Everglades Literacy

“There are no other Everglades in the world.”

What is Everglades Literacy?

Everglades Literacy is an understanding of the Everglades and its influence on you—and your influence on the Everglades.

An Everglades-literate person:

• Understands the seven fundamental concepts and supporting ideas about the Everglades shown at the end of this document.
• Can communicate these concepts and ideas about the Everglades in a meaningful way.
• Can make informed and responsible decisions regarding the Everglades and its resources.

An understanding of the Everglades can lead to:

• Making better informed decisions.
• Reducing environmental risks and negative impacts to this fragile and unique ecosystem.
• Protecting the future of America’s Everglades for future generations.

Fundamental Concepts for Everglades Literacy

The Everglades Literacy Conceptual Framework and Everglades Curriculum were developed by scientists and educators to provide an educational conceptual framework for the Everglades. These concepts, if understood and applied, help individuals make informed decisions about the Everglades.

The Everglades curriculum follows this blueprint providing the skills and tools necessary to act to protect this threatened ecosystem which provides the daily water supply for nearly 8 million Floridians, contributes billions of dollars to Florida’s economy, and provides recreational and educational opportunities for millions of visitors from all over the world.

This guide promotes greater Everglades literacy by providing an educational framework of principles and seven fundamental concepts about the Everglades that all students, and all Floridians, should understand. In fact, every child who attends school in Florida should achieve Everglades literacy.
Defining the Everglades

Ecologically, the Everglades is a place, a marsh, a region, a watershed, an ecosystem. It is the mirrored glint of sunlight on shallow water that is moving slowly, below a great swath of sawgrass, toward the sea. When Marjory Stoneman Douglas wrote her definitive description of the region in 1947, she used the metaphor “River of Grass” to explain the blending of water and plant life.

The Everglades is a vast watershed that has historically extended from Lake Okeechobee 100 miles south to Florida Bay (around a third of the southern Florida peninsula). The Greater Everglades Watershed refers to the interconnected ecosystems of water, land and climate spanning nearly 18,000 square miles. This is a large, diverse and complex region including 16 counties, from Orlando in the north to the Florida Keys. This system supports mangrove forests, nursery and nesting conditions for many species of birds, fish and invertebrates, and sustains seagrasses and aquatic life. This ecosystem also provides the drinking water supply for nearly 8 million Floridians.

Why Does It Matter?

Educated and empowered citizens can make a positive difference. Teaching Everglades literacy can help students understand STEM-based concepts and inspire them to pursue careers in related fields.

The Everglades is a unique American treasure and a rich subject, that can be approached at all levels: kindergarten through grade 12 and beyond to explore the impacts of humans, and think about potential steps to restore and protect the Everglades, and thus impact our local quality of life. Restoring the Everglades can serve as a model for the restoration of ecosystems throughout the world.

The Comprehensive Everglades Restoration Plan (CERP) is history’s largest environmental restoration effort. Future Federal and state funding will be impacted by multiple Florida governors, U.S. presidents and elected representatives in both Congress and the Florida legislature. Educated students become the engaged voters who can maintain support for this long-term effort, that provides jobs, sustains Florida’s economy and protects the water supply for nearly 8 million people and our environment.
The Everglades can also be understood through its geological context. This vast marshland exists due to the unique underlying rock formations in southern Florida that formed over 2 million years ago. Originally a shallow sea floor, the porous limestone bedrock can store water from one year to the next. The length of time that a region in the Everglades remains flooded, called a hydroperiod, determines what particular soils and vegetation are present.

At only 5,000 years old, the Everglades is young in geological terms. Its ecosystems are in constant flux due to the interplay of three factors: the type and amount of water present, the geology of the region, and the frequency and severity of fires. The Everglades is unique; no other wetland system in the world is nourished primarily from the atmosphere.

Although sawgrass and sloughs are the enduring icons of the Everglades, other ecosystems are just as vital, but the borders marking them are subtle or nonexistent. Pinelands and tropical hardwood hammocks are located throughout the sloughs; the trees, rooted in soil mere inches above the peat, marl or water, support a variety of wildlife.

The Everglades includes freshwater marshes and swamps, rivers sloughs and springs, hardwood forests and hammocks, pine flatwoods and rock land, scrub, sandhills, prairies and savannas, mangrove swamps, lagoons, estuaries, and bays. These ecological systems are always changing due to environmental factors ranging from geologic elements, climate, water levels, and the frequency and severity of storms and fire. These fluctuations help sustain and transform flora and fauna of these fragile yet resilient ecosystems.

