Phalacrocorax auritus	Double-crested Cormorant	species	Aves
Phalacrocorax brasilianus	Neotropic Cormorant	species	Aves
Pheucticus ludovicianus	Rose-breasted Grosbeak	species	Aves
Pipilo erythrophthalmus	Eastern Towhee	species	Aves
Piranga rubra	Summer Tanager	species	Aves
Pluvialis dominica	American Golden-Plover	species	Aves
Podilymbus podiceps	Pied-billed Grebe	species	Aves
Poecile carolinensis	Carolina Chickadee	species	Aves
Polioptila caerulea	Blue-gray Gnatcatcher	species	Aves
Pooecetes gramineus	Vesper Sparrow	species	Aves
Porzana carolina	Sora	species	Aves
Progne subis	Purple Martin	species	Aves
Protonotaria citrea	Prothonotary Warbler	species	Aves
Pyrocephalus rubinus	Vermilion Flycatcher	species	Aves
Quiscalus quiscula	Common Grackle	species	Aves
Regulus calendula	Ruby-crowned Kinglet	species	Aves
Sayornis phoebe	Eastern Phoebe	species	Aves
Scolopax minor	American Woodcock	species	Aves
Seiurus aurocapilla	Ovenbird	species	Aves
Selasphorus rufus	Rufous Hummingbird	species	Aves
Setophaga americana	Northern Parula	species	Aves
Setophaga cerulea	Cerulean Warbler	species	Aves
Setophaga citrina	Hooded Warbler	species	Aves
Setophaga coronata	Yellow-rumped Warbler	species	Aves
Setophaga dominica	Yellow-throated Warbler	species	Aves
Setophaga fusca	Blackburnian Warbler	species	Aves
Setophaga magnolia	Magnolia Warbler	species	Aves
Setophaga petechia	Yellow Warbler	species	Aves
Setophaga pinus	Pine Warbler	species	Aves
Setophaga ruticilla	American Redstart	species	Aves
Setophaga virens	Black-throated Green Warbler	species	Aves
Sialia sialis	Eastern Bluebird	species	Aves
Sitta pusilla	Brown-headed Nuthatch	species	Aves
Spatula clypeata	Northern Shoveler	species	Aves
Sphyrapicus varius	Yellow-bellied Sapsucker	species	Aves
Spinus pinus	Pine Siskin	species	Aves
Spinus tristis	American Goldfinch	species	Aves
Streptopelia decaocto	Eurasian Collared-Dove	species	Aves
Strix varia	Barred Owl	species	Aves
Sturnella magna	Eastern Meadowlark	species	Aves
Sturnus vulgaris	European Starling	species	Aves
Tachycineta bicolor	Tree Swallow	species	Aves
Thryothorus ludovicianus	Carolina Wren	species	Aves
Toxostoma rufum	Brown Thrasher	species	Aves
Tringa melanoleuca	Greater Yellowlegs	species	Aves
Tringa solitaria	Solitary Sandpiper	species	Aves
Troglodytes aedon	House Wren	species	Aves
Turdus migratorius	American Robin	species	Aves
Tyrannus tyrannus	Eastern Kingbird	species	Aves
Vireo griseus	White-eyed Vireo	species	Aves
Vireo olivaceus	Red-eyed Vireo	species	Aves
Vireo philadelphicus	Philadelphia Vireo	species	Aves
Vireo solitarius	Blue-headed Vireo	species	Aves

Zenaida macroura	Mourning Dove	species	Aves
Zonotrichia albicollis	White-throated Sparrow	species	Aves
Bacteria			
Nostoc commune	Star Jelly	species	Bacteria
Fungi (mushrooms)			
Abortiporus biennis	Blushing Rosette	species	Fungi
Agaricus campestris	Meadow Mushroom	species	Fungi
Agrocybe putaminum	Mulch Fieldcap	species	Fungi
Amanita abrupta	American Abrupt-Bulbed Lepidella	species	Fungi
Amanita albocreata	Ringless Panther	species	Fungi
Amanita arkansana	Arkansas Slender Caesar	species	Fungi
Amanita bisporigera	Eastern North American Destroying Angel	species	Fungi
Amanita cylindrispora	Narrowest-Spored Limbed Lepidella	species	Fungi
Amanita farinosa	American Floury Amanita	species	Fungi
Amanita flavoconia	Yellow Patches	species	Fungi
Amanita fulva	Tawny Grisette	species	Fungi
Amanita jacksonii	Jackson's slender Caesar	species	Fungi
Amanita ocreata	Western Destroying Angel	species	Fungi
Amanita onusta	Gunpowder Amanita	species	Fungi
Amanita roseotincta	Rose-Tinted Amanita	species	Fungi
Amanita vaginata	grisette	species	Fungi
Annulohypoxylon thouarsianum	Cramp Balls	species	Fungi
Anthracophyllum		genus	Fungi
Apioperdon pyriforme	Pear-shaped Puffball	species	Fungi
Arachnion album		species	Fungi
Armillaria gallica	Bulbous Honey Fungus	species	Fungi
Arthonia	Comma Lichens	genus	Fungi
Artomyces pyxidatus	crown-tipped coral fungus	species	Fungi
Auricularia auricula-judae		complex	Fungi
Auricularia cornea	Ear fungus	species	Fungi
Auricularia polytricha	Wood Ear mushroom	species	Fungi
Baeospora myosura	Conifercone Cap	species	Fungi
Bjerkandera adusta	Smoky polypore	species	Fungi
Blumenavia rhacodes		species	Fungi
Bolbitius viscosus		species	Fungi
Boletus roodyi		species	Fungi
Boletus subvelutipes	Red-mouth Bolete	species	Fungi
Bovista	True Puffballs	genus	Fungi
Calocera cornea	club-like tuning fork	species	Fungi
Calocera viscosa	Jelly-antler	species	Fungi
Calvatia craniiformis	Brain puffball	species	Fungi
Calvatia cyathiformis	Purple-Spored Puffball	species	Fungi
Calvatia rubroflava		species	Fungi
Campanella		genus	Fungi
Candelaria concolor	Candleflame Lichen	species	Fungi
Cantharellus lateritius	Smooth Chanterelle	species	Fungi
Cantharellus minor	Small Chanterelle	species	Fungi
Cantharellus texensis		species	Fungi
Cercospora		genus	Fungi
Cerrena unicolor	Mossy Maze Polypore	species	Fungi
Chalciporus		genus	Fungi
Chlorophyllum molybdites	green-spored parasol	species	Fungi
Cladonia coniocraea	Common Powderhorn	species	Fungi
Clathrus columnatus	column stinkhorn	species	Fungi
Clavariaceae	antler and spindle fungi	family	Fungi
Clavulina		genus	Fungi
Clitocybe odora	Aniseed Funnel	species	Fungi
Clitocybula		genus	Fungi
Coenogonium implexum	Pixie-hair Lichen	species	Fungi
Coltricia perennis	Brown Funnel Polypore	species	Fungi
Conocybe apala	milky conecap	species	Fungi
Coprinellus disseminatus	Trooping Crumble Cap	species	Fungi
Coprinopsis variegata	scaly ink cap	species	Fungi
Cortinarius marylandensis	red cort	species	Fungi
Craterellus fallax	Black Trumpet	species	Fungi
Craterellus tubaeformis	Yellowfoot	species	Fungi
Crepidotus	Oysterlings	genus	Fungi
Cyathus		genus	Fungi

Cymatoderma caperatum		species	Fungi
Cyptotrama chrysopepla	golden coincap	species	Fungi
Dacryopinax spathularia	Fan-shaped Jelly Fungus	species	Fungi
Daldinia		genus	Fungi
Desarmillaria tabescens	ringless honey mushroom	species	Fungi
Diatrype stigma	common tarcrust fungus	species	Fungi
Entoloma abortivum	Aborted entoloma	species	Fungi
Exidia crenata	American Amber Jelly Fungus	species	Fungi
Exidia glandulosa	Black Witches' Butter	species	Fungi
Exidia recisa	amber jelly fungus	species	Fungi
Exobasidium symploci		species	Fungi
Favolus brasiliensis		species	Fungi
Flavoparmelia caperata	common greenshield lichen	species	Fungi
Fomes fasciatus	Southern Clam Shell	species	Fungi
Fomes fomentarius	Hoof Fungus	species	Fungi
Fomitopsis betulina	birch polypore	species	Fungi
Fomitopsis nivosa		species	Fungi
Fuscoporia gilva	Mustard Yellow Polypore	species	Fungi
Fusicolla merismoides		species	Fungi
Galerina	Moss Bells	genus	Fungi
Ganoderma applanatum	artist's bracket	species	Fungi
Ganoderma curtisii	golden reishi	species	Fungi
Ganoderma sessile		species	Fungi
Geastrum	Earthstars	genus	Fungi
Gerronema strombodes	golden-gilled gerronema	species	Fungi
Gloeophyllum sepiarium	Conifer Mazegill	species	Fungi
Gymnopilus luteus		species	Fungi
Gymnopus brassicolens	Cabbage Parachute	species	Fungi
Gymnopus iocephalus		species	Fungi
Gymnopus spongiosus	hairy-stalked collybia	species	Fungi
Gyrodontium sacchari		species	Fungi
Gyroporus castaneus	Chestnut Bolete	species	Fungi
Gyroporus subalbellus		species	Fungi
Helicogloea compressa		species	Fungi
Helvella	Elfin Saddles	genus	Fungi
Helvellosebacina concrescens		species	Fungi
Hericium erinaceus	lion's-mane mushroom	species	Fungi
Herpothallon rubrocinctum	Christmas lichen	species	Fungi
Hexagonia hydnoides	Hairy Hexagonia	species	Fungi
Hortiboletus rubellus	Ruby Bolete	species	Fungi
Hydnochaete		genus	Fungi
Hydnopolyporus		genus	Fungi
Hygrocybe coccinea	Scarlet Waxy Cap	species	Fungi
Hygrocybe flavescens	Golden Waxy Cap	species	Fungi
Hygrophoropsis aurantiaca	False Chanterelle	species	Fungi
Hymenochaete		genus	Fungi
Hypholoma capnoides	Smoky-gilled Hypholoma	species	Fungi
Hypholoma fasciculare	Sulphur Tuft	species	Fungi
Infundibulicybe	Funnels	genus	Fungi
Inocybe geophylla	White Fibrecap	species	Fungi
Irpex		genus	Fungi
Irpiciporus pachyodon	marshmallow polypore	species	Fungi
Ischnoderma resinosum	Resinous Polypore	species	Fungi
Kretzschmaria		genus	Fungi
Laccaria amethystina	Amethyst Deceiver	species	Fungi
Laccaria laccata	deceiver	species	Fungi
Laccaria ochropurpurea	purple laccaria	species	Fungi
Laccaria ohiensis		species	Fungi
Lactarius indigo	indigo milk cap	species	Fungi
Lactarius peckii	Peck's milky cap	species	Fungi
Lactarius rimosellus		species	Fungi
Lactarius salmoneus		species	Fungi
Lactifluus gerardii		species	Fungi
Lactifluus piperatus	Peppery Milkcap	species	Fungi
Lactifluus rugatus		species	Fungi
Lactifluus volemus	Fishy Milkcap	species	Fungi
Laetiporus cincinnatus	White-Pored Chicken of the Woods	species	Fungi
Laetiporus persicinus		species	Fungi

Laetiporus sulphureus	chicken of the woods	species	Fungi
Lecanora thysanophora	Mapledust Lichen	species	Fungi
Leccinum scabrum		species	Fungi
Lentinula raphanica	American shitake	species	Fungi
Lentinus crinitus	fringed sawgill	species	Fungi
Lentinus flexipes		species	Fungi
Lentinus tigrinus	Tiger Sawgill	species	Fungi
Lepiota		genus	Fungi
Lepista	Blewits	genus	Fungi
Leucocoprinus birnbaumii	flowerpot parasol	species	Fungi
Leucocoprinus fragilissimus	Fragile Dapperling	species	Fungi
Loweomyces fractipes		species	Fungi
Lycoperdon marginatum	Peeling Puffball	species	Fungi
Lycoperdon perlatum		species	Fungi
Marasmiellus candidus	Fairy Parachutes	species	Fungi
Marasmiellus dichrous		species	Fungi
Marasmius capillaris		species	Fungi
Marasmius rotula	collared parachute	species	Fungi
Marasmius siccus	Orange Pinwheel	species	Fungi
Megacollybia rodmanii	Eastern American Platterful Mushroom	species	Fungi
Meripilus sumstinei	Black-staining Polypore	species	Fungi
Microporellus dealbatus		species	Fungi
Microporellus obovatus		species	Fungi
Mutinus elegans	devil's dipstick	species	Fungi
Mycena leptocephala	Nitrous Bonnet	species	Fungi
Myxarium nucleatum	Crystal Brain Fungus	species	Fungi
Nigroporus vinosus		species	Fungi
Nolanea		genus	Fungi
Omphalotus illudens	Eastern American jack-o'-lantern	species	Fungi
Oudemansiella furfuracea	Beech Rooter	species	Fungi
Panellus stipticus		species	Fungi
Panus conchatus	Lilac oysterling	species	Fungi
Panus neostrigosus		species	Fungi
Panus velutinus		species	Fungi
Parasola plicatilis	pleated inkcap	species	Fungi
Parmelia	shield lichens	genus	Fungi
Parmotrema perforatum	perforated ruffle lichen	species	Fungi
Peniophora albobadia	Giraffe Spots	species	Fungi
Pezizaceae	Pezizas		Fungi
Phaeolus schweinitzii	Dyer's Polypore	species	Fungi
Phaeotremella foliacea	Leafy Brain	species	Fungi
Phillipsia		genus	Fungi
Phlyctis argena	Whitewash Lichen	species	Fungi
Phylloporus leucomycelinus	Gilled Bolete	species	Fungi
Physcia stellaris	Star Rosette Lichen	species	Fungi
Pileolaria brevipes		species	Fungi
Pisolithus arhizus	Dyeball	species	Fungi
Pleurocybella porrigens	angel's wings	species	Fungi
Pleurotus dryinus	Veiled Oyster	species	Fungi
Pleurotus ostreatus		species	Fungi
Pleurotus pulmonarius	summer oyster mushroom	species	Fungi
Pluteus cervinus		species	Fungi
Pluteus chrysophlebius	Yellow Deer Mushroom	species	Fungi
Pluteus exilis	Western Deer Mushroom	species	Fungi
Pluteus longistriatus		species	Fungi
Podoscypha petalodes	Wine Glass Fungus	species	Fungi
Polyporus		genus	Fungi
Pseudoclitocybe cyathiformis	The Goblet	species	Fungi
Pseudocolus fusiformis	stinky squid	species	Fungi
Pseudoinonotus dryadeus	oak bracket	species	Fungi
Psilocybe cubensis	Magic Mushroom	species	Fungi
Puccinia hemerocallidis		species	Fungi
Puccinia recondita	orange wheat rust	species	Fungi
Puccinia sambuci		species	Fungi
Pulveroboletus curtisii		species	Fungi
Pulveroboletus ravenelii	powdery sulfur bolete	species	Fungi
Ramalina farinacea	Farinose Cartilage Lichen	species	Fungi
Ramaria stricta	Upright Coral Fungus	species	Fungi

Rhodofomes cajanderi	Rosy Conk	species	Fungi
Rhytisma		genus	Fungi
Russula aeruginea	Green Brittlegill	species	Fungi
Russula eccentrica		species	Fungi
Russula flavisiccans		species	Fungi
Russula perlactea		species	Fungi
Russula rosacea	blood red russula	species	Fungi
Russula subgraminicolor		species	Fungi
Russula variata	Variable Russula	species	Fungi
Sarcoscypha occidentalis	stalked scarlet cup	species	Fungi
Schizophyllum commune	splitgill mushroom	species	Fungi
Scleroderma	earthballs	genus	Fungi
Scutellinia	Eyelash cups	genus	Fungi
Sebacina schweinitzii	jellied false coral fungus	species	Fungi
Sebacina sparassoidea	white coral jelly fungus	species	Fungi
Sparassis spathulata	Eastern cauliflower mushroom	species	Fungi
Spongipellis		genus	Fungi
Stereum complicatum	crowded parchment	species	Fungi
Stereum hirsutum	hairy curtain crust	species	Fungi
Stereum ostrea	false turkey-tail	species	Fungi
Stereum versicolor		species	Fungi
Strobilomyces strobilaceus	Old-man-of-the-woods	species	Fungi
Strobilurus conigenoides	magnolia-cone mushroom	species	Fungi
Suillus hirtellus		species	Fungi
Taphrina caerulescens	Oak Leaf Blister	species	Fungi
Testicularia cyperi		species	Fungi
Tetrapyrgos nigripes		species	Fungi
Thelephora terrestris	Common Fiber Vase	species	Fungi
Thelephora vialis		species	Fungi
Trametes aesculi		species	Fungi
Trametes betulina	Gilled Polypore	species	Fungi
Trametes cubensis		species	Fungi
Trametes elegans	white maze polypore	species	Fungi
Trametes gibbosa	Lumpy Bracket	species	Fungi
Trametes hirsuta	Hairy Bracket	species	Fungi
Trametes lactinea		species	Fungi
Trametes pubescens		species	Fungi
Trametes sanguinea	Cinnabar Bracket	species	Fungi
Trametes versicolor	turkey-tail	species	Fungi
Tremella fuciformis	snow fungus	species	Fungi
Tremella mesenterica	witch's butter	species	Fungi
Trichaptum abietinum	Purplepore Bracket	species	Fungi
Trichaptum biforme	violet-toothed polypore	species	Fungi
Tylopilus ballouii	Burnt-orange Bolete	species	Fungi
Tylopilus felleus	Bitter Bolete	species	Fungi
Tylopilus rubrobrunneus	reddish brown bitter bolete	species	Fungi
Tyromyces chioneus	White Cheese Polypore	species	Fungi
Urnula craterium	devil's urn	species	Fungi
Uromyces ari-triphylli	Jack-in-the-Pulpit Rust	species	Fungi
Usnea hirta	Bristly Beard Lichen	species	Fungi
Usnea strigosa	Bushy beard lichen	species	Fungi
Volvariella bombycina	Silky Rosegill	species	Fungi
Xerocomus hypoxanthus		species	Fungi
Xeromphalina		genus	Fungi
Xylaria flabelliformis		species	Fungi
Xylaria hypoxylon	Candlesnuff Fungus	species	Fungi
Xylaria liquidambaris	Sweetgum Xylaria	species	Fungi
Xylobolus frustulatus	ceramic parchment	species	Fungi
Xylobolus subpileatus		species	Fungi
Insecta (beetles, butterflies, dragonflies, etc.)			
Abacidus		subgenus	Insecta
Abaeis nicippe	Sleepy Orange	species	Insecta
Acanalonia conica	Green Cone-headed Planthopper	species	Insecta
Acanalonia servillei		species	Insecta
Acanthocephala declivis	Giant Leaf-footed Bug	species	Insecta
Acanthocephala femorata	Florida Leaf-footed Bug	species	Insecta
Acanthocephala terminalis		species	Insecta
Acharia stimulea	Saddleback Caterpillar Moth	species	Insecta

Acheta domesticus	House Cricket	species	Insecta
Achillea millefolium	common yarrow	species	Insecta
Acilius	Small Flat Diving Beetles	genus	Insecta
Acleris semipurpurana	Oak Leafshredder Moth	species	Insecta
Acrolophus arcanella	Arcane Grass Tubeworm Moth	species	Insecta
Acrolophus plumifrontella	Eastern Grass Tubeworm Moth	species	Insecta
Acronicta hasta	Cherry Dagger	species	Insecta
Acronicta impleta	Powdered Dagger	species	Insecta
Acronicta rubricoma	Hackberry Dagger	species	Insecta
Actias luna	North American Luna Moth	species	Insecta
Acutalis tartarea		species	Insecta
Adela caeruleella	Southern Longhorn Moth	species	Insecta
Aedes albopictus	Asian Tiger Mosquito	species	Insecta
Aedes tormentor		species	Insecta
Aedes triseriatus	Eastern Treehole Mosquito	species	Insecta
Aedes vexans	Inland Floodwater Mosquito	species	Insecta
Aegomorphus quadrigibbus		species	Insecta
Agallia constricta	Constricted Leafhopper	species	Insecta
Agasicles hygrophila	Alligatorweed Flea Beetle	species	Insecta
Agrilus ruficollis	Red-necked Cane Borer Beetle	species	Insecta
Agromyza aristata		species	Insecta
Alabagrus texanus		species	Insecta
Alaus oculatus	Eastern Eyed Click Beetle	species	Insecta
Alcaeorrhynchus grandis	Giant Strong-nosed Stink Bug	species	Insecta
Alleculinae	Comb-clawed Darkling Beetles	subfamily	Insecta
Allograpta exotica	Exotic Streaktail	species	Insecta
Allograpta obliqua	Oblique Streaktail	species	Insecta
Alypia octomaculata	Eight-spotted Forester Moth	species	Insecta
Amblycorypha oblongifolia	Oblong-winged Katydid	species	Insecta
Amblytropidia mysteca	Brown Winter Grasshopper	species	Insecta
Ammophila procera	Common Thread-waisted Wasp	species	Insecta
Ampelomyia vitispomum		species	Insecta
Amphibolips confluenta	Spongy Oak Apple Gall Wasp	species	Insecta
Amphibolips quercusjuglans	Acorn Plum Gall Wasp	species	Insecta
Anaea andria	Goatweed Leafwing	species	Insecta
Anageshna primordialis	Yellow-spotted Webworm Moth	species	Insecta
Anax junius	Common Green Darner	species	Insecta
Anaxipha	Brown Trigs	genus	Insecta
Ancistrocerus		genus	Insecta
Ancyloxypha numitor	Least Skipper	species	Insecta
Andricus pattoni		species	Insecta
Andricus quercusflocci		species	Insecta
Andricus quercusfoliatus	leafy oak gall wasp	species	Insecta
Andricus quercuslanigera	Wool-bearing Gall Wasp	species	Insecta
Anicla infecta	Green Cutworm Moth	species	Insecta
Anisomorpha buprestoides	Southern Two-striped Walkingstick	species	Insecta
Anisota		genus	Insecta
Anomala	Pale and Green Leaf Chafers	genus	Insecta
Anomalon		genus	Insecta
Anoplius americanus		species	Insecta
Antheraea polyphemus	Polyphemus Moth	species	Insecta
Anthocharis midea	Falcate Orangetip	species	Insecta
Anthophorini	Digger Bees	tribe	Insecta
Anthrax argyropygus		species	Insecta
Anthrax georgicus	Black Bee Fly	species	Insecta
Anthrenus verbasci	Varied Carpet Beetle	species	Insecta
Apantesis		genus	Insecta
Apatelodes torrefacta	Spotted Apatelodes Moth	species	Insecta
Aphaenogaster	Collared Ants	genus	Insecta
Aphis nerii	Oleander Aphid	species	Insecta
Aphrophora		genus	Insecta
Aphylla angustifolia	Broad-striped Forceptail	species	Insecta
Aphylla williamsoni	Two-striped Forceptail	species	Insecta
Apis mellifera	ÐœÐµÐ´Ð¾Ð½Ð¾ÑÐ½Ð°Ñ Ð¿Ñ‡ÐµÐ»Ð°	species	Insecta
Aplos simplex		species	Insecta
Apoecilus		genus	Insecta
Archaeognatha	Bristletails	order	Insecta
Archasia belfragei		species	Insecta

Archasia pallida		species	Insecta
Archips grisea	Gray Archips Moth	species	Insecta
Argia apicalis	Blue-fronted Dancer	species	Insecta
Argia fumipennis	Variable Dancer	species	Insecta
Argia moesta	Powdered Dancer	species	Insecta
Argia sedula	Blue-ringed Dancer	species	Insecta
Argia tibialis	Blue-tipped Dancer	species	Insecta
Argidae	Argid Sawflies	family	Insecta
Arigomphus maxwelli	Bayou Clubtail	species	Insecta
Arilus cristatus	Wheel Bug	species	Insecta
Arnoldiola atra		species	Insecta
Arrhenodes minutus	Oak Timberworm Weevil	species	Insecta
Artace cribrarius	Dot-lined White	species	Insecta
Asilinae		subfamily	Insecta
Asphaera lustrans	Shiny Flea Beetle	species	Insecta
Astata		genus	Insecta
Asterocampa celtis	Hackberry Emperor	species	Insecta
Asterocampa clyton	Tawny Emperor	species	Insecta
Asteromyia carbonifera	Carbonifera goldenrod gall midge	species	Insecta
Asteromyia euthamiae	Euthamia leaf gall midge	species	Insecta
Atanycolus		genus	Insecta
Atomosia		genus	Insecta
Atteva aurea	Ailanthus Webworm Moth	species	Insecta
Augochlora pura	Pure Green-Sweat bee	species	Insecta
Augochlorella		genus	Insecta
Augochloropsis metallica	Metallic Epauletted-Sweat Bee	species	Insecta
Auplopus mellipes		species	Insecta
Automeris io	Io Moth	species	Insecta
Bacchini		tribe	Insecta
Banasa		genus	Insecta
Belostoma		genus	Insecta
Berosus		genus	Insecta
Blastobasis glandulella	Acorn Moth	species	Insecta
Blatta orientalis	Oriental Cockroach	species	Insecta
Blattella asahinai	Asian Cockroach	species	Insecta
Blattella germanica	German Cockroach	species	Insecta
Blissidae	Chinch Bugs and Allies	family	Insecta
Bolitotherus cornutus	Forked Fungus Beetle	species	Insecta
Bombus griseocollis	Brown-belted Bumble Bee	species	Insecta
Bombus impatiens	Common Eastern Bumble Bee	species	Insecta
Bombus pensylvanicus	American Bumble Bee	species	Insecta
Bombylius major	Greater Bee Fly	species	Insecta
Bothriocera		genus	Insecta
Brachymesia furcata	Red-tailed Pennant	species	Insecta
Brachymesia gravida	Four-spotted Pennant	species	Insecta
Brachymyrmex	Rover Ants	genus	Insecta
Brachypremna		genus	Insecta
Brochymena	Rough Stink Bugs	genus	Insecta
Burnsius communis	Common and White Checkered-Skippers	complex	Insecta
Burnsius oileus	Tropical Checkered-Skipper	species	Insecta
Caenurgia chloropha	Vetch Looper Moth	species	Insecta
Callandrena		subgenus	Insecta
Calligrapha bidenticola		species	Insecta
Calligrapha confluens		species	Insecta
Calliopsis		subgenus	Insecta
Callirhytis furva	Furry Oak Leaf Gall Wasp	species	Insecta
Callirhytis quercusbatatoides	Southern Live Oak Stem Gall Wasp	species	Insecta
Callirhytis quercusfutilis	Oak wart gall	species	Insecta
Callistethus marginatus	Margined Shining Leaf Chafer	species	Insecta
Callosamia angulifera	Tulip-tree Silkmoth	species	Insecta
Callosamia promethea	Promethea Silkmoth	species	Insecta
Calopteron discrepans	Banded Net-winged Beetle	species	Insecta
Calopteron reticulatum	Reticulated Net-winged Beetle	species	Insecta
Calopteron terminale	End Band Net-winged Beetle	species	Insecta
Calopteryx dimidiata	Sparkling Jewelwing	species	Insecta
Calopteryx maculata	Ebony Jewelwing	species	Insecta
Caloptilia triadicae	Chinese Tallow Leaf Miner	species	Insecta
Calosoma sayi	Black Caterpillar Hunter Beetle	species	Insecta

Calycomyza promissa		species	Insecta
Calycopis cecrops	Red-banded Hairstreak	species	Insecta
Calyptoproctus marmoratus		species	Insecta
Cameraria caryaefoliella	Pecan Leafminer Moth	species	Insecta
Camponotus castaneus	Chestnut Carpenter Ant	species	Insecta
Camponotus pennsylvanicus	Eastern Black Carpenter Ant	species	Insecta
Camptonotus carolinensis	Carolina Leafroller Cricket	species	Insecta
Caryomyia caryae	Hickory Sticky Globe Gall Midge	species	Insecta
Caryomyia echinata		species	Insecta
Caryomyia leviglobus		species	Insecta
Caryomyia marginata		species	Insecta
Caryomyia sanguinolenta	Hickory Smooth Gumdrop Gall Midge	species	Insecta
Caryomyia stellata	Hickory Starry-base Gall Midge	species	Insecta
Caryomyia thompsoni	Hickory Placenta Gall Midge	species	Insecta
Caryomyia tuberidolium		species	Insecta
Caryomyia tubicola	Hickory Bullet Gall Midge	species	Insecta
Caryomyia viscidolium	Hickory Sticky Ginger Jar Gall Midge	species	Insecta
Catocala carissima		species	Insecta
Catocala umbrosa	Umber Underwing	species	Insecta
Cedusa		genus	Insecta
Celastrina neglecta	Summer Azure	species	Insecta
Celithemis eponina	Halloween Pennant	species	Insecta
Celithemis fasciata	Banded Pennant	species	Insecta
Cerastipsocus venosus	Tree Cattle	species	Insecta
Ceratomia		genus	Insecta
Cerceris	Typical Weevil Wasps and Allies	genus	Insecta
Ceresini	Buffalo Treehoppers	tribe	Insecta
Chalcolepidius viridipilis		species	Insecta
Chalcophora virginiensis	Sculptured Pine Borer	species	Insecta
Chalcosyrphus	Leafwalkers	genus	Insecta
Chalybion	Blue Mud-dauber Wasps	genus	Insecta
Charadra deridens	Laugher Moth	species	Insecta
Chauliodes rastricornis	Spring Fishfly	species	Insecta
Chauliognathus marginatus	Margined Leatherwing Beetle	species	Insecta
Chilocorus stigma	Twice-stabbed Lady Beetle	species	Insecta
Chinavia hilaris	Green Stink Bug	species	Insecta
Chironomus		genus	Insecta
Chlaenius	Vivid Metallic Ground Beetles	genus	Insecta
Chlorotettix		genus	Insecta
Chlosyne nycteis	Silvery Checkerspot	species	Insecta
Choephora fungorum	Bent-lined Dart	species	Insecta
Choristoneura rosaceana	Oblique-banded Leafroller Moth	species	Insecta
Chortophaga australior	Southern Green-striped Grasshopper	species	Insecta
Chortophaga viridifasciata	Green-striped Grasshopper	species	Insecta
Chrysanthrax cypris		species	Insecta
Chrysendeton medicinalis	Bold Medicine Moth	species	Insecta
Chrysobothris		genus	Insecta
Chrysomela scripta	Cottonwood Leaf Beetle	species	Insecta
Chrysomya megacephala	Oriental Latrine Fly	species	Insecta
Chrysoperla rufilabris	Red-lipped Green Lacewing	species	Insecta
Chrysopilus basilaris		species	Insecta
Chrysops vittatus		species	Insecta
Chytolita morbidalis	Morbid Owlet	species	Insecta
Cicindela punctulata	Punctured Tiger Beetle	species	Insecta
Cicindela repanda	Bronzed Tiger Beetle	species	Insecta
Cicindela rufiventris	Eastern Red-bellied Tiger Beetle	species	Insecta
Cicindela sexguttata	Six-spotted Tiger Beetle	species	Insecta
Cisseps fulvicollis	Yellow-collared Scape Moth	species	Insecta
Cisthene		genus	Insecta
Clastoptera		genus	Insecta
Clemensia albata	Little White Lichen Moth	species	Insecta
Clepsis peritana	Garden Tortrix	species	Insecta
Clivina dentipes		species	Insecta
Cloanthanus		subgenus	Insecta
Coelioxys	Cuckoo Leaf-cutter Bees	genus	Insecta
Coleomegilla maculata	Spotted Pink Ladybeetle	species	Insecta
Colias eurytheme	Orange Sulphur	species	Insecta
Conchylodes ovulalis	Zebra Conchylodes Moth	species	Insecta

Condylostylus patibulatus		species	Insecta
Conocephalus fasciatus	Slender Meadow Katydid	species	Insecta
Coquillettidia perturbans	Cattail Mosquito	species	Insecta
Cordyligaster septentrionalis		species	Insecta
Coryphaeschna ingens	Regal Darner	species	Insecta
Corythucha		genus	Insecta
Cosmopepla lintneriana	Twice-stabbed Stink Bug	species	Insecta
Cosmosoma myrodora	Scarlet-bodied Wasp Moth	species	Insecta
Craneiobia tuba		species	Insecta
Crematogaster		subgenus	Insecta
Cryptolaemus montrouzieri	Mealybug Destroyer	species	Insecta
Ctenolepisma longicaudata	Long-tailed Silverfish	species	Insecta
Culex salinarius	Unbanded Saltmarsh Mosquito	species	Insecta
Cybister fimbriolatus	Fringed Diving Beetle	species	Insecta
Cyclophora packardi	Packard's Wave	species	Insecta
Cyllopsis gemma	Gemmed Satyr	species	Insecta
Danaus plexippus	Monarch	species	Insecta
Dasineura pellex	ash bullet gall midge	species	Insecta
Dasineura pudibunda	Hornbeam leaf gall midge	species	Insecta
Dasychira		genus	Insecta
Dasymutilla occidentalis	Common Eastern Velvet Ant	species	Insecta
Datana integerrima	Walnut Caterpillar Moth	species	Insecta
Deidamia inscriptum	Lettered Sphinx	species	Insecta
Delphinia picta	Common Picture-winged Fly	species	Insecta
Deltochilum gibbosum	Humpback Dung Beetle	species	Insecta
Desmia maculalis	Grape Leafroller Moth	species	Insecta
Diabrotica balteata	Banded Cucumber Beetle	species	Insecta
Diabrotica undecimpunctata	Spotted Cucumber Beetle	species	Insecta
Dialictus	Metallic Sweat Bees	subgenus	Insecta
Diapheromera femorata	Northern Walkingstick	species	Insecta
Diaspididae	Armored Scale Insects	family	Insecta
Diastrophus cuscutaeformis	blackberry seed gall wasp	species	Insecta
Diatraea evanescens	Black-dot Diatraea	species	Insecta
Dicaelus purpuratus	Notch-mouthed Ground Beetle	species	Insecta
Diceroprocta vitripennis	Green-winged Cicada	species	Insecta
Dicromantispa sayi	Say's Mantidfly	species	Insecta
Didymops transversa	Stream Cruiser	species	Insecta
Dielis plumipes	Feather-legged Scoliid Wasp	species	Insecta
Digitonthophagus gazella	Gazelle Scarab	species	Insecta
Dilophus orbatus		species	Insecta
Dineutus		genus	Insecta
Diogmites platypterus		species	Insecta
Dione vanillae	Gulf Fritillary	species	Insecta
Dioprosopa clavata	Four-speckled Hover Fly	species	Insecta
Dioxyna		genus	Insecta
Diplotaxis		genus	Insecta
Dircaea liturata		species	Insecta
Disholcaspis cinerosa	Mealy oak gall wasp	species	Insecta
Disholcaspis quercusvirens		species	Insecta
Disonycha pensylvanica		species	Insecta
Dolba hyloeus	Pawpaw Sphinx	species	Insecta
Dolichopodinae		subfamily	Insecta
Donaciinae	Aquatic Leaf Beetles	subfamily	Insecta
Doru taeniatum	Lined Earwig	species	Insecta
Doryctinae		subfamily	Insecta
Draeculacephala		genus	Insecta
Dromogomphus spinosus	Black-shouldered Spinyleg	species	Insecta
Drosophilidae	Vinegar and Fruit Flies	family	Insecta
Dryocampa rubicunda	Rosy Maple Moth	species	Insecta
Dryocosmus quercuspalustris	Succulent Oak Gall Wasp	species	Insecta
Ducetia		genus	Insecta
Dyspteris abortivaria	Bad-wing Moth	species	Insecta
Eacles imperialis	Imperial Moth	species	Insecta
Eburia quadrigeminata	Ivory-marked Borer	species	Insecta
Ectropis crepuscularia	Small Engrailed	species	Insecta
Elaphria	Midgets	genus	Insecta
Elophila obliteralis	Waterlily Leafcutter Moth	species	Insecta
Elophila tinealis	Black Duckweed Moth	species	Insecta

Emesinae	Thread-legged Bugs	subfamily	Insecta
Emmelina monodactyla	Morning-glory Plume Moth	species	Insecta
Enallagma civile	Familiar Bluet	species	Insecta
Enallagma exsulans	Stream Bluet	species	Insecta
Enallagma signatum	Orange Bluet	species	Insecta
Enallagma vesperum	Vesper Bluet	species	Insecta
Entypus		genus	Insecta
Enyo lugubris	Mournful Sphinx	species	Insecta
Epargyreus clarus	Silver-spotted Skipper	species	Insecta
Ephemeroptera	Mayflies	order	Insecta
Epiaeschna heros	Swamp Darner	species	Insecta
Epiblema desertana		species	Insecta
Epimecis hortaria	Tulip-tree Beauty	species	Insecta
Epimelissodes		subgenus	Insecta
Epiphragma solatrix	Spectacled Crane Fly	species	Insecta
Epitheca princeps	Prince Baskettail	species	Insecta
Eremnophila aureonotata	Gold-marked Thread-waisted Wasp	species	Insecta
Eristalis stipator	Yellow-shouldered Drone Fly	species	Insecta
Eristalis transversa	Transverse-banded Flower Fly	species	Insecta
Erynnis horatius	Horace's Duskywing	species	Insecta
Erynnis juvenalis	Juvenal's Duskywing	species	Insecta
Erythemis simplicicollis	Eastern Pondhawk	species	Insecta
Erythrodiplax minuscula	Little Blue Dragonlet	species	Insecta
Eubaphe mendica	Beggar Moth	species	Insecta
Euborellia annulipes	Ring-legged Earwig	species	Insecta
Euchlaena amoenaria	Deep Yellow Euchlaena Moth	species	Insecta
Eudiagogus rosenschoeldi		species	Insecta
Eudryas unio	Pearly Wood-nymph	species	Insecta
Eulithis diversilineata	Grapevine Looper Moths	complex	Insecta
Eumenes fraternus	Fraternal Potter Wasp	species	Insecta
Eumorpha fasciatus	Banded Sphinx	species	Insecta
Eumorpha pandorus	Pandorus Sphinx	species	Insecta
Eunemobius	Even-spurred Ground Crickets	genus	Insecta
Euodynerus bidens		species	Insecta
Euphoria sepulcralis	Dark Flower Scarab	species	Insecta
Euphyes vestris	Dun Skipper	species	Insecta
Euptoieta claudia	Variegated Fritillary	species	Insecta
Eurosta solidaginis	Goldenrod Gall Fly	species	Insecta
Eusarca confusaria	Confused Eusarca Moth	species	Insecta
Euschistus tristigmus	Dusky Stink Bug	species	Insecta
Euthycera arcuata		species	Insecta
Eutrapela clemataria	Curved-toothed Geometer Moth	species	Insecta
Eutreta		genus	Insecta
Flatormenis proxima	Northern Flatid Planthopper	species	Insecta
Galerita bicolor	False Bombardier Beetle	species	Insecta
Glaphyria sesquistrialis	White-roped Glaphyria Moth	species	Insecta
Gnamptopelta obsidianator	Bent-shielded Besieger Wasp	species	Insecta
Gnorimoschema		genus	Insecta
Graphocephala versuta	Versute Sharpshooter	species	Insecta
Griburius scutellaris		species	Insecta
Gryllus pennsylvanicus	Fall Field Cricket	species	Insecta
Gyropsylla ilecis		species	Insecta
Haliplus		genus	Insecta
Halysidota harrisii	Sycamore Tussock Moth	species	Insecta
Halysidota tessellaris	Banded Tussock Moth	species	Insecta
Hapithus		genus	Insecta
Haplaxius		genus	Insecta
Haploa		genus	Insecta
Harmonia axyridis	Asian Lady Beetle	species	Insecta
Harrisina americana	Grapeleaf Skeletonizer Moth	species	Insecta
Heliocis		genus	Insecta
Helocassis clavata	Clavate Tortoise Beetle	species	Insecta
Helophilus fasciatus	Narrow-headed Marsh Fly	species	Insecta
Hemileuca maia	Buck Moth	species	Insecta
Hermetia illucens	Black Soldier Fly	species	Insecta
Hermeuptychia intricata	Intricate Satyr	species	Insecta
Hermeuptychia sosybius	Carolina Satyr	species	Insecta
Herpetogramma		genus	Insecta

