

Ecological site R151XY009LA

Fresh Firm Mineral Marsh

60-64 PZ

Last updated: 3/24/2025
Accessed: 08/21/2026

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

MLRA notes

Major Land Resource Area (MLRA): 151X–Gulf Coast Marsh

Major land resource area (MLRA)151, Gulf Coast Marsh, is in Louisiana (95 percent), Texas (4 percent), and Mississippi (1 percent). It makes up about 8,495 square miles (22,015 square kilometers). The towns of Gretna, Chalmette, and Marrero, Louisiana, and the city of New Orleans, Louisiana, are in the eastern part of this MLRA. The town of Port Arthur, Texas, is in the western part. Interstate 10 and U.S. Highway 90 cross the area. The New Orleans Naval Air Station is in this MLRA. Fort Jackson, overlooking the mouth of the Mississippi River, and the Jean Lafitte National Historic Park and Preserve are in the MLRA. A number of national wildlife refuges and State parks occur throughout this area. MLRA 151 is a very complex ecosystem with active deltaic development and subsidence with extreme anthropogenic impact by man with construction of flood protection levees and channelization occurring on the eastern portion of the MLRA. The Western portion of the MLRA is more stable in that portions of the landscape is protected naturally by the Chenier's, although there is Anthropogenic affects of the interior due to channelization for navigation.

Classification relationships

Major Land Resource Area (MLRA) and Land Resource Unit (LRU) (USDA-Natural Resources Conservation Service, 2006) The Natural Communities of Louisiana - (Louisiana Natural Heritage Program - Louisiana Department of Wildlife and Fisheries)

Ecological site concept

These areas are on low Gulf of America coastal fresh water marshes, most of which are protected from flooding by a system of levees and drained with pumps. Elevations are 1 foot or less. Slopes range from 0 to 0.1 percent. The soils formed in fluid clayey sediments deposited under water that consolidated as a result of artificial drainage. The consolidated mineral and organic sediments are firm enough for cattle to graze. These areas flood frequently for long to very long duration when not protected by levees but only rarely or occasionally for brief amounts of time when protected. The source of flooding is fresh water during high water levels from the local rivers and during severe storms by sea water from the gulf. Once flooded, these areas remain ponded for very long duration. When water depths range from minus 2 inches to plus 6 inches and the water contains less than 0.5 parts per trillion (ppt) salt, Jamaica sawgrass is dominant. As average water depth increases to 0 to 12 inches, giant cutgrass and American lotus dominates. Giant cutgrass also prefers a salt content of less than 0.5 ppt. In the deepest fresh marsh, where water levels average 1 to 12 inches and salt content is from 5 to 10 ppt, maidencane is dominant. Cattails grow with the California bulrush, especially in water 2 to 18 inches deep and contain up to 15 ppt salt. These plant communities intergrade where water tolerance levels overlap. Other plants such as switchgrass and common reed are locally prominent where their optimum water levels and salinity content are found.

Associated sites

R151XY002LA	Saline Marsh 55-64 PZ The Fresh Firm Mineral Marsh frequently occurs adjacent to the Saline Mineral Marsh
R151XY004LA	Brackish Fluid Marsh 60-64 PZ The Fresh Firm mineral marsh frequently occurs adjacent to the Brackish Fluid Mineral marsh.

R151XY006LA	Clayey Chenier Brackish Marsh 55-64 PZ The Fresh Firm Mineral marsh frequently occurs adjacent to the Clayey Chenier Brackish marsh.
--------------------	--

Similar sites

R150BY715TX	Firm Brackish Marsh Occurs in MLRA 150B in Texas counties immediately west of Louisiana and occupying a narrow strip of land along the entire Texas gulf coast. Similar plant species and production.
R151XY673TX	INTERMEDIATE Firm MARSH Occurs in Texas counties immediately west of Louisiana. Similar plant species, but lower annual production due to less annual rainfall.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

These areas are on low gulf coastal fresh water marshes, most of which are protected from flooding by a system of levees and drained with pumps. Elevations are 1 foot or less. Slopes range from 0 to 0.1 percent. The soils formed in fluid clayey sediments deposited under water that consolidated as a result of artificial drainage. The consolidated mineral and organic sediments are firm enough for cattle to graze. These areas flood frequently for long to very long duration when not protected by levees but only rarely or occasionally for brief when protected. The source of flooding is fresh water during high water levels from the local rivers and during severe storms by sea water from the gulf. Once flooded, these areas remain ponded for very long duration.