The Everglades is also influenced by human activities. Diversion of water away from the Everglades for flood control has left the ecosystem too dry and vulnerable to severe fires and habitat loss. Subsequent compartmentalization and pollution from agricultural and municipal runoff have devastated the natural function of the ecosystem, causing drastic changes to the sheetflow, vegetation and wildlife.

Few places are as biologically rich as the Everglades ecosystem, which hosts a vast array of plants and animals adapted to a wet, subtropical environment. Nearly 45 species of mammals, hundreds of fish species, and thousands of invertebrates inhabit the Everglades and related bays, coastal estuarine, and offshore areas. More than 50 kinds of reptiles and 20 types of salamanders, frogs and toads live in the watershed. An astonishing 350 species of birds have been recorded sharing a home with alligators and the black bear. Sadly, 75 species are on the decline including Endangered species such as the Florida panther, wood stork and West Indian manatee. The mix of salt and freshwater makes it the only place on Earth where alligators and crocodiles exist side by side.
An International Treasure

Lying at the interface between temperate and subtropical climates, the Everglades is recognized nationally and internationally for its wetland quality and biodiversity. When Congress passed a bill in 1947 to create Everglades National Park, it was the first time in history a park had been created solely for the preservation of animals and plants, and the environment that sustains them. The Big Cypress National Preserve was created in 1974 and was the first preserve in the U.S. National Park System. Its creation was a response to a diverse coalition of conservationists, scientists, traditional outdoorsmen, Miccosukee and Seminole Indians, and dedicated individuals who became outraged by plans to construct an airport in the middle of “the swamp.” Anyone who has visited and enjoyed these beautiful natural areas can understand why their preservation is critical.

Everglades National Park was designated as an International Biosphere Reserve in 1976, as a World Heritage Site in 1979, a Wetland of International Importance in 1987, and a Specially Protected Area under the Cartagena Treaty in 2012.

Water, Water Everywhere

Florida is synonymous with water. The state has more than 2,000 miles of tidal coastline, nearly 7,800 lakes, more than 1,700 rivers, streams, fresh and saltwater marshes, swamps and deep free flowing springs. Only two seasons exist in the Everglades: wet (May to November) and dry (December to April). The Everglades Ecosystem receives approximately 53 inches of rainfall each year. It is a land shaped, defined, and heavily dependent on water.

Today, every Floridian averages about 100 gallons of water each day. The water resources that comprise the Greater Everglades Ecosystem are shared, used and sometimes abused by millions of people. Too often, people have taken this resource for granted, and not joined in common cause to ensure the welfare of their common property – the water supply. The loss of natural wetland storage has already impacted Florida’s families and businesses: suffering from discharges of polluted water, flooding and drought conditions.
The Everglades: Past, Present and Future

People have co-existed with the Everglades for thousands of years, but in the past 100 years humans have changed its natural landscape dramatically. Settlement of urban areas in southern Florida was facilitated by large drainage projects intended to create more land for development. The drainage was often implemented without understanding the processes that shape the Everglades or the value of services the ecosystem provides. In 1905, Florida began a concerted effort to drain the Everglades to make the land suitable for agriculture and development.

As the population grew, so did the need to provide flood control. In 1948, the U.S. Congress authorized the Central and South Florida Project, which created one of the most effective water management systems in the world. Today, the project’s extensive network of man-made canals, levees and water control structures channel an average of 1.7 billion gallons (6.4 billion liters) of water daily from the Everglades into the Atlantic Ocean and Gulf of Mexico.

Drainage and development has reduced the Everglades to half its original size, fragmented critical habitat, polluted waters and brought invasive species. As the water receded, so did the natural habitat of wading birds, fish and animals. Vast wetlands, which provided refuge for migratory birds and nesting grounds for wading birds, have been impacted. At least 90% of the wading birds have been lost. Saltwater flowed farther into the marsh from the ocean, and pollution flowed in from neighboring farms and cities. There is a fragile interface between people and nature, extinction and survival. Diminishing quality of life in southern Florida’s urban areas can be linked to the degraded local environment.
Integrated & Science-Based Solutions are Needed

Water conservation, better water management, and control of urban growth are three logical solutions to this problem. Without an interdisciplinary approach and strong public support, it may not be possible to save this one-of-a-kind resource that protects:

• **Water Supply for Florida's Families and Businesses:** Floridians would lose a natural recharge system for water wells serving nearly 8 million people in southern Florida and millions of tourists. Salt water contaminates wells as it seeps into them from the ocean as this occurs. As this occurs, drinkable fresh water becomes more difficult to find and the cost of supplying it increases dramatically.