Hetaerina titia	Smoky Rubyspot	species	Insecta
Heterocampa guttivitta	Saddled Prominent	species	Insecta
Homaeotarsus		genus	Insecta
Hoplitimyia mutabilis		species	Insecta
Hoshihananomia octopunctata		species	Insecta
Hyalophora cecropia	Cecropia Moth	species	Insecta
Hyalymenus tarsatus	Texas Bow-legged Bug	species	Insecta
Hydrometra		genus	Insecta
Hylephila phyleus	Fiery Skipper	species	Insecta
Hypagyrtis unipunctata	One-spotted Variant	species	Insecta
Hypena bijugalis	Dimorphic Snout	species	Insecta
Hypercompe scribonia	Giant Leopard Moth	species	Insecta
Hyphantria cunea	Fall Webworm Moth	species	Insecta
Hypoprepia		genus	Insecta
Idaea tacturata	Dot-lined Wave	species	Insecta
Ilexia intractata	Black-dotted Ruddy Moth	species	Insecta
Inga sparsiciliella	Black-marked Inga Moth	species	Insecta
Iridopsis defectaria	Brown-shaded Gray	species	Insecta
Isa textula	Crowned Slug Moth	species	Insecta
Ischnoptera deropeltiformis	Dark Wood Cockroach	species	Insecta
Ischnura hastata	Citrine Forktail	species	Insecta
Ischnura posita	Fragile Forktail	species	Insecta
Ischnura ramburii	Rambur's Forktail	species	Insecta
Jalysus		genus	Insecta
Jikradia olitoria	Coppery Leafhopper	species	Insecta
Junonia coenia	Common Buckeye	species	Insecta
Kokkocynips difficilis		species	Insecta
Labidura riparia	Shore Earwig	species	Insecta
Laphria canis		complex	Insecta
Laphria flavicollis		species	Insecta
Laphria macquarti		species	Insecta
Largus succinctus	Eastern Bordered Plant Bug	species	Insecta
Larra bicolor		species	Insecta
Lebia viridis	Flower Lebia Beetle	species	Insecta
Lema solani	Blue-banded Lema Leaf Beetle	species	Insecta
Leptoglossus oppositus		species	Insecta
Leptoglossus phyllopus	Eastern Leaf-footed Bug	species	Insecta
Lepyronia quadrangularis	Diamondback Spittlebug	species	Insecta
Lerema accius	Clouded Skipper	species	Insecta
Lestes forficula	Rainpool Spreadwing	species	Insecta
Lestes rectangularis	Slender Spreadwing	species	Insecta
Lethe appalachia	Appalachian Brown	species	Insecta
Lethe portlandia	Southern Pearly-eye	species	Insecta
Leuconycta diphteroides	Green Leuconycta Moth	species	Insecta
Leucospilapteryx venustella		species	Insecta
Libellula auripennis	Golden-winged Skimmer	species	Insecta
Libellula incesta	Slaty Skimmer	species	Insecta
Libellula vibrans	Great Blue Skimmer	species	Insecta
Libytheana carinenta	American Snout	species	Insecta
Lilioceris cheni	Air Potato Leaf Beetle	species	Insecta
Limenitis archippus	Viceroy	species	Insecta
Limenitis arthemis	Red-spotted Admiral	species	Insecta
Limnoporus canaliculatus		species	Insecta
Liriomyza schmidti		species	Insecta
Lithobiomorpha	Stone Centipedes	order	Insecta
Lonchaeidae	Lance Flies	family	Insecta
Lophosis labeculata	Stained Lophosis	species	Insecta
Loxandrus		genus	Insecta
Lucanus capreolus	Reddish-brown Stag Beetle	species	Insecta
Lucanus elaphus	Giant Stag Beetle	species	Insecta
Lucidota atra	Black Firefly	species	Insecta
Lumbricus terrestris	Common Earthworm	species	Insecta
Lycaena phlaeas	Small Copper	species	Insecta
Lychnosea intermicata	Speckled Lamplighter	species	Insecta
Lycia ypsilon	Woolly Gray Moth	species	Insecta
Lycus	Kittybeetles	genus	Insecta
Lygus lineolaris	North American Tarnished Plant Bug	species	Insecta
Macaria bisignata	Red-headed Inchworm Moth	species	Insecta

Macrochilo louisiana	Louisiana Owlet	species	Insecta
Macrodiplosis erubescens		species	Insecta
Macrodiplosis majalis		species	Insecta
Macrodiplosis niveipila		species	Insecta
Macromia illinoiensis	Swift River Cruiser	species	Insecta
Macromia taeniolata	Royal River Cruiser	species	Insecta
Macrophya		genus	Insecta
Macrostemum carolina		species	Insecta
Magicicada tredecim	Riley's 13-Year Cicada	species	Insecta
Malacosoma americana	Eastern Tent Caterpillar Moth	species	Insecta
Malacosoma disstria	Forest Tent Caterpillar Moth	species	Insecta
Mallodon dasystomus	Hardwood Stump Borer	species	Insecta
Mallota bautias	Bare-eyed Bee-mimic Fly	species	Insecta
Marathyssa		genus	Insecta
Marmara fraxinicola		species	Insecta
Marmara smilacisella		species	Insecta
Megachile albitarsis	White-footed Leafcutter Bee	species	Insecta
Megachile xylocopoides	Carpenter-mimic Leafcutter	species	Insecta
Megalodacne fasciata	Red-banded Fungus Beetle	species	Insecta
Megalodacne heros	Pleasing Fungus Beetle	species	Insecta
Megalopyge opercularis	Southern Flannel Moth	species	Insecta
Megascolecidae	Giant Earthworms	family	Insecta
Megischus bicolor	Bicolored Crown-of-thorns Wasp	species	Insecta
Megisto cymela	Little Wood Satyr	species	Insecta
Melanolestes picipes	Black Corsair	species	Insecta
Melanolophia		genus	Insecta
Melanoplus differentialis	Differential Grasshopper	species	Insecta
Melanotus		genus	Insecta
Mellilla xanthometata	Orange Wing	species	Insecta
Meromacrus acutus	Carolinian Elegant	species	Insecta
Metaleptea brevicornis	Clipped-winged Grasshopper	species	Insecta
Metcalfa pruinosa	Citrus Flatid Planthopper	species	Insecta
Metria amella	Live Oak Metria Moth	species	Insecta
Meunieriella	Smilax leaf gall midges	genus	Insecta
Miathyria marcella	Hyacinth Glider	species	Insecta
Microcentrum	Angle-winged Katydids	genus	Insecta
Microphthalma disjuncta		species	Insecta
Microrhopala		genus	Insecta
Microvelia		genus	Insecta
Milesia virginiensis	Virginia Giant	species	Insecta
Mischocyttarus mexicanus	Mexican Paper Wasp	species	Insecta
Misogada unicolor	Drab Prominent	species	Insecta
Mocis marcida	Withered Mocis	species	Insecta
Monobia quadridens	Four-toothed Mason Wasp	species	Insecta
Monomorium	Pharaoh Ants and Timid Ants	genus	Insecta
Mormidea lugens		species	Insecta
Morrisonia confusa	Confused Woodgrain Moth	species	Insecta
Musca domestica	House Fly	species	Insecta
Mycetophagidae	Hairy Fungus Beetles	family	Insecta
Mycetophilidae	Fungus Gnats	family	Insecta
Myrmeleontidae	Antlions and Owlflies	family	Insecta
Myrmex		genus	Insecta
Myxosargus nigricormis		species	Insecta
Myzinum	New World Banded Thynnid Wasps	genus	Insecta
Nasiaeschna pentacantha	Cyrano Darner	species	Insecta
Neacoryphus bicrucis	White-crossed Seed Bug	species	Insecta
Nemorimyza maculosa		species	Insecta
Nemorimyza posticata		species	Insecta
Neocicada hieroglyphica	Hieroglyphic Cicada	species	Insecta
Neoconocephalus triops	Broad-tipped Conehead	species	Insecta
Neocurtilla hexadactyla	Northern Mole Cricket	species	Insecta
Neofidia		genus	Insecta
Neolasioptera eupatorii		species	Insecta
Neolasioptera vernoniae		species	Insecta
Neolema cordata		species	Insecta
Neoporus		genus	Insecta
Neoscapteriscus vicinus	Tawny Mole Cricket	species	Insecta
Neotibicen tibicen	Swamp Cicada	species	Insecta

Neurocolpus		genus	Insecta
Neuroterus quercusirregularis		species	Insecta
Neuroterus quercusverrucarum	oak flake gall wasp	species	Insecta
Neuroterus tantulus		species	Insecta
Nezara viridula	Southern Green Stink Bug	species	Insecta
Niesthrea louisianica		species	Insecta
Nigetia formosalis	Thin-winged Owlet	species	Insecta
Nola cereella	Sorghum Webworm Moth	species	Insecta
Notiobia purpurascens		species	Insecta
Notonecta	Milky Backswimmers	genus	Insecta
Oberea perspicillata		species	Insecta
Ochrimnus mimulus		species	Insecta
Ochyromera ligustri		species	Insecta
Octotoma plicatula	Trumpet Creeper Leafminer	species	Insecta
Ocyptamus fuscipennis	Dusky-winged Hover Fly	species	Insecta
Odontomyia		genus	Insecta
Odontota		genus	Insecta
Odontotaenius disjunctus	Horned Passalus Beetle	species	Insecta
Oiceoptoma inaequale	Ridged Carrion Beetle	species	Insecta
Oiketicus abbotii	Abbot's Bagworm Moth	species	Insecta
Ommatius		genus	Insecta
Oncopeltus fasciatus	Large Milkweed Bug	species	Insecta
Ophiderma evelyna		species	Insecta
Ophiomyia parda		species	Insecta
Ophioninae	Short-tailed Ichneumonid Wasps	subfamily	Insecta
Orchelimum nigripes	Black-legged Meadow Katydid	species	Insecta
Orgyia definita	Definite Tussock Moth	species	Insecta
Orgyia detrita	Fir Tussock Moth	species	Insecta
Orgyia leucostigma	White-marked Tussock Moth	species	Insecta
Ormenoides venusta		species	Insecta
Orphulella pelidna	Spotted-winged Grasshopper	species	Insecta
Orsillinae		subfamily	Insecta
Orthemis ferruginea	Roseate Skimmer	species	Insecta
Orthonama obstipata	Gem Moth	species	Insecta
Ostrinia penitalis	American Lotus Borer Moth	species	Insecta
Otiocerus stollii		species	Insecta
Pachodynerus erynnis	Red-marked Pachodynerus Wasp	species	Insecta
Pachydiplax longipennis	Blue Dasher	species	Insecta
Pachygastrinae		subfamily	Insecta
Pachypsylla celtidismamma	Hackberry Nipplegall Psyllid	species	Insecta
Pachypsylla venusta	Hackberry Petiole Gall Psyllid	species	Insecta
Palpada pusilla	Bicolored Plushback	species	Insecta
Palpada vinetorum	Northern Plushback	species	Insecta
Panchlora nivea	Banana Cockroach	species	Insecta
Pangaeus bilineatus	Two-lined Burrowing Bug	species	Insecta
Panoquina ocola	Ocola Skipper	species	Insecta
Pantala flavescens	Wandering Glider	species	Insecta
Parancistrocerus fulvipes		species	Insecta
Parapediasia teterrellus	Bluegrass Webworm Moth	species	Insecta
Paraphlepsius		genus	Insecta
Paratrea plebeja	Trumpet Vine Sphinx	species	Insecta
Paraulacizes irrorata	Speckled Sharpshooter	species	Insecta
Parectopa plantaginisella		species	Insecta
Paroxya clavuligera	Olive-green Swamp Grasshopper	species	Insecta
Parrhasius m-album	White M Hairstreak	species	Insecta
Parthenolecanium corni	European Fruit Scale	species	Insecta
Peridea angulosa	Angulose Prominent	species	Insecta
Periplaneta		genus	Insecta
Perithemis tenera	Eastern Amberwing	species	Insecta
Perlidae	Common Stoneflies	family	Insecta
Phanogomphus exilis	Lancet Clubtail	species	Insecta
Phanogomphus lividus	Ashy Clubtail	species	Insecta
Phasmatidae		family	Insecta
Pheidole	Big-headed Ants	genus	Insecta
Philaenus spumarius	Meadow spittlebug	species	Insecta
Phileurus truncatus	Triceratops Beetle	species	Insecta
Phoebis sennae	Cloudless Sulphur	species	Insecta
Phosphila turbulenta	Turbulent Phosphila Moth	species	Insecta

Photinus pyralis	Common Eastern Firefly	species	Insecta
Photuris		genus	Insecta
Phyciodes phaon	Phaon Crescent	species	Insecta
Phyciodes tharos	Pearl Crescent	species	Insecta
Phyllobaenus		genus	Insecta
Phyllocnistis ampelopsiella		species	Insecta
Phyllocnistis insignis		species	Insecta
Phyllocnistis liquidambarisella		species	Insecta
Phyllocnistis magnoliella	Magnolia Serpentine Leafminer	species	Insecta
Phyllopalpus pulchellus	Red-headed Bush Cricket	species	Insecta
Phyllophaga	May Beetles	genus	Insecta
Phylloxera devastatrix	pecan phylloxera	species	Insecta
Phymata fasciata		species	Insecta
Phytobius vestitus		species	Insecta
Phytomyza loewii		species	Insecta
Phytomyza vomitoriae		species	Insecta
Pigritia		genus	Insecta
Pissonotus nitens		species	Insecta
Plateros		genus	Insecta
Plathemis lydia	Common Whitetail	species	Insecta
Platycotis vittata	Oak Treehopper	species	Insecta
Platynota flavedana	Black-shaded Platynota Moth	species	Insecta
Platynota idaeusalis	Tufted Apple Bud Moth	species	Insecta
Plecia nearctica	Common Lovebug	species	Insecta
Plusiinae	Plusiine Looper Moths	subfamily	Insecta
Podium luctuosum		species	Insecta
Poecilopompilus interruptus		species	Insecta
Polistes annularis	Ringed Paper Wasp	species	Insecta
Polistes bellicosus		species	Insecta
Polistes dorsalis	Hunter's Little Paper Wasp	species	Insecta
Polistes fuscatus	Dark Paper Wasp	species	Insecta
Polistes metricus	metric paper wasp	species	Insecta
Polites vibex	Whirlabout	species	Insecta
Pollaclasis bifaria		species	Insecta
Polygonia comma	Eastern Comma	species	Insecta
Polygonia interrogationis	Question Mark	species	Insecta
Polygrammate hebraeicum	Hebrew Moth	species	Insecta
Polymerus basalis	Red-spotted Aster Mirid	species	Insecta
Polystepha		genus	Insecta
Pompeius verna	Little Glassywing	species	Insecta
Prepops insitivus		species	Insecta
Prionyx		genus	Insecta
Prochoerodes lineola	Large Maple Spanworm Moth	species	Insecta
Prosapia bicincta	Two-lined Spittlebug	species	Insecta
Protalebrella conica		species	Insecta
Protoboarmia porcelaria	Porcelain Gray	species	Insecta
Proxys punctulatus	Black Stink Bug	species	Insecta
Pselliopus cinctus	Ringed Assassin Bug	species	Insecta
Pseudococcidae	Mealybugs	family	Insecta
Pseudomethoca frigida		species	Insecta
Pseudomops septentrionalis	Pale-bordered Field Cockroach	species	Insecta
Pseudomyrmex gracilis	Graceful Twig Ant	species	Insecta
Psorophora ferox	White-footed Woods Mosquito	species	Insecta
Psychodinae	Moth Flies	subfamily	Insecta
Psychomorpha epimenis	Grapevine Epimenis Moth	species	Insecta
Ptecticus trivittatus	Compost Fly	species	Insecta
Pteromalidae		family	Insecta
Pterophylla camellifolia	Common True Katydid	species	Insecta
Ptilodactyla		genus	Insecta
Pubitelphusa latifasciella	White-banded Pubitelphusa Moth	species	Insecta
Pycnoscelus surinamensis	Surinam Cockroach	species	Insecta
Pyractomena		genus	Insecta
Pyrgota undata	Waved Light Fly	species	Insecta
Pyrisitia lisa	Little Yellow	species	Insecta
Pyropyga		genus	Insecta
Pyrrharctia isabella	Isabella Tiger Moth	species	Insecta
Rainieria antennaepes		species	Insecta
Ranatra		genus	Insecta

Rasahus biguttatus		species	Insecta
Renia adspergillus	Speckled Renia Moth	species	Insecta
Resseliella clavula		species	Insecta
Reticulitermes flavipes	Eastern Subterranean Termite	species	Insecta
Rhagio albicornis		species	Insecta
Rhagonycha heterodoxa		species	Insecta
Rhagonycha lineola		species	Insecta
Rhaphidophoridae	Camel Crickets		Insecta
Rhopalomyia		genus	Insecta
Rhopalosyrphus guentherii	Hairy-bellied Squeezetail	species	Insecta
Rivellia		genus	Insecta
Romalea microptera	Eastern Lubber Grasshopper	species	Insecta
Samea multiplicalis	Salvinia Stem Borer Moth	species	Insecta
Saperda tridentata	Elm Borer	species	Insecta
Sapromyza		genus	Insecta
Sarcophaga	Common Flesh Flies	genus	Insecta
Scarites subterraneus	Big-headed Ground Beetle	species	Insecta
Sceliphron caementarium	Yellow-legged Mud-dauber Wasp	species	Insecta
Schistocerca obscura	Obscure Bird Grasshopper	species	Insecta
Schizomyia racemicola		species	Insecta
Schizura concinna	Red-humped Caterpillar Moth	species	Insecta
Schizura unicornis	Unicorn Prominent	species	Insecta
Scirtes orbiculatus		species	Insecta
Scolytini	Typical Bark Beetles	tribe	Insecta
Scudderia furcata	Fork-tailed Bush Katydid	species	Insecta
Selenisa sueroides	Pale-edged Selenisa	species	Insecta
Sepsis		genus	Insecta
Sibovia occatoria	Yellow-striped Leafhopper	species	Insecta
Sinea spinipes	Spiny Assassin Bug	species	Insecta
Solenopsis invicta	Red Imported Fire Ant	species	Insecta
Somula mississippiensis	Banded Wood Fly	species	Insecta
Sphenophorus australis		species	Insecta
Sphex habenus	Golden-reined Digger Wasp	species	Insecta
Sphex nudus	Katydid Wasp	species	Insecta
Sphinx kalmiae	Laurel Sphinx	species	Insecta
Spilomyia texana	Texas Hornet Fly	species	Insecta
Spilosoma virginica	Virginian Tiger Moth	species	Insecta
Spodoptera	Armyworm Moths	genus	Insecta
Spragueia leo	Common Spragueia Moth	species	Insecta
Stagmomantis carolina	Carolina Mantis	species	Insecta
Stenacris vitreipennis	Glassy-winged Toothpick Grasshopper	species	Insecta
Stenocranus		genus	Insecta
Stigmella caryaefoliella		species	Insecta
Strangalia luteicornis	Yellow-horned Flower Longhorn Beetle	species	Insecta
Strangalia sexnotata	Six-spotted Flower Longhorn Beetle	species	Insecta
Strongylium		genus	Insecta
Sumitrosis		genus	Insecta
Symmerista		genus	Insecta
Sympetrum corruptum	Variegated Meadowhawk	species	Insecta
Synanthedon scitula	Dogwood Borer Moth	species	Insecta
Synchroa punctata		species	Insecta
Synhalonia		subgenus	Insecta
Syrphus	Common Flower Flies	genus	Insecta
Tabanus americanus	American Horse Fly	species	Insecta
Tabanus atratus	Black Horse Fly	species	Insecta
Taeniaptera trivittata		species	Insecta
Tarophagus colocasiae		species	Insecta
Tarpela		genus	Insecta
Taxodiomyia cupressi	Cypress Flower Gall Midge	species	Insecta
Taxodiomyia cupressiananassa	Cypress Twig Gall Midge	species	Insecta
Taxodiomyia taxodii		species	Insecta
Temnostoma trifasciatum	Three-lined Falsehorn	species	Insecta
Tetanolita mynesalis	Smoky Tetanolita Moth	species	Insecta
Tetracha carolina	Carolina Metallic Tiger Beetle	species	Insecta
Tetragonoderus fasciatus		species	Insecta
Tetramorium bicarinatum	Bicolored Pennant Ant	species	Insecta
Tetriginae		subfamily	Insecta
Tettigidea lateralis	Black-sided Pygmy Grasshopper	species	Insecta

Thermonectus marmoratus	Sunburst Diving Beetle	species	Insecta
Thesprotia graminis	American Grass Mantis	species	Insecta
Thorybes bathyllus	Southern Cloudywing	species	Insecta
Thorybes dorantes	Dorantes Longtail	species	Insecta
Timandra amaturaria	(American) Cross-lined Wave	species	Insecta
Timulla		genus	Insecta
Tinea apicimaculella	Dark-collared Tinea Moth	species	Insecta
Tipula paludosa	European Crane Fly	species	Insecta
Torymus		genus	Insecta
Toxomerus jussiaeae	Orange-backed Calligrapher	species	Insecta
Toxomerus marginatus	Margined Calligrapher	species	Insecta
Toxorhynchites rutilus	Elephant Mosquito	species	Insecta
Trachymyrmex septentrionalis	Northern Fungus Farming Ant	species	Insecta
Tramea carolina	Carolina Saddlebags	species	Insecta
Tramea lacerata	Black Saddlebags	species	Insecta
Tramea onusta	Red Saddlebags	species	Insecta
Triatoma sanguisuga	Eastern Bloodsucking Conenose	species	Insecta
Trichiotinus lunulatus	Emerald Flower Scarab	species	Insecta
Trichopoda lanipes		species	Insecta
Trichopoda pennipes	Swift Feather-legged Fly	species	Insecta
Trigonopeltastes delta	Delta Flower Scarab	species	Insecta
Trimerotropini		tribe	Insecta
Trirhabda bacharidis	Groundselbush beetle	species	Insecta
Trombidiidae	True Velvet Mites	family	Insecta
Tropidia		genus	Insecta
Tropisternus collaris		species	Insecta
Trupanea		genus	Insecta
Trypoxylon politum	Organ-pipe Mud-dauber Wasp	species	Insecta
Tylozygus bifidus		species	Insecta
Tylozygus geometricus		species	Insecta
Typocerus zebra	Zebra Longhorn Beetle	species	Insecta
Udea rubigalis	Celery Leaftier Moth	species	Insecta
Urbanus proteus	Long-tailed Skipper	species	Insecta
Uroleucon		genus	Insecta
Vanessa atalanta	Red Admiral	species	Insecta
Vanessa cardui	Painted Lady	species	Insecta
Vanessa virginiensis	American Lady	species	Insecta
Vespula maculifrons	Eastern Yellowjacket	species	Insecta
Vespula squamosa	Southern Yellowjacket	species	Insecta
Vitisiella brevicauda	Grape Tumid Gallmaker Midge	species	Insecta
Xanthopastis regnatrix	Spanish Moth	species	Insecta
Xanthotype	Crocus Geometer Moths	genus	Insecta
Xenox tigrinus	Tiger Bee Fly	species	Insecta
Xylocopa micans	Southern Carpenter Bee	species	Insecta
Xylocopa virginica	Eastern Carpenter Bee	species	Insecta
Xylophanes tersa	Tersa Sphinx	species	Insecta
Xylota bicolor	Eastern Orange-tailed Leafwalker	species	Insecta
Yamatotipula		subgenus	Insecta
Zale horrida	Horrid Zale Moth	species	Insecta
Zelia		genus	Insecta
Zelus longipes	Milkweed Assassin Bug	species	Insecta
Zelus luridus	Pale Green Assassin Bug	species	Insecta
Zygogramma suturalis	Ragweed Leaf Beetle	species	Insecta
Mammalia (mammals)			
Blarina carolinensis	Southern Short-tailed Shrew	species	Mammalia
Canis familiaris	Domestic Dog	species	Mammalia
Canis latrans	Coyote	species	Mammalia
Castor canadensis	American Beaver	species	Mammalia
Cryptotis parva	North American Least Shrew	species	Mammalia
Dasypus novemcinctus	Nine-banded Armadillo	species	Mammalia
Didelphis virginiana	Virginia Opossum	species	Mammalia
Eptesicus fuscus	Big Brown Bat	species	Mammalia
Felis catus	Domestic Cat	species	Mammalia
Glaucomys volans	Southern Flying Squirrel	species	Mammalia
Lasiurus borealis	Eastern Red Bat	species	Mammalia
Lasiurus seminolus	Seminole Bat	species	Mammalia
Lontra canadensis	North American River Otter	species	Mammalia
Lynx rufus	Bobcat	species	Mammalia

Mephitis mephitis	Striped Skunk	species	Mammalia
Myocastor coypus	Nutria	species	Mammalia
Neogale vison	American Mink	species	Mammalia
Nycticeius humeralis	Evening Bat	species	Mammalia
Odocoileus virginianus	White-tailed Deer	species	Mammalia
Ondatra zibethicus	Muskrat	species	Mammalia
Peromyscus gossypinus	Cotton Mouse	species	Mammalia
Procyon lotor	Common Raccoon	species	Mammalia
Rattus norvegicus	Brown Rat	species	Mammalia
Reithrodontomys fulvescens	Fulvous Harvest Mouse	species	Mammalia
Scalopus aquaticus	Eastern Mole	species	Mammalia
Sciurus carolinensis	Eastern Gray Squirrel	species	Mammalia
Sciurus niger	Fox Squirrel	species	Mammalia
Sigmodon hispidus	Hispid Cotton Rat	species	Mammalia
Sylvilagus aquaticus	Swamp Rabbit	species	Mammalia
Sylvilagus floridanus	Eastern Cottontail	species	Mammalia
Tamias striatus	Eastern Chipmunk	species	Mammalia
Urocyon cinereoargenteus	Gray Fox	species	Mammalia
Vulpes vulpes	Red Fox	species	Mammalia
Mollusca (snails, slugs, mussels, etc.)			
Belocaulus angustipes	Black-velvet Leatherleaf	species	Mollusca
Bradybaena similaris	Asian Tramp Snail	species	Mollusca
Deroceras laeve	Meadow Slug	species	Mollusca
Euglandina rosea	Rosy Wolfsnail	species	Mollusca
Helicina orbiculata	Globular Drop Snail	species	Mollusca
Megapallifera mutabilis	Changeable Mantleslug	species	Mollusca
Neohelix albolabris	Eastern Whitelip	species	Mollusca
Opeas		genus	Mollusca
Oxychilus draparnaudi	Draparnaud's Glass Snail	species	Mollusca
Philomycus carolinianus	Carolina Mantleslug	species	Mollusca
Philomycus flexuolaris	Winding Mantleslug	species	Mollusca
Physidae	Bladder Snails	family	Mollusca
Planorbella		genus	Mollusca
Polygyra cereolus	Southern Flatcoil	species	Mollusca
Pomacea canaliculata	Channeled Apple Snail	species	Mollusca
Pomacea maculata	Island Apple Snail	species	Mollusca
Pyganodon grandis	Giant Floater Mussel	species	Mollusca
Succineidae	Amber Snails	family	Mollusca
Utterbackia imbecillis	Paper Pondshell	species	Mollusca
Utterbackiana suborbiculata	flat floater	species	Mollusca
Ventridens	Dome Snails	genus	Mollusca
Viviparidae	River Snails	family	Mollusca
Plantae (plants)			
Acalypha gracilens	Slender Three-seeded Mercury	species	Plantae
Acalypha ostryifolia	hornbeam copperleaf	species	Plantae
Acalypha rhomboidea	common copperleaf	species	Plantae
Acalypha virginica	Virginia Three-seed Mercury	species	Plantae
Acer negundo	boxelder	species	Plantae
Acer pseudoplatanus	sycamore maple	species	Plantae
Acer rubrum	red maple	species	Plantae
Acer saccharinum	silver maple	species	Plantae
Acmella oppositifolia	Oppositeleaf Spotflower	species	Plantae
Acmella repens	Oppositeleaf Spotflower	species	Plantae
Acorus calamus	sweet-flag	species	Plantae
Aeschynomene	jointvetches	genus	Plantae
Aesculus pavia	Red Buckeye	species	Plantae
Agalinis fasciculata	Beach False Foxglove	species	Plantae
Agalinis heterophylla	Prairie False Foxglove	species	Plantae
Agapanthus	agapanthus	genus	Plantae
Agastache	Hyssop	genus	Plantae
Agave americana	American century plant	species	Plantae
Ageratina altissima	white snakeroot	species	Plantae
Agrostis	bent grass	genus	Plantae
Albizia julibrissin	Persian silk tree	species	Plantae
Aletris	Colicroots	genus	Plantae
Alisma	water plantains	genus	Plantae
Allium canadense	Canadian Meadow garlic	species	Plantae
Allium vineale	wild garlic	species	Plantae

Alnus rubra	Red Alder	species	Plantae
Alocasia macrorrhizos	giant taro	species	Plantae
Aloe vera	aloe vera	species	Plantae
Alpinia zerumbet	Shell ginger	species	Plantae
Alternanthera philoxeroides	Alligatorweed	species	Plantae
Amaranthus	amaranths	genus	Plantae
Ambrosia artemisiifolia	common ragweed	species	Plantae
Ambrosia psilostachya	western ragweed	species	Plantae
Ambrosia trifida	giant ragweed	species	Plantae
Ammannia coccinea	Scarlet Toothcup	species	Plantae
Amorpha fruticosa	desert false indigo	species	Plantae
Ampelopsis arborea	pepper vine	species	Plantae
Ampelopsis cordata	heart leaf peppervine	species	Plantae
Ampelopsis glandulosa	Porcelain Berry	species	Plantae
Amphicarpaea bracteata	American hog-peanut	species	Plantae
Amsonia tabernaemontana	eastern bluestar	species	Plantae
Andersonglossum virginianum	wild comfrey	species	Plantae
Andropogon glomeratus	Bushy Bluestem	species	Plantae
Andropogon virginicus	broomsedge bluestem	species	Plantae
Angelonia		genus	Plantae
Antirrhinum majus	Snapdragon	species	Plantae
Apieae		tribe	Plantae
Apios americana	American groundnut	species	Plantae
Aralia elata	Japanese angelica tree	species	Plantae
Aralia spinosa	devil's walkingstick	species	Plantae
Ardisia crenata	Coralberry	species	Plantae
Ardisia japonica	Japanese cleyera	species	Plantae
Arisaema dracontium	green dragon	species	Plantae
Arisaema quinatum	Five-leaved Jack-in-the-pulpit	species	Plantae
Arisaema triphyllum	Jack-in-the-pulpit	species	Plantae
Aristida	wiregrass	genus	Plantae
Aristolochia tomentosa	woolly Dutchman's pipe	species	Plantae
Aronia arbutifolia	red chokeberry	species	Plantae
Artemisia annua	sweet annie	species	Plantae
Artocarpus heterophyllus		species	Plantae
Arundinaria gigantea	river cane	species	Plantae
Arundinaria tecta	switch cane	species	Plantae
Arundo donax	giant reed	species	Plantae
Asclepias curassavica	tropical milkweed	species	Plantae
Asclepias perennis	Swamp-forest Milkweed	species	Plantae
Asclepias tuberosa	butterfly milkweed	species	Plantae
Asclepias variegata	redring milkweed	species	Plantae
Asimina triloba	common pawpaw	species	Plantae
Aspidistra elatior	cast-iron plant	species	Plantae
Asplenium platyneuron	ebony spleenwort	species	Plantae
Athyrium asplenioides	southern lady fern	species	Plantae
Athyrium filix-femina	lady fern	species	Plantae
Atrichum angustatum	lesser smoothcap	species	Plantae
Atrichum undulatum	Catherine's moss	species	Plantae
Aucuba japonica	Japanese aucuba	species	Plantae
Baccharis halimifolia	groundsel tree	species	Plantae
Bacopa monnieri	Herb-of-Grace	species	Plantae
Bambusa multiplex	hedge bamboo	species	Plantae
Baptisia sphaerocarpa	Yellow Wild Indigo	species	Plantae
Bauhinia		genus	Plantae
Berberis eurybracteata		species	Plantae
Berberis thunbergii	Japanese barberry	species	Plantae
Berchemia scandens	Supplejack	species	Plantae
Betula nigra	river birch	species	Plantae
Bidens bipinnata	Spanish needles	species	Plantae
Bidens laevis	larger bur-marigold	species	Plantae
Bignonia capreolata	cross vine	species	Plantae
Boehmeria cylindrica	false nettle	species	Plantae
Boltonia asteroides	white doll's-daisy	species	Plantae
Bombacoideae		subfamily	Plantae
Botrychium	moonworts	genus	Plantae
Botrypus virginianus	rattlesnake fern	species	Plantae
Bowlesia incana	hoary bowlesia	species	Plantae

Brasenia schreberi	Watershield	species	Plantae
Brassica rapa	field mustard	species	Plantae
Briza minor	Little quaking-grass	species	Plantae
Bromus catharticus	Rescue Brome	species	Plantae
Broussonetia papyrifera	Paper mulberry	species	Plantae
Brunnichia ovata	American Buckwheat Vine	species	Plantae
Bryoandersonia illecebra	spoon-leaved moss	species	Plantae
Buchnera	bluehearts	genus	Plantae
Buxus sempervirens	common box	species	Plantae
Caladium bicolor	Heart of Jesus	species	Plantae
Callerya reticulata	Evergreen Wisteria	species	Plantae
Calliandra haematocephala	scarlet powder-puff	species	Plantae
Callicarpa americana	American beautyberry	species	Plantae
Callitriche heterophylla	Large Water-starwort	species	Plantae
Callitriche stagnalis	Pond water-starwort	species	Plantae
Callitriche terrestris	Terrestrial Water-starwort	species	Plantae
Calotropis gigantea	crown flower	species	Plantae
Calycocarpum lyonii		species	Plantae
Calyptocarpus vialis	straggler daisy	species	Plantae
Calystegia	false bindweeds	genus	Plantae
Campsis radicans	American trumpet vine	species	Plantae
Canna X generalis	Indian Shot	hybrid	Plantae
Canna indica	Indian-shot	species	Plantae
Caperonia palustris	Sacatrapo	species	Plantae
Capsella bursa-pastoris	shepherd's-purse	species	Plantae
Cardamine hirsuta	hairy bittercress	species	Plantae
Cardiospermum halicacabum	Balloon Vine	species	Plantae
Carduus	plumeless thistles	genus	Plantae
Carex abscondita	thicket sedge	species	Plantae
Carex annectens	Yellow-fruited Sedge	species	Plantae
Carex aureolensis	golden cattail sedge	species	Plantae
Carex basiantha	Basal Flower Sedge	species	Plantae
Carex blanda	eastern woodland sedge	species	Plantae
Carex bromoides	brome-like sedge	species	Plantae
Carex cephalophora	oval-headed sedge	species	Plantae
Carex cherokeensis	Cherokee sedge	species	Plantae
Carex complanata	Hirsute Sedge	species	Plantae
Carex crus-corvi	Ravenfoot Sedge	species	Plantae
Carex debilis	white-edge sedge	species	Plantae
Carex flaccosperma	Thin-fruit Sedge	species	Plantae
Carex glaucescens	Southern Waxy Sedge	species	Plantae
Carex intumescens	bladder sedge	species	Plantae
Carex joorii	Cypress Swamp Sedge	species	Plantae
Carex leavenworthii	Leavenworth's sedge	species	Plantae
Carex louisianica	Louisiana sedge	species	Plantae
Carex lupulina	hop sedge	species	Plantae
Carex lurida	sallow sedge	species	Plantae
Carex oxylepis	Sharpscale sedge	species	Plantae
Carex triangularis	Eastern Fox Sedge	species	Plantae
Carex tribuloides	blunt broom sedge	species	Plantae
Carex typhina	cattail sedge	species	Plantae
Carex vulpinoidea	fox sedge	species	Plantae
Carpinus caroliniana	American hornbeam	species	Plantae
Carya aquatica	water hickory	species	Plantae
Carya cordiformis	bitternut hickory	species	Plantae
Carya glabra	pignut hickory	species	Plantae
Carya illinoinensis	pecan	species	Plantae
Carya ovata	shagbark hickory	species	Plantae
Carya tomentosa	mockernut	species	Plantae
Catalpa bignonioides	southern catalpa	species	Plantae
Causonis japonica	Bushkiller	species	Plantae
Cayaponia quinqueloba	fivelobe cucumber	species	Plantae
Ceanothus americanus	New Jersey tea	species	Plantae
Celtis laevigata	sugar hackberry	species	Plantae
Cenchrus purpureus	napier grass	species	Plantae
Centaurium pulchellum	Lesser Centaury	species	Plantae
Centratherum punctatum	Brazilian bachelor's button	species	Plantae
Centrosema virginianum	butterfly pea	species	Plantae