Table 2. Representative physiographic features

Landforms	(1) Marsh (2) Delta plain
Flooding duration	Long (7 to 30 days)
Flooding frequency	Frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent

Elevation	0 m
Slope	0 %
Ponding depth	0 – 30 cm
Water table depth	0 – 60 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation is 60 to 65 inches. About 70 percent of the precipitation occurs during the growing season. Rainfall typically occurs as post-frontal precipitation in the winter and heat-convection showers and thunderstorms in the spring and summer. In addition, tropical storms can bring large amounts of rainfall. The freeze-free period averages 325 days and ranges from 290 to 365 days, increasing in length from north to south.

Table 3 Representative climatic features

Frost-free period (average)	330 days
Freeze-free period (average)	330 days
Precipitation total (average)	1,600 mm

Influencing water features

Marsh ecosystems are characterized by unique vegetative and hydrologic factors. Salinity, depth of water, duration of inundation, and slight differences in elevation determine the kinds of plants that can persist in marsh ecosystems. Several factors may affect salinity and/or water depth as well as duration of inundation:

Natural Factors:

- Upstream Hydrology – the duration of flooding is influenced by the volume of water discharged upstream (runoff) in the hydrologic unit. This may be a permanent or transient feature of the water regime.
- Tidal Exchange – all marsh ecosystems are affected to some degree by tidal exchange.
- Salinity – the amount of salt per unit volume of water is a limiting factor in determining which plants can persist in a marsh ecosystem. Measured in parts per thousand (ppt). Relatively few plants can tolerate prolonged exposure or inundation to waters with high salt concentrations. Salinity level in the Fresh Firm Mineral Marsh ranges from 0 to 5ppt, but is generally less than 1 ppt.

Human Induced Factors

- Navigation Enhancement – canals and realignment of natural water courses may have catastrophic effects on marsh ecosystems. These features can inject salt water into areas that previously had lower levels of salinity, and/or they may prolong salt water inundation. Navigation features are frequently deeper than previous natural hydrologic conduits. Salt water is heavier than fresh water and creates a salt water wedge below the fresher surface water in a canal or other navigation feature. In marshes near the gulf or adjacent natural water bodies, navigation features can alter the duration and salinity of tidal flux.
- Salt Water Sills or Barriers – these structural measures limit tidal flow. They are usually in a navigable stream or canal and are designed to limit the amount and/or duration of saline inundation.
- Water Control Structures – these structures are designed to maintain optimum water depth in a hydrologic or management unit. They may be used to manipulate water depth for wildlife, moderate salinity levels, and enhance vegetation management.

Soil features

These areas are on low gulf coastal fresh water marshes at elevations of 1 foot or less. Slopes range from 0 to 0.1 percent. The soils formed in fluid clayey sediments deposited under water that consolidated as a result of artificial drainage. The consolidated mineral and organic sediments are firm enough for cattle to graze. The depth to fluid materials ranges from 10 to 40 inches. These areas flood frequently for long to very long duration when not protected by levees but only rarely or occasionally for brief duration when protected. The source of flooding is fresh water during high water levels from the local rivers and during severe storms by sea water from the gulf. Once flooded, these areas remain ponded for very long duration.

Taxonomic Classification:

Ged - Very-fine, mixed, active, hyperthermic Typic Endoaqualfs

Gueydan -Fine, smectitic, nonacid, hyperthermic, cracked Typic Fluvaquents

Rita - Very-fine, smectitic, nonacid, hyperthermic vertic Endoaquepts

Table 4. Representative soil features

Surface texture	(1) Muck
Family particle size	(1) Clayey
Drainage class	Very poorly drained to poorly drained
Permeability class	Very slow
Soil depth	150 – 250 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	15.24 – 20.32 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	3.5 – 8.4

Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The Fresh Firm Mineral Marsh ecological site occurs in areas with little or no drainage. Slopes are less than 1% and relief is flat to concave. Elevations range from 2 feet above mean sea level, to as much as 10 feet above mean sea level. Soils are of recent geological origin. The fresh marsh ecosystem exists where surface water salinity levels are consistently less than 3 parts per thousand (ppt). Salinity is generally less than 1 ppt, but may fluctuate slightly on the site throughout the year depending on rainfall and tides. These variations can result in temporary shifts in kinds, amounts, and proportions of secondary vegetation from species that are typically associated with fresh marsh to those that are generally associated with intermediate or brackish marsh.