• **Florida's Economy:** Tourism and fishing in Florida are major economic contributors. Visitors want to enjoy the natural areas and water-based activities. Marine species may not survive if Florida Bay becomes too salty because of a lack of fresh water. Shrimp, lobster, crab and fish populations may decline dramatically throughout southern Florida and the Florida Keys. The cost of a diminishing supply of seafood would skyrocket.

• **Iconic Endangered Species:** Without water for the Everglades, many species will abandon the area or die out. Each time a species becomes extinct, we lose a source of potential medicine, food, and yes, beauty.

The Everglades is a national treasure just as extraordinary as the Grand Canyon, the Great Lakes, or the Redwood Forests. A remarkable coalition of highly diverse and bipartisan interests has joined forces to make restoration possible. Florida is undertaking the largest environmental ecosystem restoration in the world to revive and protect this national treasure.

In 2000, Florida’s U.S. Senator Bob Graham, a Democrat, and U.S. Representative E. Clay Shaw, Jr., a Republican, introduced a 30-year plan to restore the Everglades. The legislation was approved by a bi-partisan Congress, supported by Florida’s Republican Governor Jeb Bush, and signed into law by President Bill Clinton. The Comprehensive Everglades Restoration Plan, a 50/50 partnership between the State of Florida and the federal government, makes preserving America’s Everglades a top priority to improve the quality of life for all south Floridians, provide adequate water supply for southern Florida’s growing population and provide improved flood control, all the while ensuring a national treasure is protected for future generations.
Using the Everglades as a Teaching Tool

The Everglades Literacy Conceptual Framework and Everglades Curriculum allow students of all ages to learn and understand the complexities of this rich topic through interdisciplinary techniques. Recognizing the influence of personal actions — how we all affect and are consequently affected by the Everglades — is necessary in to explore future mitigation strategies.

The Everglades Curriculum and K-12 Teacher Toolkit are available at evergladesfoundation.org/curriculum.
The Everglades is unique and valuable.

- The Everglades has unique ecological, economic and aesthetic value. It provides habitat for many species; filters and stores our water supply; serves as a buffer against flood; provides habitat for commercial fish and shellfish, and sustains our quality of life.

- The Everglades is the dominant physical feature on the southern Florida landscape.

- The Everglades comprises the largest and only subtropical wetland ecosystem in North America.

- In hydrologic terms, the Everglades is a watershed: a land area that delivers runoff water, sediment and dissolved substances to a major river and its tributaries. A watershed includes atmospheric, surface and subsurface water as well as the pathways that water follows in its perpetual cycle. The Everglades is unique because its watercourse includes the broad shallow river of grass with its characteristic sheet flow.

- The Everglades is uniquely diverse in flora and fauna.

View of converging habitats in the Everglades: marsh (wetland grass), and bald cypress (wetland forest). These habitats provide home, foraging and nesting sites for an array of invertebrate, fish and wildlife species.

Photo by Brian F. Call Photography
• Water is the vital fluid for all life.

• Florida is a land shaped by, defined by, and heavily dependent on water.

• The Everglades influences, and is influenced by, water quality and quantity (supply and demand).

• The Everglades is an integral part of the water cycle and seasonality of southern Florida.

• Nearly 8 million Floridians rely on the Everglades for their water supply.

• Most drinking water for southern Florida comes from underground limestone aquifer systems that are recharged by rainfall and sheet-flow across the Everglades.

• Historic dynamics of water flow through the Everglades are vastly different compared to today. The changes in water flow had far-reaching effects on the ecosystems that make up the greater Everglades watershed.
The Everglades is shaped by southern Florida’s geology and geography.

- The rocky foundation of southern Florida is comprised of porous and permeable limestone formed over millions of years from the exoskeletons of ancient marine life; water moves through it with ease and is stored, at least temporarily, in spaces in the rock. The surface of this underground reservoir is called the water table, and the water below it is called ground water.

- The geologic substrate allowing for the accumulation of water and peat that formed the Everglades is called caprock – a thin, but impermeable layer of limestone material created 7,000 years ago when sea level dropped and freshwater lakes dried up.

- The layers of rock through which this water moves and is stored are called aquifers.

- Through most of the Everglades watershed, the shallow aquifer intercepts water as it percolates downward through the bedrock.

- Under most of the watershed south of West Palm Beach, those layers are called the Biscayne Aquifer – one of the most productive aquifers in the world.

- The latitude of the Everglades positions the ecosystem between temperate and tropical zones; Florida’s peninsular shape, coupled with the warm seas that surround it, provides a very humid environment.
Weather (the condition in the atmosphere at a given time and place) and climate (weather’s long-term trend) are dominant forces in the Everglades.

The Everglades ecosystem averages about 53 inches (1.3 meters) of rainfall each year.

The limiting weather factor in the Everglades is rainfall. Rain comes from local storms, larger tropical storms and hurricanes. All storms result from rising air.

Southern Florida’s water cycle results in dry and wet seasons. December through April is the dry season, where there is little rain. May through November is the wet season.

The rise and fall of water level dominates the life of the Everglades. All living things adapt to the perennial natural flux of water. Any alteration in that flux causes stress.

The proximity of the Everglades to the Atlantic Ocean and the Gulf of Mexico affects air temperatures over the area.

Sporadic severe weather plays an important part in the climate, e.g., hurricanes and droughts.

Fire is an important element in the ecological maintenance of the Everglades. Most fires are caused by lightning from thunderstorms during the rainy season. Photo by Brian F. Call Photography
The Everglades supports and is connected by a great diversity of life and ecosystems.

- The Everglades includes many distinctive habitats, and thousands of ecological niches, all fitting together like pieces of a jigsaw puzzle. The Everglades consists of sawgrass prairie, mangrove and cypress swamp, pine flatwoods, freshwater marshes and swamps, rivers, sloughs and springs, hardwood forests and hammocks, prairies and savannas, lagoons, estuaries and bays.

- The Everglades is home to a multitude of plant and animal species that play diverse, yet interrelated roles.

- Everglades’ ecosystems are connected through the Kissimmee-Okeechobee-Everglades watershed. For example, increased freshwater flows from Everglades sloughs into Florida Bay means improved fisheries and wading bird populations in the Bay.

Photos of periphyton, Climbing Aster and Red-Bellied Turtle by Jessica Hodder/Everglades Foundation; Ghost Crab, Florida Panther, and young Snowy Egrets by Brian F. Call Photography
As Florida’s population grew, the Everglades experienced an increase in problems for plants, animals and people.

Water that once pulsed through the Everglades in a seasonal pattern is now dispersed through canals, levees and gates — often too much or too little, or too soon or too late to sustain the Everglades’ ecological integrity.

For decades, water has been managed with human interests being the primary focus. Now, new policies are being implemented to advance the restoration of the Everglades.

Human activities are impacting the Everglades and in turn, compromising the ecosystem services that we rely on. Threats to the integrity of the ecosystem include: water being diverted to canals and estuaries instead of flowing naturally south from Lake Okeechobee into the Everglades; pollution from agricultural runoff; salt water intrusion; loss of recharge areas; invading exotic species; fragmentation and loss of habitats; and urban sprawl.
• Our understanding of the Everglades is improved through observations, education and research.

• The health and future of the Everglades is influenced by economic, political, environmental and social factors.

• The quality of life for all south Floridians is linked to the health of the Everglades.

• The Everglades’ rich history includes the relationship with the past and current inhabitants of southern Florida. For example, the history of the Seminole and Miccosukee tribes in Florida dates back to the early 19th century, when the tribes moved into South Florida, living on remote tree islands throughout the Everglades and Big Cypress Swamp. These resilient tribes have survived and become a vital part of Florida’s history. The Miccosukee and Seminole tribes continue to live within the Everglades and have worked for decades to help protect the system.

• The Everglades shapes, and is shaped by, the land and patterns of human use. Many stakeholders share the resources of the Everglades (farmers, ranchers, recreationalists, vacationers, residents and businesses). These groups often compete for the water resources of the Everglades.

• People can make choices and take actions to reduce the threats to the Everglades.

• Public and private entities are working together to restore and preserve the integrity of the Everglades.
REFERENCES


Development of this guide began with a partnership of FAU Pine Jog Environmental Education Center and the Everglades Foundation. Project managers were Susan Toth, Director of Education and Veronica Frehm, Program Coordinator from the FAU Pine Jog Environmental Education Center.

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For more information, to download the Everglades Teacher Toolkit and resources relating to Everglades Literacy, please visit www.evergladesfoundation.org/Curriculum

Cover photo by Jessica Hodder/Everglades Foundation