Cephalanthus occidentalis	buttonbush	species	Plantae
Cerastium glomeratum	Sticky mouse-ear chickweed	species	Plantae
Ceratophyllum demersum	coontail	species	Plantae
Cercis canadensis	eastern redbud	species	Plantae
Chaerophyllum tainturieri	Tainturier's chervil	species	Plantae
Chamaecrista fasciculata	partridge pea	species	Plantae
Chamaecrista nictitans	sensitive pea	species	Plantae
Chasmanthium latifolium	inland wood oats	species	Plantae
Chasmanthium laxum	Slender Spikegrass	species	Plantae
Chasmanthium sessiliflorum	Longleaf Woodoats	species	Plantae
Chionanthus retusus	Tassel Tree	species	Plantae
Chionanthus virginicus	white fringetree	species	Plantae
Christella hispidula	Variable maiden fern	species	Plantae
Cichorium intybus	chicory	species	Plantae
Cicuta maculata	water hemlock	species	Plantae
Cinnamomum camphora	Camphor Tree	species	Plantae
Cirsium horridulum	bristle thistle	species	Plantae
Citrus japonica	Kumquat	species	Plantae
Citrus trifoliata	trifoliate orange	species	Plantae
Claytonia virginica	Virginia spring beauty	species	Plantae
Clematis crispa	Swamp Leatherflower	species	Plantae
Clematis terniflora	autumn clematis	species	Plantae
Clematis virginiana	virgin's-bower	species	Plantae
Clerodendrum paniculatum	Pagoda-flower	species	Plantae
Climacium		genus	Plantae
Clinopodium gracile	Slender Wild Basil	species	Plantae
Clusia rosea	autograph tree	species	Plantae
Cocculus carolinus	Carolina snailseed	species	Plantae
Coleataenia anceps	beaked panicum	species	Plantae
Coleus scutellarioides	Coleus	species	Plantae
Colocasia esculenta	Taro	species	Plantae
Commelina diffusa	climbing dayflower	species	Plantae
Commelina erecta	whitemouth dayflower	species	Plantae
Commelina virginica	Virginia Dayflower	species	Plantae
Conoclinium coelestinum	blue mistflower	species	Plantae
Corchorus		genus	Plantae
Cordyline fruticosa	Ti	species	Plantae
Coreopsis lanceolata	Lance-leaved Coreopsis	species	Plantae
Coreopsis tinctoria	plains coreopsis	species	Plantae
Cornus drummondii	roughleaf dogwood	species	Plantae
Cornus florida	flowering dogwood	species	Plantae
Cornus foemina	Swamp dogwood	species	Plantae
Cortaderia selloana	Pampas Grass	species	Plantae
Corydalis micrantha	Smallflower Fumewort	species	Plantae
Corynocarpus laevigatus	Karaka	species	Plantae
Crassulaceae	stonecrop family	family	Plantae
Crataegus aestivalis	Mayhaw	species	Plantae
Crataegus marshallii	parsley hawthorn	species	Plantae
Crataegus monogyna	common hawthorn	species	Plantae
Crataegus viridis	green hawthorn	species	Plantae
Crinum americanum	Southern Swamp Crinum	species	Plantae
Crocosmia		genus	Plantae
Crotalaria sagittalis	arrowhead rattlebox	species	Plantae
Crotalaria spectabilis	Showy Rattlebox	species	Plantae
Cryptotaenia canadensis	honewort	species	Plantae
Cuphea carthagenensis	Colombian waxweed	species	Plantae
Curcuma petiolata	hidden lily	species	Plantae
Cuscuta campestris	Field Dodder	species	Plantae
Cycas revoluta	Sago cycad	species	Plantae
Cyclospermum leptophyllum	Marsh parsley	species	Plantae
Cymbopogon	Lemon Grasses	genus	Plantae
Cynanchum laeve	honey-vine climbing milkweed	species	Plantae
Cynodon dactylon	Bermuda grass	species	Plantae
Cynoglossum	Hound's-tongues	genus	Plantae
Cyperus brevifolius	Shortleaf Spikesedge	species	Plantae
Cyperus iria	Rice flat-sedge	species	Plantae
Cyperus odoratus	Fragrant flatsedge	species	Plantae
Cyperus papyrus	Papyrus sedge	species	Plantae

Cyperus rotundus	Purple nutsedge	species	Plantae
Cyperus strigosus	straw-colored flatsedge	species	Plantae
Cyperus virens	Green Flatsedge	species	Plantae
Cyrtomium falcatum	house holly-fern	species	Plantae
Daphne laureola	Spurge-laurel	species	Plantae
Deparia petersenii	Japanese lady fern	species	Plantae
Desmanthus illinoensis	Illinois bundleflower	species	Plantae
Desmodium paniculatum	panicled ticktrefoil	species	Plantae
Desmodium rotundifolium	Round-leaved Trailing Tick-trefoil	species	Plantae
Dianthus barbatus	Sweet-William	species	Plantae
Dichanthelium boscii	Bosc's Witchgrass	species	Plantae
Dichanthelium clandestinum	deertongue	species	Plantae
Dichanthelium commutatum	variable witchgrass	species	Plantae
Dichanthelium dichotomum	forked witchgrass	species	Plantae
Dichanthelium laxiflorum	open-flower witchgrass	species	Plantae
Dichanthelium scoparium	Velvet Panicum	species	Plantae
Dichondra carolinensis	Carolina ponysfoot	species	Plantae
Dicranum scoparium	broom moss	species	Plantae
Digitalis purpurea		species	Plantae
Diodia virginiana	buttonweed	species	Plantae
Dioscorea bulbifera	air potato	species	Plantae
Dioscorea villosa	wild yam	species	Plantae
Diospyros virginiana	American persimmon	species	Plantae
Ditrysinia fruticosa	Gulf Sebastian-bush	species	Plantae
Drosera brevifolia	dwarf sundew	species	Plantae
Duranta erecta	skyflower	species	Plantae
Dysphania ambrosioides	Mexican tea	species	Plantae
Dysphania pumilio	Clammy goosefoot	species	Plantae
Echinacea purpurea	purple coneflower	species	Plantae
Echinochloa colona	Jungle Rice	species	Plantae
Echinodorus cordifolius	Creeping burhead	species	Plantae
Eclipta prostrata	false daisy	species	Plantae
Elaeagnus pungens	thorny olive	species	Plantae
Elaeagnus reflexa		species	Plantae
Eleocharis macrostachya	Pale Spikerush	species	Plantae
Eleocharis obtusa	Blunt Spikerush	species	Plantae
Eleocharis palustris	Common Spike-rush	species	Plantae
Elephantopus carolinianus	leafy elephant's-foot	species	Plantae
Elephantopus tomentosus	common elephant's-foot	species	Plantae
Elymus virginicus	Virginia wildrye	species	Plantae
Endodeca serpentaria	Virginia Snakeroot	species	Plantae
Ensete ventricosum	Abyssinian banana	species	Plantae
Entodon seductrix	seductive entodon moss	species	Plantae
Equisetum hyemale	rough horsetail	species	Plantae
Eragrostis spectabilis	Purple Lovegrass	species	Plantae
Erechtites hieraciifolius	fireweed	species	Plantae
Erigeron bonariensis	Flax-leaved Horseweed	species	Plantae
Erigeron canadensis	horseweed	species	Plantae
Erigeron philadelphicus	Philadelphia fleabane	species	Plantae
Erigeron strigosus	daisy fleabane	species	Plantae
Eriobotrya japonica	Loquat	species	Plantae
Eryngium prostratum	creeping eryngo	species	Plantae
Eryngium yuccifolium	rattlesnake master	species	Plantae
Erythrina herbacea	Coral Bean	species	Plantae
Euonymus americanus	strawberry bush	species	Plantae
Eupatorium X pinnatifidum		hybrid	Plantae
Eupatorium capillifolium	dogfennel	species	Plantae
Eupatorium compositifolium	Coastal Dog Fennel	species	Plantae
Eupatorium perfoliatum	common boneset	species	Plantae
Eupatorium rotundifolium	round-leaved boneset	species	Plantae
Eupatorium serotinum	late boneset	species	Plantae
Euphorbia corollata	flowering spurge	species	Plantae
Euphorbia hirta	asthma plant	species	Plantae
Euphorbia hyssopifolia	hyssop spurge	species	Plantae
Euphorbia maculata	Spotted spurge	species	Plantae
Euphorbia nutans	nodding spurge	species	Plantae
Euphorbia prostrata	prostrate sandmat	species	Plantae
Euthamia graminifolia	flat-topped goldenrod	species	Plantae

Euthamia leptocephala	Bushy Goldentop	species	Plantae
Fagus grandifolia	American beech	species	Plantae
Fatoua villosa	hairy crabweed	species	Plantae
Ficus carica	common fig	species	Plantae
Ficus lyrata	Fiddle-leaf Fig	species	Plantae
Ficus pumila	Climbing fig	species	Plantae
Fimbristylis	Fringe Rush	genus	Plantae
Firmiana simplex	Chinese parasol tree	species	Plantae
Fleischmannia incarnata	Pink thoroughwort	species	Plantae
Forestiera acuminata	eastern swamp privet	species	Plantae
Frangula caroliniana	Carolina buckthorn	species	Plantae
Fraxinus americana	white ash	species	Plantae
Fraxinus caroliniana	Carolina Ash	species	Plantae
Fraxinus excelsior	European ash	species	Plantae
Fraxinus pennsylvanica	green ash	species	Plantae
Gaillardia pulchella	Indian blanket	species	Plantae
Galium aparine	catchweed bedstraw	species	Plantae
Galium obtusum	Bluntleaf Bedstraw	species	Plantae
Galium tinctorium	Stiff Marsh Bedstraw	species	Plantae
Galium uniflorum	one-flowered bedstraw	species	Plantae
Gamochaeta pensylvanica	Pennsylvania Everlasting	species	Plantae
Gamochaeta purpurea	Spoon-Leaf Purple Everlasting	species	Plantae
Garcinia subelliptica	Common Garcinia	species	Plantae
Gardenia	gardenias	genus	Plantae
Gelsemium sempervirens	yellow jessamine	species	Plantae
Geranium carolinianum	Carolina crane's-bill	species	Plantae
Geum canadense	white avens	species	Plantae
Gibasis pellucida	Tahitian bridalveil	species	Plantae
Ginkgo		genus	Plantae
Gleditsia triacanthos	honey locust	species	Plantae
Gnaphalium	cudweeds	genus	Plantae
Gonolobus suberosus	Anglepod	species	Plantae
Gratiola neglecta	clammy hedge-hyssop	species	Plantae
Gratiola pilosa	shaggy hedgehyssop	species	Plantae
Gratiola virginiana	Virginia hedge-hyssop	species	Plantae
Habenaria repens	Waterspider Bog Orchid	species	Plantae
Halesia diptera	Two-wing Silverbell	species	Plantae
Haloragis		genus	Plantae
Hamamelis virginiana	american witch-hazel	species	Plantae
Hamelia patens	Firebush	species	Plantae
Hedera helix	common ivy	species	Plantae
Hedychium coronarium	White ginger	species	Plantae
Helenium amarum	Bitterweed	species	Plantae
Helenium autumnale	common sneezeweed	species	Plantae
Helenium flexuosum	Southern Sneezeweed	species	Plantae
Helianthus angustifolius	narrowleaf sunflower	species	Plantae
Helianthus maximiliani	Maximilian sunflower	species	Plantae
Helianthus simulans	Muck Sunflower	species	Plantae
Heliconia latispatha	Expanded Lobsterclaw	species	Plantae
Heliotropium indicum	Indian Heliotrope	species	Plantae
Hellenia		genus	Plantae
Hemerocallis lilioasphodelus	yellow daylily	species	Plantae
Heptapleurum arboricola	Miniature umbrella tree	species	Plantae
Herbertia lahue	Prairie Nymph	species	Plantae
Heteranthera limosa	Blue Mudplantain	species	Plantae
Hexasepalum teres	rough buttonweed	species	Plantae
Hibiscus coccineus	Scarlet Rosemallow	species	Plantae
Hibiscus laevis	Halberd-leaf Rosemallow	species	Plantae
Hibiscus moscheutos	swamp rose mallow	species	Plantae
Hibiscus mutabilis	Changeable Rose-mallow	species	Plantae
Hibiscus syriacus	common hibiscus	species	Plantae
Hieraciinae	hawkweeds	subtribe	Plantae
Hippeastrum hybridum		species	Plantae
Hordeum pusillum	little barley	species	Plantae
Hosta	hostas	genus	Plantae
Houstonia procumbens	roundleaf bluet	species	Plantae
Houstonia pusilla	tiny bluet	species	Plantae
Hydrangea barbara	woodvamp	species	Plantae

Hydrangea quercifolia	oakleaf hydrangea	species	Plantae
Hydrocotyle bonariensis	largeleaf pennywort	species	Plantae
Hydrocotyle umbellata	manyflower marshpennywort	species	Plantae
Hydrocotyle verticillata	Whorled Pennywort	species	Plantae
Hydrolea ovata	blue waterleaf	species	Plantae
Hygrophila lacustris	Waterweed	species	Plantae
Hymenocallis liriosme	spring spiderlily	species	Plantae
Hymenocallis occidentalis	woodland spider-lily	species	Plantae
Hypericum crux-andreae	St. Peter's-wort	species	Plantae
Hypericum drummondii	Nits and Lice	species	Plantae
Hypericum gymnanthum	Claspingleaf St. John's Wort	species	Plantae
Hypericum hypericoides	St. Andrew's cross	species	Plantae
Hypericum mutilum	Dwarf St. John's Wort	species	Plantae
Hypnum cupressiforme	Cypress-leaved Plait-moss	species	Plantae
Hypochaeris microcephala	white cat's ear	species	Plantae
Hypoxis hirsuta	yellow star grass	species	Plantae
Hypoxis sessilis	glossy-seeded star grass	species	Plantae
Ilex aquifolium	European holly	species	Plantae
Ilex cornuta	Chinese holly	species	Plantae
Ilex crenata	Japanese holly	species	Plantae
Ilex decidua	possumhaw	species	Plantae
Ilex longipes	Georgia Holly	species	Plantae
Ilex opaca	American holly	species	Plantae
Ilex verticillata	winterberry holly	species	Plantae
Ilex vomitoria	Yaupon Holly	species	Plantae
Illicium floridanum	Florida Anise	species	Plantae
Impatiens capensis	common jewelweed	species	Plantae
Ipomoea cordatotriloba	Tievine	species	Plantae
Ipomoea hederifolia	scarlet creeper	species	Plantae
Ipomoea lacunosa	White Morning-glory	species	Plantae
Ipomoea pandurata	wild potato vine	species	Plantae
Ipomoea quamoclit	Cypress Vine	species	Plantae
Iresine	bloodleaves	genus	Plantae
Iris X vinicolor		hybrid	Plantae
Iris brevicaulis	leafy blue flag	species	Plantae
Iris fulva	Copper Iris	species	Plantae
Iris pseudacorus	Yellow Iris	species	Plantae
Iris virginica	southern blue flag	species	Plantae
Isolepis		genus	Plantae
Itea virginica	Virginia sweetspire	species	Plantae
Iva annua	Sumpweed	species	Plantae
Jacobaea maritima	Dusty miller	species	Plantae
Jacquemontia tamnifolia	Hairy cluster-vine	species	Plantae
Jasminum polyanthum	Pink jasmine	species	Plantae
Jatropha		genus	Plantae
Juncus acuminatus	tapered rush	species	Plantae
Juncus articulatus	Jointed rush	species	Plantae
Juncus dichotomus	Forked Rush	species	Plantae
Juncus effusus	Soft Rush	species	Plantae
Juncus marginatus	Grass-leaved Rush	species	Plantae
Juncus repens	Creeping Rush	species	Plantae
Juncus roemerianus	needlegrass rush	species	Plantae
Juncus scirpoides	Needlepod Rush	species	Plantae
Juncus tenuis	Slender Path Rush	species	Plantae
Juniperus virginiana	eastern redcedar	species	Plantae
Justicia americana	American water-willow	species	Plantae
Justicia ovata	Looseflower Water-willow	species	Plantae
Koelreuteria		genus	Plantae
Krigia cespitosa	weedy dwarfdandelion	species	Plantae
Kummerowia striata	Japanese Clover	species	Plantae
Lactuca canadensis	Canada wild lettuce	species	Plantae
Lactuca floridana	woodland lettuce	species	Plantae
Lactuca serriola	prickly lettuce	species	Plantae
Lagerstroemia indica	Crape-myrtle	species	Plantae
Lamium amplexicaule	henbit deadnettle	species	Plantae
Lantana camara		species	Plantae
Laportea canadensis	wood nettle	species	Plantae
Lathyrus	sweet peas and vetchlings	genus	Plantae

Laurus nobilis	Bay laurel	species	Plantae
Leersia lenticularis	Catchfly grass	species	Plantae
Leersia virginica	white grass	species	Plantae
Lemna minor	common duckweed	species	Plantae
Lepidium virginicum	Virginia pepperweed	species	Plantae
Leptochloa panicoides		species	Plantae
Lespedeza cuneata	Chinese bushclover	species	Plantae
Leucanthemum		genus	Plantae
Leucobryum albidum	white moss	species	Plantae
Leucodontales		order	Plantae
Ligularia	Leopard plants	genus	Plantae
Ligustrum japonicum	wax-leaf ligustrum	species	Plantae
Ligustrum lucidum	tree privet	species	Plantae
Ligustrum sinense	Chinese privet	species	Plantae
Lilaeopsis carolinensis	Carolina grasswort	species	Plantae
Lilium formosanum	Formosa lily	species	Plantae
Lindera benzoin	northern spicebush	species	Plantae
Lindernia dubia	Yellowseed False Pimpernel	species	Plantae
Linum	Flaxes	genus	Plantae
Liquidambar styraciflua	American sweetgum	species	Plantae
Liriodendron tulipifera	tulip tree	species	Plantae
Liriope muscari	Liriope	species	Plantae
Lobelia cardinalis	cardinal flower	species	Plantae
Lobelia puberula	downy lobelia	species	Plantae
Lobelia spicata	pale-spiked lobelia	species	Plantae
Lolium multiflorum	Italian Ryegrass	species	Plantae
Lolium perenne	Perennial Ryegrass	species	Plantae
Lonicera japonica	Japanese honeysuckle	species	Plantae
Lonicera sempervirens	coral honeysuckle	species	Plantae
Loropetalum chinense	Chinese fringe flower	species	Plantae
Ludwigia decurrens	Wingleaf Primrose-Willow	species	Plantae
Ludwigia glandulosa	Cylindricfruit Primrose-willow	species	Plantae
Ludwigia grandiflora	large-flowered primrose-willow	species	Plantae
Ludwigia hirtella	Spindleroot	species	Plantae
Ludwigia leptocarpa	Angle Stem Primrose Willow	species	Plantae
Ludwigia octovalvis	Mexican Primrose-willow	species	Plantae
Ludwigia palustris	Water Purslane	species	Plantae
Ludwigia peploides	floating primrose-willow	species	Plantae
Ludwigia peruviana	Peruvian primrose-willow	species	Plantae
Ludwigia repens	Creeping Primrose-willow	species	Plantae
Lycopus americanus	American bugleweed	species	Plantae
Lycopus virginicus	sweet bugleweed	species	Plantae
Lycoris radiata	red spider lily	species	Plantae
Lygodium japonicum	Japanese climbing fern	species	Plantae
Lysimachia arvensis	scarlet pimpernel	species	Plantae
Lysimachia radicans	Trailing Yellow Loosestrife	species	Plantae
Lythrum alatum	Winged Loosestrife	species	Plantae
Maclura pomifera	Osage-orange	species	Plantae
Macrothelypteris torresiana	Mariana Maiden Fern	species	Plantae
Magnolia grandiflora	southern magnolia	species	Plantae
Magnolia virginiana	sweetbay magnolia	species	Plantae
Malus angustifolia	southern crabapple	species	Plantae
Malvaviscus arboreus	Turk's cap	species	Plantae
Mandevilla		genus	Plantae
Marsilea vestita	water clover	species	Plantae
Matelea carolinensis	Carolina climbing-milkweed	species	Plantae
Mazus pumilus	Japanese mazus	species	Plantae
Mecardonia acuminata	common axil-flower	species	Plantae
Mecardonia procumbens	Yellow-flowered waterhyssop	species	Plantae
Medicago lupulina	black medick	species	Plantae
Medicago polymorpha	bur clover	species	Plantae
Melaleuca viminalis	weeping bottlebrush	species	Plantae
Melia azedarach	Chinaberry	species	Plantae
Melica mutica	Twoflower Melicgrass	species	Plantae
Melilotus albus	white sweetclover	species	Plantae
Melilotus indicus	small melilot	species	Plantae
Melochia		genus	Plantae
Melothria pendula	creeping cucumber	species	Plantae

Menispermum canadense	moonseed	species	Plantae
Micranthemum umbrosum	Dwarf Helzine	species	Plantae
Mikania cordifolia	Florida Keys Hempvine	species	Plantae
Mikania scandens	climbing hempvine	species	Plantae
Millettia		genus	Plantae
Mimosa nuttallii	Catclaw Briar	species	Plantae
Mimosa pudica	Sensitive Plant	species	Plantae
Mimosa strigillosa	sunshine mimosa	species	Plantae
Mimulus alatus	sharpwing monkeyflower	species	Plantae
Mirabilis jalapa		species	Plantae
Mitchella repens	partridgeberry	species	Plantae
Mitreola petiolata	Lax Hornpod	species	Plantae
Modiola caroliniana	Carolina Bristlemallow	species	Plantae
Monarda citriodora	lemon beebalm	species	Plantae
Monarda fistulosa	wild bergamot	species	Plantae
Monarda punctata	spotted horse mint	species	Plantae
Morella cerifera	wax myrtle	species	Plantae
Moringa oleifera	Moringa tree	species	Plantae
Morus alba	white mulberry	species	Plantae
Morus nigra	black mulberry	species	Plantae
Morus rubra	red mulberry	species	Plantae
Murdannia nudiflora	Nakedstem Dewflower	species	Plantae
Musa X paradisiaca	Plantain	hybrid	Plantae
Musa acuminata	Cavendish banana	species	Plantae
Musa ornata	Flowering Banana	species	Plantae
Myosotis macrosperma	largeseed forget-me-not	species	Plantae
Myriophyllum aquaticum	Parrot's feather	species	Plantae
Nandina domestica	Heavenly bamboo	species	Plantae
Neckera pennata	shingle moss	species	Plantae
Nemophila aphylla	smallflower baby blue eyes	species	Plantae
Neotoma floridana	Eastern Woodrat	species	Plantae
Neottia bifolia	Southern Twayblade	species	Plantae
Nitella flexilis	Smooth Stonewort	species	Plantae
Nothoscordum bivalve	crowpoison	species	Plantae
Nuphar advena	spatterdock	species	Plantae
Nuttallanthus texanus	Texas toadflax	species	Plantae
Nymphaea odorata	American white waterlily	species	Plantae
Nyssa aquatica	Water Tupelo	species	Plantae
Nyssa biflora	Swamp tupelo	species	Plantae
Nyssa sylvatica	Black Tupelo	species	Plantae
Ocimum basilicum	Sweet basil	species	Plantae
Oenothera biennis	common evening-primrose	species	Plantae
Oenothera fruticosa	Narrow-leaved Sundrops	species	Plantae
Oenothera laciniata	cutleaf evening primrose	species	Plantae
Oenothera lindheimeri	clockweed	species	Plantae
Oenothera speciosa	Pinkladies	species	Plantae
Onoclea sensibilis	sensitive fern	species	Plantae
Ophioglossum	adder's-tongues	genus	Plantae
Ophiopogon	Lily-Turfs	genus	Plantae
Oplismenus hirtellus	Basket Grass	species	Plantae
Opuntia	prickly-pears	genus	Plantae
Orontium aquaticum	Golden Club	species	Plantae
Osmanthus fragrans	Sweet olive	species	Plantae
Osmunda spectabilis	American Royal Fern	species	Plantae
Ostrya virginiana	American hophornbeam	species	Plantae
Oxalis articulata	pink-sorrel	species	Plantae
Oxalis corniculata	Creeping Woodsorrel	species	Plantae
Oxalis debilis	Largeflower pink-sorrel	species	Plantae
Oxalis dillenii	slender yellow woodsorrel	species	Plantae
Oxalis hispidula	fine bristle woodsorrel	species	Plantae
Oxalis stricta	upright yellow woodsorrel	species	Plantae
Oxydendrum arboreum	sourwood	species	Plantae
Packera anonyma	Small's ragwort	species	Plantae
Packera glabella	Butterweed	species	Plantae
Pallavicinia		genus	Plantae
Panicum rigidum		species	Plantae
Paraserianthes lophantha	Plume Albizia	species	Plantae
Parthenium hysterophorus	Santa Maria feverfew	species	Plantae

Parthenocissus quinquefolia	Virginia creeper	species	Plantae
Paspalum dilatatum	Dallis grass	species	Plantae
Paspalum notatum	Bahia grass	species	Plantae
Paspalum setaceum	Thin Paspalum	species	Plantae
Paspalum urvillei	Vasey Grass	species	Plantae
Passiflora amethystina X caerulea	Passiflora 'Lavender Lady'	hybrid	Plantae
Passiflora caerulea	Bluecrown passionflower	species	Plantae
Passiflora incarnata	purple passionflower	species	Plantae
Passiflora lutea	yellow passionflower	species	Plantae
Penstemon digitalis	foxglove beardtongue	species	Plantae
Penstemon tenuis	Sharpsepal Beardtongue	species	Plantae
Pentapetes phoenicea		species	Plantae
Pentas		genus	Plantae
Penthorum sedoides	ditch stonecrop	species	Plantae
Perilla frutescens	beefsteak plant	species	Plantae
Persicaria chinensis	China knotweed	species	Plantae
Persicaria hydropiperoides	swamp smartweed	species	Plantae
Persicaria lapathifolia	pale smartweed	species	Plantae
Persicaria longiseta	low smartweed	species	Plantae
Persicaria maculosa	spotted lady's thumb	species	Plantae
Persicaria pensylvanica	pinkweed	species	Plantae
Persicaria punctata	dotted knotweed	species	Plantae
Persicaria virginiana	American jumpseed	species	Plantae
Phalaris angusta	Timothy Canarygrass	species	Plantae
Phanopyrum gymnocarpon	cottonmouth grass	species	Plantae
Phegopteris hexagonoptera	broad beech fern	species	Plantae
Philodendron	philodendrons	genus	Plantae
Phoradendron leucarpum	American Mistletoe	species	Plantae
Photinia	Christmas berries	genus	Plantae
Phyla lanceolata	lanceleaf frogfruit	species	Plantae
Phyla nodiflora	turkey tangle frogfruit	species	Plantae
Phyllanthus urinaria	Chamberbitter	species	Plantae
Phyllostachys aurea	fishpole bamboo	species	Plantae
Physalis angulata	cutleaf groundcherry	species	Plantae
Physalis virginiana	Virginia groundcherry	species	Plantae
Physostegia virginiana	obedient plant	species	Plantae
Phytolacca americana	American pokeweed	species	Plantae
Pinus echinata	shortleaf pine	species	Plantae
Pinus elliottii	slash pine	species	Plantae
Pinus glabra	spruce pine	species	Plantae
Pinus palustris	longleaf pine	species	Plantae
Pinus taeda	loblolly pine	species	Plantae
Pistia stratiotes	water lettuce	species	Plantae
Pittosporum tobira	Japanese pittosporum	species	Plantae
Pityopsis graminifolia	Narrowleaf Silkgrass	species	Plantae
Plagiomnium cuspidatum	Woodsy Thyme-moss	species	Plantae
Planera aquatica	Water Elm	species	Plantae
Plantago major	greater plantain	species	Plantae
Plantago virginica	dwarf plantain	species	Plantae
Platanus occidentalis	American sycamore	species	Plantae
Plectocephalus americanus	American basketflower	species	Plantae
Pleopeltis michauxiana	resurrection fern	species	Plantae
Pluchea camphorata	Camphor-weed	species	Plantae
Pluchea foetida	stinking camphorweed	species	Plantae
Poa annua	Annual Meadow-grass	species	Plantae
Poa autumnalis	Autumn Bluegrass	species	Plantae
Poa compressa	Flattened Meadow-grass	species	Plantae
Podocarpus macrophyllus	kusamaki	species	Plantae
Podophyllum peltatum	mayapple	species	Plantae
Polygala mariana	Maryland Milkwort	species	Plantae
Polygala nana	candyroot	species	Plantae
Polygonum aviculare	prostrate knotweed	species	Plantae
Polypremum procumbens	Rust Weed	species	Plantae
Polystichum acrostichoides	Christmas fern	species	Plantae
Polytrichum	haircap mosses	genus	Plantae
Pontederia cordata	pickerelweed	species	Plantae
Pontederia crassipes	common water hyacinth	species	Plantae
Populus deltoides	eastern cottonwood	species	Plantae

Porella		genus	Plantae
Portulaca oleracea	Common purslane	species	Plantae
Portulaca pilosa	shaggy portulaca	species	Plantae
Potamogeton nodosus	Longleaf Pondweed	species	Plantae
Potentilla indica	mock strawberry	species	Plantae
Prunella vulgaris	common selfheal	species	Plantae
Prunus caroliniana	Carolina laurelcherry	species	Plantae
Prunus laurocerasus	Cherry laurel	species	Plantae
Prunus mexicana	Mexican Plum	species	Plantae
Prunus serotina	black cherry	species	Plantae
Prunus umbellata	Hog Plum	species	Plantae
Pseudognaphalium obtusifolium	sweet everlasting	species	Plantae
Psidium cattleyanum	strawberry-guava	species	Plantae
Psidium guajava	Common guava	species	Plantae
Ptelea trifoliata	common hoptree	species	Plantae
Pteridium aquilinum	common bracken	species	Plantae
Ptilimnium capillaceum	herbwilliam	species	Plantae
Pueraria montana	kudzu	species	Plantae
Pycnanthemum albescens	Whiteleaf Mountain Mint	species	Plantae
Pycnanthemum muticum	Clustered Mountainmint	species	Plantae
Pyrrhopappus carolinianus	Carolina desert-chicory	species	Plantae
Pyrrhopappus pauciflorus	false dandelion	species	Plantae
Pyrus calleryana	Callery pear	species	Plantae
Quercus acutissima	Sawtooth oak	species	Plantae
Quercus alba	white oak	species	Plantae
Quercus coccinea	scarlet oak	species	Plantae
Quercus falcata	southern red oak	species	Plantae
Quercus laurifolia	laurel oak	species	Plantae
Quercus lyrata	overcup oak	species	Plantae
Quercus marilandica	blackjack oak	species	Plantae
Quercus michauxii	swamp chestnut oak	species	Plantae
Quercus nigra	water oak	species	Plantae
Quercus pagoda	cherrybark oak	species	Plantae
Quercus phellos	willow oak	species	Plantae
Quercus shumardii	Shumard oak	species	Plantae
Quercus similis	Bottomland Post Oak	species	Plantae
Quercus stellata	post oak	species	Plantae
Quercus suber	cork oak	species	Plantae
Quercus texana	Texas red oak	species	Plantae
Quercus velutina	black oak	species	Plantae
Quercus virginiana	southern live oak	species	Plantae
Ranunculus abortivus	small-flowered buttercup	species	Plantae
Ranunculus fascicularis	Early Buttercup	species	Plantae
Ranunculus muricatus	Rough-fruited buttercup	species	Plantae
Ranunculus occidentalis	Western Buttercup	species	Plantae
Ranunculus pusillus	low spearwort	species	Plantae
Ranunculus repens	Creeping buttercup	species	Plantae
Ranunculus sardous	hairy buttercup	species	Plantae
Ratibida columnifera	upright prairie coneflower	species	Plantae
Reynoutria japonica	Japanese knotweed	species	Plantae
Rhaphiolepis indica	Indian Hawthorn	species	Plantae
Rhapidophyllum hystrix	needle palm	species	Plantae
Rhexia mariana	Maryland meadowbeauty	species	Plantae
Rhexia virginica	Virginia meadowbeauty	species	Plantae
Rhododendron canescens	Mountain Azalea	species	Plantae
Rhus copallinum	shining sumac	species	Plantae
Rhynchosia minima	Least Snoutbean	species	Plantae
Rhynchospora caduca	anglestem beaksedge	species	Plantae
Rhynchospora corniculata	short-bristled horned beaksedge	species	Plantae
Robinia pseudoacacia	black locust	species	Plantae
Rorippa	yellowcresses	genus	Plantae
Rosa bracteata	Macartney's rose	species	Plantae
Rosa laevigata	Cherokee rose	species	Plantae
Rotala ramosior	Toothcup	species	Plantae
Rubus allegheniensis	Allegheny blackberry	species	Plantae
Rubus flagellaris	Common Dewberry	species	Plantae
Rubus fruticosus	European bramble complex	complex	Plantae
Rubus occidentalis	black raspberry	species	Plantae

Rubus pensilvanicus	Pennsylvania Blackberry	species	Plantae
Rubus trivialis	southern dewberry	species	Plantae
Rudbeckia amplexicaulis	clasping coneflower	species	Plantae
Rudbeckia fulgida	orange coneflower	species	Plantae
Rudbeckia grandiflora	rough coneflower	species	Plantae
Rudbeckia hirta	black-eyed Susan	species	Plantae
Rudbeckia triloba	Brown-eyed Susan	species	Plantae
Ruellia caroliniensis	Carolina ruellia	species	Plantae
Ruellia nudiflora	violet ruellia	species	Plantae
Ruellia simplex	Mexican ruellia	species	Plantae
Rumex crispus	curled dock	species	Plantae
Rumex verticillatus	swamp dock	species	Plantae
Russelia equisetiformis	Firecracker plant	species	Plantae
Sabal minor	Dwarf Palmetto	species	Plantae
Sabal palmetto	cabbage palmetto	species	Plantae
Sabatia angularis	Rosepink	species	Plantae
Sabatia calycina	Coastal Rose Gentian	species	Plantae
Saccharum giganteum	sugarcane plumegrass	species	Plantae
Sacciolepis striata	American Cupscale	species	Plantae
Sagina decumbens	Beach Pearlwort	species	Plantae
Sagittaria graminea	Grass-leaved Arrowhead	species	Plantae
Sagittaria lancifolia	lanceleaf arrowhead	species	Plantae
Sagittaria latifolia	broadleaf arrowhead	species	Plantae
Sagittaria papillosa	Nipplebract Arrowhead	species	Plantae
Sagittaria platyphylla	Delta Arrowhead	species	Plantae
Salix nigra	black willow	species	Plantae
Salvia coccinea	Tropical sage	species	Plantae
Salvia lyrata	lyreleaf sage	species	Plantae
Salvia officinalis	garden sage	species	Plantae
Salvia polystachya	Wild Sage	species	Plantae
Salvinia minima	water spangles	species	Plantae
Sambucus canadensis	American black elderberry	species	Plantae
Samolus parviflorus	seaside brookweed	species	Plantae
Sanicula canadensis	Black Snakeroot	species	Plantae
Sassafras albidum	sassafras	species	Plantae
Saururus cernuus	lizard's tail	species	Plantae
Sceptridium biternatum	sparse-lobed grapefern	species	Plantae
Sceptridium dissectum	cut-leaved grape-fern	species	Plantae
Schizachyrium scoparium	little bluestem	species	Plantae
Scirpus cyperinus	woolgrass	species	Plantae
Scleria muehlenbergii	Muehlenberg's nutrush	species	Plantae
Scleria oligantha	Littlehead Nutrush	species	Plantae
Scleria triglomerata	Whip Nutrush	species	Plantae
Scoparia dulcis	licorice weed	species	Plantae
Scutellaria integrifolia	Helmet skullcap	species	Plantae
Scutellaria racemosa	South American Skullcap	species	Plantae
Selaginella apoda	meadow spikemoss	species	Plantae
Senna alata	Candelabra Bush	species	Plantae
Senna obtusifolia	American Sicklepod	species	Plantae
Sesbania drummondii	Rattlebush	species	Plantae
Sesbania herbacea	bigpod sesbania	species	Plantae
Sesbania vesicaria	Bladder Pod	species	Plantae
Setaria pumila	yellow foxtail	species	Plantae
Sherardia arvensis	Field madder	species	Plantae
Sicyos angulatus	Bur-cucumber	species	Plantae
Sida acuta	Spinyhead Sida	species	Plantae
Sida rhombifolia	Cuban jute	species	Plantae
Sideroxylon lanuginosum	Gum bumelia	species	Plantae
Sideroxylon lycioides	Buckthorn Bully	species	Plantae
Sisyrinchium angustifolium	narrow-leaved blue-eyed grass	species	Plantae
Sisyrinchium micranthum	Blue Pigroot	species	Plantae
Sisyrinchium rosulatum	Annual Blue-eyed Grass	species	Plantae
Smallanthus uvedalia	bear's foot	species	Plantae
Smilax auriculata	Earleaf Greenbrier	species	Plantae
Smilax bona-nox	saw greenbrier	species	Plantae
Smilax glauca	sawbrier	species	Plantae
Smilax laurifolia	laurel-leaf greenbrier	species	Plantae
Smilax pumila	sarsaparilla vine	species	Plantae