The vegetation of the Fresh Firm Mineral Marsh ecological site consists primarily of grasses and grass-like plants. This site, like other marsh sites, is a dynamic ecosystem which changes constantly, and sometimes rapidly, as a result of natural environmental conditions and climatic events. Tidal exchange determines depth of water, duration of inundation, and salinity of surface and ponded water. These are all factors that influence the amount and kind of vegetation that is present in a selected state. The site is dominated by maidencane (paille fine). Giant cutgrass, California bulrush (bullwhip), Jamaica sawgrass, cattail, and bulltongue are the most significant sub-dominant species.

Plants such as Roseau cane (common reed), switchgrass, and bushy bluestem, as well as most forbs and shrubs occur on this site in areas that are slightly elevated. Small areas of open water with floating or submerged aquatic vegetation are included within this site. These open water areas are very important to waterfowl and other wildlife.

Water control plans have been developed and implemented on a hydrologic unit basis on some areas. These plans include the use of water control structures that are designed to maintain constant water depth and salinity in order to support a desired plant community.

The site is subject to flooding from gulf storms. Abnormally high tides that occasionally flood the site are the primary source of soil salinity. Surface runoff and internal drainage are very slow due to the flat slopes and dense vegetation. Reduced runoff and slow drainage combined with abundant rainfall cause the soil to be saturated to the surface most of the year. The soils are usually semifluid at the surface, but become firm within 15 inches of the surface. During the winter months, the soil may have up to 18 inches of water on the surface. During the summer months, increased evapotranspiration rates and higher temperatures may cause the water table to drop to 2 to 15 inches below the soil surface.

The marsh serves as a natural filtration system for the adjacent coastal waters. It captures sediments, waste, pollutants, and nutrients deposited from agricultural, urban, and industrial areas above the marsh. As upstream waters move through the marsh ecosystem, the continuous filtering action releases cleaner water into the gulf. Marsh sites function as nitrogen and phosphorous sinks, resulting in improvement in the quality of water that passes through the site. It can serve as a buffer to modify the effects of storms. Marsh vegetation also stabilizes the shoreline and reduces erosion caused by tides, wave action, storms, and flooding.

The proximity to the gulf makes this site susceptible to degradation by several natural and human induced actions. Hurricanes and tropical storms can cause entire plant communities to be destroyed in a very short period of time. Constant wind action and low topographic relief make shoreline erosion a constant threat. Those areas with a long fetch of open water are especially vulnerable to wave action. Deepening of existing water bodies and/or dredging new access to canals can cause changes in water depth and increase salinity levels, which may affect marsh vegetation. This may lead to permanent loss of vegetation and eventually result in regression to open water.

Fire and grazing are also factors that affect plant composition and production. Elimination of fire from the ecosystem can result in an unhealthy plant community dominated by senescent vegetation and a loss of plant diversity. Grazing by cattle, furbearers, and geese can adversely affect vegetation on this site if not properly managed. In order to maintain or improve the plant community, livestock grazing must be managed by implementing a planned grazing system. Sustainable stocking rates are the primary factor to consider. Grazing management can be enhanced by manipulation of the time, frequency, intensity, and duration of grazing. Wildlife grazing pressure presents a management challenge because it is not possible to consistently control the numbers and movements of most wildlife species. Uncontrolled grazing may result in the decline or elimination of historic vegetation which is replaced by more aggressive and competitive species.

Fire is primary tool for management of marsh ecosystems. In order for fire to play a beneficial role in marsh management, burning must

be done in a prescribed manner. Burning should be done when there is at least 6 inches of water covering the marsh. This cushion of water protects the vegetative reproduction tissues of marsh plants. Fire is used effectively to remove old growth, encourage vigorous new growth, enhance wildlife habitat, and improve forage quality and production potential. Burning also changes the structure of the plant community which can be beneficial to many wildlife species. Cattle, geese, and furbearers are attracted to the high quality vegetation on freshly burned areas. Burns should be sufficient in size to prevent destructive grazing by livestock, furbearers and geese.

Some plant communities that are dominated by bunchgrasses may be susceptible to sheet erosion. Upright vegetation and the basal stools of these bunchgrasses do not dissipate the energy from tidal fluctuations. Water flow between the basal stools of these bunchgrasses washes away the soil, increases water depth, and jeopardizes the existence of the bunchgrass plant community.

State and Transitional Pathways:

The State and Transition Diagram which follows provides information on some of the most typical pathways that the vegetation on this site can follow as the result of natural events, management inputs, and application of conservation treatments. There may be other plant communities that can exist on this site under certain conditions. Consultation with local experts and professionals is recommended prior to application of practices or management strategies in order to ensure that specific objectives will be met.

State and Transition Model Legend

T1A – uncontrolled grazing and/or elimination of fire

R1A – prescribed burning during the correct season to benefit the desired vegetation, followed by prescribed grazing if livestock are present

T1B – surface water depth greater than 2 inches

R1B – decreased depth of water, reduced period of saturation or inundation by installation of water control structures

T1C – salinity greater than 1.5, uncontrolled grazing

R1C – decreased salinity levels by installation of water control structures, followed by prescribed grazing

T2A – abusive grazing and/or elimination of fire, surface water depth greater than 12 inches

T2B – surface water depth greater than 12 inches

T2C – salinity greater than 3 ppt

T2D – surface water depth greater than 18 inches

T3A – salinity greater than 3 ppt

R3A – decreased salinity levels by installation of water control structures, followed by prescribed grazing

T3B – surface water depth greater than 18 inches

T3C – surface water depth greater than 18 inches

State and transition model

Figure 5. Fresh Firm Mineral Marsh

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Grasses/Grasslike			7846-22417	
	maiden cane	PAHE2	<i>Panicum hemitomom</i>	1905-22417	–

	Jamaica swamp sawgrass	CLMAJ	<i>Cladium mariscus ssp. jamaicense</i>	2242-11208	–
	giant cutgrass	ZIMI	<i>Zizaniopsis miliacea</i>	2242-11208	–
	California bulrush	SCCA11	<i>Schoenoplectus californicus</i>	1121-4483	–
	common reed	PHAU7	<i>Phragmites australis</i>	0-2242	–
	saltmeadow cordgrass	SPPA	<i>Spartina patens</i>	0-560	–
	spikerush	ELEOC	<i>Eleocharis</i>	0-560	–
	Malabar sprangletop	LEFU21	<i>Leptochloa fusca</i>	0-560	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0-112	–
	chairmaker's bulrush	SCAM6	<i>Schoenoplectus americanus</i>	0-112	–
	coast cockspur grass	ECWA	<i>Echinochloa walteri</i>	0-112	–
	bushy bluestem	ANGL2	<i>Andropogon glomeratus</i>	0-112	–
Forb					
2	Forbs			1121-3363	
	cattail	TYPHA	<i>Typha</i>	1121-3363	–
	bulltongue arrowhead	SALA	<i>Sagittaria lancifolia</i>	224-1121	–
	pickerelweed	POCO14	<i>Pontederia cordata</i>	0-224	–
	knotweed	POLYG4	<i>Polygonum</i>	0-112	–
	alligatorweed	ALPH	<i>Alternanthera philoxeroides</i>	0-112	–
	herb of grace	BAMO	<i>Bacopa monnieri</i>	0-112	–
Shrub/Vine					
3	Shrubs			0-112	
	eastern baccharis	BAHA	<i>Baccharis halimifolia</i>	0-112	–
	common buttonbush	CEOC2	<i>Cephalanthus occidentalis</i>	0-112	–
	wax myrtle	MOCE2	<i>Morella cerifera</i>	0-112	–
	rattlebox	SEPU7	<i>Sesbania punicea</i>	0-112	–

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 7. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 8. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 10. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 11. Community 3.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Animal community