Smilax rotundifolia	roundleaf greenbrier	species	Plantae
Smilax smallii	Lanceleaf Greenbrier	species	Plantae
Smilax tamnoides	bristly greenbrier	species	Plantae
Smilax walteri	Coral Greenbrier	species	Plantae
Smilia fasciata		species	Plantae
Solanum americanum	American black nightshade	species	Plantae
Solanum carolinense	Carolina horsenettle	species	Plantae
Solanum chenopodioides	tall nightshade	species	Plantae
Solanum lycopersicum	tomato	species	Plantae
Solanum nigrum	black nightshade	species	Plantae
Solanum pseudocapsicum	Jerusalem cherry	species	Plantae
Solidago altissima	tall goldenrod	species	Plantae
Solidago caesia	bluestem goldenrod	species	Plantae
Solidago gigantea	giant goldenrod	species	Plantae
Solidago rugosa	common wrinkle-leaved goldenrod	species	Plantae
Solidago sempervirens	northern seaside goldenrod	species	Plantae
Soliva sessilis	common soliva	species	Plantae
Sonchus asper	prickly sowthistle	species	Plantae
Sonchus oleraceus	Common Sow-thistle	species	Plantae
Sorghum halepense	Johnson grass	species	Plantae
Sphagneticola trilobata	trailing daisy	species	Plantae
Sphagnum	Sphagnum mosses	genus	Plantae
Sphenoclea zeylanica	chickenspike	species	Plantae
Sphenopholis		genus	Plantae
Spigelia marilandica	Indian Pink	species	Plantae
Spiraea japonica	Japanese Spiraea	species	Plantae
Spiranthes odorata	Marsh Ladies' Tresses	species	Plantae
Spiranthes praecox	Grass-leaved Ladies' Tresses	species	Plantae
Spiranthes vernalis	Spring Ladies' Tresses	species	Plantae
Stachys floridana	Florida Hedgenettle	species	Plantae
Stachys tenuifolia	smooth hedgenettle	species	Plantae
Stellaria media	common chickweed	species	Plantae
Stenotaphrum secundatum	Saint Augustine grass	species	Plantae
Stokesia laevis	Stokes' aster	species	Plantae
Strophostyles helvola	trailing fuzzy-bean	species	Plantae
Stylosanthes biflora	sidebeak pencilflower	species	Plantae
Styrax grandifolius	Bigleaf Snowbell	species	Plantae
Symphyotrichum cordifolium	Common Blue Wood Aster	species	Plantae
Symphyotrichum divaricatum	Yard Aster	species	Plantae
Symphyotrichum dumosum	Bushy Aster	species	Plantae
Symphyotrichum lateriflorum	calico aster	species	Plantae
Symphyotrichum patens	late purple aster	species	Plantae
Symphyotrichum pilosum	hairy white oldfield aster	species	Plantae
Symphyotrichum praealtum	willowleaf aster	species	Plantae
Symplocos tinctoria	Sweetleaf	species	Plantae
Syngonium podophyllum	Goosefoot-plant	species	Plantae
Syntrichia ruralis	star moss	species	Plantae
Taraxacum officinale	common dandelion	species	Plantae
Taxodium ascendens	pondcypress	species	Plantae
Taxodium distichum	baldcypress	species	Plantae
Tecoma		genus	Plantae
Teloschistes exilis	slender orange-bush	species	Plantae
Ternstroemia gymnanthera	Japanese Ternstroemia	species	Plantae
Thalia dealbata	Powdery thalia	species	Plantae
Thaumatophyllum bipinnatifidum	Tree Philodendron	species	Plantae
Thelypteris kunthii	stately maiden fern	species	Plantae
Thuidium delicatulum	delicate fern moss	species	Plantae
Thunbergia alata	Black-eyed Susan vine	species	Plantae
Thyrsanthella difformis	climbing dogbane	species	Plantae
Tilia americana	basswood	species	Plantae
Tillandsia recurvata	ballmoss	species	Plantae
Tillandsia usneoides	Spanish moss	species	Plantae
Tipularia discolor	crane-fly orchid	species	Plantae
Toxicodendron pubescens	Atlantic poison oak	species	Plantae
Toxicodendron radicans	poison ivy	species	Plantae
Trachelospermum asiaticum	Asiatic jasmine	species	Plantae
Tradescantia fluminensis	small-leaf spiderwort	species	Plantae
Tradescantia hirsutiflora	Hairyflower Spiderwort	species	Plantae

Tradescantia ohiensis	bluejacket	species	Plantae
Tradescantia virginiana	Virginia spiderwort	species	Plantae
Trentepohlia		genus	Plantae
Trepocarpus aethusae	Whitenymph	species	Plantae
Triadica sebifera	Chinese Tallow	species	Plantae
Trichostema dichotomum	Blue Curls	species	Plantae
Tridens strictus	Longspike Tridens	species	Plantae
Trifolium dubium	Lesser hop trefoil	species	Plantae
Trifolium incarnatum	crimson clover	species	Plantae
Trifolium pratense	red clover	species	Plantae
Trifolium repens		species	Plantae
Trifolium resupinatum	Reversed clover	species	Plantae
Trillium foetidissimum	Mississippi River wakerobin	species	Plantae
Triodanis biflora	Venus's looking-glass	species	Plantae
Triodanis perfoliata	clasping Venus's looking glass	species	Plantae
Tripsacum dactyloides	Eastern Gamagrass	species	Plantae
Typha angustifolia	narrow-leaved cattail	species	Plantae
Typha latifolia	broadleaf cattail	species	Plantae
Ulmus alata	Winged Elm	species	Plantae
Ulmus americana	American elm	species	Plantae
Ulmus crassifolia	Cedar Elm	species	Plantae
Ulmus glabra	Wych Elm	species	Plantae
Ulmus parvifolia	Chinese elm	species	Plantae
Ulmus rubra	slippery elm	species	Plantae
Urena lobata	Caesar weed	species	Plantae
Urtica chamaedryoides	heartleaf nettle	species	Plantae
Urtica dioica	stinging nettle	species	Plantae
Utricularia gibba	humped bladderwort	species	Plantae
Vaccinium arboreum	sparkleberry	species	Plantae
Vaccinium elliottii	mayberry	species	Plantae
Vaccinium stamineum	deerberry	species	Plantae
Valerianella radiata	beaked cornsalad	species	Plantae
Verbena bonariensis	purpletop vervain	species	Plantae
Verbena brasiliensis	Brazilian Vervain	species	Plantae
Verbena halei	Texas vervain	species	Plantae
Verbena rigida	Slender Vervain	species	Plantae
Verbesina alternifolia	wingstem	species	Plantae
Verbesina virginica	frostweed	species	Plantae
Verbesina walteri	Carolina Crownbeard	species	Plantae
Vernicia fordii	tung oil tree	species	Plantae
Vernonia gigantea	Tall Ironweed	species	Plantae
Veronica persica	bird's-eye speedwell	species	Plantae
Viburnum dentatum	southern arrowwood	species	Plantae
Viburnum rufidulum	Rusty Blackhaw	species	Plantae
Vicia ludoviciana	slender vetch	species	Plantae
Vicia sativa	Common Vetch	species	Plantae
Vicia tetrasperma	Smooth tare	species	Plantae
Vigna luteola	Wild Cowpea	species	Plantae
Vinca major	greater periwinkle	species	Plantae
Viola alba	White Violet	species	Plantae
Viola bicolor	American field pansy	species	Plantae
Viola esculenta	salad violet	species	Plantae
Viola lanceolata	white bog violet	species	Plantae
Viola palmata	early blue violet	species	Plantae
Viola primulifolia	primrose-leaved violet	species	Plantae
Viola septemloba	Southern Coastal Violet	species	Plantae
Viola sororia	common blue violet	species	Plantae
Viola walteri	Prostrate blue violet	species	Plantae
Vitex agnus-castus	Lilac chaste tree	species	Plantae
Vitis aestivalis	summer grape	species	Plantae
Vitis cinerea	graybark grape	species	Plantae
Vitis mustangensis	mustang grape	species	Plantae
Vitis palmata	catbird grape	species	Plantae
Vitis rotundifolia	muscadine	species	Plantae
Vitis vulpina	frost grape	species	Plantae
Wisteria sinensis	Chinese wisteria	species	Plantae
Woodwardia areolata	netted chain fern	species	Plantae
Xanthium strumarium	rough cocklebur	species	Plantae

Xanthosoma sagittifolium	Arrowleaf Elephant's Ear	species	Plantae
Xyris laxifolia	Laxleaf Yelloweyed Grass	species	Plantae
Youngia japonica	Oriental false hawksbeard	species	Plantae
Zelkova serrata	Japanese zelkova	species	Plantae
Zephyranthes carinata	Rose Pink Zephyr Lily	species	Plantae
Zinnia elegans	Elegant Zinnia	species	Plantae
Zizaniopsis miliacea	Giant Cutgrass	species	Plantae
Protozoa			
Arcyria		genus	Protozoa
Ceratiomyxa fruticulosa	Honeycomb Coral Slime Mold	species	Protozoa
Fuligo septica	Dog Vomit Slime Mold	species	Protozoa
Lycogala epidendrum		species	Protozoa
Metatrichia vesparium	Wasp's Nest Slime Mold	species	Protozoa
Physarum globuliferum		species	Protozoa
Reticularia lycoperdon	False Puffball	species	Protozoa
Stemonitis fusca		species	Protozoa
Reptilia (snakes, turltes, lizards, etc.)			
Agkistrodon contortrix	Eastern Copperhead	species	Reptilia
Agkistrodon piscivorus	Northern Cottonmouth	species	Reptilia
Alligator mississippiensis	American Alligator	species	Reptilia
Anolis carolinensis	Green Anole	species	Reptilia
Anolis sagrei	Brown Anole	species	Reptilia
Apalone spinifera	Spiny Softshell Turtle	species	Reptilia
Carphophis amoenus	Eastern Worm Snake	species	Reptilia
Chelydra serpentina	Common Snapping Turtle	species	Reptilia
Coluber constrictor	North American Racer	species	Reptilia
Diadophis punctatus	ring-necked snake	species	Reptilia
Farancia abacura	Mudsnake	species	Reptilia
Graptemys pseudogeographica	False Map Turtle	species	Reptilia
Haldea striatula	Rough Earthsnake	species	Reptilia
Hemidactylus turcicus	Mediterranean House Gecko	species	Reptilia
Kinosternon subrubrum	Eastern Mud Turtle	species	Reptilia
Lampropeltis holbrooki	Speckled Kingsnake	species	Reptilia
Nerodia cyclopion	Mississippi Green Watersnake	species	Reptilia
Nerodia erythrogaster	Plain-bellied Watersnake	species	Reptilia
Nerodia fasciata	Banded Watersnake	species	Reptilia
Nerodia rhombifer	Diamondback Watersnake	species	Reptilia
Nerodia sipedon	Common Watersnake	species	Reptilia
Opheodrys aestivus	Rough Greensnake	species	Reptilia
Pantherophis obsoletus	Western Ratsnake	species	Reptilia
Pantherophis spiloides	Gray Ratsnake	species	Reptilia
Plestiodon fasciatus	Common Five-lined Skink	species	Reptilia
Plestiodon laticeps	Broad-headed Skink	species	Reptilia
Pseudemys concinna	River Cooter	species	Reptilia
Sceloporus consobrinus	Prairie Lizard	species	Reptilia
Scincella lateralis	Little Brown Skink	species	Reptilia
Sternotherus odoratus	Eastern Musk Turtle	species	Reptilia
Storeria dekayi	Dekay's Brownsnake	species	Reptilia
Storeria occipitomaculata	Red-bellied Snake	species	Reptilia
Thamnophis proximus	Western Ribbon Snake	species	Reptilia
Thamnophis saurita	Eastern Ribbon Snake	species	Reptilia
Thamnophis sirtalis	Common Garter Snake	species	Reptilia
Trachemys scripta	Common Slider	species	Reptilia
Virginia valeriae	Smooth Earthsnake	species	Reptilia

Appendix 2: Land Acquisition Rubric

BREC Land Acquisition Rubric

The acquisition of land by BREC expands recreation opportunities for the people living in East Baton Rouge Parish. This document is intended to assist BREC staff with prioritizing new land acquisition opportunities. This rubric is designed to aid BREC in clarifying the acquisition process and identifying the purpose for each acquisition. As an effort to guide BREC's land acquisition program, the following criteria has been established to prioritize land acquisition opportunities.

BREC will evaluate land acquisition opportunities using a numeric system based on a set of criteria that was developed using information provided in the 2019 Community Interest and Opinion Survey, 2019 Resiliency Strategy to assist with flood control, the EBR Pedestrian and Bicycle Master Plan and the Future BR Plan.

As is evident in the 2019 Survey, residents of East Baton Rouge Parish support BREC and are proud BREC is among the best recreation departments in the United States. EBR residents value the recreation programs provided by BREC and the natural resources BREC preserves in the parks. Respondents to the Community Interest survey placed a high value on natural areas, greenways, and nature trails. They also valued the ability of natural areas to hold flood waters and reduce temperatures in the summer months.

The land acquisition rubric is based on a numeric system that places a value on each property while allowing for professional judgement needed to rank each acquisition. The rubric is to be filled out by BREC professionals who understand the process and park system. It is important to use the rubric as a guide and not completely remove the judgement of park planning professionals who oversee the long-term vision for the growth of the BREC system. Although the Planning and Engineering Department will likely fill out the rubric, it is important that BREC's Park Operations and Recreation Departments also be consulted during the assessment process to evaluate operational, maintenance and programming considerations.

Each of the eight criteria will receive a number value 0 through 5, with five being the highest. Select only one number per criteria. Provide notes on why the number was chosen. After each criterion is scored, the point values for each property are totaled and the property with the highest value is considered the preferred acquisition. Use the rubric to compare potential acquisitions, focusing on sites with the highest point values. Properties above 30 should be strongly considered for acquisition. Properties with low point values, under 10, should be removed from consideration unless there is extenuating circumstances that make acquisition of the site reasonable.

Land Acquisition Assessment Criteria

1. Proximity to BREC Property

Is the subject property adjacent to an existing BREC property or facility? (4.1.8)

The subject property shares more than 100 total linear feet of a common boundary along more than one side of an existing BREC property or connects to an existing greenway system and is necessary to extend trail system.	5
The subject property shares more than 100 total linear feet of a common boundary along only one side an existing BREC property or provides access to an existing greenway system.	4
The subject property shares less than 100 total linear feet of a common boundary with an existing BREC property.	3
The subject property is "adjacent" to an existing BREC property, but is separated by a street, drainage channel, or stream.	2
The subject property is located diagonally from an existing BREC property.	1
The subject property is not adjacent to an existing BREC property.	0

Score: ____________________________

Notes: ____

2. Strategic Planning

3Is the subject property identified as an acquisition for any of the following BREC Plans or Initiatives: BREC Strategic Plan; Parish-Wide Bike-Pedestrian Master Plan; Gap Analysis for high priority areas and for BREC's 10-minute walk goal as identified by the Trust for Public Land Park Score? (4.1.2, 4.1.3, 4.1.4, 4.1.6)

The subject property is identified as an acquisition for any of the following BREC Plans or Initiatives: BREC's strategic plan; the EBR Parish Pedestrian and Bicycle Master Plan; Gap Analysis for high priority areas and for BREC's 10-minute walk goal as identified by the Trust for Public Land Park Score.	5
The subject property is not identified in a plan but will assist in accomplishing other strategic directions or master plan goals and is located near or adjacent to a property that was identified as an acquisition in above said plans.	4
The subject property is not identified as an acquisition but will assist in accomplishing other strategic directions or master plan goals.	3
The subject property is not identified as an acquisition but will assist partially in accomplishing other strategic or master plan goals	2
The subject property is located in an area that may assist in goals not yet identified by BREC or the City-Parish.	1
The subject property is not mentioned as an acquisition and will not assist BREC or the City-Parish in accomplishing goals.	0

Score: _____________________________

Notes: ____

3. Service Gap/Future Expansion

Is the subject property needed to fulfill a level of service gap, community need or for future expansion of BREC programs? (4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.6)

The subject property is critical to fulfilling a LOS gap or high-ranking community need	5
The subject property partially fulfills a LOS gap or high-ranking community need	4
The subject property has potential to fulfill a LOS gap or expand BREC programs in the near future (this year or next).	3
The subject property has potential to fulfill a LOS gap or expand BREC programs in the next 2-5 years.	2
The subject property is not necessary to fulfill a gap or expand BREC programs, but would improve the quality of existing facilities, amenities or existing BREC programs.	1
The subject property is not necessary to fulfill a LOS gap, fulfill a community need or expand BREC programs.	0

Score: ________________________________

Notes: ____

4. Ecological Value

Does the subject property support high biodiversity of East Baton Rouge Parish and/or does the property have a high ecological value?

The subject property represents a historical and threatened natural community of EBR parish and/or ranks high on the Ecological Value Rubric.	5
The subject property would preserve a rare species or sensitive habitat and ranks High or Medium on the Ecological Value Rubric.	4
The subject property has a High to Medium Floristic Quality Index (FQI) rating and ranks High to Medium on the Ecological Value Rubric.	3
The subject property supports native flora and fauna and with reasonable stewardship the property can increase its conservation value score and/or ranks Medium to Low on the Ecological Value Rubric	2
The property is disturbed, has low diversity and more than 50% invasive species but with moderate stewardship the property could be restored to a functioning natural community and ranks Medium to Low on the Ecological Value Rubric.	1
The subject property is highly disturbed and provides little benefit to native flora and fauna, little to no potential for restoration and ranks low on the Ecological Value Rubric.	0

Ecological Value Rubric Score: ____________________

Score: ______________________________

Notes: ____

5. Unique Features

Does the subject property protect or provide access to unique features, landmarks, or cultural resources? (4.1.1, 4.1.6)

The subject property preserves identified historic landmarks and cultural resource sites.	5
The subject property preserves unique natural features.	4
The subject property contributes to the "feeling" or "setting" of the unique feature, landmark, or cultural resource being preserved.	3
The subject property acts as a physical buffer to a protected unique feature, landmark, or cultural resource.	2
The subject property provides access to a unique feature, landmark, cultural resource.	1
The subject property does not include, protect or provide access to unique features, landmark, or cultural resources.	0

Score: ________________________________

Notes: ____

6. Natural Capital/Ecosystem Service Benefits

Does the subject property provide benefits to the surrounding community and residents of East Baton Rouge Parish resulting in a positive impact on the local economy as defined by the Natural Capital Rubric?

The subject property provides an identified benefit as outlined in the Resilience Strategy on a parish-wide level and/or ranks High on the Natural Capital Rubric.	5
The subject property provides benefit on a local community level and ranks High to Medium on the Natural Capital Rubric.	4
The subject property has potential to provide some benefit to the community through restoration in the near future (this year or next) and ranks Medium on the Natural Capital Rubric.	3
The subject property may benefit the community in the next 2-5 years and ranks Medium to Low on the Natural Capital Rubric	2
The property does not currently provide benefits to the community but through park design and restoration could provide in the future and ranks Low on the Natural Capital Rubric.	1
The subject property provides little to no benefit to the community with no potential for restoration and ranks Low on the Natural Capital Rubric.	0

Natural Capital Rubric Score: ___________________

Score: ______________________

Notes: ____

7. Increase Existing Property/Facility Value

Does the subject property increase the ecological, natural capital or recreational value (based on Ecologic and Natural Capital Rubrics) of an existing BREC property or facility? (4.1.1)

The subject property will increase the ecological, natural capital and recreational value of an existing BREC property.	5
The subject property will increase 2 of the 3 assessed values (ecological, natural capital values based on rubrics or recreational value) of an existing BREC property.	4
The subject property will increase 1 of the 3 assessed values (ecological, natural capital values based on rubrics or recreational value) of an existing BREC property.	3
The subject property may increase at least 1 of the 3 assessed values (ecological, natural capital values based on rubrics or recreational value) in the near future.	2
The property does not currently increase the value (ecological, natural capital values based on rubrics or recreational value) of an existing BREC property but through sustainable design and restoration it has the potential to.	1
The subject property does not increase the value (ecological, natural capital values based on rubrics or recreational value) of any existing BREC parks.	0

Score: ________________________________

Notes: ____

8. Funding and Property Cost

Was the subject property donated or is the cost of purchase below appraised value or previously budgeted?

The subject property was donated to BREC, or the full cost is being covered by outside funding.	5
A portion of the property was donated to BREC, or a portion of the costs covered by outside funding.	4
The property is being purchased at a cost below the appraised value.	3
The property is being purchased at appraised value, but the cost was planned and budgeted.	2
The property is being purchased at appraised value and the cost was not previously planned or budgeted.	1
The property is priced above appraised value.	0

Score: ___________________________________

Notes: ____

Rubric Evaluation Results

Criteria		Score	Comment
1	Proximity to BREC Property		
2	Strategic Planning		
3	Service Gap/Future Expansion		
4	Ecological Value		
5	Unique Features		
6	Natural Capital/Ecosystem Service Benefits		
7	Increase Existing Property/Facility Value		
8	Funding and Property Cost		
Total Score:			

Acquisition Priority

High Acquisition Priority: 31-40

Medium Acquisition Priority: 21-30

Low Acquisition Priority: 11-20

Remove from Consideration: 0-10

Appendix 3: Land Planning and Decision-Making Framework

Land Planning and Development Decision Making Framework

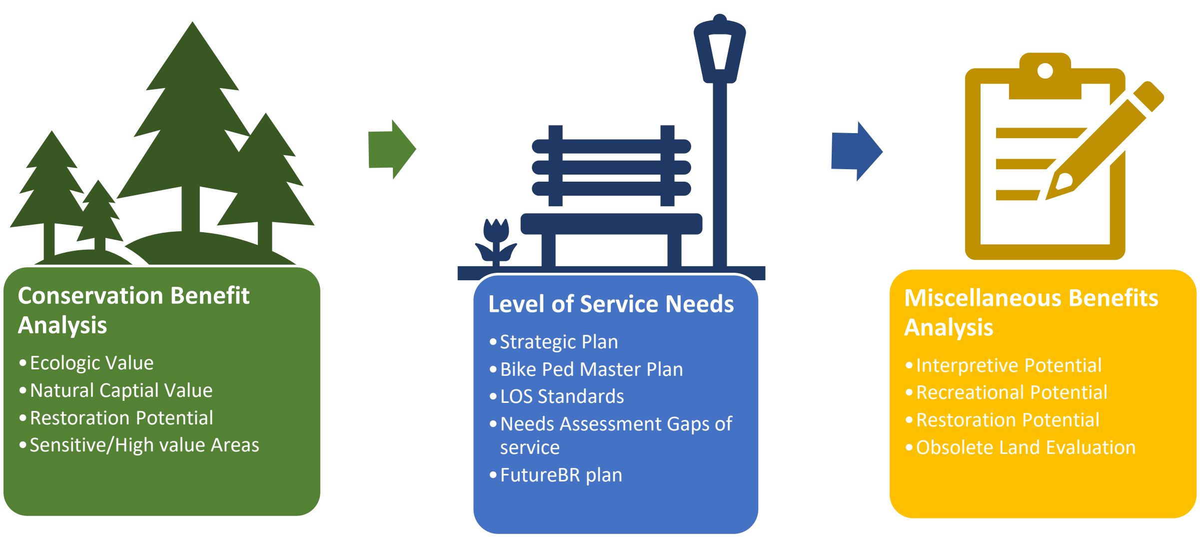
BREC is committed to both the conservation of natural resources and to providing recreational opportunities to the residents of East Baton Rouge Parish. Balancing these two priorities can sometimes be difficult since one often impacts the other. For example, the construction of recreational amenities can significantly impact the ecological services of an ecosystem. Thus, it is important that BREC have a systematic and scientific tool for evaluating the benefits of each to aid in the decision-making process.

The following framework is designed to work in conjunction with other data gathering rubrics, as well as BREC's Level of Service Standards, and will allow BREC to evaluate and weigh the ecological and natural capital benefits of its properties. The framework will give BREC planners access to ecological and ecosystem service value data for each park, rate the importance of those factors, and ultimately direct decisions about the properties role in BREC's system and how the public will interact with the property. This process is not designed to replace the Master Planning process where public input is received but instead will hopefully assist in providing data necessary to make informed decisions and guide planners through potential benefits and ways in which the park can best serve the community. The framework was designed to evaluate a single property, not evaluate the best location for a certain LOS need or amenity. It will hopefully provide enough data to guide Park Type classification decisions if the property is not yet designated in the BREC system or help direct re-classification if the park's goals and community needs have changed. It is important that this process be data driven and transparent to show the factors that are considered when making planning decisions.

Using the Framework

To use this framework, answer the questions in succession and document the answers accordingly. Not every question will lead to a "decision". Some questions will simply provide data to be used further along in the framework.

The framework is divided into three sections: conservation benefits, level of service needs, and miscellaneous benefits.



1) **Conservation Benefits:** This section must be completed for every property in question to determine its conservation potential. In this section the existing ecological and ecosystem service (natural capital) benefits of a park's natural resources will be evaluated, as well as the potential ecological and ecosystem service benefits of parks natural resources if they are restored. Following the completion of this section most parks will have both an ecological and natural capitol rating. Some parks will not receive an ecological value depending on how the framework questions are answered. However, even these parks will have a natural capital rating. It is important that BREC staff in the Natural Resource Division complete the Ecological Value Rubric and assist in the completion of the Natural Capital Rubric as needed.

2) **Level of Service Needs**: In this section the recreational needs of a community will be evaluated using BREC's Level of Service (LOS) metrics. Most properties will provide some aspect of recreational value to the public and in this section those benefits will be ranked based on BREC's standards and the community's needs. The recreation benefits ranked in this section will simultaneously be weighed against their potential ecological impacts.

   Impact to the ecological value and ecosystem services should be evaluated by redoing the rubrics in Section 1 using the hypothetical development proposed by the LOS metrics or community needs survey. If the Conservation Benefits rating decreases in the hypothetical scenario, a conscious decision must then be made in Question 8 to ensure that the LOS metrics support that the recreational needs outweigh ecological or natural capital benefit losses. This decision must be made jointly between BREC's planning and design team and natural resource staff to ensure both sides are weighed. If the conclusion is made that the ecological impacts outweigh the recreational benefits, a different location should be pursued for the LOS need. By the end of Section 2, most parks will have a designation and proceeding to Section 3 will not be necessary. However, if the park under evaluation does not yet hold a designation, additional considerations should be assessed before assigning a park classification and Section 3 must be completed.

3) **Miscellaneous Benefits:** The miscellaneous benefits section was created to account for the secondary benefits that a park may provide which may assist in determining how the public could interact with the property and the level of amenities that could or should be provided. This section should not replace the master planning process which takes into consideration public input. However, it can be used during the master planning process to evaluate any potential opportunities and benefits. Only parks which do not receive a classification in questions 7-9 should proceed to Section 3. This section also provides the potential for the property to be decommissioned from the system if there is no LOS need or recreation potential and the benefits of the park do not outweigh the costs to maintain it.

Section 1: Conservation Benefits

1. Is there natural habitat located on the property?

This question is used to determine if there are any natural areas within the park that can be evaluated in the Ecological Value Rubric. Natural habitat includes any of the natural communities as defined by LDWF such as ponds, forests, prairie, etc. but also includes restoration and native planting areas and any areas within a park that are undeveloped or have naturalized due to low or no maintenance such as a low-mow zone. Maintained, man-made, landscaped features such as flower beds or parking lot islands do not qualify as natural habitat. Although parks should be evaluated on a case-by-case basis, size should be a modest consideration. Typically, only areas .25 acres or larger would be significant enough to be evaluated in the rubric depending on the site.

Parks that are mainly impermeable surfaces and built structures do not have features that can be assessed from an ecological standpoint. However, we give an opportunity to assess restoration potential in question 4.

A. YES or NO Question
   a. If yes go to Question #2
   b. If no go to Question #4
B. Answer: _____________
C. Example:
   a. Milford Wampold Park: No, there are no un-maintained, un-landscaped areas within the park.
   b. North Street Park: Yes, due to nearly 1 acre swath of unmaintained forest/shrub area on edge of property.

2. What is the Ecological Value of the Park?

To answer this question, fill out the Ecological Value Rubric which will require evaluating each of the below parameters. The Rubric should be attached to this framework as evidence of values assigned. The Ecological Value Rubric is meant to assess the natural habitats within the park for habitat quality, wildlife benefits, unique ecological features, sensitive species, or areas, etc. Although all outdoor areas have some ecological value, the nature of this rubric is to evaluate, on a deeper level, qualities that may deter certain development, require protection of certain areas, and evaluate how much consideration should be given to the ecological value when weighing against recreational needs of the community. The Natural Capital Rubric will also evaluate the ecosystem services of a park from the standpoint of how they benefit the people of East Baton Rouge Parish.

- Undeveloped status: ______________________
- Size and Continuity of Undeveloped Natural areas: _____________________
- Floristic Quality Index/Habitat Condition: _________________________
- Hydrological Condition: ________________________
- Prescence of Wetlands: __________________________
- Wildlife Habitat/Corridors and Buffers: _____________________
- Wildlife Habitat/Natural Communities: ________________
- Prescence of Rare, Threatened or Endangered Species: ________________

- Prescence of Rare, Threatened or Endangered Natural Communities: __________________
- Unique Ecological Features: _________________________________
- Invasive Species Threat: ______________________________
- Negative Influences: _______________________________

A. Note Rubric Score and Go to Question #3
B. Rubric Score: __________
   Ecological Value Rating: ______________

3. Are there areas within the park that have a higher ecological value and/or are more ecologically sensitive than others?

Through the evaluation and survey processes completed to fill out the ecological rubric in question 2, areas should have been identified within the park that have higher value than others or are considered sensitive/rare if they exist. This question may help designate these areas which require a higher level of protection or may identify the only areas within the park that could require conservation or management and require some level of protection. This may dictate areas which would be off limits for development, or which would require a buffer around them. An example is a salamander breeding pool within a forest or the only patch of natural hardwood forest in a mostly developed park.

A. YES or NO Question
   a. If YES or NO go to Question #4
B. Answer: _____________
C. Example considerations which may result in a YES answer:
   a. Breeding/Nesting Sites
   b. Rare/Threatened Species presence
   c. Rare/Threatened Habitats
   d. Wetland
   e. Island habitat within a developed park

4. Is there potential to restore the natural habitat in the park?

Although some parks may not already contain natural, undeveloped resources, it does not mean the ecological benefits cannot be restored to the property. Designating fully developed parks as having no ecological significance would be a disservice to the residents of the parish. New research shows that micro-habitats within urban areas can be extremely beneficial to birds, pollinators and can significantly impact urban heat index. BREC strives for parks to do the most for its patrons and the benefits of adding green infrastructure and applying restoration techniques will often outweigh the costs.

When answering this question, keep in mind the ultimate goals or benefits of the restoration and be sure to document those benefits so that they may be weighed against the potential costs. For example, although adding a grow zone to a park would add considerable benefits, if the park in question only has room for a few hundred square feet, the benefits may not outweigh the costs of managing the restoration area. Here are a few considerations:

- Is it adjacent to an existing conservation area?
- Is there enough space for a grow zone/reforestation area?
- Are urban plantings needed?
- Does it result in the reduction of impermeable surfaces?
- Does it result in the reduction in urban heat index with tree plantings?
- Does it increase the FQI of the property?

A. Yes or No Question
 a. If YES or NO, go to Question #5
B. Answer: ________________

5. What amount of natural capital (ecosystem services) does this property provide to the community?

To answer this question, complete the Natural Capital Rubric which will require evaluating the below listed metrics for every park. The Rubric should be attached to this framework as evidence of values assigned. Natural capital is meant to assess the economic impact of the ecosystem services that a property provides for the residents of East Baton Rouge Parish. This should not be confused with property value, as this does not include the resale or appraisal value of the land. Most properties will provide some level of ecosystem service even if they do not include undeveloped land. For example, just having some trees can have a positive effect on urban heat island effect in that area. The following parameters are based on available research and do not include a comprehensive list of all potential economic impacts.

- Storm-water benefit analysis
- Urban heat index
- Carbon sequestration
- Air Quality
- Property Value
- Physical Health Benefits

A. Note Rubric Score and go to Section 2, Question #6
B. Rubric Score: ________________
 Natural Capital Rating: ____________________

If the park received a Medium to High Ecological Value or Natural Capital Score, the property has potential for consideration as a Conservation Area, Nature Reserve or a different park type which includes a Conservation Management Unit, or Sensitive Habitat Zone. If a park ranked low in the one of the above ratings it will most likely be classified based on the Recreation Level of Service need. Regardless of score, continue to Section 2.

Section 2: Level of Service Needs

6. Does this property fill a Level of Service gap or need for the community?

This question is used to determine whether the park's purpose will be mainly directed by filling a goal, gap or need identified by a guiding strategic document such as BREC's Strategic Plan, Level of Service Standards, EBR Pedestrian and Bicycle Plan, Community Needs Assessments or the FutureBR plan. This question should be answered by BREC staff in the Planning and Engineering Department or contracted planning professionals following planning guidelines found in BREC's Planning and Engineering *Guiding Principles and Standard Operating Procedures Manual*. BREC's Park Operations and Recreation Departments should also be consulted and engaged in the process of answering this question.

A. Yes or No Question
   a. If Yes, then move onto Question #7
   b. If No, then move onto Question #9.

7. Is it possible to fill this need while also protecting ecological values and ecosystem services?

Answer this question only after Questions 1-5 have been answered and all rubrics are completed. This question is a subjective evaluation of a loss of value and should be answered by BREC's Natural Resource Management staff. If the Natural Capital and Ecological Value rubrics were filled out following development of the recreational amenity in question, would the development result in a reduction in value rating? If so, the answer to question 7 is no, the ecological value and ecosystem services cannot be protected. This does not mean that the park/amenity/facility will not be built but consideration must be given to the land being converted and the value that will be lost.

A. Yes or No Question
   a. If the answer is yes, it is possible to maintain the ecological and ecosystem service value of the park even while fulfilling the recreational needs, then the park can serve both recreational and ecological purposes and can be classified by the LOS Need Designation. For example, if the land fulfilled a need for a greenway trail, it may be labeled as a Conservation Area if that is the only development to take place and it received a Medium or High in either the Ecological Value or Natural Capital Rubrics. If it fulfills the need for a Community Park, then it would be labeled a Community Park type.

      If the park is not a conservation area and ranked High or Medium in the Ecologic Value and Natural Capital Rubrics, the park would most likely also have a secondary conservation classification. For instance, if the LOS is indicating it needs to be a Community Park, it would be a Community Park with certain natural areas within that park being classified as a Conservation Management Unit (CMU). Within the CMU's there could also be additional areas designated as Sensitive Habitat Zones that protect more ecologically sensitive areas which would be at the discretion of BREC planners and natural resource scientists and would limit development in those specific zones.

By answering yes to Question 7, the property or park should have a park type designation and it is not necessary to move further through the Framework.

b. If the answer is no, it is not possible to balance the LOS needs and maintain the ecological and natural capital value. Proceed to question #8.

B. Answer: ____________
C. If YES, Park Type Designation: ______________________________________

8. **Do the LOS needs of the community outweigh the benefits of the ecological or ecosystem services to the community?**

There will be occasions where the ecological and natural capital benefits cannot be maintained post-development. To move forward with the proposed development in this case, it is important to document the reason for the high level of recreational need. Typically, parks that rate Low in the Ecologic value and Natural Capital will not have value that outweighs the LOS need. However, if a park rated Medium or High in Section 1 and the answer to this question is yes, that the LOS needs outweigh the ecologic and ecosystem services benefits, it is important to document the data which informs this decision such as needs assessments, community engagement surveys, etc. Additionally, it is important to conduct an alternative resource analysis to show that other locations were assessed and found inadequate to pursue this level of development. Because conservation of resources is an important component of BREC's values, every effort should be made to preserve natural functions whenever possible or at least design the amenity in such a way that recreates the ecosystem services with man-made features such as green infrastructure.

A. Yes or No Question
   a. If yes, then classify the park based on the LOS Need Designation. For instance, depending on the recreational goals the park may become a Community Park or a Special Use Facility. Also, if the answer is yes and the park ranked High or Medium in the conservation benefits sections, it can be designated as a conservation area depending on the type of LOS need and proposed development. For instance, if building a greenway through a park would reduce the ecological benefits but there is great need, it can still be designated a conservation area with every effort to maintain benefits to the furthest extent during construction and management of the greenway.

      Similar to Question 7, if the park ranked High or Medium in the Ecological Value or Natural Capital Rubric, there is the potential to establish Conservation Management Units or Sensitive Habitat Zones within the park to protect the most ecologically sensitive areas where possible.

By answering yes to this question, the park will receive a park type designation based on the recreational goals and established community need and it is not necessary to move further through the framework.

b. If no, other locations of less ecological value should be pursued that provide less crucial ecosystem services for this LOS Need. Conducting an alternative resource analysis may produce alternative locations for the amenity, park, or facility. Proceed to Question #9 for this property.

B. Answer: _____________

C. If Yes, Park Type Designation: ______________________________________

Parks that have not yet received a park type designation through the above question and which are not being used to directly fill a LOS need or community assessment gap will continue through the matrix in order to identify how the park is serving the community and how best to designate it based on its goals.

9. Does this property already carry a BREC park classification?

This question assists with designating parks in the system in which the proposed LOS need does not outweigh the ecological impacts or that has not been identified as directly fulfilling a LOS need (answered No to Question #6). If the park already holds a specific park type designation it can retain that designation until a new need is identified. If the park goals need to be reevaluated for a reimagining and a new master plan, then public input should be considered, and it is possible that the goals of the park may shift from the existing designation. For instance, a neighborhood park may shift focus to become more nature oriented and become a conservation area if the community expresses interest. This rubric can be used during the master plan process to aid in the decision of which goals to pursue and which designation to decide on.

A. Yes or No Question

a. If answer yes, the park currently has a classification, AND it received a Medium-High in the Natural Capital and Ecological rubrics, then classify the park as its existing designation + Conservation management unit. Or if there is interest from the community, change the existing designation to a full Conservation Area or Nature Reserve.

If the park is being re-imagined and it received a Medium-High in the Ecologic Value and Natural Capital rubrics, protecting those benefits should play an important role in redefining the park's goals and should be weighed during the master plan process. If there is a chance the park goals may change enough during the master plan process to change park type designation, proceed to Section 3 to assist in evaluating other potential benefits as well.

b. If answer yes, the park currently has a classification, AND it received a Low in the Ecologic and/or Natural Capital rubrics, then leave existing designation or begin the master plan process to assess community needs and use Section 3 to evaluate potential other community benefits during that process. Section 3 evaluates the potential for restoring the property to bring up the Ecological and Natural Capital Value ratings.

c. If answer no, the park does not currently have a park classification, then proceed to Section 3, Question #10 and/or begin the master plan process to receive public input on park goals.

B. Answer: _______________
C. If Yes, Park Type Designation: ____

Parks that have not been directly identified as a level of service need or been identified for a specific strategic direction can continue through the matrix to aid in identifying other potential benefits the park may provide to the public and determine its park type classification. At this point in the planning process, it may be useful to enter in the master planning procedures if not already, to determine the wide range of BREC and Community needs to be considered. The Miscellaneous Benefits section evaluates other potential benefits but is not all encompassing and focuses mainly on development and amenity potentials as that tends to guide programming opportunities not identified as a service gap.

Section 3: Miscellaneous Benefits

10. Does this property have interpretive potential?

Some parks/greenways may provide a high benefit if there is potential for interpretive or environmental education opportunities that could potentially guide future planning decisions. This question should be answered using the Interpretive Potential Rubric which was designed to determine the benefits and feasibility to utilize the park for interpretive opportunities. Fill out the rubric evaluating the values below.

- Does the park contain unique natural, historical/cultural features and/or habitats?
  - Is it close to other pre-existing interpretive opportunities?
  - Is it easily accessible?
  - Are there budget considerations?
  - Is it close to community/schools?

A. Yes or No Question based on Rubric Score
   a. Note Rubric Score and Answer Yes or No then continue to Question #11.
B. Rubric Score: ________________
   Interpretive Potential Rating: ____________________
   Answer (Y/N): _______________
   a. If receive High or Medium rating then yes, property has potential.