The Fresh Firm Mineral Marsh provides good habitat for a variety of terrestrial and avian wildlife species because of the diversity of plant species composition and structure. Deer, alligator, nutria, swamp rabbit, crawfish, and duck concentrations are generally highest in the fresh marsh. Mink, otter, raccoon, geese, and a wide variety of non-game birds also thrive in the fresh marsh. Predators such as coyotes

and bobcats are present on this site. Native white-tailed deer in the marsh have adapted to the wet environment. They have developed exceptionally large hooves that allow them to travel easily in the soft and frequently saturated soils of the marsh. They feed on the tender leaves of the grasses and forbs in the open grasslands of the fresh marsh, and then return to the higher ground in areas where spoil piles from canals and the natural levees of rivers and bayous occur. These slightly elevated and dryer areas support “brushy” vegetation that provides escape cover and shade. These woody plants are also a source of browse, twigs, leaves, fruits, seeds, and mast that are eaten by the deer. Migratory ducks arrive in the marsh in October, and stay through the winter until late March before returning to the north. Geese prefer to feed in open areas with very short, tender vegetation. They eat the roots, shoots, tubers, and tender leaf growth of plants. Recently burned areas are favored feeding grounds for geese. After heavy grazing by geese, these areas are heavily disturbed and often denuded. Alligators are abundant in the fresh marsh, especially in Cameron, Vermilion, and Calcasieu Parishes. Although they were once a threatened species and were federally protected, their numbers have now increased so greatly that there is a special harvest season to remove surplus animals from the marsh. They are also commercially raised on alligator farms throughout the marsh region. Nutria are most the most common and most abundant furbearer in the fresh marsh. They have the ability to reproduce rapidly and frequently. They can quickly overpopulate an area. They can be very destructive and disruptive of the marsh ecosystem. They burrow into ditch banks, build feeding rafts in the marsh, and severely overgraze vegetation in the marsh. These overgrazed areas are known as “eat outs”. Constant overgrazing by nutria causes deterioration of the desired plant community and is detrimental to other wildlife species and livestock. Cattle grazing is prevalent on this site. Marsh cattle are often subjected to harsh and strenuous conditions. Insects, disease, standing water, submerged grazing areas, unstable and boggy soil conditions, extremely warm temperatures, and high humidity, lack of shelter and fresh drinking water sources present unique challenges to cattle grazing in the marsh. During the summer months, heavy infestations of mosquitoes and deer flies cause discomfort and stress for cattle, and can lead to serious health problems. In the most extreme situations mosquitoes can kill cattle, and are especially hazardous to newborn calves. Most cattle are usually moved into the marsh in late October or early November and moved to intensively managed pasturelands or fresher marsh sites by the end of May.

Hydrological functions

Waterways such as canals, trapper ditches, and property line ditches, have been developed to gain access to and within inland marshes which were not accessible by natural riverine systems. The development of deepwater navigation canals, as well as the deepening and realignment of natural riverine systems has also provided a conduit for salt water into previously fresher marsh ecosystems. Geologic subsidence is another major factor in salt water intrusion into fresher marshes. Many of the navigation features that have been installed restrict overbank flow of sediment during periods of high fresh water flow. These sediments help offset the effects of geologic subsidence. Duration of tidal inundation is also affected by these geologic and human activities. During periods of low fresh water flow, tidal inundation overpowers fresh water head, and saltwater enters previously fresher marsh ecosystems. Tidal salt water inundation results in the die-off of less salt tolerant plant species. The loss of these plants and their root systems leads to soil loss, and result in the area becoming open water. The hydrologic function of tidal fluctuation is a determining factor in fresh marsh ecosystems.

Recreational uses

Hunting, camping, tourism, and bird watching offer recreational opportunities for the public as well as economic opportunities for landowners in the marsh. Duck and goose hunting are prevalent in this area. The marsh sites are preferred areas for resident and migratory waterfowl, songbirds, shore birds, and wading birds. Hunting and fishing camps are common in the marsh. There are many state and national wildlife refuges in the marsh. Commercial enterprises offer air boat excursions, marsh tours, and sightseeing in some areas. Recreational boating, fishing, and crabbing are common activities in adjacent water bodies. In recent years, bird watching has become increasingly popular with the public. Bird watching potential can be enhanced by constructing observation platforms, boardwalks, etc. to provide access for visitors.

Other information

Trappers often use marsh sites to harvest mammals which are valued for their pelts. The marsh provides habitat for numerous furbearers such as muskrats, raccoons, minks, otters, bobcats, and coyotes. Nutria are trapped and harvested as a food source for alligators being produced on alligator farms. Alligators are harvested for their hides and meat. Alligator eggs are removed from their nests and provided to alligator farms where the eggs are hatched and alligators are produced commercially. The fresh marsh plays a critical role in the life cycle of many species of estuarine wildlife such as shrimp, blue crab, and menhaden. Fresh marshes serve as nurseries for these species as they mature from the juvenile to the adolescent stage.