11. Would the property benefit the public recreationally if developed as such or if designed in such a way to better facilitate needed programming?

If the park has made it to this level, it already received a low LOS need ranking. In this case, there is no strong data which shows the public is in strong need of a recreational outlet at this location. However, that does not mean that one would not be appreciated or used. To answer this question a local community survey should be used to determine if there are any recreational needs the local community has for this park. This is not limited to just static amenities but also any development which may facilitate a particular type of programming that is desired by the community. For instance, a walking loop, small playground, or multi-use field may be desired by a portion of the community but may not have registered as a high-ranking LOS need.

A. Yes or No Question
   a. Document your answer and proceed to Question #12.
B. Answer: _______________

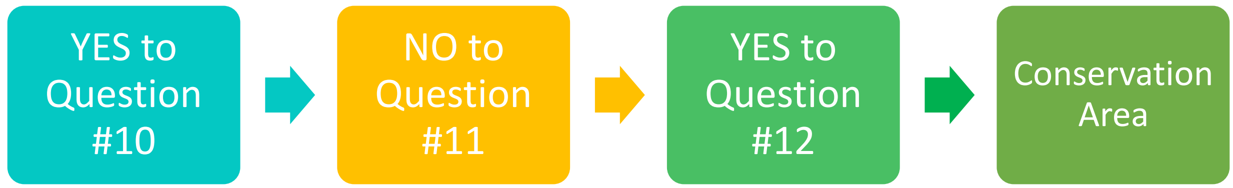
12. Would restoring the park increase the ecosystem services of the property enough to outweigh operational expenses of restoration?

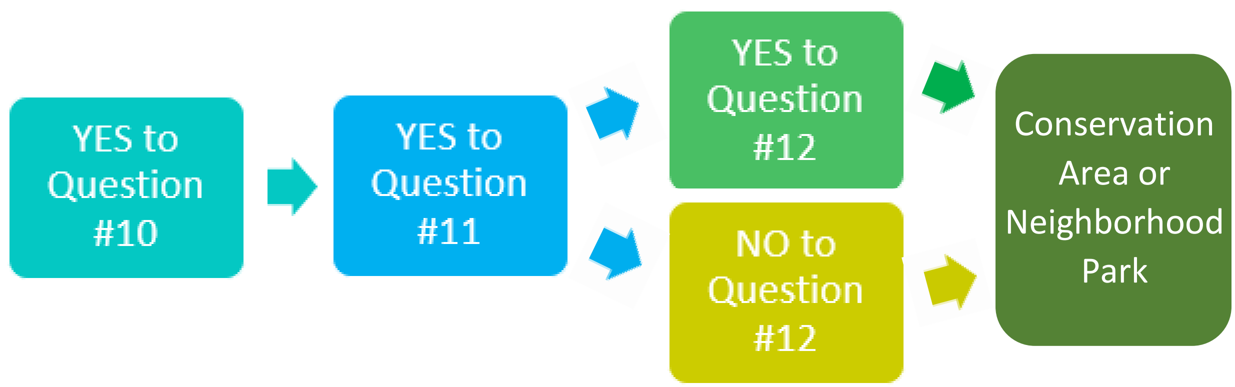
This question is designed to evaluate whether the benefits of restoring the park would outweigh the installation and management costs of the park. There is potential that restoration could reduce the maintenance costs of the park and that should be considered. However, the budget necessary to introduce native species, labor associated with maintaining and managing the restoration area and the time that it would take for the property to achieve its potential should weigh heavily in the decision. Parks at this point in the framework received a Low Ecological and/or Natural Capital rating. If the park received a “Yes” in question #4, the potential to restore the park should be evaluated to determine if it would benefit the community. Bringing the park from a Low to Medium or High value in either the Ecological or Natural Capital rubric may impact the neighboring community exponentially. This impact may be even more significant in underserved communities in urban centers lacking natural areas and which may be in higher need than other areas in the parish. In these instances, even small patches of restoration areas should be considered if feasible. It is important that several divisions/departments be consulted to consider and evaluate this question including Park Operations, Natural Resource Management and potentially Golf as they will be directly responsible for the long-term maintenance and management of the property and potential restoration area.

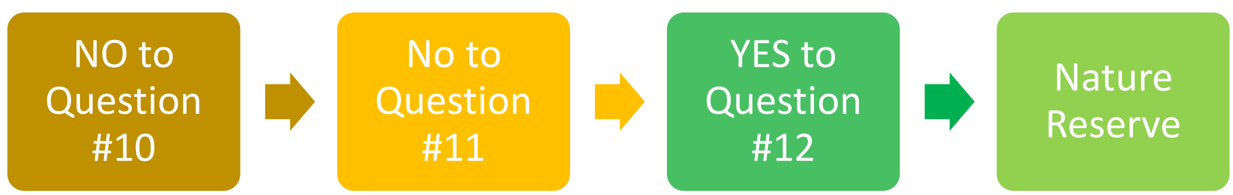
Below is a key to assist in determining potential park type designations at this point in the framework. Use these suggested designations along with community input and other planning considerations to make the final park type determination.

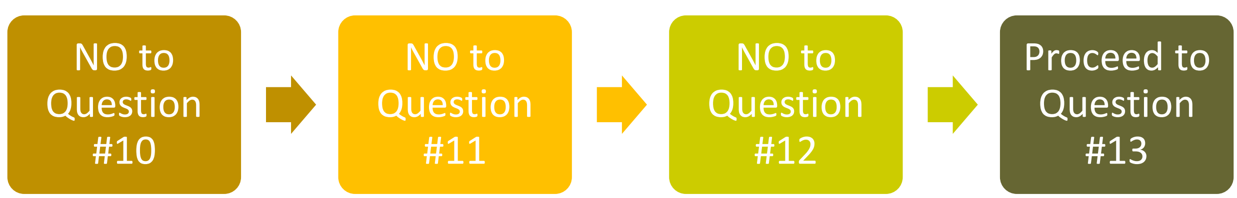
A. Yes or No Question
   a. Document your answer and proceed to the Decision Matrix below to determine park type classification or way to proceed.
B. Answer: ________________

Using your answers from Questions #10 -12, follow the matrix to determine classification type or how to proceed. In addition to the figure, use the explanation below for guidance as needed.









A. If yes to Question #10, no to Question #11, and Yes to Question #12: Conservation Area
   a. Parks with interpretive potential and restoration potential but without recreational potential best fall into the Conservation Area Park Type.

Although Conservation Areas do allow some recreation, the focus is interacting with nature and interpretation of the site. There is a chance the property could become a Special Use Facility depending on the circumstances if the interpretive resource is cultural/historical with restoration potential. If interpretive potential is there but not necessarily desired in that area, the park could be a Nature Reserve.

B. If yes to Questions #10-12: Neighborhood Park or Conservation Area
    a. A park with interpretive, recreational and restoration potential would most likely be classified as a Conservation Area or Neighborhood Park.
    b. Use the Value rating found in Section 1 and the type of recreational amenity desired to help determine which park type to choose. Parks with High or Medium Ecological Value or Natural Capital rating are most likely to be designated Conservation Areas. Parks with lower values are most likely to be Neighborhood Parks. However, because the restoration potential for these parks is high, if the value can increase to Medium or High from restoration, the park could be designated a Conservation Area although less likely.
    c. If the interpretive resource is cultural/historical there is a chance the property could become a Special Use Facility depending on the circumstances.

C. If yes to Question #10, yes to Question #11, and no to Question #12: Neighborhood Park or Conservation Area.
    a. A park with interpretive and recreational potential would most likely be classified as a Conservation Area or Neighborhood Park.
    b. Use the Value rating found in Section 1 and the type of recreational amenity desired to help determine which park type to choose. Parks with High or Medium Ecological Value or Natural Capital value are most likely to be designated Conservation Areas. Parks with lower values are most likely to be Neighborhood Parks.
    c. If the interpretive resource is cultural/historical there is a chance the property could become a Special Use Facility depending on the circumstances.

D. If no to Questions #10 and #11, and yes to Question #12: Nature Reserve
    a. A park without interpretive or recreational potential but with restoration potential would best fit in the Nature Reserve park classification. If the property did not rank High or Medium in Section 1 for either rubric, ideally after restoration those values would go up to allow the park to serve the community in that capacity.
    b. There is a chance that if even after restoration the value does not go up enough the decision could be made to proceed to Question #13.

E. If no to Questions #10-12 proceed to Question #13.

13. Would it benefit the community more to remove this property from the system and reallocate resources to higher benefit areas?

There is a chance that once evaluated the park is found to not serve the public adequately and the resources associated with managing and maintaining the park could be better utilized elsewhere in the BREC system. Based on the above framework if a park ranked Low in both Sections 1 and did not receive a classification in Sections 2 and 3, it is likely not serving a large population or does not contain resources which are serving the residents or East Baton Rouge Parish. It is important that BREC use taxpayer funds in the most appropriate manner and in some instances that does not include maintaining under-utilized or low-functioning properties. This Decision Framework and the associated rubrics should provide sufficient evidence and data to support a necessary decision to place a property on BREC's Obsolete Land list.

A. Yes or No Question
   a. If Yes, place the property on BREC's Obsolete Land list to be sold, donated, traded, or otherwise dissolved from BREC ownership and maintenance responsibilities.
   b. If No, document why and return to Section 2, Question #6 to reevaluate the park's LOS needs to determine if redirecting park goals and conducting a new needs assessment would provide additional information to classify the park.

B. Answer: ___________________

Appendix 4: Ecological Value Rubric

Ecological Value Rubric

The rubric below is intended to be a rapid ecological assessment to calculate an ecological value of the park being examined. The ecological value for each criteria is summed to give the park an overall score. Parks with a score of 17 to 25 are considered high in ecological value, parks with a score of 9 to 16 are considered medium in ecological value, and parks with a score of 0 to 8 are considered low in ecological value. The assessment parameters were chosen to reflect BREC's Conservation Goals focusing on habitat health, uniqueness, wildlife value and increasing or preserving biodiversity. While a variety of parameters could be considered for this rubric, the criteria below were chosen since they can be quickly quantified with resources currently available. This rubric should be completed by BREC Natural Resource Management staff scientists only and will require a variety of data collection techniques including field visits, government databases, GIS mapping and aerial and historical imagery.

Ecological Value Assessment Criteria

1. Natural Area Presence

The intent of this criteria is to evaluate the amount of natural area that is currently present in the park, regardless of the size of the park. For this criterion, natural areas include all areas that are mapped as Natural Communities in BREC's Natural Community GIS Layer. This includes forested areas, lakes/ponds, rivers/streams, native grasslands, wetlands, and restoration areas. Areas that are not considered natural areas are mapped as developed in BREC's Developed GIS layer. This includes impervious surfaces such as parking lots, sidewalks, and buildings, and pervious surfaces such as high use sports fields, landscaping, and low mow zones.

Parks in which the majority of the property is a natural area, i.e., ≥ 75 to 100%, are given a high score (3), parks in which ≥ 25 to < 75% of the property is a natural area are given a medium score (2), and parks in which little of the area is a natural area, i.e., 0 to < 25%, are given a low score (1). This criterion should be determined using aerial imagery and BREC's Natural Communities GIS Layer in Arc GIS.

Ranking	**Score**	**% Undeveloped Land**
High	3	≥ 75 to 100% of the park is a natural area
Medium	2	≥ 25 to < 75% of the park is a natural area
Low	1	0 to < 25% of the park is a natural area

Score: _________

Notes:

2. Natural Area Size

The intent of this criteria is to evaluate the size of the natural area in the park and assumes that larger natural areas have a greater potential for habitat diversity and hold more individuals of a given species. Like the Natural Area Presence criteria, BREC's Natural Community GIS Layer should be used to calculate this parameter. Only areas mapped as Natural Communities and as defined in Category 1 above, should be considered a natural area. Parks with ≥ 50 acres of natural area present are given a high score, parks with ≥ 10 to < 50 acres of natural area present are given a medium score, and parks with 0 to < 10 acres of natural area present are given a low score.

Ranking	Score	Undeveloped Acres
High	3	≥ 50 acres of natural area is present.
Medium	2	≥ 10 to < 50 acres of natural area is present.
Low	1	0 to < 10 acres of natural area is present.

Score: __________

Notes:

3. Floristic Quality Index (FQI)

The intent of this criteria is to rank the quality of the habitat based on the quality of the flora present. A Floristic Quality Index (FQI) quantifies the quality of flora present and is based on a Coefficients of Conservatism (C value) framework that ranks plant species on their affinity to natural, remnant habitats and their tolerance to degradation. C values are typically ranked on a scale ranging from 0-10 with highly conservative species assigned the highest values (8-10) and the least conservative species assigned the lowest values (0-3). Highly conservative species are those that are only found in pristine, unaltered habitat conditions, whereas species considered the least conservative are those common in habitats with high levels of natural or human-induced disturbance (mowing, dredging, urban development, etc.) that inhibit mid and high-ranked species from occurring there. The mean C value alone is not always valuable since it can be similar for areas with extremely high or low species richness; therefore, the FQI is calculated by weighting the mean C by species richness. The FQI metric can be calculated using the Universal FQA Calculator (http://universalFQA.org) or by using the equation below where I is FQI, $\overline{C}$ is the mean C value, and *n* is species richness.

$$I = \overline{C}\sqrt{n},$$

Ranking	Score	FQI
High	3	Assessment of floristic quality results in a FQI ≥ 35
Medium	2	Assessment of floristic quality results in a FQI of ≥ 20 to < 35
Low	1	Assessment of floristic quality results in a FQI of 1 to < 20

Score: __________

Notes:

4. Hydrologic Condition

The intent of this criteria is to evaluate the degree in which the parks hydrology is controlled by natural forces. Parks in which the natural hydrology is undisturbed, or has minor disturbances, are given a high score (3), parks in which the hydrology has been slightly disturbed are given a medium score (2), while parks in which the hydrology has been heavily disturbed are given a low score (1). Since the amount of impervious surfaces plays a large part in the retention time of water, the presence of this surface type should be used in calculating this criteria. To calculate this criteria BREC's Developed GIS layer should be used which maps the amount of impervious surfaces present. The percentage of impervious surfaces should be calculated by dividing the amount of impervious surfaces present by the size of the park.

Ranking	**Score**	**% Impervious Surfaces**
High	3	< 5% of the park contains impervious surfaces.
Medium	2	≥ 5 to < 20% of the park contains impervious surfaces.
Low	1	≥ 20% of the park contains impervious surfaces.

Score: __________

Notes:

5. Wildlife Habitat: Habitat Fragmentation

The intent of this criteria is to evaluate the quality of wildlife habitat present in the park. Since it is unrealistic to quickly assess the wildlife species present (i.e., identify every species), the degree of habitat fragmentation is used to estimate this criteria. Habitat fragmentation is defined as the disruption of extensive habitats into isolated and smaller patches and results not only in the loss of species, but creates smaller, more vulnerable, populations as well (Meffe et al. 1997). It is thus assumed that more habitat fragmentation leads to less wildlife habitat available which leads to less wildlife species present. Examples of fragmentation include man-made land alterations, structures, or development such as roads, buildings, land clearing, agriculture, railroads, etc.

To evaluate this criterion the perimeter of natural areas in the park should first be calculated, followed by the amount that is surrounded by developed areas. BREC's Natural Community and Developed GIS layers should be used for areas within each park, while best professional judgement should be used for areas outside of the park. If more than one natural area is found within a park, the perimeter of each natural area should first be summed, followed by the amount that each is bordered by developed areas. For example, Forest Community Park contains 4-5 separate forested areas, each of which is surrounded by developed areas. The perimeter of each natural area should first be calculated, followed by the amount that is surrounded by developed area, and then summed to calculate the overall percentage that is fragmented.

Parks in which the majority of natural areas are unfragmented (≥ 50% of the perimeter is undeveloped) are given a high score (3), parks in which the natural area is somewhat fragmented (i≥ 10 to < 50% of the perimeter is natural) are given a medium score (2), and parks in which the majority of natural area is isolated and not connected to other natural areas (0 to < 10% of the perimeter is natural) are given a low score (1).

Ranking	**Score**	**% Perimeter Undeveloped**	**% Description**
High	3	≥ 50%	≥ 50% of the perimeter of natural area in the park is further surrounded by natural area.
Medium	2	≥ 10 to < 50%	≥ 10 to < 50% of the perimeter of natural area in the park is further surrounded by natural area.
Low	1	0 to < 10%	0 to < 10% of the perimeter of natural area in the park is further surrounded by natural area.

Score: _________

Notes:

6. Wildlife Habitat: Natural Communities

Along with the Habitat Fragmentation criterion, the intent of this criteria is to evaluate the quality of wildlife habitat present in the park. Since it is well documented that more Natural Communities equal greater wildlife diversity, the number of Natural Communities present is used to evaluate this criterion. Parks with a higher number of unique Natural Communities, as mapped in BREC's GIS Natural Community Layer, are thus given higher scores, while parks with less unique Natural Communities in BREC's GIS Natural Community Layer are given lower scores. Natural Communities in BREC's GIS layer include forested areas, lakes/ponds, rivers/streams, native grasslands, wetlands, and restoration areas. Subtypes of these layers should be considered when evaluating this criterion. For example, the forested layer includes different types including Bottomland Hardwood Forest, Cypress Tupelo Swamp, Prairie Terrace Loess Forest, etc. and each of these subtypes should be considered when evaluating this criterion.

Ranking	**Score**	**# of Unique Natural Communities in Park**
High	3	≥ 5 Natural Communities as mapped in BREC's Natural Communities GIS Layer.
Medium	2	2 to 4 Natural Communities as mapped in BREC's Natural Communities GIS Layer.
Low	1	1 Natural Community as mapped in BREC's Natural Communities GIS Layer.
None	0	No Natural Communities are mapped in BREC's Natural Communities GIS Layer.

Score: _________

Notes:

7. Rare, Threatened, or Endangered Species

The intent of this criteria is meant to recognize the importance of protecting rare, threatened, or endangered species. Almost 700 species of native Louisiana plants and animals are considered 'Species of Greatest Conservation Need', a Louisiana Department of Wildlife and Fisheries (LDWF) designation that includes threatened and endangered species as well as uncommon species that rely on imperiled habitats. Using this criterion, a parks ecological value is increased if a rare, threatened, or endangered species is present Site visits by NRM staff are required to generate this criterion.

Score	Species of Greatest Conservation Need Prescence
1	1 or more 'Species of Greatest Conservation Need', as defined by the LDWF, is present.
0	'Species of Greatest Conservation Need', as defined by the LDWF, are not present.

Score: _________

Notes:

8. Rare, Threatened, or Endangered Natural Communities

The intent of this criteria is meant to recognize the importance of protecting rare, threatened, or endangered natural communities. Natural communities are groups of plants and animal species that typically occur in association with each other in certain landscapes or physical environments. Like the list of 'Species of Greatest Conservation Need, the LDWF also lists 'Louisiana's Rare and Outstanding Natural Communities'. While the ecological value of a park is increased if a rare, threatened, or endangered species is present, its score is not decreased if one is not present. Site visits are required to generate this rubric.

Score	Rare and Outstanding Natural Community Prescence
1	1 or more 'Rare and Outstanding Natural Communities', as defined by the LDWF, is present.
0	'Rare and Outstanding Natural Communities', as defined by the LDWF, are not present.

Score: _________

Notes:

9. Wetlands

The intent of this criteria is to recognize the importance of wetlands and the ecological values they provide. Wetlands not only provide valuable habitat to a wide variety of plants and animals but improve water quality and minimize storm water damage (Mitch and Gosselink 2000). The intent of this rubric is to increase a parks ecological score if a wetland is present, but not decrease its value if a wetland is not present. Thus, only an additional point is given to parks with a significant presence of wetlands. Although a formal USACE wetland delineation is not required for this rubric, the methods used by the USACE to delineate wetlands, i.e., the presence of hydrophytic vegetation, hydric soils, and evidence of hydrology should be used. Site visits are required to generate this score.

a. Wetlands present (1): Wetlands, as defined by the USACE, are present.
b. Wetlands not present (0): Wetlands, as defined by the USACE, are not present.

Score	**Wetland Prescence**
1	Wetlands, as defined by the USACE, are present
0	Wetlands, as defined by the USACE, are not present

Score: _________

Notes:

10. Unique Ecological Features

The intent of this criteria is meant to capture the presence of unique ecological features that may not be captured within the other rubrics but give the park an asset that increases its ecological value. Examples include the presence of a rookery, a salamander breeding pond, etc. Justification must be provided that thoroughly states the ecological value of this presence. While the ecological value of a park is increased if a unique feature is present, its score is not decreased if one is not present. Site visits are required to generate this criteria.

Score	**Unique Ecological Features Prescence**
1	Unique ecological feature is present are present (state importance in notes)
0	A unique ecological feature is not present.

Score: _________

Notes:

11. Invasive Species Threat

The intent of this criteria is meant to recognize the serious threat that invasive species pose to BREC's natural resources. Invasive species are a widespread and serious threat to BREC's goal to protect unique and historically representative habitats and reduce the loss of species. Invasive species not only outcompete and displace native species, but they can have far reaching impacts that alter industrial, agricultural, commercial, and private business sectors (Mehta et al. 2007). Examples of invasive species include not only plants such as Chinese Tallow, Chinese Privet, and Water Hyacinth, but wildlife such as Apple Snails and Feral Hogs. When evaluating this criterion only Focal Plant and Animal Species as listed in BREC's Invasive Species Management Plan should be considered.

Score	Invasive Species Prescence	Prescence Description
1	< 49% plant coverage, or for animals, activity is not currently recognized	a Natural Community as mapped in BREC's Natural Community GIS Layer contains minimal Focal Invasive Plant Species and evidence of Focal Invasive Animal Species has not been found that could result in potential changes to ecological function.
0	≥ 50% coverage of a Focal Invasive Plant Species; or an abundance of Focal Invasive Animal Species activity is present	A Natural Community as mapped in BREC's Natural Community GIS Layer contains considerable Focal Invasive Plant Species and an abundance of Focal Invasive Animal Species present which will result in potential changes in ecological function. (i.e., abundance of feral hog activity, large amount of apply snails found)

Score: _________

Notes:

12. Negative Influences

The intent of this criteria is meant to evaluate negative influences that surround and occur in BREC's parks. This factor refers to anthropogenic influences such as noise and/or light pollution, residential or commercial development, and industrial influences. While it is difficult to quickly quantify each of these influences, it is assumed that as the number of negative influences increases, so does the amount of noise, light, etc. To evaluate this criterion aerial imagery along with BREC's Natural Community GIS Layer should be used. In evaluating this criterion, a point is given for each negative influence present. Below is a list of negative influences to consider. Each contributes a different type and/or level of disturbance to the natural systems present in the park and therefore is a negative influence on native ecosystems and present wildlife.

Negative Influences Include:

- A road, railroad, or parking lot directly borders ≥ 25% of the perimeter of the park. Measure the perimeter of the park, along with the length that the road, railroad, or parking lot borders the park. Calculate the percentage that surround the park.
- Development (buildings in the form of residential homes or commercial construction) border ≥ 25% of the park. Measure the perimeter of the park, along with the length that the development borders the park. Calculate the percentage that surround the park.
- ≥ 15% of the park is composed of Impermeable Development Type (i.e., concrete) as mapped in BREC's Natural Community GIS Layer.
- A Permeable Tournament Sports Field/Golf as mapped in BREC's Natural Community GIS Layer is present within the park.

Ranking	Score	# of Negative Influences Present
High	0	All 4 negative influences are present in the park
Medium	1	Two to three negative influences are present in the park
Low	2	Zero to one negative influence is present in the park

Score: _________

Notes:

Rubric Evaluation Results

Factor	Option	Value	Score	Definition	Comment
1. Undeveloped Land Status	High	3		≥ 75 to 100% of the park is a natural area.	
	Medium	2		≥25 to > 75% of the park is a natural area.	
	Low	1		< 25% of the park acreage is a natural area.	
2. Undeveloped Land Size	High	3		≥ 50 acres of natural area is present.	
	Medium	2		≥ 10 to < 50 acres of natural area is present.	
	Low	1		0 to < 10 acres of natural area is present.	
3. FQI	High	3		Assessment of floristic quality results in a FQI ≥ 35.	
	Medium	2		Assessment of floristic quality results in a FQI of ≥ 20 to < 35.	
	Low	1		Assessment of floristic quality results in a FQI of 1 to < 20.	
4. Hydrologic Condition	High	3		The site contains ≤ 5% impervious surfaces.	
	Medium	2		The site contains 6 to < 20% impervious surfaces.	
	Low	1		The site contains ≥ 20% impervious surfaces.	
5. Wildlife Habitat: Habitat Fragmentation	High	3		≥ 50% of the perimeter of natural area in the park is further surrounded by natural area.	
	Medium	2		≥ 10 to < 50% of the perimeter of natural area in the park is further surrounded by natural area.	
	Low	1		0 to < 10% of the perimeter of natural area in the park is further surrounded by natural area.	
6. Wildlife Habitat: Natural Communities	High	3		The Park possesses ≥ 5 Natural Communities as mapped in BREC's Natural Communities GIS Layer	
	Medium	2		The Park possesses 2 to 4 Natural Communities as mapped in BREC's Natural Communities GIS Layer.	
	Low	1		The Park possesses 1 Natural Community as mapped in BREC's Natural Communities GIS Layer.	
	None	0		The Park does not possess any Natural Communities as mapped in BREC's Natural Communities GIS Layer.	
7. Rare and Threatened Species	Yes	1		A 'Species of Greatest Conservation Need', as defined by the LDWF, is present.	
	No	0		A 'Species of Greatest Conservation Need', as defined by the LDWF, is not present.	
	Yes	1		A 'Rare and Outstanding Natural Community', as defined by the LDWF, is present.	

8. Rare and Threatened Habitat	No	0		A 'Rare and Outstanding Natural Community', as defined by the LDWF, is not present.	
9. Wetlands	Yes	1		Wetlands as defined by the USACE are present	
	No	0		Wetlands as defined by the USACE are not present	
10. Unique Ecological Features	Yes	1		A unique ecological feature is present: Justification must be provided thoroughly stating the ecological importance of this feature.	
	No	0		A unique ecological feature is not present.	
11. Invasive Species Threat	Yes	0		For plants, a Natural Community as mapped in BREC's Natural Community GIS Layer contains ≥ 50% coverage of a Focal Invasive Plant Species, or for animals, an abundance of Focal Invasive Animal Species activity is present resulting in the potential for changes in ecological function (ex. feral hogs are present on the site and their impacts are evident, or an abundance of apple snails are present on the site).	
	No	1		For plants and animals, a Focal Invasive Species does not pose a threat to a Natural Community present (i.e., < 49% plant coverage, or for animals, activity is not currently recognized that could result in potential changes in ecological function).	
12. Negative Influences	High	0		4 negative influences are present.	
	Medium	1		2 to 3 negative influences are present.	
	Low	2		0 to 1 negative influence is present.	

Overall Score: ___/25

Overall Ecological Value

High: 17 to 25

Medium: 9 to 16

Low: 0 - 8

Appendix 5: Natural Capital Rubric

Natural Capital Rubric

This Rubric is designed to be an assessment tool to evaluate the economic impact of a park or properties ecosystem services or natural capital. Natural capital are the positive benefits that a park's natural resources may provide to the local community and residents of East Baton Rouge Parish and can include but are not limited to stormwater management, increased air quality, carbon sequestration, increased property value, reduction in health care costs and more. According to the National Recreation and Park Association (NRPA), parks are essential public services just as water, sewer and public safety and are vitally important to establishing and maintain the quality of life in a community. This rubric assists BREC in calculating this value in a way which can be used to justify planning and development decisions.

This rubric evaluates six categories that are guided by BREC's Conservation Goals, and each is assigned a ranking which is then tallied to provide an overall Park Natural Capital rating. This rubric should be filled out by BREC staff in the Planning and Engineering Division and will require collecting data through a variety of sources including but not limited to GIS data, field surveys, aerial imagery, and open-source data platforms.

Natural Capital Assessment Categories

1. Stormwater benefit (Reduced Runoff)

Flooding and poor stormwater management decreases natural capital value by damaging property and costing the US billions of dollars annually. As urbanization increases throughout East Baton Rouge Parish, so do the areas of smooth impervious surfaces (e.g., concrete, asphalt, roofs). These surfaces prevent water from infiltrating into the soil and increase the rate of stormwater runoff into drainage systems, unlike pervious rough surfaces, such as low compaction lawns and forests. Runoff coefficients are used to estimate runoff from various surfaces and in general, parks have a lower runoff coefficient than surrounding urban areas. Parks with low runoff coefficients have the potential to reduce the volume and rate of runoff entering the parish's storm water management systems and lower the chances of damaging floods. Scoring for this service is based on the weighted average of runoff coefficients of the community types throughout the park property compared to the baseline runoff coefficient of suburban areas. This will require the total area of the park, area of each community type within the park, and the runoff coefficients associated with each community type. Runoff coefficients are based on the LADOTD Hydraulics Manual. This scoring does not include ponds and lakes.

Weighted average = (% area of *Developed – Impervious* *0.95) + (% area of *Developed – Pervious High Maintenance* *0.25) + (% area of *Developed – Pervious Low Maintenance* *0.20) + (% area of *Undeveloped* *0.15) / (Total % of areas of Community Type)

i. Low – The average runoff coefficient for the park/property is greater than or equal to the baseline of 0.5 (1pt).
ii. Medium – The average runoff coefficient for the park/property is less than 0.5 but greater than 0.3 (2 pts).

iii. High – The average runoff coefficient for the park/property is less than 0.3 (3pts).

Community Type	Runoff Coefficient
Developed – Impervious (sidewalk, parking, buildings, etc.)	0.95
Suburban areas (baseline comparison)	0.50
Developed – Pervious High Maintenance (sports fields, mowed open space, etc.)	0.25
Developed – Pervious Low Maintenance (low mow zones)	0.20
Undeveloped* (forests, grow zones, prairies)	0.15

* If green infrastructure is incorporated into the park, then the runoff coefficient of those areas should be considered as *Undeveloped.*

2. Urban Heat Island Effect

The urban heat island effect has been observed in cities all over the world and refers to the significant temperature differences between cities and the surrounding rural and forested areas, which leads to higher energy costs, increased ozone production, and potential health risks for city residents. Baton Rouge has been shown to be up to 13°F hotter in the city than nearby rural areas, with an average difference of 1.2°F. Areas with large percentages of structures such as buildings, roads, sidewalks, and parking lots become warmer than areas high in vegetation, especially trees, due to the lack of evapotranspiration and shade. Therefore, parks with a high percentage of tree cover and low percentage of urban structures have the greatest potential to reduce the urban heat island effect within the park and the immediate surrounding areas. Scoring for this service is based on differences between average Land Surface Temperature (LST) of park and the average LST of urban areas within EBR parish. This will require a list of the land surface temperatures that has been pre-calculated. Additional guidance on creating the list can be found at the bottom of this document.

i. Low – The average LST of the park/property is equal to or greater than the average LST of urban areas within EBR parish (1 pt).
ii. Medium – The average LST of the park/property is less than the average LST of urban areas within EBR parish, but the difference is not greater than 1°C (2 pts).
iii. High – The average LST of the park/property is less than the average LST of urban areas within EBR parish, and the difference is greater than 1°C (3 pts).

3. Carbon Sequestration

Atmospheric carbon dioxide is the most abundant and long-lived greenhouse gas and one of the largest contributors to climate change. Trees and other vegetation can help reduce carbon dioxide by directly removing it from the atmosphere and storing it within their biomass, though once the tree or vegetation begins to decompose the gas is then release back into the environment. Frequently required maintenance of trees and grassy areas, such as mowing, tree trimming, and tree removal, can result in indirect increases of atmospheric carbon dioxide. Therefore, long-lived trees, wetlands, and grasslands (tall-grass prairies) with limited maintenance have the greatest potential for sequestering and storing carbon over long periods of time. Scoring for this service is based on land use and frequency of maintenance activities and can be determined using aerial imagery and knowledge of park use.

i. Low – The park/property has less than 30% of low maintenance tree or grassland cover and is dominated by frequently maintained lawn areas (1 pts).
ii. Medium – The park/property has greater than 30% but less than 60% cover of low maintenance tree or grassland cover (2 pts).
iii. High – The park/property is dominated by low maintenance tree or grassland cover with greater than 60% cover (3 pts).

4. Air Quality (Pollution)

East Baton Rouge Parish has received an "F" grade and a "C" grade concerning ozone and short-term particle pollution respectively from the American Lung Association State of the Air report. Poor air quality can have negative effects on both human health and the environment. Trees in urban parks can have a positive effect on local air pollution through reduction of local air temperatures and removal of gaseous air pollution through leaf surfaces. Urban trees within Baton Rouge have been estimated to remove approximately $350 worth of pollution removal per acre of tree cover per year. Although trees can have some negative affects by emitting volatile organic compounds (VOCs), these negatives are greatly outweighed by their positive effects previously given. Large areas of trees canopy cover have the greatest potential to reduce pollution because these areas have been shown to lower the local air temperature and have a greater amount of available leaf area capable of removing pollutants. Scoring for this service is based on percent tree cover and age/size of trees within the property and can be determined using aerial imagery and previously conducted surveys of the area.

i. Low – The park/property has less than 30% tree canopy cover (1 pt).
ii. Medium – The park/property has greater than 30% but less than 60% tree canopy cover (2 pts).
iii. High – The park/property has greater than 60% tree canopy cover (3 pts).

5. Real Estate Impact

Several studies show parks have a positive effect on real estate values, often increasing property values by 8-10%. Landowners perceive their homes sell faster and the park or trail has a positive influence on the property value. The data shows homes within 2,000 feet of a park sell for more than comparable homes further away. Houses within 500 feet of a park benefit the most. Parks larger than 40 acres have the greatest impact on home values, while small noisy parks and lighted ballfields can have a negative effect on property values. Multifamily homes show the highest benefit from parks, possibly because multifamily housing does not have yards for families to recreate so they the availability of a park adds a premium to the property. The Department of Transportation and the Trust for Public Lands have identified a half mile or a 10-minute walk as the standard reasonable distance it should take to get to a park. Homes within a 10-minute walking distance of a park are likely to have a higher value due to the closer proximity. The higher the number of homes within the 10-minute walking distance, the greater the economic impact of the park. Scoring for this service is based on park use and number of buildings within a 10-minute walk.

i. Low – Unimproved parks/properties or parks with loud and/or bright active recreation zones within 500 feet of neighboring houses (1 pts).
ii. Medium – Parks not in the "Low Value" that have less than 1,100 houses within a 10-minute walk of the park or a connecting greenway (2 pts).
iii. High – Parks not in the "Low Value" that have greater than 1,100 houses within a 10-minute walk of the park or a connecting greenway (3 pts).

6. Physical Health Benefits

According to the Centers for Disease Control and Prevention (CDC), participating in 150 minutes of moderate physical activity or 75 minutes of vigorous physical activity each week can provide individuals with immediate and long-term benefits for their physical and mental health. These benefits include reduced risk of chronic health conditions, reduced stress and anxiety, improved weight management, and improved physical function of daily activities as people age. Individuals who meet the suggested exercise guidelines have less physical healthcare expenses each year than those who do not get enough exercise. A study found that the average adult with heart disease who exercises regularly can save $2,500 annually in health care costs. The same study found that healthy people without heart troubles can expect to save about $500 per year by working out regularly. Parks offer recreational opportunities by providing open fields, trails, playgrounds, and activity-specific areas that are ideal for getting the community engaged in moderate or vigorous activities. Parks that offer a range of moderate and vigorous recreational opportunities can provide physical health benefits to a broader demographic than parks that have limited opportunities. Scoring for this service is based on the diversity of recreational activities (moderate and vigorous) available within a park and can be determined by identifying park use (see examples in chart below). Trails that are less than 2 miles in length should not be considered as a vigorous recreational activity.

Moderate Recreational Activity	Vigorous Recreational Activity
Brisk walking, hiking with light equipment, water aerobics, biking on flat terrain slower than 10mph, slow-paced dance classes, roller blading, yoga	Race walking, hiking with a heavy pack and/or uphill, jogging/running, swimming laps, biking faster than 10mph and/or on hilly terrain, singles tennis, upbeat dance classes, team sports

i. Low – The park/facility does not provide moderate or vigorous recreational activities to the community (1 pts).
ii. Medium – The park/facility provides only moderate or vigorous recreational activities to the community (2 pts).

iii. High – The park/facility provides both moderate and vigorous recreational activities to the community (3 pts).

Rubric Evaluation Results

Ecosystem Service	Natural Capital Value			Score	Notes
	Low - 1	Medium - 2	High - 3		
Storm Water	The average runoff coefficient for the park is greater than or equal to 0.5.	The average runoff coefficient for the park is less than 0.5 but greater than 0.3.	The average runoff coefficient for the park is less than 0.3.		e.g., storm water capacity can be increased if park is managed/ habitats are restored.
Urban Heat Island Index	The average LST of the park is equal to or greater than the average LST of urban areas within EBR parish.	The average LST of the park is less than the average LST of urban areas within EBR parish, but the difference is not greater than 1°C.	The average LST of the park is less than the average LST of urban areas within EBR parish, and the difference is greater than 1°C.		
Carbon Sequestration	The park is dominated by frequently maintained lawn areas with less than 30% of low maintenance tree or grassland cover.	The park is a combination of frequently maintained lawn areas and has greater than 30% but less than 60% cover of low maintenance tree or grassland cover.	The park is dominated by low maintenance tree or grassland cover with greater than 60% cover.		
Air Quality	The park has less than 30% tree canopy cover.	The park has greater than 30% but less than 60% tree canopy cover.	The park has greater than 60% tree canopy cover.		
Real Estate Impact	Unimproved parks or parks with loud and/or bright active recreation zones within 500 feet of neighboring houses.	Parks not in the “Low Value” that have less than 1,100 houses within a 10-minute walk of the park or a connecting greenway.	Parks not in the “Low Value” that have greater than 1,100 houses within a 10-minute walk of the park or a connecting greenway.		
Physical Health Benefits	The park does not provide moderate or vigorous recreational activities to the community.	The park provides only moderate or vigorous recreational activities to the community.	The park provides both moderate and vigorous recreational activities to the community.		