Inventory data references

Production and Composition Data for Native Grazing Lands (SCS-RANGE-417) clipping data was reviewed to determine species occurrence and production on soils that are representative of the Fresh Firm Mineral Marsh ecological site. In addition vegetation transect data from Cameron and Terrebonne Parishes collected from 1991-1995 was used to determine species occurrence and production on typical Fresh Firm Mineral Marsh ecological sites.

Other references

- Allen, Dr. Charles, Dawn Allen Newman, and Dr. Harry Winters. Grasses of Louisiana, 3rd Edition. Allen's Native Ventures. Pitkin, LA. 2004.
- Ball, D.M., C.S. Hoveland, and G.D. Lacefield. Southern Forages, Third Edition. Potash and Phosphate Institute and Foundation for Agronomic Research. Norcross, GA. 2002.
- Brown, Clair A. Wildflowers of Louisiana and Adjoining States. Louisiana State University Press. Baton Rouge, LA. 1991.
- Chabreck, Robert H. and R.E. Condrey. Common Vascular Plants of the Louisiana Marsh. Sea Grant Publication No. LSU-T-79-003. Louisiana State University Center for Wetland Resources. Baton Rouge, LA. 1979.
- Chabreck, Robert H. Vegetation, Water and Soil Characteristics of the Louisiana Coastal Region. Bulletin 664. Louisiana State University. Baton Rouge, LA. 1972.
- Chabreck, Robert H. Vegetation, Water and Soil Characteristics of the Louisiana Coastal Region. Bulletin 664. Louisiana State University. Baton Rouge, LA. 1972.
- Cutshall, Jack R. Vegetation Establishment of Smooth Cordgrass (*Spartina alterniflora*) for Shoreline Erosion Control. Soil Conservation Service, Alexandria, LA. 1984.
- Daigle, Jerry, et. al. Ecoregions of Louisiana. Interagency map and descriptions. US EPA, USDA NRCS, and USGS.
- Louisiana Department of Wildlife and Fisheries. The Natural Communities of Louisiana. Louisiana Natural Heritage Program. LDWF. Baton Rouge, LA. 2004
- Radford, Albert E., Harry E. Ahles and C. Ritchie Bell. Manual of the Vascular Flora of the Carolinas. The University of north Carolina Press. Chapel Hill, NC. 1987
- Southeast Texas Resource Conservation and Development Sponsors. Southeast Texas Resource Conservation and Development, Inc. Coastal Marsh Management–Southeast Texas.
- Stutzenbaker, Charles D. Aquatic and Wetland Plants of the Western Gulf Coast. Texas Parks and Wildlife Department, Wildlife Division. Austin, TX. 1999.
- Tarver, David P., John A. Rodgers, Michael J. Mahler, and Robert L. Lazor. Aquatic and Wetland Plants of Florida Second Edition. Bureau of Aquatic Plant Research and Control. Florida Department of Natural Resources. 1979.
- Thomas, R. Dale & Charles M. Allen. Atlas of the Vascular Flora of Louisiana, Vol.I: Ferns & Fern Allies, Conifers, & Monocotyledons. Louisiana Department of Wildlife & Fisheries Natural Heritage Program and The Nature Conservancy. Baton Rouge, LA. 1993.
- Thomas, R. Dale & Charles M. Allen. Atlas of the Vascular Flora of Louisiana, Vol.II: Dicotyledons, Acanthaceae – Euphorbiaceae. Louisiana Department of Wildlife & Fisheries Natural Heritage Program and The Nature Conservancy. Baton Rouge, LA. 1996.
- Thomas, R. Dale & Charles M. Allen. Atlas of the Vascular Flora of Louisiana, Vol.III: Dicotyledons, Fabaceae – Zygophyllaceae. Louisiana Department of Wildlife & Fisheries Natural Heritage Program and The Nature Conservancy. Baton Rouge, LA. 1998.
- United States Army Corps of Engineerers. New Orleans District, Regulatory Functions Branch. USACOE, New Orleans, LA. 1977.
- United States Department of Agriculture Natural Resources Conservation Service. The PLANTS Database <http://plants.usda.gov>. USDA NRCS National Plant Data Center. Baton Rouge, LA. 2008.
- United States Department of Agriculture Natural Resources Conservation Service. Cameron-Creole Watershed 2003 Vegetative Monitoring Report. USDA NRCS. Alexandria, LA. 2007.
- United States Department of Agriculture Natural Resources Conservation Service. Ag Handbook 296. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. USDA NRCS Soil Survey Division. Washington, DC. 2006.
- United States Department of Agriculture Natural Resources Conservation Service. Production and Composition Record for Native Grazing Lands. SCS-RANGE-417 data from Cameron, Vermillion, Iberia, St. Mary, Terrebonne, and La Fourche Parishes. 1981-1986.
- United States Department of Agriculture Natural Resources Conservation Service. Published Soil Surveys from Cameron, Vermillion, Terrebonne, and La Fourche Parishes. Various publication dates.
- United States Department of Agriculture Natural Resources Conservation Service. Web Soil Survey.