Overall Score: ___/18

Overall Natural Capital Value

High ≥ 15

Medium 10-14
Low ≤ 9

Literature

- Stormwater
  - https://landstudies.com/parks-can-play-major-role-managing-stormwater/
  - https://neworleanscitypark.com/sustainability-and-conservation/stormwater-management
  - https://ascelibrary.org/doi/10.1061/JSWBAY.0000880
  - https://stormwater.brla.gov/wp-content/uploads/2020/12/FUTUREBR_Infrastructure.pdf
  - http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Public_Works/Hydraulics/Documents/Hydraulics%20Manual.pdf
- Urban Heat Index
  - https://www.epa.gov/heatislands/measuring-heat-islands
  - https://www.climatecentral.org/news/urban-heat-islands-threaten-us-health-17919
  - https://www.fs.fed.us/nrs/pubs/jrnl/2010/nrs_2010_nowak_002.pdf
- **Carbon Sequestration**
  - https://www.nrs.fs.fed.us/pubs/jrnl/2002/ne_2002_nowak_002.pdf
  - https://www.researchgate.net/publication/277556190_Baseline_and_Projected_Future_Carbon_Storage_Carbon_Sequestration_and_Greenhouse-Gas_Fluxes_in_Terrestrial_Ecosystems_of_the_Eastern_United_States#pf2e
  - https://www.fs.fed.us/climatechange/documents/SouthernRegionCarbonAssessment.pdf
  - https://www.researchgate.net/publication/282543110_Modeling_Carbon_Sequestration_in_Home_Lawns
  - https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/fee.1988
  - https://pubs.usgs.gov/sir/2010/5233/pdf/sir2010-5233.pdf
  - https://static-content.springer.com/esm/art%3A10.1038%2Fncomms13835/MediaObjects/41467_2016_BFncomms13835_MOESM2179_ESM.pdf
  - https://www.fs.usda.gov/ccrc/topics/grassland-carbon-management#:~:text=Despite%20these%20slow%20changes%2C%20the,over%2050%20years%20(19).
  - https://www.nature.com/articles/s41467-019-08636-w
  - http://www.conservationfund.org/images/projects/files/Houston_Galveston_Report.pdf
  - https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/fee.1988
- Air Quality
  - https://www.fs.fed.us/ne/newtown_square/publications/other_publishers/OCR/ne_2006_nowak001.pdf
  - https://www.fs.fed.us/nrs/pubs/jrnl/2010/nrs_2010_nowak_002.pdf
  - https://www.stateoftheair.org/city-rankings/states/louisiana/
- Real Estate

- https://www.nrpa.org/parks-recreation-magazine/2020/april/how-much-impact-do-parks-have-on-property-values/
- http://cloud.tpl.org/pubs/ccpe-econvalueparks-rpt.pdf
- https://dc.uwm.edu/cgi/viewcontent.cgi?article=2296&context=etd
- https://www.nrpa.org/parks-recreation-magazine/2020/may/the-impact-of-trails-and-greenways-on-property-values/
- https://www.nrpa.org/parks-recreation-magazine/2020/april/how-much-impact-do-parks-have-on-property-values/
- https://web.tplgis.org/parkservedatadownloads/TPL_10MinWalk.pdf
- https://10minutewalk.org/

- Personal Health
  - http://depts.washington.edu/hhwb/Thm_ActiveLiving.html
  - https://www.cdc.gov/physicalactivity/basics/pa-health/index.htm
  - https://www.cdc.gov/physicalactivity/about-physical-activity/why-it-matters.html
  - https://www.businessinsider.com/financial-benefits-of-exercise-2016-9
  - https://www.cdc.gov/physicalactivity/basics/measuring/index.html
  - https://www.cdc.gov/physicalactivity/basics/adults/index.htm
  - https://www.cdc.gov/physicalactivity/basics/age-chart.html
  - https://www.ajpmonline.org/article/S0749-3797(04)00304-6/fulltext
  - https://www.cdc.gov/physicalactivity/basics/measuring/heartrate.htm

Additional Guidance

Urban Heat Effect:

- Requirements: Landsat 8 data (Band 4, Band 5, Band 10, and metadata) and ArcMap with Spatial Analyst extension; the Landsat data should be from a day between June 1 and Aug 31 (hottest days in BR – will be best for showing cooling effects of an area during time when they are most beneficial) and should have less than 10% cloud cover over the EBR area (cloud cover greatly skews the calculation of surface temperature of areas below them)
- Process: https://giscrack.com/how-to-calculate-land-surface-temperature-with-landsat-8-images/; https://downloads.hindawi.com/journals/js/2016/1480307.pdf; you can also find video tutorials that are a bit easier to follow along.
- Product: will generate a raster file containing the land surface temperature in C° (Degrees Celsius) which can be manipulated to show temperature differences of areas within EBR parish; symbology should be classified into 20+ classes by equal division with a color gradient that easily distinguishes high from low
- To evaluate the natural capital value of a park in relation to Urban heat Island you will have to calculate the average temperature of each park using Zonal Statistics and then compare to average LST of urban areas within EBR – used ESRI's urban areas layer and clipped to EBR. The average LST for the data I used was 29.5°C. You can then look at the

temperature difference between a specific park and the urban average to determine the cooling or warming effect a park may have.

- Notes: this is not the same as air temperature (typically what we experience - this data does not cover large areas) but can be used to see temperature differences between areas at a finer scale; this data has not been validated by field-observation and is likely to have been affected by environmental conditions that have not been accounted for. *"USGS Landsat Provisional Surface Temperature Science Product may report unvalidated results for certain observational conditions."*

Calculating carbon sequestration potential of a park:

- Separate the park into natural communities/land types listed below.
- Each natural community is assigned an average rate of carbon sequestration or an average potential storage capacity.
- Multiply the acres of each community type by the associated carbon sequestration rate to determine the total carbon sequestered.
- Total Carbon Sequestered = (acres of *Marsh or swamp that is wet year-round* *206) + (acres of *Temporary, vegetated wetlands**91) + (acres of *Upland prairie, grow zones* *78) + (acres of *Upland forest* *61) + (acres of *Open water pond or lake* *10) + (acres of *Maintained lawn* * 0.8)

Community Type	**Carbon Sequestered**
Marsh or swamp that is wet year-round	206 metric ton of carbon per acre
Temporary, vegetated wetlands	91 metric ton of carbon per acre
Upland prairie, restoration plantings, grow zones	78 metric ton of carbon per acre
Upland forest	61 metric ton of carbon per acre
Open water pond or lake	10 metric ton of carbon per acre
Maintained lawn	0.8 metric ton of carbon per acre
Developed – Sidewalks, parking lots, bldgs.	0

Air Quality (Pollution Reduction)

- iTree may be able to provide estimates of the amount of pollution removed by an urban forest, and the associated percent air quality improvement over the year.

Physical Health Benefits

- Intensity level of an activity is measured using an individual’s target heart rate. For moderate intensity your target heart rate should be 64%-76% of your maximum heart rate and for vigorous intensity your target heart rate should be 77%-93% of your maximum heart rate. The “talk test” is another way to determine the intensity level of an activity. If you can hold a conversation while engaged in an activity it is moderate intensity, but if you are not able to say more than a few words during an activity then it is vigorous intensity.
- Data on the economic benefits of exercise on mental health is severely limited, therefore it was not used in the evaluation of the park system.

Appendix 6: Interpretive Potential Rubric

Interpretive Potential Rubric

As defined by The National Association of Interpretation, Interpretation is “the communication process that forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resource”. Interpretation can include formal interpretation guided by staff through programming but for the purposes of this rubric will mainly include informal interpretation through signage, displays and the appropriate amenities required to facilitate and enhance the user's experience. The intent of this rubric is to provide an assessment tool which assists in evaluating the interpretive potential of a park. Interpretive potential can span a wide range of meanings including but not limited to, the presence of unique features, site accessibility, and gaps in service for local interpretive opportunities. Additionally, other considerations should include proximity to underserved populations which would directly benefit from the interpretation, such as a school or densely populated urban neighborhood, and the feasibility of developing the site to facilitate interpretive opportunities.

The Interpretive Potential Rubric evaluates seven categories providing a ranking for each which are then tallied for an overall Interpretive Potential rating for the park. The rubric should be filled out collectively by BREC’s Planning and Engineering Department and CORE and Special Facilities Divisions based on expertise.

Interpretive Potential Assessment Categories

1. **Presence of Interpretive Features**
   Does the site contain one of the following features to interpret?
   a. Unique cultural or historical feature
   b. Unique natural feature as defined when filling out the Ecological Rubric
   c. Habitat or natural community not highlighted elsewhere in the parish

If Yes, continue to #2 to determine full potential. If No, then answer No to question #10 on the Land Planning and Development Decision Making Framework.

2. **Proximity to other Interpretive Sites**
   Would the surrounding community benefit more from the interpretation of this site than the nearest interpreted location with an equivalent experience?
   a. If there is another high value interpretive site that provides an equivalent interpretive experience (i.e., both are cypress swamps or river overlooks) within 10 minutes of this location, it is not likely that this site would benefit the community more than the existing one unless it provided a unique opportunity not located at the other sites as described in Question #1.
   b. Yes 1/No 0

3. **Park Accessibility**
   Is the park already accessible to the public (parking, trails, or sidewalks)?
   a. Yes 1/No 0
   b. If no, would making the park accessible negatively impact the natural or cultural resource being interpreted?
      i. Yes 0/No 1

4. **Budget and Funding**
   Is there an existing budget for adding interpretive resources to this park?
   a. Yes 1/No 0
   b. If No, could a budget be developed within 3 years?
      i. Yes 1/No 0

5. **Potential Interaction Level/Community Impact**
   Is the property near a school, church, include a recreation/activity center or serve another high-density community which would provide a high level of interaction and engagement with the interpretive site?
   a. Yes 1/No 0

Rubric Evaluation Results

Interpretive Factor	Option	Value	Score	Comment
2. Proximity to Other Interpretive Sites	Yes	1		
	No	0		
3. Park Accessibility	Yes	1		
	No	0		
3b. Park Access Development Impacts	Yes	0		
	No	1		
4. Budget and Funding	Yes	1		
	No	0		
4a. Potential Future Budget and Funding	Yes	1		
	No	0		
5.Potential Interaction Level/Community Impact	Yes	1		
	No	0		

Overall Score= _________/4

High interpretive Potential: 4 pts

Medium interpretive potential: 2-3 pts

Low interpretive potential: 0-1 pts

Appendix 7: Example Biodiversity Assessment Report

BREC Natural Resource Management Division
Initial Biodiversity Assessment Report

Property Name: Baywood Park
Address: 20001 Pride-Baywood Rd Baton Rouge, LA 70770
Coordinates: 30.711739, -90.915661
Survey Date: November 11, 2020
BREC Staff: Amanda Takacs, Dylan DeRouen, Mike Rabalais
Property Size: 29.1 acres
Area Traversed: Approximately 0.97 miles
Soils Present: Ouachita, Ochlockonee, and Guyton soils (OUA;17.4 acres); Toula silt loam (TuB; 8.3 acres), and Bude silt loam (BuB; 3.4 acres)
iNaturalist Link: Baywood Park

Summary of Findings

Baywood Park is a 29.1-acre neighborhood park that features a playground, tennis court, basketball court, baseball field, a lawn that is actively mowed, and 25 acres of forested area that is currently not being utilized. The forested area contains three potential habitat types: Spruce Pine Hardwood Flatwood, Small Stream Forest, and Mixed Hardwood Loblolly Pine Forest. According to state and global rankings, Small Stream Forests (S3/G3) are considered rare and Spruce Pine Hardwood (S1/G1G2) are considered imperiled. Sixty-nine vascular plant species and 11 Animal/Fungi species were noted during the assessment as well as several unique and attractive natural features, such as expansive stands of loblolly pine forests that tower overhead, large American beech, sweet leaf, and tulip poplar trees that rival the largest known individuals in the parish, and steep ravines/streams associated with Hanna Creek and its adjacent tributary which pass through the northwest section of the park. Baywood park is in the most northeastern region of the parish in a rural area where residents are lacking nature-based education activities and likely driving great distances to receive these opportunities in other parts of the parish. This park could provide additional recreational benefits beyond the playground and baseball field in the form of nature-based passive recreation. Recommendations include marking property boundaries, enforcement signage to prevent mis-use, establishment of an interpretive nature trail and expanding the park's buffer to better protect imperiled habitat.

Threats and Management Concerns

The forested habitat of Baywood Park is in great condition and supports species typically found in Mixed Hardwood-Loblolly Pine, Spruce Pine Hardwood Flatwood, and Small Stream Forests. Most of the threats facing Baywood Park relate to the potential of encroaching development. Mis-use of resources and threats to wildlife were observed in both the southeast and northwest sections of the park. There was a considerable amount of dumping and hunting equipment in these two different sections of the park, and it appears to be ongoing. Invasive species do not pose a significant threat to the forested area of Baywood Park, with the few invasive species present being found in small numbers along the forest edges and the southern part of the park.

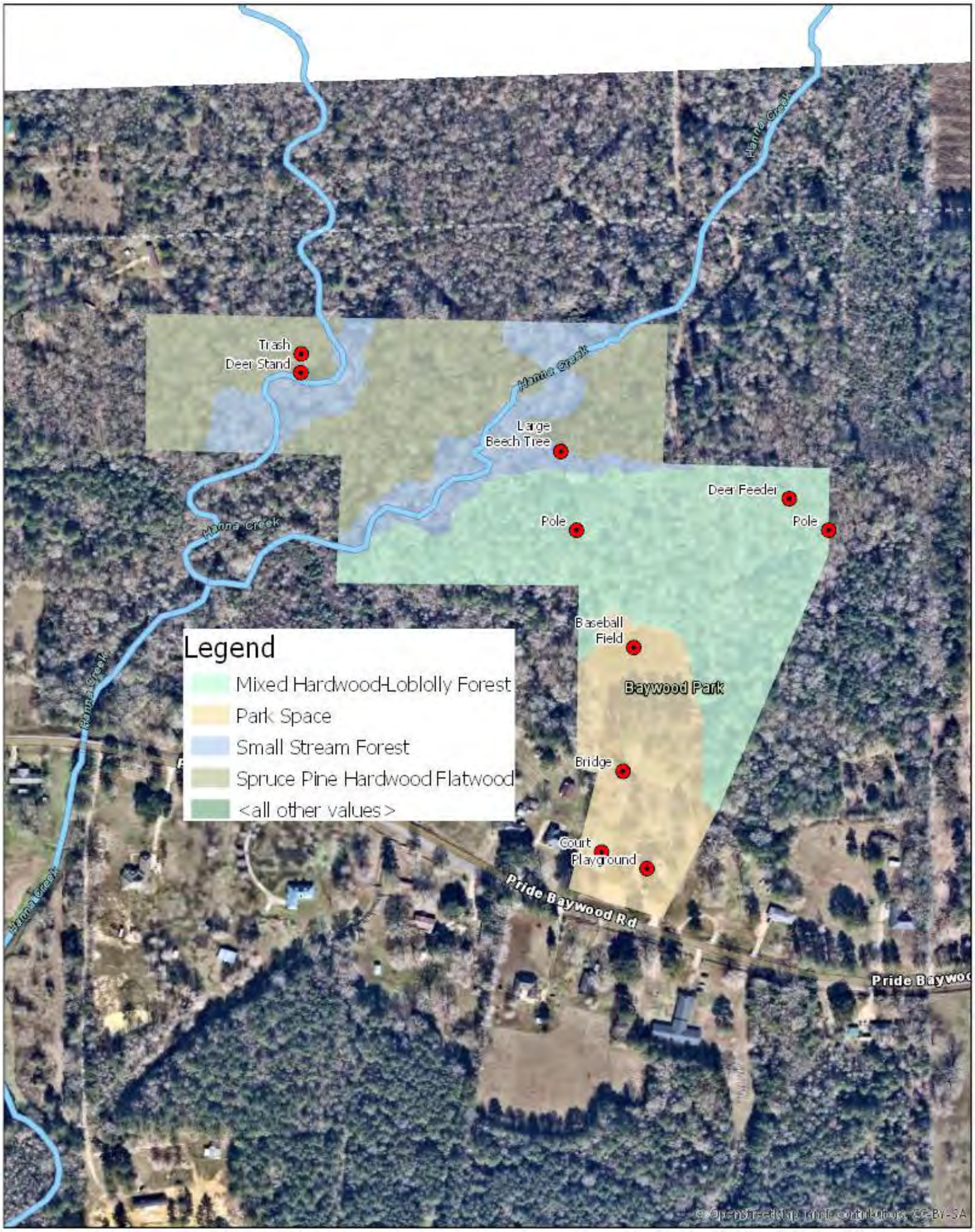


Figure 1. Current existing conditions of Baywood Park including recreational features, notable natural features, and observed misuse (red dots). General locations of natural communities present are also depicted (see legend).

Property Description
Baywood Park is a small, neighborhood park with 4 acres of open space for recreation and a 25-acre underutilized tract of forested land (Fig. 2) Baywood Park is located in the north east region of East Baton Rouge Parish, a rural area along Pride-Baywood Road (Fig. 3). Recent historical imagery (1989-present; Figure 4) suggests that Baywood Park has been relatively untouched. According to a letter from Henry Childress of the Department of Forestry and Agriculture to Mark. A Tillman, the previous property owner of the park property, there was some surveying conducted to assess potential timber value of the property (Fig. 5). The timber survey suggests 305 trees were marked and quoted for potential timber harvest including 169 loblolly pine trees, 123 spruce pine trees, and 13 hardwood trees of various size classes (Fig. 6). There is no evidence that the previous property owner pursued this objective. Hanna Creek flows through the North central section of the park along with a smaller tributary to the West that joins Hanna Creek outside of the park (Figure 7). The area along Hanna Creek is designated as a Level A Flood Hazard Area while the rest of the park is designated as a Level X Flood Hazard Area (Fig. 8). The topography is variable and ranges from relatively flat woods and open park space to deep well-defined ravines along Hanna Creek (Fig. 9). Three soil types (Fig. 10) are present in the park: Ouachita, Ochlockonee, and Guyton soils (OUA;17.4 acres); Toula silt loam (TuB; 8.3 acres), and Bude silt loam (BuB; 3.4 acres). OUA is considered partially hydric while TuB and BuBare predominantly non-hydric. This report serves as a Bioassessment Survey to provide initial information on the potential habitats present and unique ecological features of the park.

Methods
Baywood Park was visited by BREC Natural Resource Management (NRM) staff on November 11, 2020. Approximately 0.97 miles of the park was traversed following 3 transects (Fig. 11). The first transect followed the Eastern boundary of the park in a South-North direction, while the 2nd and 3rd transects crossed the park in an East-West direction parallel to the Northern boundary. All species observed along these transects were recorded, general habitat types were delineated, and other features were noted, including forest structure. A Trimble TDC 150 was used to mark all notable locations, tracks were recorded using the All Trails app, and field photos were uploaded to iNaturalist was used to document plant, animal, and fungi species present.

Detailed Assessment
Baywood Park features a playground, tennis court, basketball court, baseball field, a 4-acre lawn that is actively mowed, and an estimated 25 acres of forested area containing three potential habitat types: Mixed Hardwood-Lobolly Forest, Spruce Pine Hardwood Flatwood, and Small Stream Forest (Fig. 1). Spruce Pine Hardwood Flatwoods and Small Stream Forests are considered rare or imperiled by state and global rankings The Mixed Hardwood-Loblolly Forest was found in the Southeast section of the park while the Spruce Pine Hardwood Flatwood was found in the Northern section of the park. The Small Stream Forest dissected these two community types and was found along Hanna creek and its associated tributary.

In total, 69 vascular plant species, 4 fungi, and 6 animal species were observed at Baywood Park (see Appendix 3 and 4). Notable features included Hanna Creek and the surrounding Small Stream Forest which included deep, well defined banks, a variety of fern species, and several large American beech trees. One notable species observed during the bioassessment were two individual plants presumed to be Venus' pride (*Houstonia purpurea*), which is uncommon in the state (reported in only 13 parishes in Louisiana; USDA). Venus' pride is known to occur in the East Feliciana, St. Helena, and Tangipahoa parishes to the northeast of EBR, but current USDA range maps suggest that it has not been observed in EBR parish. A voucher specimen collection of this species in fruit/flower should be made next year and, if confirmed, would serve as the first and only official record of this plant occurring in EBR parish. A variety of greenbriar species were also found including saw greenbriar (*Smilax bona-nox*), bristly greenbriar (*S. tamnoides*), cat greenbriar (*S. glauca*), and sarsaparilla vine (*S. pumila*). Invasive species, including Chinese privet (*Ligustrum sinense)* and Chinese tallow (*Triadica sebifera)* were present but appeared to be limited to the Southern section of the park and along the forest edge with little to no noticeable displacement of the native species within the forest.

The park boundaries, particularly within the forested area, were not evident with only a few property boundary poles found during the assessment. There were signs of active hunting found in both the southeast section of the forest and the northwest section of the forest. The lack of staff presence, park enforcement and definitive park boundaries has likely enabled this behavior.

Spruce Pine Hardwood Flatwood

Rarity Rank: S1/G1G2 (imperiled, rare)

The Spruce Pine Hardwood Flatwood Forest occupies an estimated 4.54 acres of the park (Fig. 12), surrounding outer lying areas along Hanna's creek tributary. This habitat is ranked as rare/imperiled according both state (S1) and global (G1G2) rankings and is currently represented in few locations of EBR. This spruce-pine harwood forests at Baywood park are dominated by mostly hardwood speceis (oak and elm spp.) with an obvious spruce pine component distributed sparsely throughout, even dominating the canopy in some locations. Notable understory species observed include Venus' pride (*Houstonia purpurea*), an uncommon species in the state that does not have any official record of occurence in EBR parish. One active hunting stand was found in this section including corn spread on the ground nearby. Trash, including old bed frames, home supplies, etc. was also found nearby. See appendix 2 for field images.

Small Stream Forest

Rarity Rank: S3/G3 (rare)

The Small Stream Forest occupies an estimated 8.67 acres of Baywood Park and is narrow, following the lengths of Hanna Creek and its associated tributary (Fig. 12). This rare habitat type is characterized by a canopy of American beech (*Fagus grandifolia*) and southern magnolia (*Magnolia grandifolia*) with tulip poplar (*Liriodendron tulipifera*) as a notable codominant. The midstory is dominated by ironwood (*Ostrya virginiana*) and common sweetleaf (*Symplocos tincoria*) with Carolina laurel cherry (*Prunus carolinana*) and witch hazel (*Hamamelis virginiana*) also observed in the area. Notable herbaceous species found in this area include the sarsaparilla vine (*Smilax pumila*), cardinal flower (*Lobelia cardinalis)* and a high abundance of ferns (mostly *Athryium filix-femina*), liverworts, and mosses, which were supported by the steep, well-defined ravines and sandy creek bottoms of this water systems. This habitat supported some of the most scenic views in the park. with its steep ravines and large beech and tulip polar trees. See appendix 2 for field images.

Mixed Hardwood-Loblolly Forest
Rarity Rank: S4/G4 (secure)
The Mixed Hardwood-Lobolly Forest habitat occupies an estimated 10.83 acres of the forest (Fig. 12) and is characterized by strong presence of loblolly pine (*Pinus taeda*), which dominates more than 20% of the canopy. Other canopy species included spruce pine (*Pinus glabra*) which was sparsely present throughout, and a variety of hardwood species (*Quercus alba, Q. phellos,Fagus grandifolius,* and *Carya glabra*.), and an understory dominated by winged elm (*Ulmus alata*). Plant abundance was low due to habitat type and the time of year, but some notable herbaceous species included woodoats species (*Chasmanthium* spp.), wrinkle leaf goldenrod (*Solidago rugosa*), partridgeberry (*Mitchella repens*), and crossvine (*Bignonia capreolata*). This section had the highest elevation of Baywood Park, but still contains some lower areas with Facultative Wetland species such as dwarf palmetto (*Sabal minor*) present. An active deer feeder was found within the park in this area, with an associated hunting stand located just outside of the park boundary (Figure 8). Two yellow poles were also found that may represent previous park boundaries. See appendix 2 for field images.

Recommendations
This park is in the most northeastern region of the parish in a rural area where residents are lacking nature-based education activities and likely driving great distances to receive these opportunities in other parts of the parish, such as the Zoo and Bluebonnet Swamp Nature Center. With there being a BREC park containing high quality natural communities located in the area, this park has the potential to fill a service gap in environmental education and interpretation. BREC does not have many healthy representative communities of Spruce Pine Hardwood Flatwoods, an imperiled habitat, and the presence in this park is notable. This habitat should be protected and used as an educational resource for parishioners. The forested area is relatively open and is large enough to support a meandering nature trail. This park could provide additional recreational benefits beyond the playground and baseball field in the form of nature-based passive recreation. Interpretive signage, highly visible directional signage, wide trail openings, and trail cameras are recommended to limit mis-use and ensure patrons feel safe. Education should focus on the unique habitats present in the landscape, the interaction of humans with the landscape and natural processes and the role this tract plays in local ecology.

Considerations should be made to expand the park where feasible to obtain additional rare habitats and create a further buffer to the natural communities protected in the park from future development and land use changes. Development is minimal surrounding the park but there are a few residential homes nearby, signs of active hunting on/near park boundaries, and forested area that extends well beyond the park boundary, which may be subject to a variety of current or future land use changes or harvesting (hunting, lumber, development, etc.). Some invasive species are present, but they are minimal and appear to be restricted to the southern part of the park and the forest edges Baywood Park can thus be described as a segment of high-quality habitat in a relatively undeveloped part of the parish and a valuable resource to the residents of the surrounding area and parish.

Being in a rural area, there is concern for misuse of the resources. Evidence of active deer hunting was found along with trash dumping. Marking the property boundaries of the park and adding No Hunting signage on our boundaries along with other rules and enforcement signs should aid in reducing this behavior. Increased staff presence and the use of trail cameras may also assist in assessing illegal activity taking place in the park. Louisiana Department of Wildlife and Fisheries should be notified of unauthorized hunting. Opening a trail could also provide a vector for the spread of invasive species, so mapping of invasive plants prior to trail development is suggested. Because so few invasive species were found in the forested area of the park, it would be beneficial to remove what is present in order to preserve the native forest community.

Appendix 1: Figures

Figure 2. Current satellite imagery of Baywood Park.

Figure 3. Satellite imagery showing Baywood Park location in reference to East Baton Rouge Parish boundary.

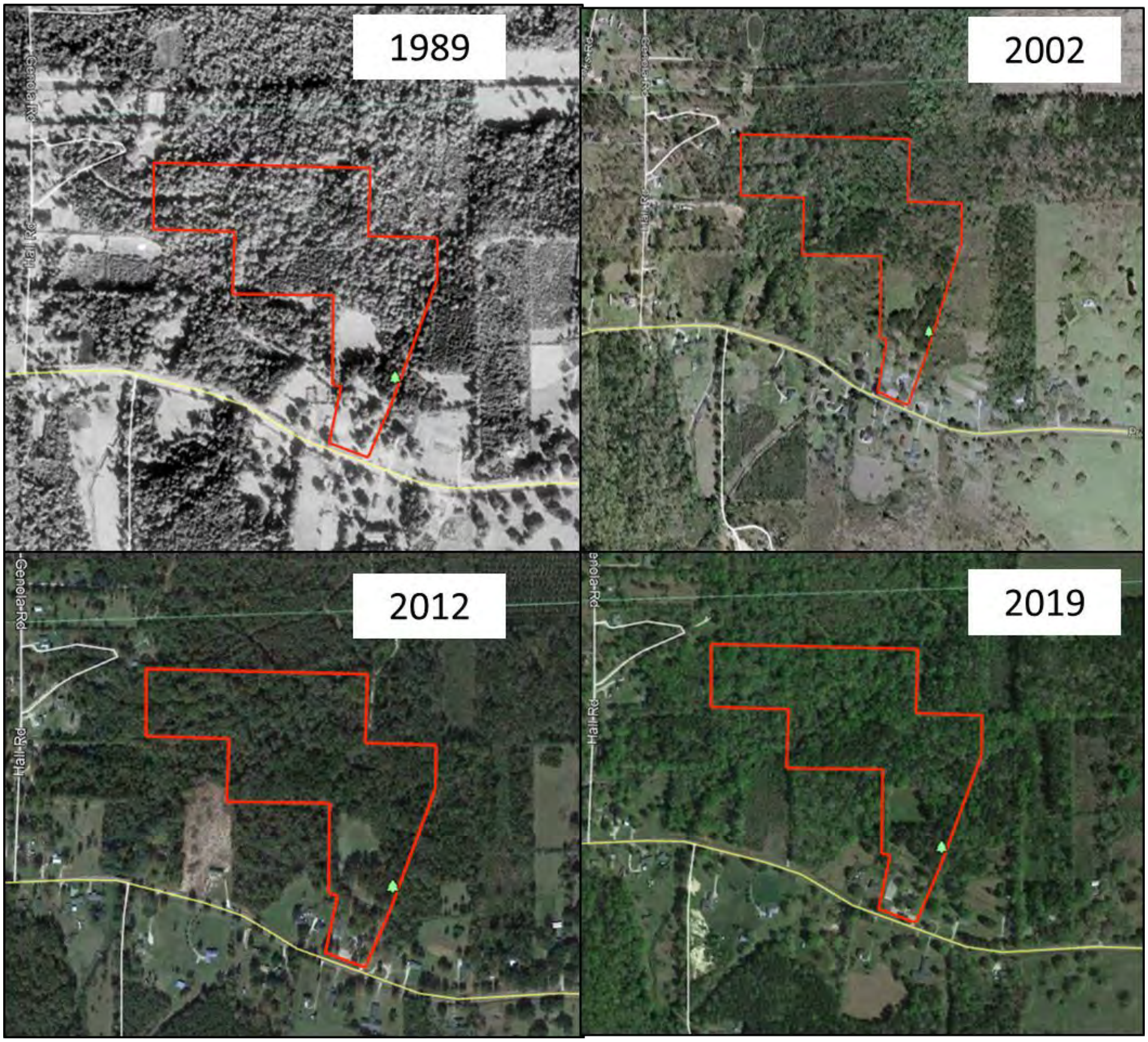


Figure 4. Historical satellite imagery of Baywood Park from four different time stamps.

Louisiana Department of Agriculture & Forestry
Office of Forestry
Post Office Box 8
Clinton, Louisiana
70722
(504) 683-5862

BOB ODOM
COMMISSIONER

PAUL D. FREY
ASSISTANT COMMISSIONER
and STATE FORESTER

June 22, 1993

Mr. Mark A. Tillman
Louisiana Department of Agriculture & Forestry
Office of Management & Finance
Audit Division
P. O. Box 3481
Baton Rouge, Louisiana 70821-3481

Dear Mr. Tillman:

The Louisiana Department of Agriculture and Forestry, Office of Forestry, has recently completed marking and tallying your 21 acres of timber located in Section 9, Township 4 South, Range 3 East, East Baton Rouge Parish, Louisiana.

We are enclosing a list of timber buyers, a sample contract and a tally of trees marked by species and size. You should contact as many of the buyers as possible. I have checked the ones most likely to offer a bid.

If you need my assistance in showing the property to prospective buyers, please call me at home or at work. If you have any questions, please do not hesitate to contact me.

Sincerely,

Henry R. Childres

HENRY R. CHILDRES - FORESTER

/sb

Enclosures

SAWTIMBER SUMMARY

OWNER: Mark Tillman
DATE: 6-4-93
LOCATION: Sec. 9, Twp 4S; Rn. 3E N. of BREC Park on Pride-Baywood Hwy.
NO. ACRES: 21
TREE SCALE: Doyle FC 80

Species	Loblolly Pine		Spruce Pine		Hardwood					
DBH	NO. TREES	VOL. BD. FT.	NO. TREES	VOL. BD. FT.	NO. TREES	VOL. BD. FT.	NO. TREES	VOL. BD. FT.	NO. TREES	VOL. BD. FT.
12	50	2190	12	468						
14	52	4348	39	3240	1	42				
16	31	4175	31	4271	1	101				
8	25	5307	24	4830	6	764				
20	8	2305	11	2801	2	400				
22	3	1155	4	1470	1	262				
24			2	628	2	666				
TOTALS	169	19,480	123	17,708	13	2235				

Figure 5-6. Letter from the Department of Forestry and Agriculture summarizing number and types of trees assessed and marked for potential logging.

Figure 7. Baywood Park Hydrology, displaying water systems relative to park boundary.

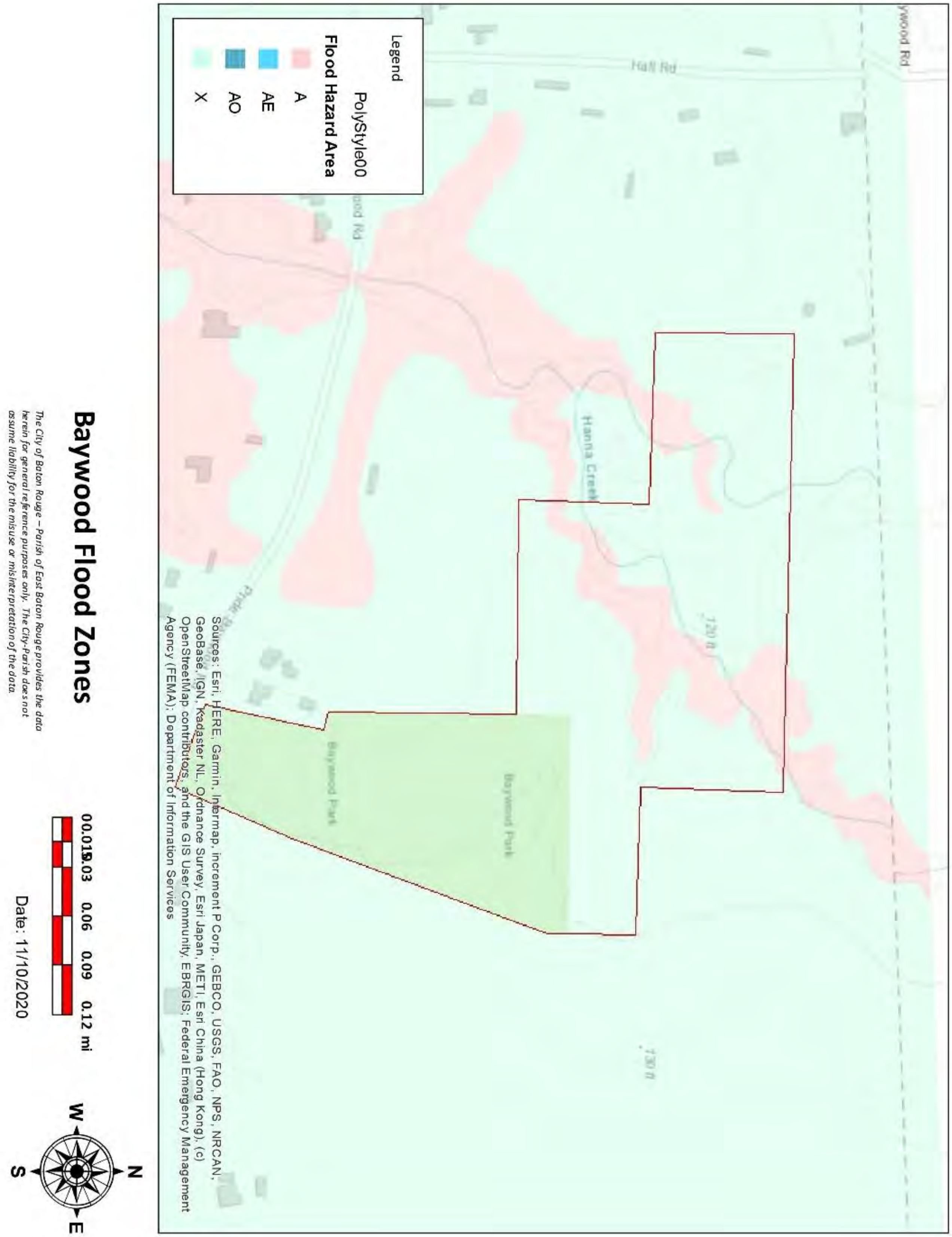


Figure 8. Baywood Park Flood Zones.

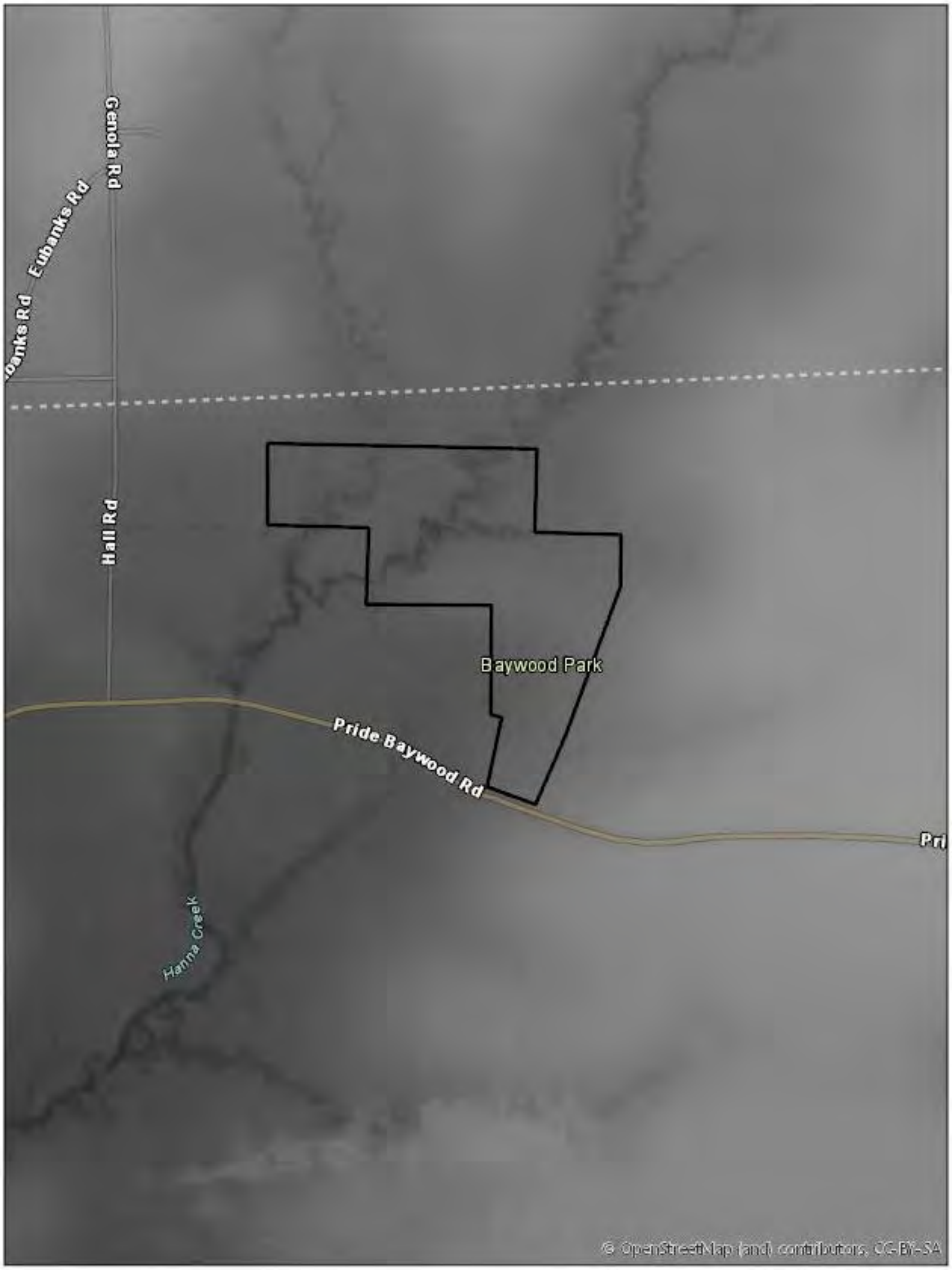


Figure 9. Baywood Park topography. Darker areas represent lower elevations. Lighter areas represent higher elevations.

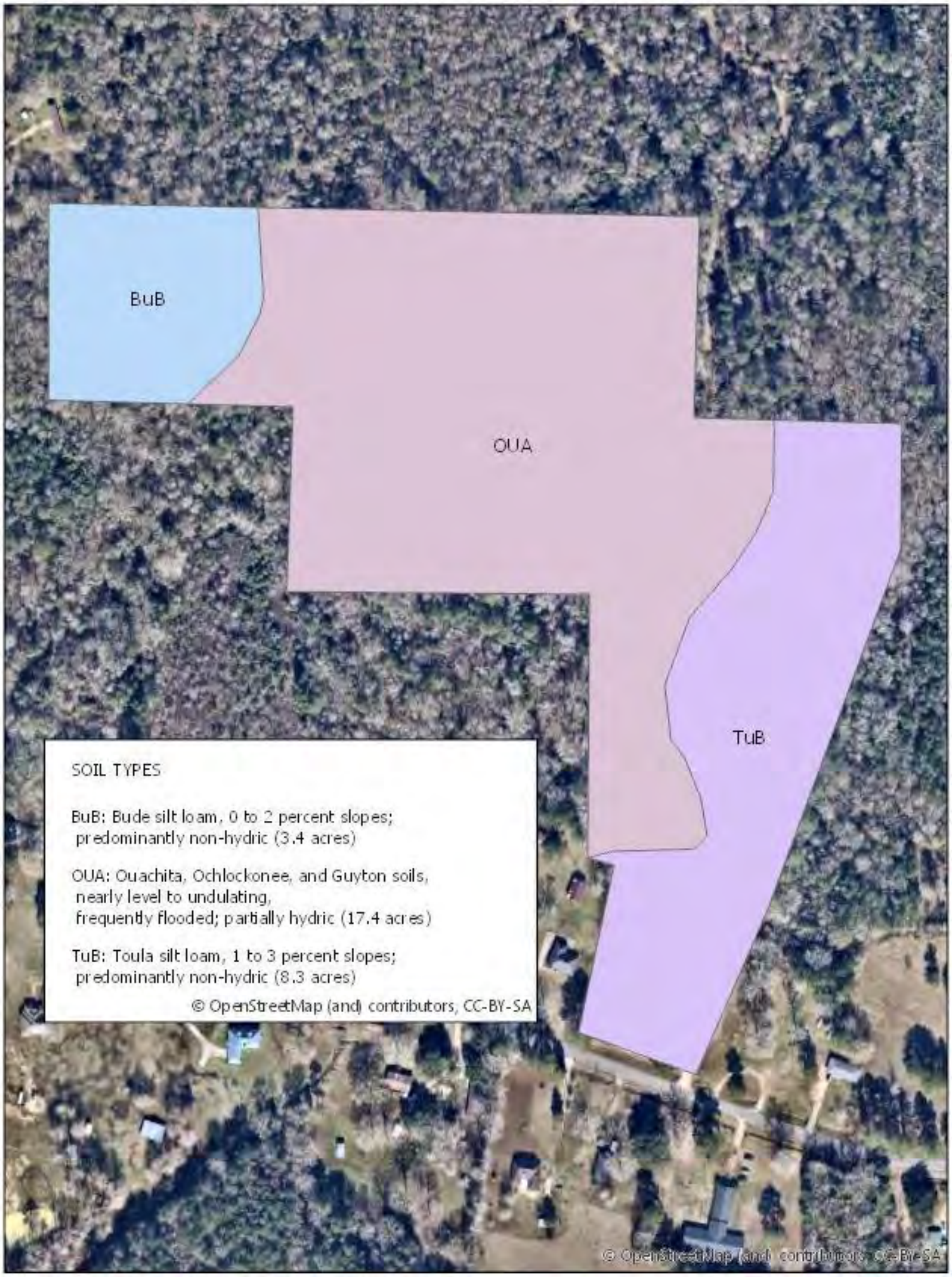


Figure 10. Three different underlying soil types present at Baywood Park.

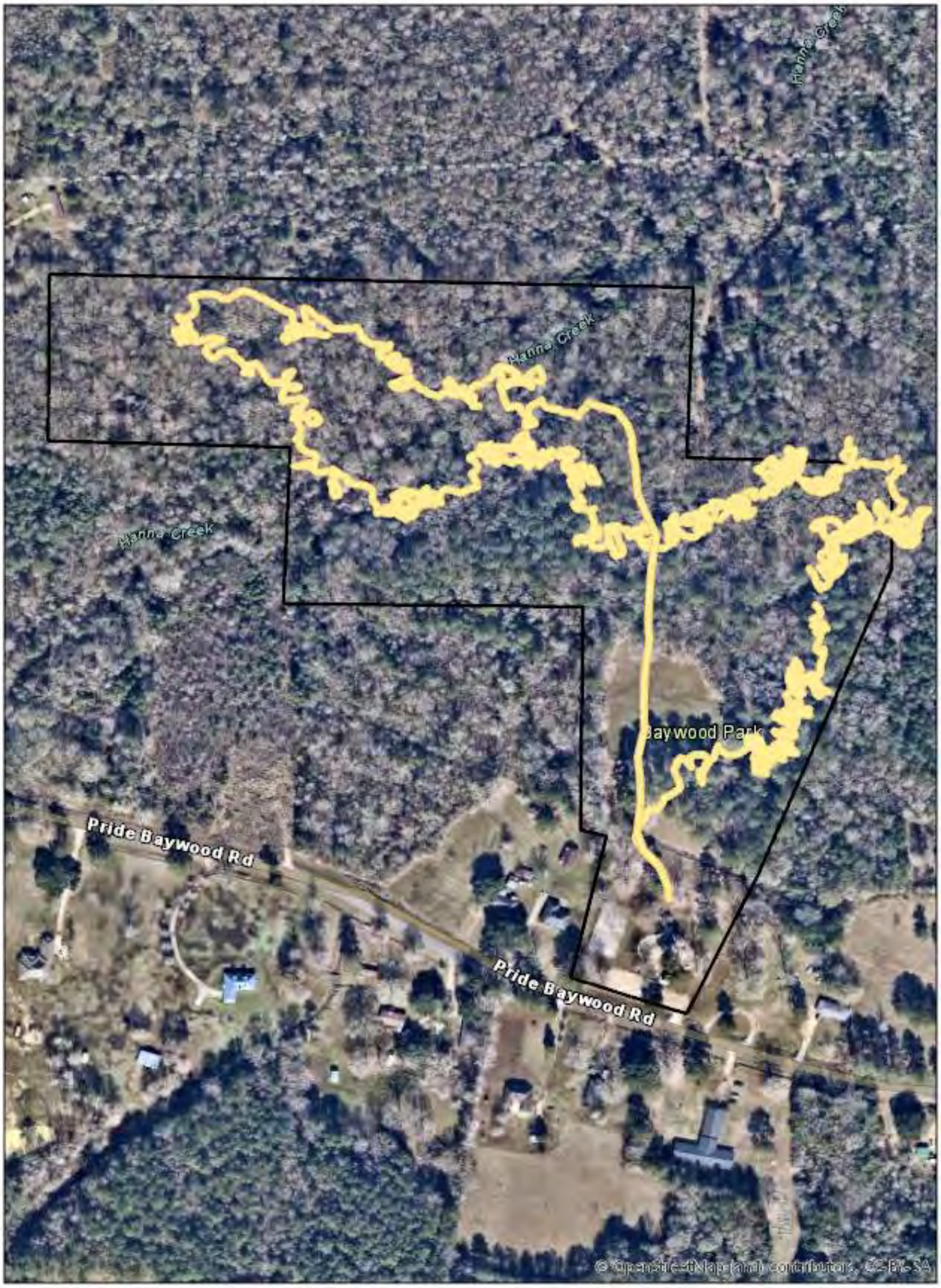


Figure 11. Baywood Park Bioassessment AllTrails Track displaying route hiked during the bioassessment of Baywood Park (approximately 0.97 miles).

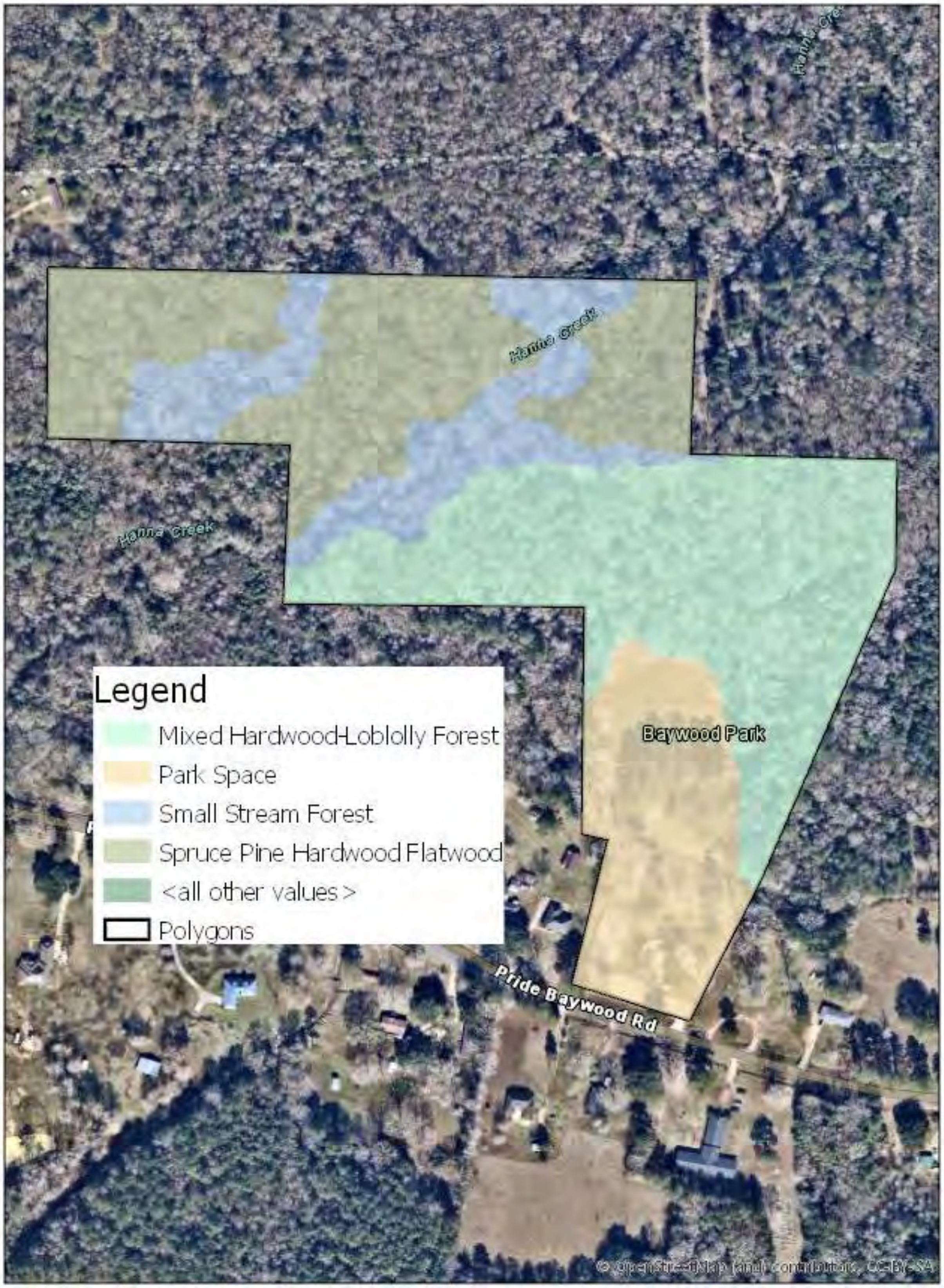


Figure 12. Baywood Park Potential Natural Communities.

Figure 13. Baywood Park infrared satellite imagery.

Appendix 2: Field Images

Image 1. North-facing image of Baywood Park's open space with baseball field and forest treeline in the distance. Trees in this space include lobolly, spruce pine and white oak.

Image 2. South-facing image of the open park space showing courts and playground along Pride Baywood Road.

Image 3. Typical potential Mixed Hardwood-Loblolly Forest.

Image 4. Typical potential Small Stream Forest habitat at Baywood Park.

Images 5. Steep ravine and sandy creek bottom of Hanna Creek.

Image 6. Large American beech and tulip poplar trees found in the small stream forest habitat.

Image 7. Typical potential Spruce Pine Hardwood Forest.

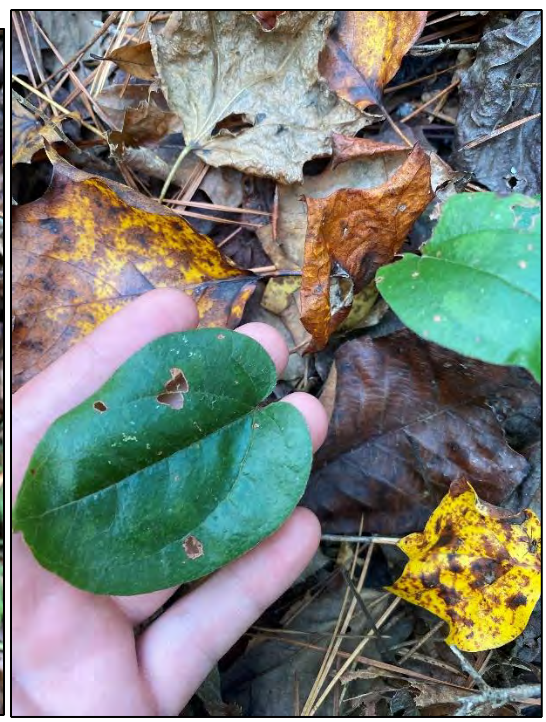


Image 8-9. Two of the four greenbriar species found in Baywood Park, the bristly greenbrier (left) and the sarsaparilla vine (right).

Image 10. One of several fern species found in Baywood Park, the netted chain fern (*Woodwardia areolata*).

Image 11. Venus' pride, an uncommon species in Louisiana and a potential parish record.

Images 12-14. Active deer feeder and deer stand found in southeast and northwest sections of Baywood Park, respectively. Trash dumping was also observed in the northwest section.

Appendix 3: Plant List

A list of the 69 plant species observed at Baywood Park. List is sorted by phylogenetically by major group, then alphabetically by family and scientific name. Wetland and Prairie C-values were derived from the Louisiana Plants Database (https://warcapps.usgs.gov/PlantID). All other information, including scientific names and common names, are derived from USDA PLANTS Database (http://plants.usda.gov).

Group: Monocot, Dicot, Gymnosperms, Pteriophytes
Type: Duration and growth habit: a=annual, p=perennial, b=biennial. Forb/herb, graminoid, lichenous, nonvascular, shrub, subshrub, tree, vine
Native Status: List if the plant is native, introduced, and/or invasive. 0=native, 1=introduced, 2= invasive
Ind: Wetland indicator status for the Atlantic and Gulf Coast Region
W: Wetland coefficient of conservatism value
P: Prairie coefficient of conservatism value

Group	Family	Scientific name	Common name	Type	Ind.	W	P	N
Pteridophyte	Blechnaceae	*Woodwardia areolata*	netted chain fern	p-fern	OBL	7		0
Pteridophyte	Dryopteridaceae	*Athyrium filix-femina*	common ladyfern	p-fern	FAC			0
Pteridophyte	Dryopteridaceae	*Polystichum acrostichoides*	Christmas fern	p-fern	FAC			0
Pteridophyte	Lygodiaceae	*Lygodium japonicum*	Japanese climbing fern	p-vine	FAC	0	-2	1
Gymnosperm	Pinaceae	*Pinus glabra*	spruce pine	tree				0
Gymnosperm	Pinaceae	*Pinus taeda*	loblolly pine	tree	FAC	6	2	0
Monocot	Araceae	*Sabal minor*	dwarf palmetto	p-shrub	FACW	8		0
Monocot	Cyperaceae	*Cyperus odoratus*	rusty flatsedge	p-graminoid	FACW			0
Monocot	Cyperaceae	*Cyperus odoratus*	fragrant flatsedge	p-graminoid				0
Monocot	Poaceae	*Arundinaria gigantea*	giant cane	p-grass, shrub	FACW	5		0
Monocot	Poaceae	*Chasmanthium laxum*	slender woodoats	p-graminoid	FACW			0
Monocot	Poaceae	*Chasmanthium sessiliflorum*	longleaf woodoats	p-graminoid	FAC			0
Monocot	Poaceae	*Dichanthelium* sp.		p-graminoid				0
Monocot	Poaceae	*Oplismenus hirtellus*	basketgrass	p-graminoid				0,1
Monocot	Poaceae	*Sporobolus indicus*	smut grass	p-graminoid				1
Monocot	Smilaceae	*Smilax bona-nox*	saw greenbrier	p-vine	FAC	5	3	0
Monocot	Smilaceae	*Smilax glauca*	cat greenbrier	p-vine	FAC	5		0
Monocot	Smilaceae	*Smilax pumila*	sarsparilla vine	p-vine	UPL			0
Monocot	Smilaceae	*Smilax tamnoides*	bristly greenbrier	p-vine	FAC			0

Dicot	Aceraceae	*Acer rubrum*	red maple	tree	FAC	7		0
Dicot	Anacardiaceae	*Toxicodendron radicans*	eastern poison ivy	p-vine	FAC	2	1	0
Dicot	Aquifoliaceae	*Ilex decidua*	possumhaw	tree	FACW	7	2	0
Dicot	Aquifoliaceae	*Ilex opaca*	american holly	tree	FAC			0
Dicot	Aquifoliaceae	*Ilex vomitaria*	yaupon	shrub, tree	FAC			0
Dicot	Asclepiadaceae	*Gonolobus suberosus*	five-angled shiny-pod	p-forb, vine	FACW		2	0
Dicot	Asteraceae	*Acmella oppositifolia*	creeping spotflower	p-forb	FACW			0
Dicot	Asteraceae	*Elephantopus* sp.						0
Dicot	Asteraceae	*Eupatorium capillifolium*	dogfennel	p-forb	FACU	1	0	0
Dicot	Asteraceae	*Solidago rugosa*	wrinkle leaf goldenrod	p-forb	FAC			0
Dicot	Asteraceae	*Symphyotrichum lateriflorum*	Calico aster	p-forb	FAC	4		0
Dicot	Asteraceae	*Youngia japonica*	oriental false hawksbeard	p-forb	FACU			1
Dicot	Betulaceae	*Carpinus carolinianus*	American hornbeam	tree	FAC			0
Dicot	Bignoniaceae	*Bignonia capreolata*	crossvine	p-vine	FAC	5		0
Dicot	Campanulaceae	*Lobelia cardinalis*	cardinal flower	p-forb	FACW	8		0
Dicot	Caprifoliaceae	*Lonicera japonica*	Japanese honeysuckle	p-vine	FAC		-1	1
Dicot	Cornaceae	*Cornus drummondii*	roughleaf dogwood	tree	FAC	6	3	0
Dicot	Cornaceae	*Nyssa sylvatica*	blackgum	tree	FAC	7	1	0
Dicot	Ebenaceae	*Diospyros virginiana*	common persimmon	tree	FAC	7		0
Dicot	Ericaceae	*Vaccinium elliotti*	Elliot's blueberry	p-shrub	FACW			0
Dicot	Oleaceae	*Ligustrum sinense*	chinese privet	p-shrub	FAC	0	0	1,2
Dicot	Euphorbiaceae	*Triadica sebifera*	chinese tallow	tree	FAC	0	-3	1,2
Dicot	Fagaceae	*Fagus grandifolia*	American beech	tree	FACU			0
Dicot	Fagaceae	*Quercus alba*	white oak	tree	FACU			0
Dicot	Fagaceae	*Quercus michauxii*	swamp chestnut oak	tree	FACW			0
Dicot	Fagaceae	*Quercus nigra*	water oak	tree	FAC	7	1	0
Dicot	Fagaceae	*Quercus pagoda*	cherrybark oak	tree				0
Dicot	Fagaceae	*Quercus phellos*	willow oak	tree	FACW			0
Dicot	Hamamelidaceae	*Hamamelis virginiana*	witchhazel	shrub, tree	FACU			0
Dicot	Hamamelidaceae	*Liquidambar styraciflua*	sweet-gum	tree	FAC	6	3	0
Dicot	Juglandaceae	*Carya glabra*	pignut hickory	tree	FACU			0

Dicot	Hypericaceae	*Hypericum prolificum*	shrubby St. John's wort	forb	FAC	5		0
Dicot	Lamiaceae	*Callicarpa americana*	American beautyberry	p-shrub	FACU			0
Dicot	Magnoliaceae	*Liriodendron tulipifera*	tulip tree	tree	FACU			0
Dicot	Magnoliaceae	*Magnolia grandiflora*	southern magnolia	tree	FAC	7		0
Dicot	Moraceae	*Morus rubra*	red mulberry	tree	FAC		2	0
Dicot	Passifloraceae	*Passiflora lutea*	yellow passionflower	p-vine				0
Dicot	Rhamnaceae	*Rhamnus caroliniana*	Carolina buckthorn	tree	FACU	6		0
Dicot	Rosaceae	*Crataegus marshallii*	parsley hawthorn	tree	FAC			0
Dicot	Rosaceae	*Prunus caroliniana*	carolina laurelcherry	tree	FACU			0
Dicot	Rosaceae	*Rubus argutus*	sawtooth blackberry	p-vine	FAC	4	3	0
Dicot	Rosaceae	*Rubus trivialis*	southern dewberry	p-vine	FAC	4	3	0
Dicot	Rubiaceae	*Houstonia purpurea*	venus' pride	p-forb				0
Dicot	Rubiaceae	*Mitchella repens*	partridge berry	p-forb, shrub	FACU			0
Dicot	Salicaceae	*Populus deltoides*	cottonwood	tree	FAC	5		0
Dicot	Symplocaceae	*Symplocos tinctoria*	common sweetleaf	shrub, tree	FAC			0
Dicot	Ulmaceae	*Ulmus alata*	winged elm	tree	FACU	6		0
Dicot	Urticaceae	*Boehmeria cylindrica*	small-spike false nettle	p-forb	FACW	4	3	0
Dicot	Violaceae	*Viola* sp.	violet	p-forb				0
Dicot	Vitaceae	*Ampelopsis arborea*	peppervine	p-vine	FAC	5	1	0
Dicot	Vitaceae	*Vitis rotundifolia*	muscadine	p-vine	FACW	5		0

Appendix 4: Animal and Fungi List

A list of the 6 animal species and 5 fungi/lichen at Baywood park. List is organized by type, then alphabetically by scientific name.

Type	Scientific name	Common name	N
Amphibian	*Acris gryllus*	southern cricket frog	0
Arachnid	*Pisaurina dubia*	nursery web spider	0
Arachnid	*Trichonephila clavipes*	golden silk spider	0
Bird	*Meleagris gallopavo*	wild turkey	0
Fungi	*Auricularia* sp.	wood ear fungi	0
Fungi	Phylum Basidiomycota		0
Fungi	*Pleurotus* sp.	oyster mushroom	0
Fungi	*Russula* sp.	brittlegills	0
Lichen	*Usnea strigosa*	bushy beard lichen	0
Mammal	*Odocoileus virginianus*	white-tailed deer	0
Reptile	*Storeria dekayi*	DeKay's brown snake	0

Appendix 8: BREC's Terrestrial Rapid Ecological Assessment Protocol

Rapid Ecological Assessment Protocol

BREC Natural Resource Management Division

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INTRODUCTION

What is Rapid Ecological Assessment?

Rapid ecological assessments are surveys developed by natural resource management agencies for assessing the health and quality of ecosystems/habitats in a manner that is quicker and more cost effective than traditional methods. Likewise, BREC's Rapid Ecological Assessment Protocol (REAP or REA) was created to assess the quality of BREC's terrestrial and aquatic habitats through a relatively quick and repeatable assessment tool. Separate survey methods have been developed for assessing terrestrial (REAP Terrestrial) and aquatic (REAP Lotic/Lentic) ecosystems. The REAP outlines the methodology and variables collected during REA field surveys and the justification for those variables based on established research. Each variable collected is tied directly to one or more of the five management goals below.

Goals of BREC's REAP:

1. Monitor changes to ecosystem quality and health through time and space
2. Identify immediate stressors to the habitat that may guide management priorities
3. Provide baseline data for future modifications from natural or man-made activities
4. Determine conservation value of land for future prioritization
5. Determine historic landcover types and potential for restoration projects

REAP TERRESTRIAL

The following sections outline the workflow in which REAP terrestrial surveys should be conducted. BREC's terrestrial REAP is based primarily on vegetation since plants are relatively stable, static indicators of biological communities and because vegetation data are more readily accessible than that of other organisms (Bedford 1996, Niemi and McDonald 2004). REAP plot surveys are conducted twice a year, once during spring/early summer and again during the fall to ensure that most plants within the ecosystem are represented, regardless of seasonal occurrence. Though data collected during the REA surveys are primarily for BREC internal use, the variables selected for REAP terrestrial (pg. 7) were chosen with partner agencies and local scientific researchers in mind and the understanding that these data may benefit ongoing research activities on BREC properties or spark new scientific interest in BREC parks and conservation areas.

SURVEY PLANNING AND SITE ASSESSMENT

The first step to conducting a REA survey is planning the data collection. The property of interest must first be thoroughly assessed in order to determine distinct ecosystems, stand units, sampling intensity (# of plots surveyed) and where plots will be located. The three phases of REA planning and site assessment are as follows:

1. **Landscape analysis.** The goal of landscape analysis is to identify historic disturbances and distinct habitats or stand units to ensure that REAP sampling captures all management histories (e.g., agricultural land vs. secondary remnant forests, floodplain vs upland terrace; Fig. 1). This will ensure that survey plots are distributed/stratified proportionately among these landscapes and that data collected do not bias our assessment towards one type of landscape. Landscape analysis is carried out via GIS or by analyzing physical maps of aerial imagery, soils, and topography. May also require site visits by BREC staff in order to gather greater detail of landscape differences and ecotones (ecosystem boundaries).

Figure 1. Aerial imagery of Blackwater Conservation Area (BCA) in 1953 displaying historical land use within BCA's current property boundary. This historical land use may result in an underlying difference of ecological conditions compared to the rest of the area (e.g., species composition, stand age). Therefore, a certain proportion of REAP plots should be assigned to the area to account for these potential differences.

2. **Determining sampling intensity.** The goal of any research survey is to collect accurate measurements of your variables, but measuring every tree in a *population* (i.e., property), for example, is not feasible and certainly not rapid enough for REA. To conserve time while maintaining accuracy, BREC's REAP utilizes $1/10^{th}$ acre plots to collect data *samples* within the population that are then extrapolated to the entire population. The smaller the sample (# of plots), the larger the uncertainty of our population estimate. Sampling intensity is therefore based on local conditions and desired confidence intervals. The general rule followed for BREC's REAP is to sample at least 5% of the total area of target property, with 20% area sampled being the most ideal. The following equation is used to determine the # of plots to be sample.

$$number\ of\ plots = \frac{total\ natural\ acreage\ x\ sample\ intensity\ as\ percentage}{area\ of\ plots\ size\ in\ acres}$$

3. **Determining plot layout.** Once the landscape has been analyzed, and the sampling intensity determined, the number of plots (samples) are distributed proportionately across the various landscapes within the population, a method known as stratified proportionate sampling. The location of each plot is determined using a mix of probability sampling and subjective sampling in order to minimize bias while targeting NRM priorities. First, using GIS, a numbered grid system is overlaid onto aerial imagery of the target natural area/property and a random number generator is used to select 80% of the REAP plot locations. Then, plots targeting particular areas of interest (designated treatment areas, areas that can be potentially affected by urban development, etc.) are then assigned for the remaining 20% of plots. The center points of the assigned plots are then recorded in a field notebook and/or exported to a GPS so that plots can be easily targeted in the field.

Figure 2. Satellite imagery with grid overlay. Each square is numbered and represents a potential REAP plot area. A number generator is used to select where plots will be located.

REAP TERRESTRIAL SURVEY SETUP

Forest inventory methodology utilized in BREC's REAP terrestrial is derived from Davis et al. (2016) due to overlapping management goals and our desire to adopt a method that would allow BREC staff to utilize citizen scientists (i.e., volunteers) lacking special training in forestry and ecology. REAP terrestrial surveys should be conducted by at least two field crew members and at least one field crew member should have considerable experience conducting scientific research and identifying plant species. Each plot should take no longer than one hour, though additional time may be spent afterwards for identifying collected plants or entering data. See Appendix 2 and 3 for an equipment checklist and visual aid cheat sheets used during REAP surveys.

Plot Delineation (5 minutes)

REAP terrestrial uses 1/10th acre circular fixed-radius plots (r = 37.2 ft), a method commonly used in southern forest management since it is time and cost effective and reduces edge effect. To delineate the plot, first locate and mark the plot center that was predetermined during the site assessment and planning phase. Using the compass and measuring tape, walk 37.2 ft from the plot center in each cardinal direction, marking four plot boundaries with flagging. For plots with uneven terrain (i.e., slopes and hills) be sure to measure plot boundaries with the measuring tape raised above the ground while keeping the tape as horizontally level as possible. Afterwards, lay 74.5 ft of rope to delineate the N-S transect (in plots with uneven terrain the transect rope will not reach measured edge of plot boundary). Repeat for the E-W transect, creating four quadrants (Fig. 3). Note that trees on the plot boundary are only counted if at least half of the stem is included in the plot (Fig 4). Optional: To further delineate the boundary of the circular fixed-radius plot, you may mark 37.2 ft from plot center in each primary intercardinal direction (NE, SE, etc.) with flagging. Once the plot is delineated, you may remove the center flag and begin the REA survey.

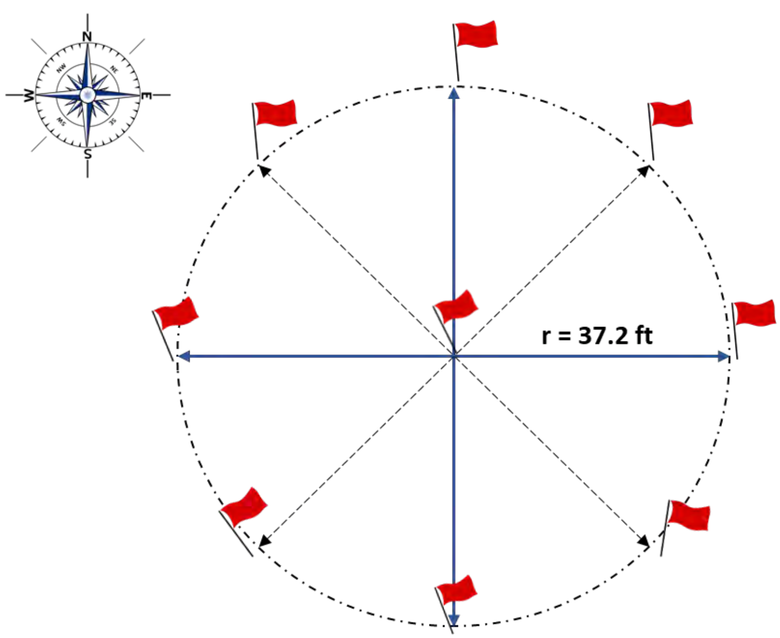


Figure 3. Depiction of a delineated fixed-radius plot (r = 37.2 ft). The blue lines represent rope used to delineate the N-S and E-W transects. The dotted lines represent unmarked plot boundaries and radii from plot center in the direction of each primary intercardinal direction.

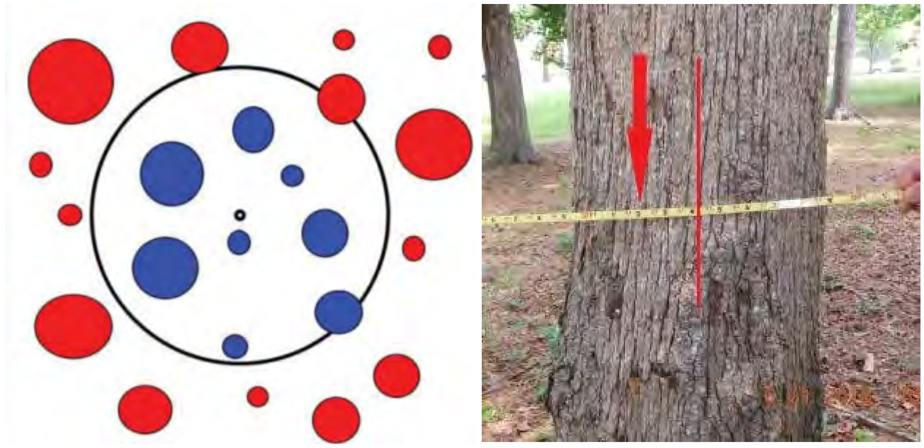


Figure 4. A schematic of a fixed-area plot that displays how trees are determined as in or out of the plot boundary with "In" trees represented by blue circles and "out" trees represented by red circles (A). The tree shown is considered as "out" the midpoint of its trunk/stem, indicated by the vertical red line, does not fall within the 37.2 ft plot boundary, indicated by the red arrow (B).

REAP TERRESTRIAL DATA COLLECTION

All data collected during the REAP survey will be recorded using Survey123 (ESRI 2020). Before data can be collected, the recorder must first enter the date of collection, the GPS point associated with the plot, and also the plot id #. The plot id # should be automatic, sequential and add the park acronym in front of plot, followed by type of plot, then number. For example, plot 1 at Forest Community park would be labeled FTCPplot1. Once the plot id # has been assigned, collection of the 12 REAP terrestrial data variables (Table 1) can begin. These data can be used to analyze changes in forest stand dynamics over time, assess the effectiveness of management treatments, assess floristic quality, and vascular plant species composition. This section outlines detailed descriptions of the variables collected and how these variables are measured in the field. For a quick guide to collecting REAP terrestrial survey data see Appendix 1 pg. 24.

Table 1. The 15 variables collected during REAP terrestrial.

Coarse Woody Debris Abundance	Coarse Woody Debris Decay Class	Tree Diameter and Regeneration
Canopy Cover	Horizontal Cover	Ground Cover
Invasive Species Cover	Floral Richness (Plant list)	Fauna Richness (Animal list)
Microtopography	LDWF Natural Community	Primary/secondary Stressors

Coarse Woody Debris (10 minutes)

Description: BREC defines coarse woody debris (CWD) as downed logs or branches that measure > 2 m (6.56 ft) long and > 7.6 cm (~3 in) wide. CWD serves a critical role in forest ecology as substrates, food sources, and habitat for a wide variety of organisms such invertebrates (Braccia and Batzer, 2001), bacteria/fungi (Harmon et al. 1986), birds, reptiles, amphibians, and mammals (Grove, 2002). Measurements of CWD are important in quantifying carbon/nutrient cycling (Russell et al. 2015) since dead materials store carbon and nutrients. CWD can also be used to assess forest changes over time when collected as a supplement with live tree inventory data (Woodall and Westall 2009). Data on downed woody debris such as CWD is under collected and is expected to become increasingly important in the midst of climate change since it is useful for assessing tree mortality rates/causes by pests, droughts, windstorms, and wildfires (Woodall et al. 2019). CWD abundance size, and decay are important components of forest structure (Herrman et al. 2015, Galen et al., 2019).

Measuring coarse woody debris diameter class and decay class: Using the go or no-go tool, enter diameter class for all logs that intersect the N-S and E-W transects within the plot. For each log observed also enter a decay class. Decay classes can be determined using the CWD decay class cheat sheet on pg. 10.

Table 2. Descriptions for the five CWD decay classes.

Decay Class	Bark	Texture	Twigs	Shape	Wood Color	Portion of log on ground
1	Intact	Intact	Present	Round	Original	None, elevated on supporting points
2	Intact	Intact to soft	Absent	Round	Original	Parts touch, still elevated, sagging slightly
3	Trace	Hard, large pieces	Absent	Round	Original to faded	Bole on ground
4	Absent	Soft, blocky pieces	Absent	Round to oval	Light brown to faded brown	Partially below ground
5	Absent	Soft, powdery	Absent	Oval	Faded light yellow or gray	Mostly below ground

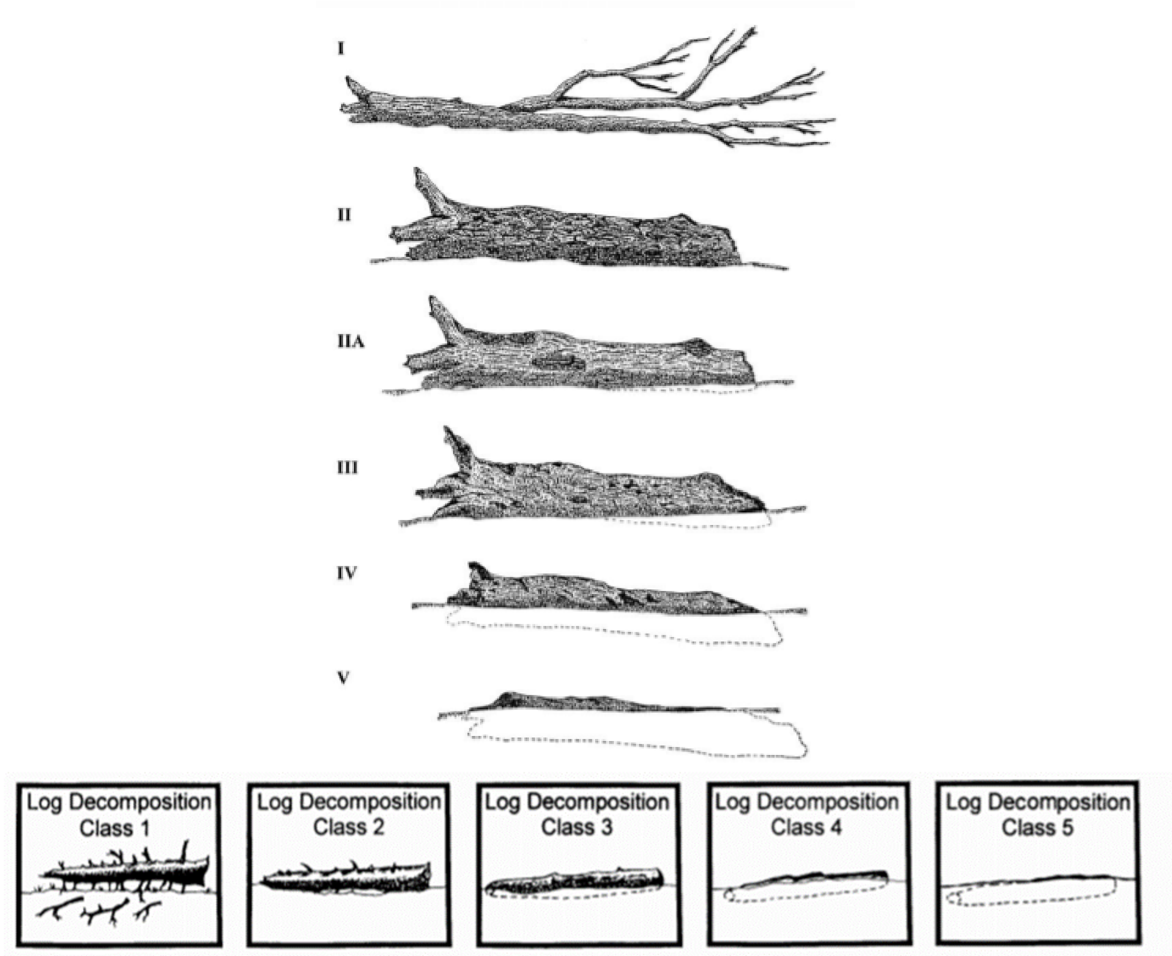


Figure 5. Two visual aids displaying the five CWD decomposition classes.

Table 3. The six diameter classes assigned to CWD based on diameter.

Diameter Class	Diameter (in.)
1	3.0-4.9
2	5.0-7.4
3	7.5-9.9
4	10.0-12.4
5	12.5-14.9
6	>14.9

Figure 6. displaying how to classify CWD in each diameter class using the go or no go gauge.

Tree Size and Regeneration (10 minutes)

Description: Diameter at Breast Height (DBH) is a standard measurement in forest inventory, with DBH usually being defined as the diameter of the tree at 4.5 ft above the ground. This variable gives a general idea of forest age/structure and productivity. This variable also provides baseline data that can be used to assess how the habitat changes over time due to natural disturbances, climate change, or specific treatment (e.g., invasive species removal). Regeneration refers to the number of tree seedlings/saplings in the plot.

How to measure: Using DBH tape, walk along the N-S and E-W transects and measure all trees and shrubs within three feet of the transects (Table 4). Trees below 3 inches DBH are considered saplings (or shrubs?) and all trees shorter than breast height are considered seedlings. All seedlings and saplings observed are tallied rather than measured and are used to calculate regeneration. Any especially large trees within the plot that did not fall within the plot transect are also measured using DBH tape to ensure records are kept of our largest trees. Data entered via survey 123.

Canopy Cover/Closure (5 minutes)

Description: An estimate of percent sky covered by canopy foliage. Canopy cover directly affects light environment, understory plant productivity and defines the character of habitat for many vertebrates. Birds such as Eastern Wood-pewee, Acadian Flycatcher, Blue-gray Gnatcatcher and Red-eyed Vireos depend on closed canopy forests for breeding and foraging. In forests it can be used to study effects of fire, pollution hazards and microclimate as well as impacts of forest use, degradation, and thinning. Denser canopy cover results in less sunlight and rainfall, resulting in cool temperatures, less water runoff, and less ground and understory growth.

Thinner canopy cover promotes new understory growth (e.g., invasive species), warmer microclimates, and higher potential for water runoff.

How to measure: While standing at the center of the plot, hold the convex spherical densiometer about 12” in front of you with both hands and at elbow height. Follow the instructions on the densiometer and enter the measurement into Survey123 (Forestry Suppliers Inc. 2008).

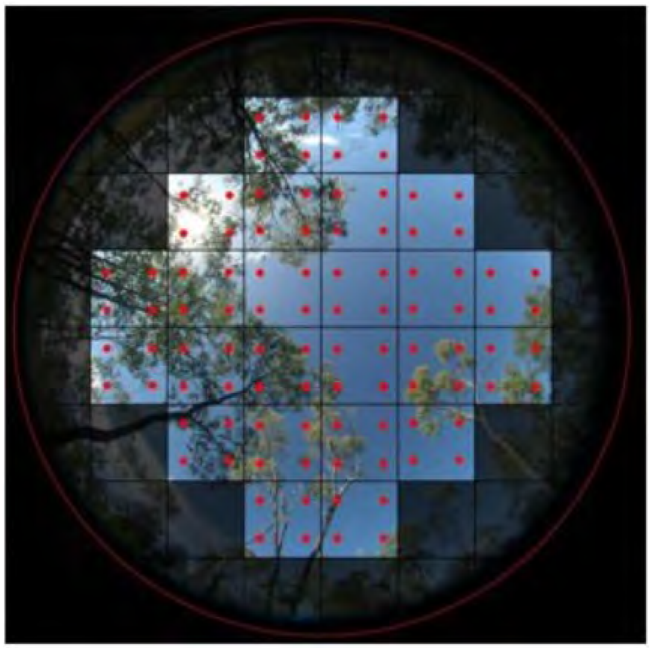


Figure 7. A visual representation of estimating canopy cover using a convex spherical densiometer. Approximately 39 of the 96 red dots are not occupied by canopy cover. Multiplying 35 by 1.04 results suggests that 40.56% of the area is *not* occupied by canopy. Subtracting 36.4% from 100% results in a 59.44% canopy cover estimate.

Horizontal Cover (10 minutes)

Description: A measure of understory vegetation at different heights above ground. Serves as important cover for small mammals and birds that help them avoid predation; important criteria in habitat selection for foraging species (Althoff and Dewalle 1997, Deperno 1998, Wegge et al. 2005, Potash et al. 2019). Ecosystems with more horizontal cover promotes foraging activities and helps facilitate ecosystem function.

How to measure: Nudd’s Board is held up approximately 3 ft from plot edge in each cardinal direction, along the N-S and E-W transects and used to estimate the percent of the board covered by visual obstructions (shrubs, branches, hanging snags, etc.; Nudds, 1977). Nudd’s board is visualized as possessing four sections (top, mid top, mid bottom, bottom), each containing four squares (Fig. 8). Standing from the plot center, cover is estimated for each section of the board and recorded (repeat for each cardinal direction).

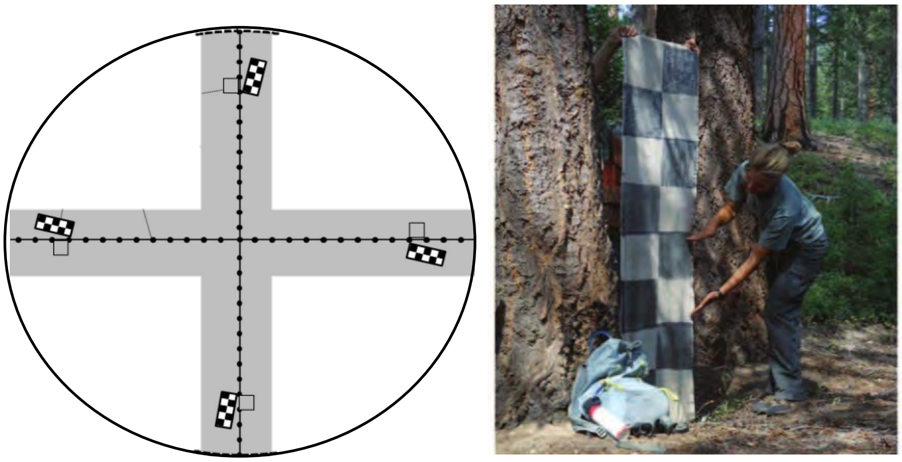


Figure 8. Visual representation of Nudd's Board estimation and placement. The researcher pictured is pointing to the mid bottom section of the board, which from our angle is covered 0%.

Ground Cover (5 minutes)

Description: Percent of leaf litter, herbaceous, standing water, bare soil, woody debris, rock, and tree/shrub cover (covering the ground, not the canopy). Important for assessing fire behavior, wildlife suitability and can be used as a measure of forest floor disturbance and understory productivity. For example, ground cover estimates can be used in erosion models such as the U.S. Forest Service Disturbed Water Erosion Prediction Project (FSWEPP) to predict soil erosion (Elliot et al. 2000, and Merritt et al. 2003). High bare soil cover suggests that forest productivity is low and that water runoff in the ecosystem is high. Higher plant cover in the ecosystem suggests higher productivity and less water runoff.

How to measure: Using point-line transect method, mark a point every two feet while walking the N-S transect (15 points total), tallying each cover type marked. Repeat for the E-W transect. Alternatively, use the ground cover cheat sheet to visually estimate percent cover of each type in the plot. Consider using estimation methods such as the "dividing down" method, assessing each quadrant at a time and taking an average (Wilson 2007). Repeat for all other cover types. Enter results into Survey 123. Cover total can exceed 100% since plants can overlap.

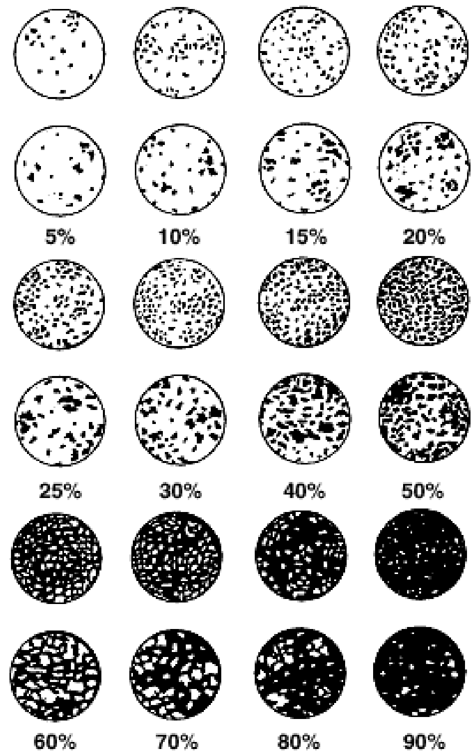


Figure 6. A visual aid for estimating percent ground cover. Markings in black represent the material of interest (leaf litter, plant cover, etc.) in relation to its % cover on the ground.

Species Richness and Identity of Vascular Flora (10 minutes)

Description: Vascular plant species richness is defined as the number of vascular plant species that occur within the plot (Figure 7). Species richness is often confused with species diversity, which considers both the number of species present in an area (species richness), but also the species evenness. In ecology, a healthy ecosystem is presumed to be one that supports a wide variety of organisms. Therefore, the higher the species richness, the higher the presumed health of the community. Species richness and identity is also used to conduct Floristic Quality Assessments which are important in quantifying the quality of an ecosystem.

How to measure: In Survey 123, check the box of each plant species you observe in the plot. If a species is not listed in the dropdown menu include these species in the notes so that they can be added to the database afterwards. Some plants may not be readily identified in the field and therefore will need to be collected using a garden knife, pruning shears, and collection bag. If unknown plants need to be collected for ID, check to see if the plant is growing outside of the plot before removing the plant from the plot. On Survey123, check the "plants collected for ID" box and list the number of plants collected.

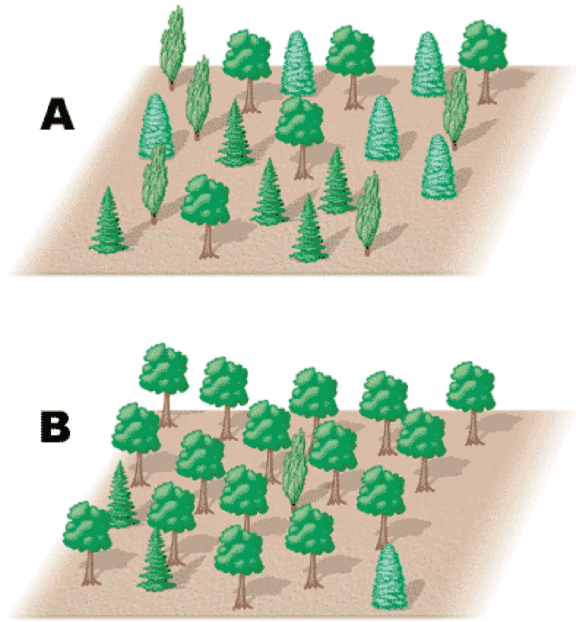


Figure 7. An illustration of two plant communities with equal species richness. Both community A and community B have 5 species, but the relative abundance and evenness of these communities differ. REAP collects data on species richness and identity, but not evenness.

Species Richness and Identity of Fauna (5 minutes)

Description: Fauna refers to all organisms belonging to Kingdom Animalia, which includes mammals, reptiles, amphibians, birds, and insects. Similar to species richness of vascular flora, the number of species of fauna in an area is indicative of the ecosystem's health. The higher the species richness, the healthier the ecosystem is presumed to be. Since animals tend to avoid humans, it is both difficult and time consuming to get accurate measures of species richness of fauna. Thus, this variable is not a critical component of the REAP, but was included to gather happenstance data and gain further insight into what organisms occur at our parks.

How to measure: In Survey 123, check the box of each animal species you observe in the plot. If any notable behavior was observed add an additional note. Type it in.

Invasive Plant Species Cover (5 minutes)

Description: Invasive species cover refers to the percent of invasive species foliage that contributes to ground or canopy cover (dependent on species growth habit) within the plot. This is a rapid way of estimating the severity of invasiveness. Less than 10% invasive species cover suggests that the ecosystem is in relatively good condition and that invasive species management in the area is low priority. High invasive species cover suggests that native plants are at risk for extirpation and that invasive species management may need to be implemented.

How to measure: Identify how many invasive species are in your plot. For shrub and canopy species, visually estimate the amount of foliage/canopy cover contributed by the species.

Similarly, if the species is an herbaceous plant, visually estimate the percent of its foliage that contributes to ground cover. Enter estimates into Survey123, noting any saplings in the area.

Microtopography (2 minutes)

Description: Microtopography refers to the presence of elevation change within an ecosystem.

How to measure: Using Survey123 check "yes" or "no" for whether microtopography is present or absent. If present, provide a visual estimate of percent slope and any additional notes you may find as important.

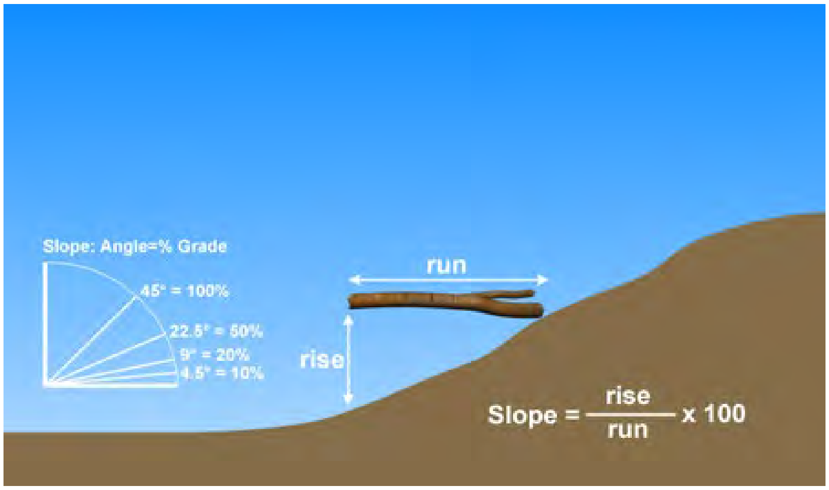


Figure 8. Illustration of a 22.5-degree (50%) slope.

Primary/Secondary Stressors (3 minutes)

Description: Primary/Secondary Stressors helps to identify any natural or cultural disturbances in the ecosystem. These disturbances include foot traffic, mowing, soil tillage, hog activity, etc.

How to measure: Using Survey123 check "yes" or "no" for whether the plot has any signs of primary/secondary stressors. If yes, identify whether it is "cultural" or "natural" and select a stressor from the dropdown menu. If desired stressor is not there, mark other and leave detailed comments.

Designating LDWF Natural Community (5 minutes)

Description: BREC defines its habitats based on Louisiana Department of Wildlife and Fisheries' (LDWF) natural communities, which outlines the habitats present in the state of Louisiana. Fact sheets regarding LDWF natural communities can be found here.

How to measure: Using species richness/identity, hydrology, and microtopography information as supplement to your knowledge of natural communities in East Baton Rouge Parish (EBR), select a habitat from the dropdown menu in Survey123.

Natural community/habitat (LA Natural Communities detected in EBR Parish LDWF classification)

- PAUSTRINE – A. Aquatic bed
  - Submerged Algal Vegetation
  - Submerged Floating Vascular Vegetation
- PAUSTRINE – B. Emergent Vegetation
  - Flatwood Pond
- PAUSTRINE – C. Scrub/Shrub Wetland Vegetation
  - Scrub/Shrub Swamp
  - Shrub Swamp
- PAUSTRINE – D. Forested Wetland
  - Baldcypress-Tupelo Swamp
  - Baldcypress Swamp
  - Tupelo-Blackgum Swamp
  - Bottomland Hardwood Forest
    - Overcup Oak-Water Hickory Swamp
    - Hackberry-American Elm-Green Ash Forest
    - Batture
    - Sweetgum-Water Oak Forest
  - Wet Hardwood Flatwood
  - Small Stream Forest
- RIVERINE – A. Riverine Subtidal Channel
  - Tidal Mud Flat
  - Subtidal Open Water
- RIVERINE – B. Lower Perennial Channel
  - Sand/Gravel Beach/Bar
  - Mud Bar
  - Lower Perennial Open Water
- RIVERINE – C. Aquatic Bed
  - Submerged Floating Vascular Vegetation
- TERRESTRIAL – A. Grassland
  - Saline Prairie
- TERRESTRIAL – C. Deciduous Forest
  - Hardwood Slope Forest
- TERRESTRIAL – D. Mixed Evergreen/Deciduous Forest
  - Shortleaf Pine/Oak-Hickory Forest
  - Mixed Hardwood-Loblolly Forest
  - Spruce Pine-Hardwood Flatwood

FLORISTIC QUALITY ASSESSMENT

Floristic Quality Assessment (FQA) is a plant community monitoring system that is used by many government, conservation, and natural resource management agencies to quantify the quality of a natural area's ecosystem. FQA will be an important component of BREC's Rapid Ecological Assessment Protocol (REAP), serving as a supplement to the forest inventory data collected for assessing changes to forest stand dynamics over time. Species richness data collected during the REAP surveys are used for the FQA and calculating the FQA metrics.

FQAs are based on a Coefficients of Conservatism (C value) framework that was originally developed by Swink and Wilhelm (1994) for ranking plant species on their affinity to natural, remnant habitats and their tolerance to degradation. C values are typically ranked on a scale ranging from 0-10 with highly conservative species assigned the highest values (8-10) and the least conservative species assigned the lowest values (0-3). Highly conservative species are those that are only found in pristine, unaltered habitat conditions, whereas species considered the least conservative are those common in habitats with high levels of natural or human-induced disturbance (mudslide, dredging, urban development, etc.) that inhibit mid and high-ranked species from occurring there. C values are assigned to all species within an ecological or geographic region with non-native species typically assigned a 0. The FQI is an indication of native vegetative quality for an area: generally 1-19 indicates low vegetative quality; 20-35 indicates high vegetative quality and above 35 indicates "Natural Area" quality. Wetlands with a FQI of 20 or greater are considered high quality aquatic resources. The Native Mean C is also an indication of native vegetative quality. Wetlands with Native Mean C values over 3.5 are considered high quality aquatic resources. (USFWS site)

The quantifiable metrics that are produced by FQAs for quantifying ecosystem quality include the Floristic Quality Index (FQI) and the adjusted FQI. These metrics can be calculated using the equations below or the Universal FQA Calculator (http://universalFQA.org) for those C-value datasets that have already been developed (Table 5; Freyman et al. 2016). The mean C value alone is not always valuable since it can be similar for areas with extremely high or low species richness; therefore, the FQI is calculated by weighting the mean C by species richness:

$$I = \overline{C}\sqrt{n},$$

Where $\overline{C}$ is the mean *C* value, and *n* is species richness. The adjusted FQI was developed by Miller and Wardrop (2006) for assessing sites with high levels of human disturbance, and essentially reduces the calculations sensitivity to species richness. When assessing sites with high levels of human disturbance, the adjusted FQI is used:

$$I' = 100\left(\frac{\overline{C_n}}{10}\right)\left(\frac{\sqrt{n_n}}{\sqrt{n_n}}\right),$$

Where $\overline{C_n}$ is native mean *C,* n_n is native species richness, and n_t is the total species richness.

C value datasets are usually developed for a specific geographic or ecologic region, but currently there is not a dataset appropriate for FQA of all ecosystems found on BREC properties, which includes bottomland hardwood forests, cypress swamps, hardwood slope forests, and mixed pine hardwood flatwoods, to name a few. While the universal FQA calculator may be useful for achieving this goal, BREC's natural resource division is considering developing its own C value dataset for internal use only. This dataset development will begin by compiling C value datasets developed in nearby states that encompass a wide variety of ecosystems (wetlands, prairies, upland forests, etc.) so that we can compare values of species currently found on BREC properties. Using these C value comparisons, firsthand knowledge of BREC staff, and a dichotomous key developed by Zomleger et al. (2013; Fig. 9) for assigning C values to species, we will produce a preliminary C value dataset. This preliminary dataset will be reviewed by current Louisiana State University (LSU) professor and former state botanist, Dr. Chris Reid and will be put into practice by BREC staff as a trial run. The hope is that after input from Dr. Chris

Reid and corrections from field trials, a reliable C value dataset, subject to annual reassessment, can be developed. BREC's C value dataset will potentially be validated during REAP surveys using null-modelling tests (Bauer et al. 2019).

Dichotomous Key for Coefficient of Conservatism Rankings

(a) Non-native species....................................(b)
  (b) invasive ....**rank 0**
  (b) relatively benign ....**rank 1**
(a) Native species....................................(c)
  (c) opportunistic, broad range of ecological tolerance, more or less restricted to areas subject to human disturbance....................................**rank 2**
  (c) non-opportunistic, intermediate to narrow range of ecological tolerance...........(d)
    (d) intermediate range of ecological tolerance, typifies a stable phase of some native community, thrives and/or persists under natural or human disturbance....................................(e)
      (e) persists and/or thrives under natural or human disturbance..............**rank 3**
      (e) persists but does not thrive under limited natural or human disturbance....................................(f)
        (f) persists with some disturbance....................................**rank 4**
        (f) persists with a little disturbance....................................**rank 5**
    (d) narrow range of ecological tolerance, typifies a stable or near climax community (including fire-dependent disclimax communities), tolerates little to no disturbance (unless surrogate for fire or other natural disturbance)....................................(g)
      (g) moderate fidelity to a narrow habitat requirement, may or may not tolerate limited disturbance....................................(h)
        (h) more or less narrow range of ecological tolerance, tolerates limited disturbance....................................**rank 6**
        (h) narrower range of ecological tolerance, does not tolerate disturbance....................................(i)
          (i) somewhat narrow range of ecological tolerance..................**rank 7**
          (i) narrow range of ecological tolerance....................................**rank 8**
      (g) high fidelity to a narrow range of habitat requirement, does not tolerate disturbance....................................(j)
        (j) narrow range of ecological tolerance, relatively high fidelity to a narrow range of habitat requirement....................................**rank 9**
        (j) very narrow range of ecological tolerance, very high fidelity to a very narrow range habitat requirement....................................**rank 10**

Figure 9. Dichotomous key for coefficient of conservatism rankings (Zomleger et al. 2013).

Table 5. FQA databases available in the Universal FQA calculator (Freyman et al. 2016).

Region	FQA Data base	Number of Species	% Native Species	Native Mean C
Chicago	Swink & Wilhelm (1994)	2530	64·7	7·3
Chicago	Herman, Sliwinski & Whitaker (2013)	2790	63·6	7·2
Chicago	Herman, Sliwinski & Whitaker (2014)	2768	63·4	7·2
Dakotas (excluding the Black Hills)	Northern Great Plains Floristic Quality Assessment Panel (2001)	1584	82·6	6·1
Delaware	McAvoy (2013)	2306	69·3	6·2
Illinois	Taft *et al.* (1997)	3040	68·6	6·4
Indiana	Rothrock (2004)	2812	71·9	6·0
Iowa	Drobney *et al.* (2001)	1963	75·8	6·0
Kansas	Freeman (2014)	2306	77·7	4·8
Louisiana (Coastal Prairie)	Allain *et al.* (2004)	591	86·6	4·4
Maine	Maine Natural Areas Program (2014)	2396	63·2	5·0
Michigan	Reznicek *et al.* (2014)	2872	63·0	6·5
Mid-Atlantic Allegheny Plateau (glaciated)	Mid-Atlantic Wetland Workgroup (2012)	1506	100·0	6·1
Mid-Atlantic Allegheny Plateau (non-glaciated)	Mid-Atlantic Wetland Workgroup (2012)	2135	100·0	6·2
Mid-Atlantic Coastal Plain	Mid-Atlantic Wetland Workgroup (2012)	2086	100·0	6·0
Mid-Atlantic Piedmont Region	Mid-Atlantic Wetland Workgroup (2012)	2029	100·0	6·1
Mid-Atlantic Ridge and Valley Region	Mid-Atlantic Wetland Workgroup (2012)	2048	100·0	6·2
Minnesota Wetlands	Milburn, Bourdaghs & Husveth (2007)	1266	87·5	5·9
Missouri	Ladd (1993)	2641	72·2	6·3
Missouri	Ladd & Thomas (2015)	2960	69·4	6·1
Nebraska	Rolfsmeier & Steinauer (2003)	2071	75·9	5·2
New Jersey	Bowman's Hill Wildflower Preserve (2006)	3435	62·7	6·4
Pennsylvania Piedmont	Bowman's Hill Wildflower Preserve (2006)	3419	46·0	4·6
Southern Ontario	Oldham, Bakowsky & Sutherland (1995)	2333	69·3	6·9
Washington State (Eastern: Columbia Basin)	Rocchio & Crawford (2013)	2734	76·2	5·3
Washington State (Eastern: mountains)	Rocchio & Crawford (2013)	2734	76·2	5·3
Washington State (Western)	Rocchio & Crawford (2013)	2218	68·6	5·1
West Virginia	West Virginia Natural Heritage Program (2015)	2827	74·2	6·1
Wisconsin (Midwest region)	Parker *et al.* (2014)	2594	65·7	6·4
Wisconsin (Northcentral–Northeast region)	Parker *et al.* (2014)	2594	65·7	6·4

APPENDIX 1 Quick Guide to Rapid Assessment

1. Delineate the plot and transects by flagging boundaries in each of the cardinal and primary intercardinal directions.

2. Measure coarse woody debris diameter and decay class along N-S and E-W transect using the go or no-go board and decay class cheat sheet.

3. Measure the diameter class of each tree in the plot using the go or no-go board and count the number of saplings in the understory.

4. Measure canopy cover from the plot center using the densiometer.

5. Measure horizontal cover from four points along the transects (10 feet from plot boundary) using the horizontal cover board.

6. Measure ground cover by visually estimating the percent of water, herbaceous plants, leaf litter, and bare soil that covers the plot.

7. Measure invasive species cover by estimating the percent of foliage that covers the plot. Provide one measurement for each invasive species present in the plot.

8. Measure microtopography.

9. Measure primary/secondary stressors.

10. Identify LDWF natural community.

Appendix 2. Equipment Checklist

☐GPS with coordinates

☐Azimuth Compass with local declination

☐Open Reel Measuring Tape (100ft)

☐Chaining pins/flagging

☐Fluorescent String

☐Go-no-go diameter class board

☐Clipboard

☐Sharpened pencils or weatherproof pens

☐Metric Diameter at Breast Height tape

☐Data sheets, cheat sheets, and maps

☐Horizontal cover board cloth

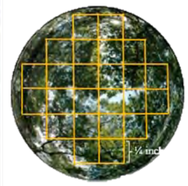
☐Densiometer

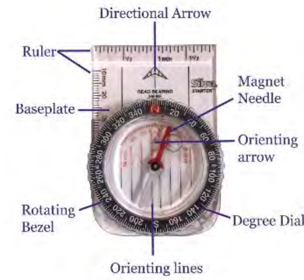
☐Garden Knife

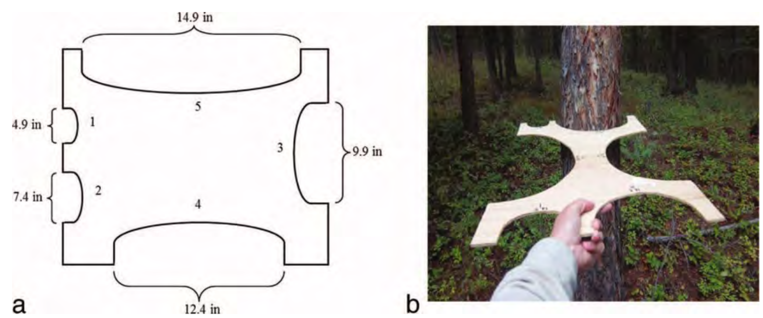
☐Pruning shears 4

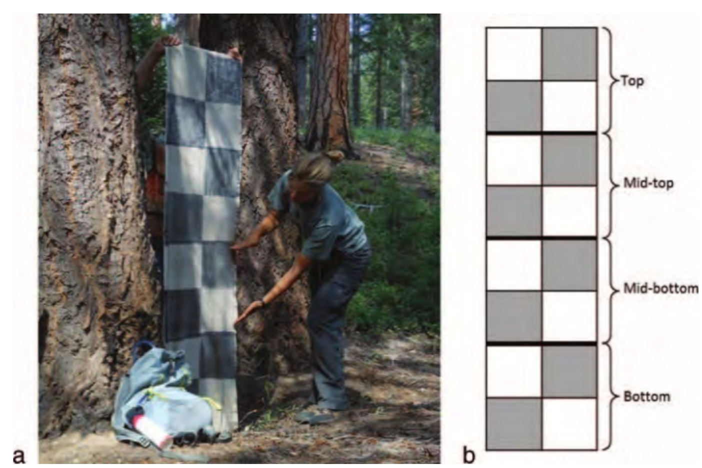
☐Collection bags for plants

☐Ice chest and Ice packs (if applicable)

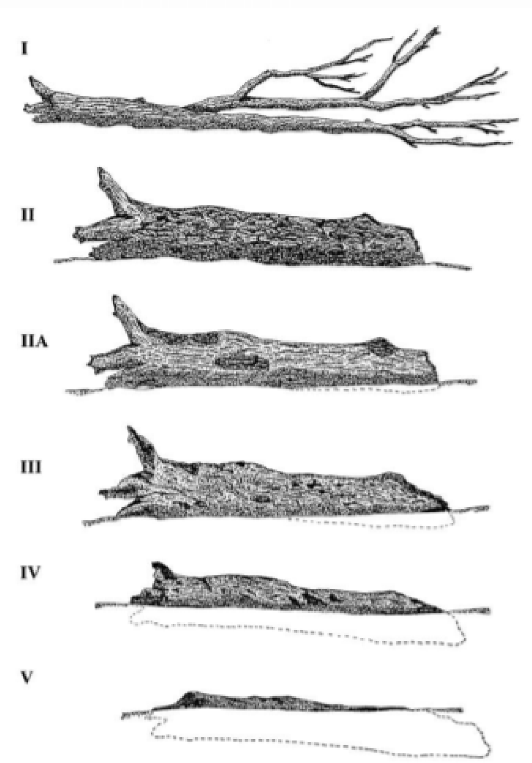


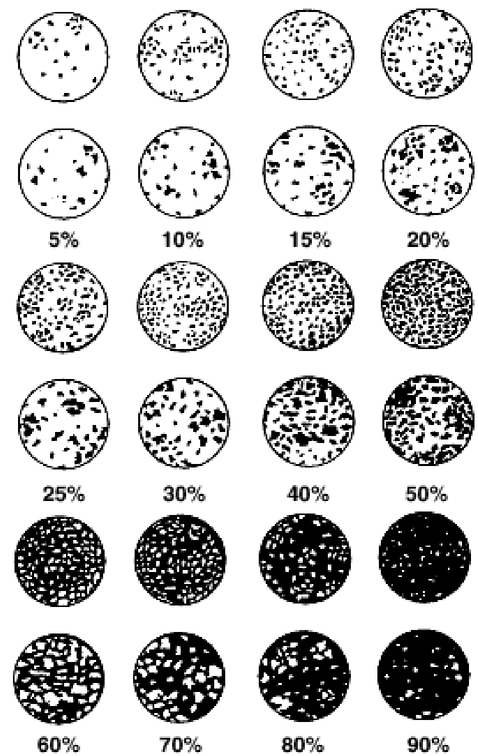


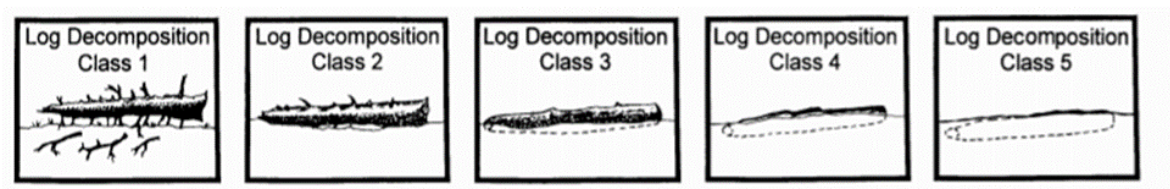




Appendix 3. Visual Aid Cheat Sheets







Decay Class	Bark	Texture	Twigs	Shape	Wood Color	Portion of log on ground
1	Intact	Intact	Present	Round	Original	None, elevated on supporting points
2	Intact	Intact to soft	Absent	Round	Original	Parts touch, still elevated, sagging slightly
3	Trace	Hard, large pieces	Absent	Round	Original to faded	Bole on ground
4	Absent	Soft, blocky pieces	Absent	Round to oval	Light brown to faded brown	Partially below ground
5	Absent	Soft, powdery	Absent	Oval	Faded light yellow or gray	Mostly below ground

REFERENCES

Althoff, D. P., Storm, G. L., & Dewalle, D. R. (1997). Daytime habitat selection by cottontails in central Pennsylvania. *The Journal of wildlife management*, 450-459.

Bauer, J. T., Koziol, L., & Bever, J. D. (2018). Ecology of floristic quality assessment: Testing for correlations between coefficients of conservatism, species traits and mycorrhizal responsiveness. Aob Plants, 10(1), plx073. doi:10.1093/aobpla/plx073

Bedford, B.L. 1996. The need to define hydrologic equivalence at the landscape scale for freshwater wetland mitigation. Ecological Applications 6:57-68.4

Davis, C. R., Belote, R. T., Williamson, M. A., Larson, A. J., & Esch, B. E. (2016). A rapid forest assessment method for multiparty monitoring across landscapes. Journal of Forestry, 114(2), 125-133. doi:10.5849/jof.14-118

Deperno, C. S. (1998). Habitat selection of a declining white-tailed deer herd in the central Black Hills, South Dakota and Wyoming.

Forestry Suppliers Inc. (2008). Using Forest Densiometers: Instructions. Jackson, MS: Forestry Suppliers Inc.

Freyman, W. A., Masters, L. A., Packard, S., & Poisot, T. (2016). The universal floristic quality assessment (FQA) calculator: An online tool for ecological assessment and monitoring. Methods in Ecology and Evolution, 7(3), 380-383. doi:10.1111/2041-210X.12491

Elliot, W.J., Hall, D.E., Scheele, D.L., 2000. Technical Documentation: Disturbed WEPP Interface for Disturbed Forest and Range Runoff, Erosion and Sediment Delivery. U.S. Forest Service Rocky Mountain Research Station, and San Dimas Tech. and Development Center. Accessed from: http://forest.moscowfsl.wsu.edu/fswepp/ docs/distweppdoc.html.

ESRI (2020). ArcGIS Survey123 [Mobile app]. App Store. https://survey123.arcgis.com

Galen, L. G., Jordan, G. J., & Baker, S. C. (2019). Relationships between coarse woody debris habitat quality and forest maturity attributes. Conservation Science and Practice, 1(8), n/a. doi:10.1111/csp2.55

Herrmann, S., Kahl, T., & Bauhus, J. (2015). Decomposition dynamics of coarse woody debris of three important central european tree species. *Forest Ecosystems, 2*(1), 1-14.

Nudds, T. D. (1977). Quantifying the vegetative structure of wildlife cover. Wildlife Society Bulletin, 5(3), 113-117.

Merritt, W. S., Letcher, R. A., & Jakeman, A. J. (2003). A review of erosion and sediment transport models. Environmental Modelling & Software : With Environment Data News, 18(8-9), 761-799.

Miller, S.J. & Wardrop, D.H. (2006) Adapting the floristic quality assessment index to indicate anthropogenic disturbance in central Pennsylvania wetlands. Ecological Indicators, 6, 313–326.

Niemi, G. J., & McDonald, M. E. (2004). Application of ecological indicators. Annual Review of Ecology, Evolution, and Systematics, 35(1), 89-111.

Potash, A. D., Conner, L. M., & McCleery, R. A. (2019). Vertical and horizontal vegetation cover synergistically shape prey behaviour. Animal Behaviour, 152, 39-44.

Swink, F. & Wilhelm, G. (1994) Plants of the Chicago Region, 4th edn. Indiana

Academy of Science, Indianapolis, USA

Wegge, P., Olstad, T., Gregersen, H., Hjeljord, O., & Sivkov, A. V. (2005). Capercaillie broods in pristine boreal forest in northwestern Russia: the importance of insects and cover in habitat selection. Canadian Journal of Zoology, 83(12), 1547-1555.

Wilson, V. Mark (2007) “How to Measure: Measuring Vegetation Characteristics per Area.”Oregon State University, oregonstate.edu/instruct/bot440/wilsomar/Content/HTM-perarea.htm.

Zomlefer, W. B., Chafin, L. G., Carter, J. R., & Giannasi, D. E. (2013). Coefficient of conservatism rankings for the flora of georgia: Wetland indicator species. Southeastern Naturalist (Steuben, Me.), 12(4), 790-808. doi:10.1656/058.012.0426