<http://websoilsurvey.nrcs.usda.gov/app>. USDA NRCS Soil Survey Division. Washington, DC. 2008.

- United States Department of Agriculture Soil Conservation Service. Louisiana Wetlands Plant List. USDA SCS Louisiana Bulletin No. 190-7-3. USDA SCS. Alexandria, LA. 1986.
- United States Department of Agriculture Soil Conservation Service. Range Site Descriptions for the Gulf Coast Marsh Major Land Resource Area 151. USDA SCS. Alexandria, LA. Various publication dates.
- United States Department of Agriculture Soil Conservation Service. Range Site Descriptions for the Coastal Saline Prairie Major Land Resource Area 150B. USDA SCS. Temple, TX. Various publication dates.
- United States Department of Agriculture Soil Conservation Service. Submerged and Floating Aquatic Plants of South Louisiana. Alexandria, LA. 1988.
- United States Department of Agriculture Soil Conservation Service. Marshland Vegetation for Waterfowl and Furbearers. Alexandria, LA. 1988.
- United States Department of Agriculture Soil Conservation Service. Southern Wetland Flora. USDA SCS South National Technical Center, Fort Worth, TX.
- United States Department of Agriculture Soil Conservation Service. Louisiana's Native Ranges and Their Proper Use. USDA SCS. Alexandria, LA. 1982.
- United States Department of Agriculture Soil Conservation Service. Gulf Coast Wetlands Handbook. USDA SCS. Alexandria, LA. 1977.
- United States Department of Agriculture Soil Conservation Service. 100 Native Forage Grasses in 11 Southern States. Agriculture Handbook 389. 1971
- United States Department of Agriculture Soil Conservation Service. Louisiana Range Handbook. USDA SCS. Alexandria, LA. 1956.
- United States Department of Agriculture Soil Conservation Service. Results of Plant Analyses From Samples Sent In During 1950 (Louisiana). USDA Soil Conservation Service Operations Laboratory. Soil Conservation Service. Fort Worth, TX. 1951.
- United States Department of Interior Fish and Wildlife Service. Classification of Wetlands and Deepwater Habitats of the United States. USDI FWS. Washington, DC. 1979.
- United States Department of Interior Fish and Wildlife Service. National List of Plant Species That Occur In wetlands: Southeast Region (Region 2). USDI FWS Biological Report 88. Washington, DC. 1988.
- Yarlett, Lewis A. Common Grasses of Florida and the Southeast. The Florida Native Plant Society. Spring Hill, FL. 1996.

ACKNOWLEDGEMENTS

We would like to express our appreciation to the following for their assistance and input in the development of this document:
Apache Louisiana Minerals, Inc., Houma, LA

Johanna Pate, State Grazing Lands Specialist, USDA Natural Resources Conservation Service, Alexandria, LA

Contributors

Jack R. Cutshall And Dan M. Caudle

Approval

Matthew Duvall, 3/24/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	08/21/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

5. Number of gullies and erosion associated with gullies:

6. Extent of wind scoured, blowouts and/or depositional areas:

7. Amount of litter movement (describe size and distance expected to travel):

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):

12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant:

Sub-dominant:

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

14. Average percent litter cover (%) and depth (in):

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):

16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. Perennial plant reproductive capability:
