

Task 3.2

**Lamb Island Dairy Remediation
Final Operation and Maintenance Plan**

SFWMD Contract No. C-13410

Submitted by
HSA Engineers & Scientists

HSA Project No. 8005-7106-00
March 2006

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Introduction and Background

The Lamb Island Dairy Site, also known as the former Ferrell Dairy, includes approximately 808 acres in the southeast corner of Section 36 of Township 35 South, Range 33 East and in the southwest corner of Section 31 of Township 35 South, Range 34 East of Okeechobee County, Florida. Between the years of 1982-1988 there were approximately 1000-1100 head of cattle on the property, both lactating and dry and there were approximately 800 head on the property from 1988 to 1994. The Site was acquired by the South Florida Water Management District (SFWMD) in 1994, in accordance with the Kissimmee River Restoration and Headwaters Revitalization Program to restore the historical river flood plains in the Cypress Slough. Per a lease agreement with the SFWMD, the previous property owner was allowed to keep beef animals on the property. All animals were removed from the Site in late 1998.

In 1990, Site dairy operations were required to be in accordance with the FDEP Dairy Rule, with a total Phosphorus (P) concentration discharge limit of 1.2 mg/L (ppm). A Works of District Permit was issued for the Site in 1997, with a lower discharge limit of 0.35 mg/L total P since the land had been converted to improved pasture (#47-00416-Q, SWET 2002). The Lake Okeechobee Protection Program has established a Total Maximum Daily Load (TMDL) of 154 tons (140 metric tons) of P per year for Lake Okeechobee. This relates to an in-lake concentration goal of 0.04 mg/L total P.

In 2000, Dames & Moore (D&M) conducted a waste management assessment (Dames & Moore 2000) on the Dairy including characterization of the serial waste storage ponds, the high intensity grazing and cow lounging areas (HIAs), and the treatment ponds. The primary P sources were identified as barn washwater, cow spray and runoff from the HIA and the perimeter dike. The D&M report includes a description of the Bion wastewater treatment system that was installed at the dairy. The Bion system included treating the animal wastes and rinsewaters from the Dairy barn into settling ponds and then adding iron salts before the “eco-reactor”, a large pond used for solids settling.

In 2003, HSA Engineers & Scientists (HSA) was retained by the (SFWMD) to implement remedial alternatives to minimize storm water P discharges from the Site. **Figure 1** shows the location of Lamb Island Dairy. The implemented alternatives were intended to reduce P discharges to the maximum extent practicable while taking into consideration cost effectiveness as well as the minimization of long term operation and maintenance requirements.

Site construction occurred during the summer of 2004 and the following remedial measures were completed:

- As shown in **Figure 2**, construction of a surface water containment berm around the HIA (containing the high P soils) which allows gravity flow of storm waters to the existing eco-reactor and swale. Biological (wetland) P uptake will occur in the eco-reactor cells as long as the area remains hydrated;

- Construction of a containment berm at the edge-of-farm to effect increased capture of pasture surface water runoff;
- Construction of terrace berms in the pasture runoff containment area;
- Construction of a wetland/marsh at the southern end of the pasture runoff containment area. Biological P uptake will occur in this area as long as the area remains hydrated;
- Alum amendment of the dairy wastes (residual manure solids) material contained in Ponds 1 and 2 leaving inactivated material in-place;
- Backfill Pond 1;
- Backfill Pond 2;
- Alum amendment of the impounded waters contained in the settling pond (Pond 3) and cooling pond to inactivate soluble P content; and,
- Dewatering and backfilling the onsite perimeter ditch.

The remedial design included collecting storm water runoff in two areas, (1) the high intensity area (HIA); and, (2) the outer pasture. An approximate 40-acre surface water containment area was created by constructing an earthen berm around the original HIA and other high-P soils. The HIA collection system design included using the existing berms on the north side of the eco-reactor. Ditches on the upstream side of the berm will convey the runoff by gravity to the eco-reactor.

Aside from the 40-acre collection system, the HIA containment area includes an additional estimated 21.5 acres of storage contained in the eco-reactor (~6.5 acres) and the existing swale (~15 acres) located downstream of the eco-reactor. Berms are constructed on the south and east sides of the swale routing runoff to a discharge location at the southern end of the swale (**Figure 2**).

An approximate 109-acre surface water containment area was created by constructing earthen berms along the eastern and southern sides of the property. Ditches on the upstream side of the berm will convey the runoff by gravity to a new discharge location on the south side of property (**Figure 2**). Ditches were also constructed on the upstream side of the containment berms to convey the runoff by gravity to the wetland/marsh at the southern end of the containment area.

Three terrace berms (6-12 inch berm height) were constructed across the pasture area as also shown in (**Figure 2**). The terrace berms are designed to increase runoff retention, evapotranspiration (ET), and P uptake in the pasture area.

The cumulative runoff from the HIA will flow by gravity through the former eco-reactor and swale system via a series of metal culverts with riser inlets. Runoff from the HIA containment area will ultimately flow by gravity through a culvert at an existing discharge location and the outer pasture area runoff will ultimately flow by gravity through a culvert at a new discharge location (**Figure 2**).

Now that the P reduction treatment system has been built, the site will need to be maintained and operated to maintain maximum system performance to be effective at

reducing the P load of the storm waters. This operation and maintenance plan describes the procedures and methods needed to maintain the system and achieve maximum reduction of P from discharge waters.

1.0 Maintenance and Hydraulic Structure Operation

The property owner should operate the water control structures installed on the Lamb Island project site according to the prescribed criteria identified below:

1.1 Maintenance

The landowner should maintain, rehabilitate, or replace, all water control structures and features including levees, berms, swales, ditch blocks, culverts, etc. as necessary, to insure continuous operation and water quality treatment. The landowner should conduct annual inspections, and special inspections after major storm events in excess of the 25 year, 3 day design storm event (9 inches of rainfall in 72 hours), of all water control structures and features to monitor them for degradation by erosion, tree growth, animal burrows, cracks, settlement, bulges, slides, sloughs, inadequate erosion protection, spalling, scaling, corrosion, leakage or other conditions that would hinder the structures or feature's ability to control the water elevation or other design purpose, as applicable.

Water control structures should be maintained free of any objects or obstruction that would prevent the free flow of water being discharged from the property. Conditions that prevent the free flow of water through discharge structure(s) or culvert(s) should be repaired immediately. Other types of degradation identified during the annual and special inspections should be repaired promptly, to prevent inadequate system operation.

1.2 Hydraulic Structure Management

As necessary, the landowner should conduct five (5) activities:

1. Cut grass - Maintain grass less than six (6") inches in height in the vicinity of control structure. By maintaining the grass to this height, the condition of these structures can be visually inspected. Vegetation in diversion ditches and swales should not be cut, but vegetative growth that may impede water flow should be controlled.
2. Remove trash - Remove any trash or debris from control structures, and culverts. Special care should be taken to inspect the control structures and the boards on a regular basis to remove debris, which may inhibit proper discharge.
3. Watch for erosion - Inspect any areas subject to erosion and seed or sod as necessary. Special attention should be given to the areas around the control structures.

4. Inspect after storms - The water control structures, swales, and berms should be inspected 24 hours after a 25 year 3 day storm event (9 inches of rainfall in 72 hours).
5. Inspect water control structures (see Figure 3) - The boards (stop logs) for discharge from the HIA/Swale area emergency overflow culvert should be maintained at 43 feet NGVD or less to avoid damage to the containment berm. No boards are recommended to be installed in the eco-reactor influent culvert (SW1). Eco-reactor cell culvert board heights can be varied from the invert elevation to a maximum of 42 feet NGVD. The eco-reactor discharge culvert (SW2) should be kept at 43 feet NGVD. For the outer pasture area, the boards in the swale discharge culvert (SW3) should be maintained at 39.0 feet and the wetland discharge culvert (SW5) should be maintained at 37.75 feet or less. It is recommended that the boards be kept at their maximum level to reduce the amount of runoff from the property and increase system efficiency. **Table 1** below shows recommended and maximum board heights for each culvert location.

Table 1

Structure	Recommended Board Height (NGVD)	Max Board Height (NGVD)
HIA Emergency Overflow	43 feet	43 feet
Eco-Reactor Influent (SW1)	No Boards	43 feet
Eco-Reactor Internal Cells	No Boards	43 feet
Eco-Reactor Discharge (SW2)	43 feet	43 feet
Swale Discharge (SW3)	39 feet	39 feet
Wetland Discharge (SW5)	37.75 feet	37.75 feet

2.0 Intended Land Use

The intended land use should be considered in the overall operation and maintenance of the property. Because it is not known at this time what the property owners intended land use will be, general guidelines for different land uses are provided below. For all intended land uses exotic invasive plant species control should be considered as follows.

2.1 Exotic Invasive and Nuisance Plant Control

Exotic invasive and nuisance plant species are recommended to be controlled by the landowner seasonally on the property with the goal of managing each primary plant species at the “maintenance” level of control.

- Exotic species are defined by the Florida Exotic Pest Plant Council as species introduced to Florida from a natural range outside of Florida. Exotic species become problematic, or “invasive exotics”, when they spread in range and

threaten the integrity and diversity of Florida's natural plant communities. The Florida Exotic Pest Plant Council 2005 list is included for reference in **Appendix A**.

- Nuisance species are those that are native but are undesirable in a specific location.
- Florida law (F.S. 372.925) defines "maintenance control" as "a method of managing exotic plants in which control techniques are utilized in a coordinated manner on a continuous basis in order to maintain a plant population at the lowest feasible level." Maintenance control results in the overall use of less herbicides, less organic deposition in aquatic environments, less environmental impacts from the exotic and nuisance plant species and their management, and reduced management costs.
- Removal method(s) and frequency for all species should be performed consistent with the current recommendations of the NRCS Pest Management guidelines (Conservation Practice Code 595) provided in **Appendix B**, and Florida Exotic Pest Plant Council "maintenance control" of the species listed **Appendix A**.
- The property owner should minimize adverse impact to native wetland flora and fauna as a result of exotic and nuisance plant species maintenance activities.

2.2 Hay Cropping

A hay cropping schedule is recommended for the Lamb Island Dairy property. The timely cutting and removal of forages from the field as hay, green-chop, or ensilage will help maintain the remediation system performance and improve nutrient removal through P uptake in the hay. General guidelines for hay cropping are included in **Appendix C**, in the NRCS Conservation Practice Standard "Forage Harvest Management" Code 511. Fertilization guidelines developed specifically for the Lake Okeechobee basin should be utilized to minimize P inputs to the property.

2.3 Cattle Grazing

If cattle grazing is a land use chosen by the property owner every effort should be made to reduce the impact of the livestock to existing property improvements and control structures. Grazing prescription should be designed to meet habitat requirements of plant and wildlife species of concern and a balance of livestock numbers and forage available by seasons should be evaluated. Regular checks should be conducted around the property to ensure the live stock are not compromising property berms, ditches, or any other structure designed to reduce offsite P discharges. General guidelines for grazing management are included in **Appendix D**, in the NRCS Conservation Practice Standard "Prescribed Grazing" Code 528A.

2.4 Prescribed Burns

Prescribed burning is not meant to be an annual management practice. Burn only to meet a specific management objective. Generally it is not necessary to burn more often than once every 3-5 years. When burning to control undesirable sprouting woody vegetation, it

may be necessary to burn two or more consecutive years. All prescribed burning shall comply with applicable Federal, state, and local laws, rules and regulations. Burns shall be planned with consideration given to the sites' vegetative characteristics, animal nutritional requirements, overall management objectives, protection to grazing animals, and location of livestock fences and other structures. **Appendix E** from Code 338: NRCS Conservation Practice "Prescribed Burns" contains general guidelines for prescribed burns.

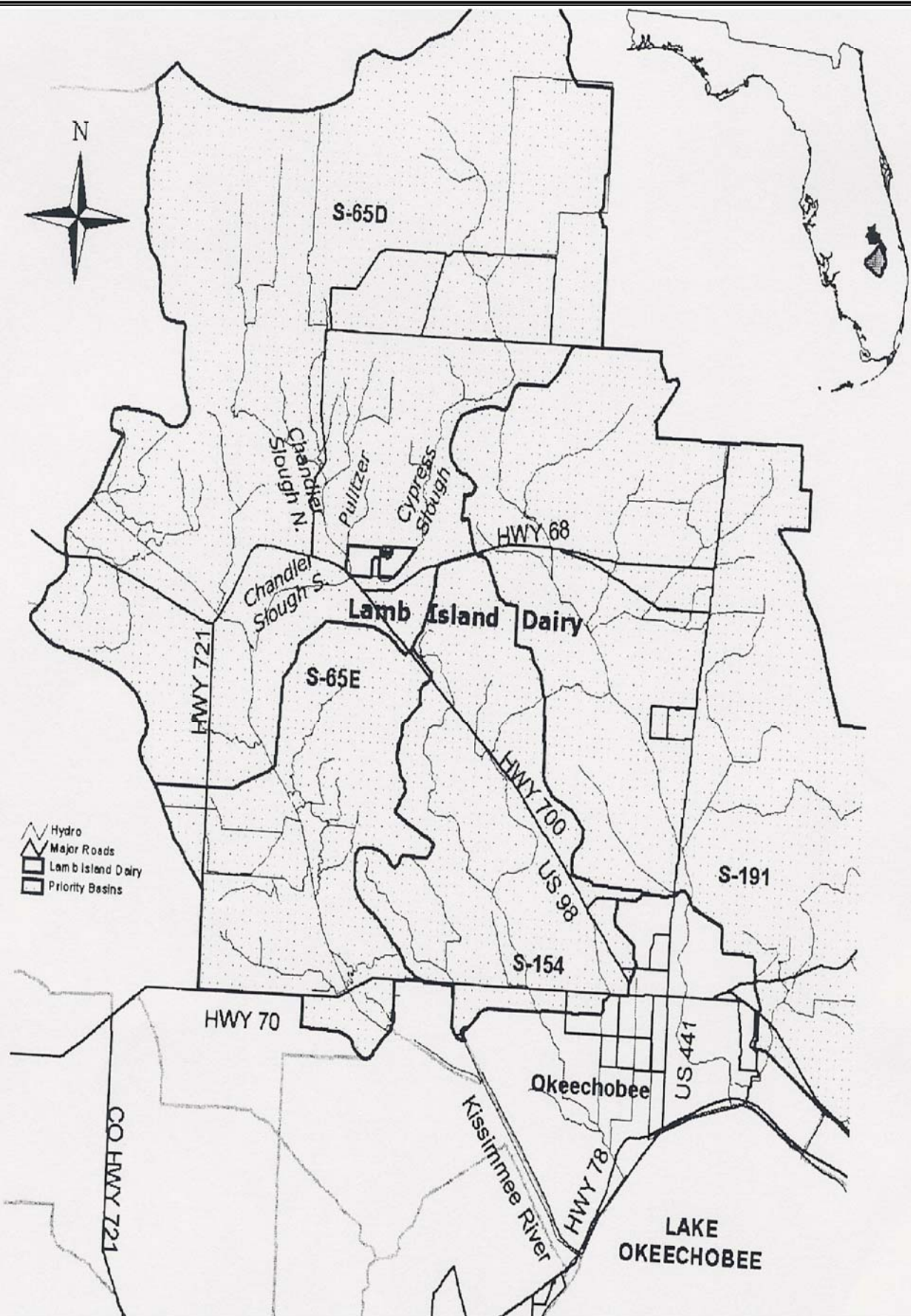
3.0 Water Quality

At this time no water quality monitoring for the property is required; however, during periods of heavy rain structures should be observed to ensure proper operation and maintain system performance. Any future monitoring requirements will be driven by future permitting and regulatory requirements.

4.0 Inspection Checklist

Appendix F contains an inspection checklist for the property. **Figure 3** shows the location of structures and previous water quality monitoring points throughout the property. At a minimum both the edge of farm berm and HIA containment berm should be checked for breaches, erosion, or other signs of weakness that could preclude berm failure. Ditches and swales should be checked for debris or other items that may slow the conveyance of water through them. All internal and discharge culverts and risers should be checked to be free of debris and that all boards are in place at the proper elevation required for maximizing the P reduction capabilities of the system..

FIGURES



JOB NO.: 8005716000
CAD NO.: 010
DATE: 01/16/06



1486-A Skees Road West Palm Beach, Florida 33411

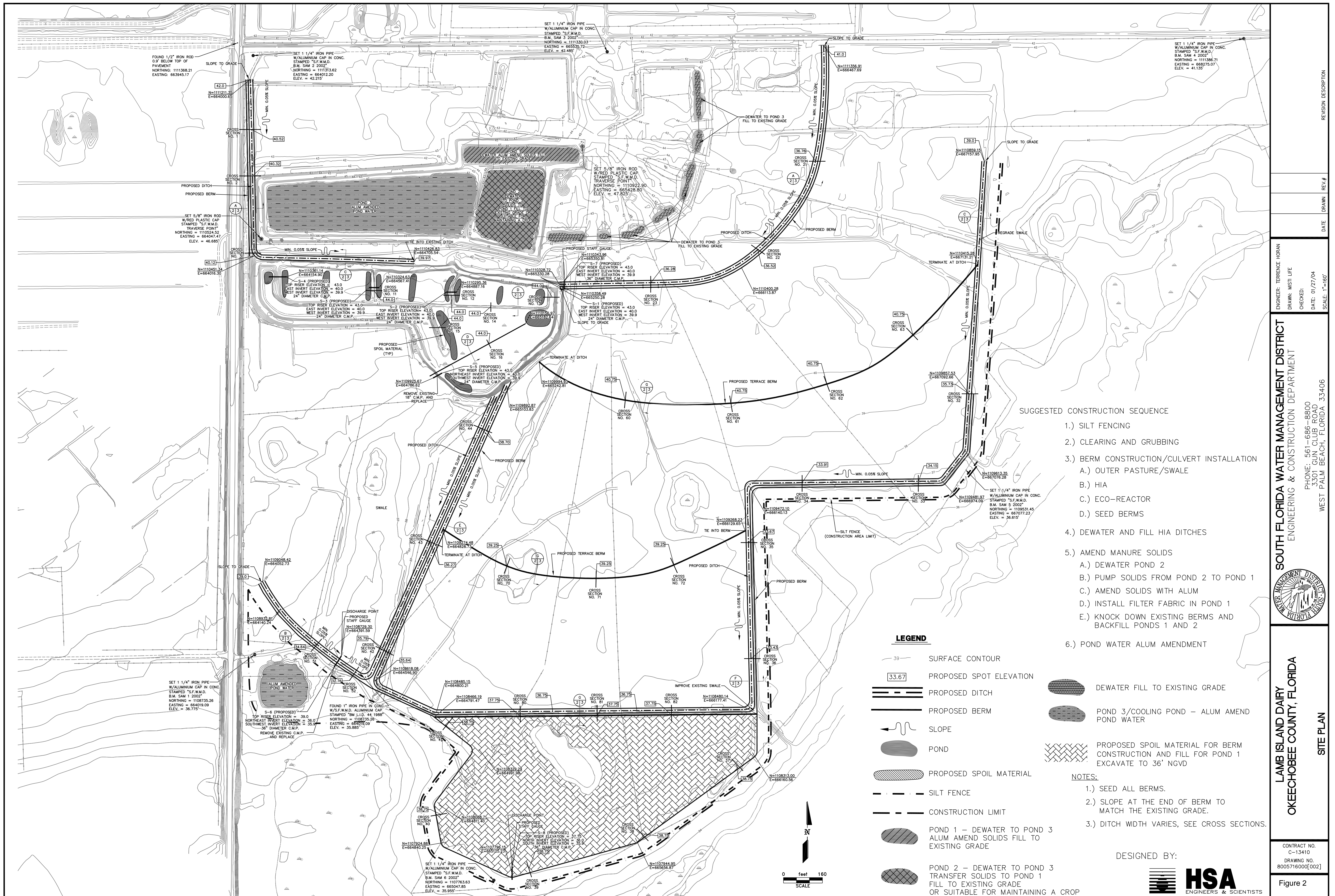
Tel: (561) 688-9008

LAMB ISLAND DAIRY
OKEECHOBEE COUNTY, FLORIDA

SHEET TITLE

SITE
MAP

FIGURE 1



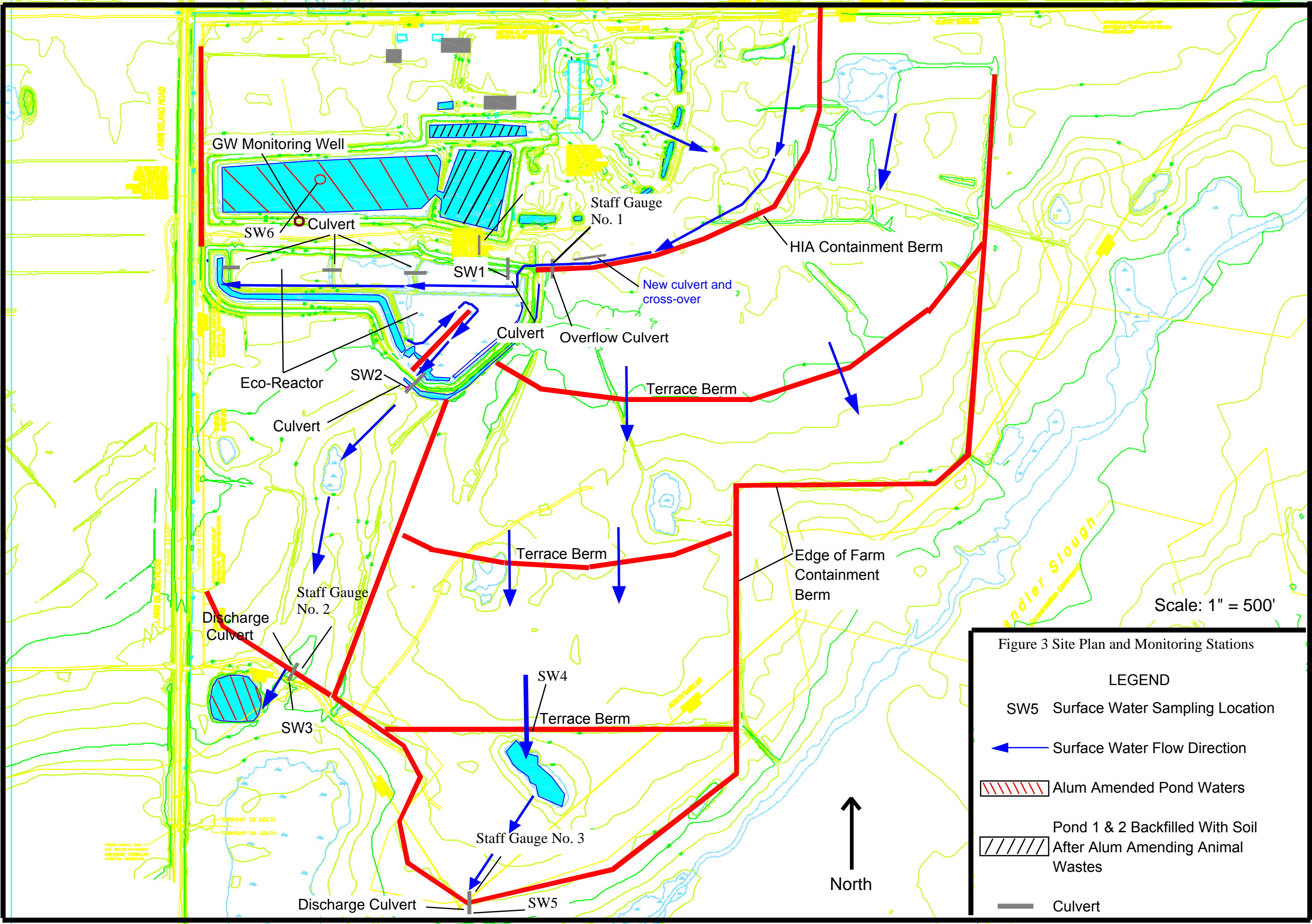


Figure 3 Site Plan and Monitoring Stations

LEGEND

- SW5 Surface Water Sampling Location
- Surface Water Flow Direction
- Alum Amended Pond Waters
- Pond 1 & 2 Backfilled With Soil After Alum Amending Animal Wastes
- Culvert

Appendix A

Florida Exotic Plant List

Florida Exotic Pest Plant Council's

2005

List of Invasive Species

Purpose of the List: *To focus attention on --*

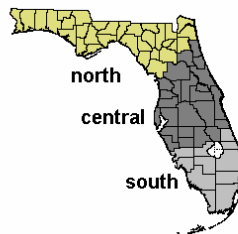
- the adverse effects exotic pest plants have on Florida's biodiversity and plant communities,
- the habitat losses from exotic pest plant infestations,
- the impacts on endangered species via habitat loss and alteration,
- the need to prevent habitat losses through pest-plant management,
- the socio-economic impacts of these plants (e.g., increased wildfires in certain areas),
- changes in the seriousness of different pest plants over time,
- the need to provide information that helps managers set priorities for control programs.

DEFINITIONS: *Exotic*—a species introduced to Florida, purposefully or accidentally, from a natural range outside of Florida. *Native*—a species whose natural range included Florida at the time of European contact (1500 AD). *Naturalized exotic*—an exotic that sustains itself outside cultivation (it is still exotic; it has not "become" native). *Invasive exotic*—an exotic that not only has naturalized but is expanding on its own in Florida plant communities.

Abbreviations used:

for "Gov. list": **P** = Prohibited by Fla. Dept. of Environmental Protection, **N** = Noxious weed listed by Fla. Dept. of Agriculture & Consumer Services, **U** = Noxious weed listed by U.S. Department of Agriculture.

for "Reg. Dis.": **N** = north, **C** = central, **S** = south, referring to each species' current distribution in general



regions of Florida (not its potential range in the state). See following map.

For additional information on distributions of particular species by county, visit the University of South Florida's Atlas of Florida Vascular Plants web site, www.plantatlas.usf.edu. Many of those species entries also have habit and close-up pictures of the species.

Additional images for some species may be found at the "Introduced Species" page on the [Univ. of Florida Herbarium](http://Univ.ofFloridaHerbarium) website, at Fairchild Tropical Garden's [Virtual Herbarium](http://VirtualHerbarium), and the [Godfrey Herbarium database](http://GodfreyHerbariumdatabase), Florida State University.

For other additional information on plants included in this list, see related links and pages at this web site on the [home page](#) menu.

Category I - Invasive exotics that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. *This definition does not rely on the economic severity or geographic range of the problem, but on the documented ecological damage caused.*

Scientific Name	Common Name	EPPC Cat.	Gov. list	Reg. Dist.
<i>Abrus precatorius</i>	rosary pea	I		C, S
<i>Acacia auriculiformis</i>	earleaf acacia	I		S
<i>Albizia julibrissin</i>	mimosa, silk tree	I		N, C
<i>Albizia lebbek</i>	woman's tongue	I		C, S
<i>Ardisia crenata</i> (= <i>A. crenulata</i>)	coral ardisia	I		N, C
<i>Ardisia elliptica</i> (= <i>A. humilis</i>)	shoebutton ardisia	I		S
<i>Asparagus aethiopicus</i> (= <i>A. sprengeri</i> ; <i>A. densiflorus</i> misapplied)	asparagus-fern	I		C, S
<i>Bauhinia variegata</i>	orchid tree	I		C, S
<i>Bischofia javanica</i>	bischofia	I		C, S
<i>Calophyllum antillanum</i> (= <i>C. calaba</i> ; <i>C. inophyllum</i> misapplied)	santa maria (names "mast wood," "Alexandrian laurel" used in cultivation)	I		S
<i>Casuarina equisetifolia</i>	Australian pine	I	P	N,C,S
<i>Casuarina glauca</i>	suckering Australian pine	I	P	C, S
<i>Cinnamomum camphora</i>	camphor-tree	I		N,C,S
<i>Colocasia esculenta</i>	wild taro	I		N,C,S
<i>Colubrina asiatica</i>	lather leaf	I		S
<i>Cupaniopsis anacardioides</i>	carrotwood	I	N	C, S
<i>Dioscorea alata</i>	winged yam	I	N	N,C,S
<i>Dioscorea bulbifera</i>	air-potato	I	N	N,C,S
<i>Eichhornia crassipes</i>	water-hyacinth	I	P	N,C,S
<i>Eugenia uniflora</i>	Surinam cherry	I		C, S
<i>Ficus microcarpa</i> (<i>F. nitida</i> and <i>F. retusa</i> var. <i>nitida</i> misapplied)	laurel fig	I		C, S
<i>Hydrilla verticillata</i>	hydrilla	I	P, U	N,C,S
<i>Hygrophila polysperma</i>	green hygro	I	P, U	N,C,S
<i>Hymenachne amplexicaulis</i>	West Indian marsh grass	I		C, S
<i>Imperata cylindrica</i> (<i>I. brasiliensis</i> misapplied)	cogon grass	I	N, U	N, C, S
<i>Ipomoea aquatica</i>	waterspinach	I	P, U	C
<i>Jasminum dichotomum</i>	Gold Coast jasmine	I		C, S
<i>Jasminum fluminense</i>	Brazilian jasmine	I		C, S

<i>Lantana camara</i>	lantana, shrub verben	I		N,C,S
<i>Ligustrum lucidum</i>	glossy privet	I		N, C
<i>Ligustrum sinense</i>	Chinese privet, hedge privet	I		N,C,S
<i>Lonicera japonica</i>	Japanese honeysuckle	I		N,C,S
<i>Lygodium japonicum</i>	Japanese climbing fern	I	N	N,C, S
<i>Lygodium microphyllum</i>	Old World climbing fern	I	N	C, S
<i>Macfadyena unguis-cati</i>	cat's claw vine	I		N,C, S
<i>Manilkara zapota</i>	sapodilla	I		S
<i>Melaleuca quinquenervia</i>	melaleuca, paper bark	I	P, N, U	C, S
<i>Mimosa pigra</i>	catclaw mimosa	I	P, N, U	C, S
<i>Nandina domestica</i>	nandina, heavenly bamboo	I		N, C
<i>Nephrolepis cordifolia</i>	sword fern	I		N,C,S
<i>Nephrolepis multiflora</i>	Asian sword fern	I		C, S
<i>Nevraudia revnaudiana</i>	Burma reed, cane grass	I	N	S
<i>Paederia cruddasiana</i>	sewer vine, onion vine	I	N	S
<i>Paederia foetida</i>	skunk vine	I	N	N,C
<i>Panicum repens</i>	torpedo grass	I		N,C,S
<i>Pennisetum purpureum</i>	Napier grass	I		C, S
<i>Pistia stratiotes</i>	waterlettuce	I	P	N,C,S
<i>Psidium cattleianum</i> (=P. littorale)	strawberry guava	I		C, S
<i>Psidium guajava</i>	guava	I		C, S
<i>Pueraria montana</i> var. <i>lobata</i> (=P. <i>lobata</i>)	kudzu	I	N, U	N,C, S
<i>Rhodomirtus tomentosa</i>	downy rose-myrtle	I	N	C, S
<i>Rhoeo spathacea</i> (see <i>Tradescantia spathacea</i>)				
<i>Rhynchelytrum repens</i>	Natal grass	I		N, C, S
<i>Ruellia tweediana</i> (= <i>R. brittoniana</i>)	Mexican petunia	I		N, C, S
<i>Sapium sebiferum</i> (= <i>Triadeca sebifera</i>)	popcorn tree, Chinese tallow tree	I	N	N, C, S
<i>Scaevola taccada</i> (=Scaevola sericea, <i>S. frutescens</i>)	scaevola, half-flower, beach naupaka	I		C, S
<i>Schefflera actinophylla</i> (=Brassaia actinophylla)	schefflera, Queensland umbrella tree	I		C, S
<i>Schinus terebinthifolius</i>	Brazilian pepper	I	P, N	N, C, S
<i>Senna pendula</i> var. <i>glabrata</i> (=Cassia <i>coluteoides</i>)	climbing cassia, Christmas cassia, Christmas senna	I		C, S
<i>Solanum tampicense</i> (=S. houstonii)	wetland night shade, aquatic soda apple	I	N, U	C, S
<i>Solanum viarum</i>	tropical soda apple	I	N, U	N, C, S

<i>Syngonium podophyllum</i>	arrowhead vine	I		C, S
<i>Syzygium cumini</i>	jambolan, Java plum	I		C, S
<i>Tectaria incisa</i>	incised halberd fern	I		S
<i>Thespesia populnea</i>	seaside mahoe	I		C, S
<i>Tradescantia fluminensis</i>	white-flowered wandering jew	I		N, C
<i>Tradescantia spathacea</i> (= <i>Rhoeo spathacea</i> , <i>Rhoeo discolor</i>)	oyster plant	I		S
<i>Urochloa mutica</i> (= <i>Brachiaria mutica</i>)	Pará grass	I		C, S

Category II - Invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. *These species may become ranked Category I, if ecological damage is demonstrated.*

Scientific Name	Common Name	EPPC Cat.	Gov. list	Reg. Dist.
<i>Adenanthera pavonina</i>	red sandalwood	II		S
<i>Agave sisalana</i>	sisal hemp	II		C, S
<i>Aleurites fordii</i> (= <i>Vernicia fordii</i>)	tung oil tree	II		N, C
<i>Alstonia macrophylla</i>	devil-tree	II		S
<i>Alternanthera philoxeroides</i>	alligator weed	II	P	N, C, S
<i>Antigonon leptopus</i>	coral vine	II		N, C, S
<i>Aristolochia littoralis</i>	calico flower	II		N, C
<i>Asystasia gangetica</i>	Ganges primrose	II		C, S
<i>Begonia cucullata</i>	wax begonia	II		N, C
<i>Blechnum pyramidatum</i>	green shrimp plant, Browne's blechnum	II		N, C, S
<i>Broussonetia papyrifera</i>	paper mulberry	II		N, C
<i>Callisia fragrans</i>	inch plant, spironema	II		C, S
<i>Casuarina cunninghamiana</i>	Australian pine	II	P	C, S
<i>Cecropia palmata</i>	trumpet tree	II		S
<i>Cestrum diurnum</i>	day jessamine	II		C, S
<i>Chamaedorea seifrizii</i>	bamboo palm	II		S
<i>Clematis terniflora</i>	Japanese clematis	II		N, C
<i>Cryptostegia madagascariensis</i>	rubber vine	II		C, S
<i>Cyperus involucratus</i> (<i>C. alternifolius</i>)	umbrella plant	II		C, S

misapplied)				
<i>Cyperus prolifer</i>	dwarf papyrus	II		C
<i>Dalbergia sissoo</i>	Indian rosewood, sissoo	II		C, S
<i>Elaeagnus pungens</i>	thorny eleagnus	II		N, C
<i>Epipremnum pinnatum</i> cv. Aureum	pothos	II		C, S
<i>Ficus altissima</i>	false banyan, council tree	II		S
<i>Flacourtia indica</i>	governor's plum	II		S
<i>Hemarthria altissima</i>	limpo grass	II		C, S
<i>Hibiscus tiliaceus</i>	mahoe, sea hibiscus	II		C, S
<i>Ipomoea fistulosa</i> (= <i>I. carnea</i> ssp. <i>fistulosa</i>)	shrub morning-glory	II	P	C, S
<i>Jasminum sambac</i>	Arabian jasmine	II		S
<i>Kalanchoe pinnata</i>	life plant	II		C, S
<i>Koelreuteria elegans</i> ssp. <i>formosana</i> (= <i>K. formosana</i> ; <i>K. paniculata</i> misapplied)	flamegold tree	II		C, S
<i>Leucaena leucocephala</i>	lead tree	II		N, C, S
<i>Limnophila sessiliflora</i>	Asian marshweed	II	P	N, C, S
<i>Livistona chinensis</i>	Chinese fan palm	II		C, S
<i>Melia azedarach</i>	Chinaberry	II		N, C, S
<i>Merremia tuberosa</i>	wood-rose	II		S
<i>Murraya paniculata</i>	orange-jessamine	II		S
<i>Myriophyllum spicatum</i>	Eurasian water-milfoil	II	P	N, C, S
<i>Nymphoides cristata</i>	snowflake	II		C, S
<i>Panicum maximum</i>	Guinea grass	II		C, S
<i>Passiflora biflora</i>	two-flowered passion vine	II		S
<i>Pennisetum setaceum</i>	green fountain grass	II		S
<i>Phoenix reclinata</i>	Senegal date palm	II		C, S
<i>Pittosporum pentandrum</i>	Philippine pittosporum, Taiwanese cheesewood	II		S
<i>Phyllostachys aurea</i>	golden bamboo	II		N, C
<i>Pteris vittata</i>	Chinese brake fern	II		N, C, S
<i>Ptychosperma elegans</i>	solitary palm	II		S
<i>Ricinus communis</i>	castor bean	II		N, C, S
<i>Sansevieria hyacinthoides</i>	bowstring hemp	II		C, S
<i>Scleria lacustris</i>	Wright's nutrush	II		C, S
<i>Sesbania punicea</i>	purple sesban, rattlebox	II		N, C, S
<i>Solanum diphyllum</i>	Two-leaf nightshade	II		N, C, S
<i>Solanum jamaicense</i>	Jamaica nightshade	II		C
<i>Solanum torvum</i>	susumber, turkey berry	II	N, U	N, C, S
<i>Sphagneticola trilobata</i>	wedelia	II		N, C, S

(= <i>Wedelia trilobata</i>)				
<i>Stachytarpheta urticifolia</i> (= <i>S. cayennensis</i>)	nettle-leaf porterweed	II		S
<i>Syagrus romanzoffiana</i> (= <i>Arecastrum romanzoffianum</i>)	queen palm	II		C, S
<i>Syzygium jambos</i>	rose-apple	II		C, S
<i>Terminalia catappa</i>	tropical almond	II		C, S
<i>Terminalia muelleri</i>	Australian almond	II		C, S
<i>Tribulus cistoides</i>	puncture vine, burr-nut	II		N, C, S
<i>Urena lobata</i>	Caesar's weed	II		N, C, S
<i>Vitex trifolia</i>	simple-leaf chaste tree	II		C, S
<i>Washingtonia robusta</i>	Washington fan palm	II		C, S
<i>Wedelia</i> (see <i>Sphagneticola</i> above)				
<i>Wisteria sinensis</i>	Chinese wisteria	II		N, C
<i>Xanthosoma sagittifolium</i>	malanga, elephant ear	II		N, C, S

Citation example:

FLEPPC. 2005. List of Florida's Invasive Species. Florida Exotic Pest Plant Council. Internet: <http://www.fleppc.org/05list.htm>

The 2005 list was prepared by the FLEPPC Plant List Committee:

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Appendix B

Pest Management

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

PEST MANAGEMENT

(Acre)
Code 595



DEFINITION

Utilizing environmentally sensitive prevention, avoidance, monitoring and suppression strategies, to manage weeds, insects, diseases, animals and other organisms (including invasive and non-invasive species), that directly or indirectly cause damage or annoyance.

PURPOSES

This practice may be applied as part of a Resource Management System (RMS) to support one or more of the following purposes:

- Enhance quantity and quality of commodities.
- Minimize negative impacts of pest control on soil resources, water resources, air resources, plant resources, animal resources and/or humans.

CONDITIONS WHERE PRACTICE APPLIES

Wherever pests will be managed.

CRITERIA

General Criteria Applicable To All Purposes

Compliance with Federal, state, and local laws is required (e.g., Food Quality Protection Act (FQPA); Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); Worker Protection Standard (WPS); Interim Endangered Species Protection Program (H7506C); Chapter 5E-2 and 5E-9 Florida Administrative Code (F.A.C.); and Florida Statute (F.S.), Chapter 487.

An appropriate set of mitigation techniques MUST be planned and implemented where necessary to reduce the environmental risks of pest management activities consistent with meeting the quality criteria in Section III of the Field Office Technical Guide (FOTG). Mitigation techniques may include conservation practices and management techniques that are known to be effective in reducing the negative impacts of pest management. See Table 1 of this standard for a list of mitigation techniques to be considered when there is a need to reduce pesticide impacts on water quality.

Integrated Pest Management (IPM) is defined as an approach to pest control that combines biological, cultural, and other alternatives to chemical control with the judicious use of pesticides. The objective of IPM is to maintain pest levels below economically damaging levels while minimizing harmful effects of pest control on human health and environmental resources.

Integrated Pest Management (IPM) principles that strive to balance economics, efficacy and environmental risk, shall be incorporated into planning alternatives. Two or more biological, cultural, mechanical, sanitation, and chemical control methods used in combination to treat a

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

targeted pest is required. Examples of biological control methods are the use of grazing animals, predators, parasites, nematodes, and pest diseases (e.g., use of Bollgard cotton, which contains Bt (*Bacillus thuringiensis*) to control budworm and bollworm). Cultural control methods are the use of crop rotations, cultivations, sanitation, pruning, and microbials. Mechanical control methods include traps, barriers, tillage, site preparation, and mowing (e.g., use of scalping for site preparation to plant pine trees to control weeds). See Florida NRCS conservation practice standards: Conservation Crop Rotation, Code 328, Field Border, Code 386, Filter Strip, Code 393, Residue Mgt., Codes 329 A & B and Code 344, and Mulching, Code 484 for additional criteria on the use of IPM control methods on cropland. On pasture, hayland, rangeland, forest, and wildlife land see Florida NRCS conservation practice standards: Brush Mgt., Code 314, Forage Harvest Mgt., Code 511, Grazing Land Mechanical Treatment, Code 548, Prescribed Grazing, Code 528A, Forest Site Preparation, Code 490, Prescribed Burning, Code 338, Tree and Shrub Establishment, Code 612, Upland Wildlife Habitat Management, Code 645, and Wetland Wildlife Habitat Management, Code 644.

Clients shall be instructed to pay special attention to all environmental hazards and site-specific application criteria listed on pesticide labels and those recommended by University of Florida, Institute of Food and Agricultural Sciences (UF-IFAS) Extension Agents and/or a Certified Crop Advisor (CCA) representatives.

Additional Criteria To Protect Quantity and Quality of Commodities

As an essential component of both commodity specific IPM and IPM general principles, clients shall be encouraged to use the minimum level of pest control necessary to meet their objectives for commodity quantity and quality.

Treatment will be made when the pest damage reaches the “economic threshold level”.

Additional Criteria to Protect Soil Resources

In conjunction with other conservation practices, the number, sequence and timing of tillage operations shall be managed to maintain soil quality and maintain soil loss at or below the soil loss tolerance (T) or any other planned soil loss

objective. Use current erosion prediction technology (i.e. RUSLE 2 and WEPS) for soil loss, and the Soil Conditioning Index (SCI) for soil quality.

Clients shall be encouraged to pay special attention to pesticide label instructions for limiting pesticide residues in soil that may negatively impact non-target plants, animals and humans.

The pesticides TRIUMPH and TEMIK have special soil ratings in Florida. For TRIUMPH, county-specific lists of soils on which the product may be applied have been developed by the product manufacturer and are available from the County Extension Offices or the product dealers. TRIUMPH should not be applied to soils that are included on these lists. In the case of TEMIK, the product label contains a list of Florida soils which have special shallow drinking water well set-back requirements (see label for definition of “shallow well”). Labels for TEMIK should be carefully read before using the product.

Additional Criteria To Protect Water Resources

Pest management environmental risks, including the impacts of pesticides in ground and surface water on humans and non-target plants and animals, must be evaluated for all identified water resource concerns. Evaluation methods shall include the following: NRCS’ Windows Pesticide Screening Tool (WIN-PST) and National Agricultural Pesticide Risk Analysis (NAPRA). The WIN-PST program can be downloaded from <http://www.wcc.nrcs.usda.gov/water/quality/comm/pestmgt/winpst.htm>. Florida soils must also be downloaded. See the above web-site or Chapter 10, Pest Management, of the Florida Agronomy Field Handbook for download instructions.

When a chosen alternative has significant potential to negatively impact important water resources, (e.g., WIN-PST ‘Extra High’, ‘High’ or ‘Intermediate’ soil/pesticide human risk ratings in the drainage area of a drinking water reservoir), an appropriate set of mitigation techniques MUST be put in place to address risks to humans and non-target aquatic and terrestrial plants and wildlife. Pesticide alternatives with a WIN-PST soil/pesticide Hazard risk rating of ‘Extra High’, ‘High’, or ‘Intermediate’ shall be accompanied by one or more mitigating practices. Selection of mitigating practices and/or management

techniques shall be based on site-specific resource concerns and pesticide loss pathways. Table 1 contains a list of conservation practices, which can help mitigate the adverse impacts of pesticides depending upon pesticide loss pathways. Effects are rated as:

Effect	Positive	Negative
no effect	blank	blank
slight	+	-
moderate	++	--
significant	+++	---

Clients shall be encouraged to pay special attention to pesticide label instructions for limiting pesticide residues in leachate and runoff that may negatively impact non-target plants, animals and humans.

The number, sequence and timing of tillage operations shall be managed in conjunction with other sediment control tactics and practices, in order to minimize sediment losses to nearby surface water bodies.

Where surface water may be impacted, aquatic toxicity will be listed for the selection of chemicals to be used. Only chemicals labeled for aquatic use will be applied to any surface water.

In areas where groundwater is subject to high level of potential contamination an evaluation of the stage of plant growth, ground cover, half-life of the chemical, organic content of the soil, and amount of active ingredient in the chemical will be provided to the client.

Open mixing of chemicals will not occur within 100 feet of a well or surface water body. Open mixing will be performed down gradient of wells.

Where chemical mixing occurs continuously in the same location or within 100 feet of a well or surface water, closed transfer systems or portable agrichemical handling facilities will be used. See NRCS - Florida conservation practice standards, Agrichemical Mixing Station – Portable, Code 703 and Agrichemical Handling Facility, Code 702.

Backflow prevention devices shall be used on all water sources which supply water to chemical

mixing tanks or where chemicals are applied through irrigation systems.

Additional Criteria to Protect Air Resources

Clients shall be encouraged to pay special attention to pesticide label instructions for minimizing volatilization and drift that may negatively impact non-target plants, animals and humans.

Additional Criteria to Protect Plant Resources

Clients shall be encouraged to pay special attention to pesticide label instructions including those directed at:

- Preventing misdirected pest management control measures that negatively impact plants (e.g., removing pesticide residues from sprayers before moving to the next crop and properly adjusting cultivator teeth and flame burners).
- Appropriate climatic conditions, crop stage, soil moisture, pH, and organic matter in order to protect plant health.
- Limit pesticide residues in soil that can carry over and harm subsequent crops. Follow crop rotations or plant-back restrictions.

Additional Criteria to Protect Animal Resources

Clients shall be encouraged to pay special attention to pesticide label instructions that minimize negative impacts to animals, both wildlife and domestic.

Additional Criteria To Protect Humans

Clients shall be encouraged to pay special attention to pesticide label instructions that minimize negative impacts to humans.

Minimize exposure to chemicals, wear proper protective clothing, and use safety equipment as appropriate. Assure that agricultural workers and pesticide handlers are trained about general pesticide safety as required by the Worker Protection Standard.

The pesticide applicator shall know the exact field location to be treated.

Operators of equipment shall be alert at all times to avoid bodily injury and unnecessary exposure to chemicals.

Notify workers about areas where pesticide applications are taking place or where restricted-entry intervals are in effect. Unless the pesticide labeling requires both types of notification, notify workers either orally or by posting warning signs at entrances to treated areas. Inform workers which method of notification is being used. Reentry times shall be posted and followed.

Store pesticides in original containers in a locked, well ventilated weather resistant building. Post warning signs on or around the building. Locate the building so that accidental spills will create minimal environmental effects. Dispose of pesticide containers according to label directions and adhere to local or state regulations.

Provide emergency wash stations (decontamination sites) for personnel who might be accidentally exposed to chemicals.

Formulate a safety plan complete with telephone numbers and information about locations of emergency treatment centers for personnel exposed to chemicals. Post the Worker Protection Standard safety poster at a central location that workers and pesticide handlers can access.

Material Safety Data Sheets (MSDS) shall be readily accessible to personnel. See www.cpppress.com, "MSDS Reference" for latest manufactures MSDS information.

CONSIDERATIONS

The following should be considered when developing the pest management section of a conservation plan:

- Prevention, such as using pest-free seeds and transplants, cleaning tillage and harvesting equipment between fields, irrigation scheduling to avoid situations conducive to disease development, etc.
- Avoidance, such as using pest resistant varieties, crop rotation, trap crops, and adjusting planting dates to help control weed, insect, and disease problems.
- Monitoring, such as pest scouting, soil testing, weather forecasting, etc. to help target suppression strategies and avoid routine preventative pest control.
- Suppression, such as cultural, biological and chemical controls, that can reduce a pest population or its impacts. Chemical controls should be used judiciously in order to minimize environmental risk and pest resistance.
- The effect of adequate plant nutrients and soil moisture, favorable pH, good soil condition, and proper management of plant resource to reduce plant stress and improve plant vigor.
- Use of hand weeding for small, isolated areas, or on larger areas where labor costs are not prohibitive. Spot spraying and wick application of pesticides rather than full-coverage spraying should be considered when applicable.
- Pesticide characteristics such as solubility, toxicity, degradation process, mobility, persistence, adsorption, and efficacy, and their relationships to site characteristics such as soil, geology, depth to water table, proximity to surface water, topography, and sensitive areas to assess the potential impact on water quality.
- Timing of pesticide application in relation to present soil moisture, anticipated weather conditions, wind speed, and irrigation to achieve greatest efficiency and to reduce potential for offsite transport. The method of pesticide application, such as ground or aerial spraying, wicking, or dry granules is important to the degree of drift and volatilization that can be expected.
- The stage of plant growth and/or if soil applied in assisting with evaluating the leaching or runoff potential.
- The effects of erosion control practices, including subsurface water management, conservation buffers, and filter strips, used to reduce soil loss and runoff transport of adsorbed and dissolved pesticides.

- Leaving plant residue (residue management) on the surface increases organic matter, which reduce the chances of some herbicides like atrazine reaching groundwater.
 - The effects of repetitive use of the same pesticide(s) with the same mode of action on pest resistance and shifts in the pest types.
 - Effects of pest control measures on non-target soil organisms, and on aquatic and terrestrial life. Special care should be afforded to threatened and endangered species of plants and animals and their habitats.
 - Effects of the seasonal water budget on potential pesticide loss from the plant environment to surface or ground water.
 - Pesticide users must read and follow label directions, maintain appropriate Material Safety Data Sheet (MSDS), and become certified to apply restricted use pesticides.
 - Properly rinse equipment and re-use rinsate for subsequent batches of the same pesticide, where possible.
 - The dangers from excessive exposure to many chemicals.
 - The potential for pesticide drift based on droplet size and wind velocity.
 - Becoming familiar with Private Applicator Agricultural Pest Control (SM-53), UF, Cooperative Extension Service (CES), IFAS; and Applying Pesticides Correctly (SM-1), UF, CES, IFAS and the Environmental Protection Agency (EPA).
 - Location of sensitive resources and filter strip buffers. See NRCS - Florida conservation practice standard, Filter Strip, Code 393 and NRCS Publication "Conservation Buffers to Reduce Pesticide Losses" for guidance on flow lengths and widths of buffers.
 - Environmental risk analysis shall use WIN-PST Soil/Pesticide Interaction Loss Potential and Hazard Rating Report for alternative pest management recommendations. The environmental risk analysis will include Soil/Pesticide Interaction Screening Procedure 2 (SPISP2) ratings for Leaching Potential (ILP), Solution Runoff Potential (ISRP), Absorbed Runoff Potential (IARP), and Human and Fish Hazard Ratings. Use University of Florida, Institute of Food and Agriculture Science (UF, IFAS) Pesticide Selection Guides (Circular #961 through 1015, dated 1/98), crop specific supplement or copies of the filled out form(s) (last page of the circular) where the selection has been made by the cooperator in consultation with IFAS or a certified crop adviser.
 - Interpretation of Hazard Ratings. Hazard Ratings are divided into 5 classes. These are:
 - X – Extra High
 - H – High
 - I – Intermediate
 - L – Low
 - V – Very Low
- Hazard Ratings of 'Low' or 'Very Low' require no further action as long as they are used according to the label and meet quality criteria for Resource Management Systems (RMS's). Hazard Ratings of 'Intermediate' or 'High' require mitigation measures to meet quality criteria for a RMS. 'High' ratings warrant more extensive mitigation measures than 'Intermediate' ratings. Mitigation measures may not be effective for 'Extra High' hazard ratings if resources are highly sensitive or a high degree of resource protection is desired. In these cases, an efficacious, economically acceptable pesticide with a lower risk or an alternate method of pest control may be required to meet quality criteria for a RMS.

PLANS AND SPECIFICATIONS

The pest management component of a conservation plan shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

As a minimum, the pest management component of a conservation plan shall include:

- Plan map and soil map of managed site.
- Identification of appropriate mitigation techniques. See Table 1 for list of

management techniques and conservation practices.

OPERATION AND MAINTENANCE

The pest management component of a conservation plan shall include appropriate operation and maintenance (O&M) items for the client. As a minimum, the O&M plan shall include:

- The O&M plan shall be reviewed and updated periodically in order to incorporate new IPM technology, respond to cropping system and pest complex changes, and avoid the development of pest resistance.
- Maintain mitigation techniques identified in the plan in order to ensure continued effectiveness.
- Develop a safety plan for individuals exposed to chemicals, including telephone numbers and addresses of emergency treatment centers for individuals exposed to chemicals and the telephone number for the nearest poison control center. The National Pesticide Information Center (NPIC). The telephone number for NPIC is: **1-800-858-7378**.

Monday – Friday
6:30 a.m. to 4:30 p.m. Pacific Time

For advice and assistance with emergency spills that involve agri-chemicals, the local emergency telephone number should be provided. The national 24-hour CHEMTREC telephone number is: **1-800-424-9300**.

- Follow label requirements for mixing/loading setbacks from wells, intermittent streams and rivers, natural or impounded ponds and lakes, or reservoirs. (State or local regulations may be more restrictive).
- Post signs according to label directions and/or Federal, State, and local laws around sites that have been treated. Follow restricted entry intervals.

- Dispose of pesticides and pesticide containers in accordance with label directions and adhere to Federal, State, and local regulations.
- Read and follow label directions and maintain appropriate Material Safety Data Sheets (MSDS).
- Calibrate application equipment according to Extension and/or manufacturer recommendations before each seasonal use and with each major chemical change.
- Replace worn nozzle tips, cracked hoses, and faulty gauges.
- Maintain records of pest management for at least two years. Pesticide application records shall be in accordance with USDA Agricultural

Marketing Service's Pesticide Record Keeping

Program. See USDA's publication on Pesticide Record-keeping Requirements. Florida Pesticide Law requires certified applicators to keep records on the applications

of Restricted Use Pesticides (RUP). Information on the RUP needs to be recorded within two working days of the application and maintained for two years from the application date.

Table 1 – Mitigation Effectiveness Guide - Reducing Pesticide Impacts on Water Quality

Note: Pest Management (595) requires environmental risk evaluation and appropriate mitigation for all identified resource concerns. This table identifies management techniques and conservation practices that have the potential to mitigate pesticide impacts on water quality. Not all techniques will be applicable to a given situation. Relative effectiveness ratings by pesticide loss pathway are “no effect” (blank), “slight effect” (+/-), “moderate effect” (++)/(-), and “significant effect” (+++/-). The table also identifies how the techniques function. Effectiveness of any mitigation technique can be highly variable based on site conditions and how it is designed. Therefore, with guidance provided by the table, site-specific selection and design of mitigation techniques that are appropriate for identified resource concerns is left to the professional judgement of the conservation planner.

Pest Management Mitigation Techniques	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Management Techniques^{1/}				
Application Timing	+++	+++	+++	Reduces exposure potential - delaying application when significant rainfall events are forecast can reduce pesticide transport to ground and surface water, application when conditions are optimal can reduce the amount of pesticide applied, also delaying application when wind speed is not in accordance with label requirements can reduce pesticide drift to surface water
Formulations/Adjuvants	++	++	+	Reduces exposure potential – formulations and/or adjuvants that increase efficacy allow lower application rates
Lower Application Rates	+++	+++	+++	Reduces exposure potential - use lowest effective rate
Partial Treatment	+++	+++	+++	Reduces exposure potential - spot treatment, banding and directed spraying reduce amount of pesticide applied
Pesticide Label Environmental Hazard Warnings and BMPs	Required ^{2/}	Required ^{2/}	Required ^{2/}	Reduces exposure potential - label guidance must be carefully followed for pesticide applications near water bodies and on soils that are intrinsically vulnerable to erosion, runoff, or leaching
Scouting and Integrated Pest Management (IPM) Thresholds	+++	+++	+++	Reduces exposure potential - reduces the amount of pesticide applied
Set-backs	+	++	+	Reduces exposure potential - reduced application area reduces amount of pesticide applied, can also reduce inadvertent pesticide application and drift to surface water
Soil Incorporation – mechanical or irrigation	---	+++	+++	Reduces exposure potential for surface losses, but increases exposure potential for leaching losses

Pest Management Mitigation Techniques	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Substitution – <ul style="list-style-type: none"> Alternative pesticides Cultural controls Biological controls 	+++	+++	+++	Reduces hazard potential - use alternative pesticides with low environmental risk, substituting cultural (including burning and mechanical controls) and biological controls can reduce the need for pesticides
Conservation Practices ^{3/}				
Agrichemical Mixing Center - Portable (703) Agrichemical Handling Facility (702)	+++	+++	+++	Reduces the potential for point source pesticide contamination
Anionic Polyacrylamide (PAM) Erosion Control (450)	-	+	+++	Increases infiltration and deep percolation, reduces soil erosion
Bedding (310)	+	+	+	Increases surface infiltration and aerobic pesticide degradation in the rootzone
Brush Management (314)	+++	+++	+++	Using non-chemical brush control often reduces the need for pesticides, pesticide use requires environmental risk analysis and appropriate mitigation
Conservation Cover (327)	+++	+++	+++	Retiring land from annual crop production often reduces the need for pesticides, builds soil organic matter
Constructed Wetland (656)	+	+	++	Captures pesticide residues and facilitates their degradation
Conservation Crop Rotation (328)	++	++	++	Reduces the need for pesticides by breaking pest lifecycles
Contour Buffer Strips (332)		++	++	Increases infiltration, reduces soil erosion
Contour Farming (330)	-	+	+	Increases infiltration and deep percolation, reduces soil erosion
Contour Stripcropping (585)		++	++	Increases infiltration, reduces soil erosion
Cover Crop (340)	+	+	++	Increases infiltration, reduces soil erosion, builds soil organic matter
Deep Tillage (324)	-	+	+	Increases infiltration and deep percolation
Dike (356)	++/--	++	++	Reduces exposure potential - excludes outside water (++ leaching) or captures pesticide residues and facilitates their degradation (-- leaching)
Diversion (362)	+	+	+	Reduces exposure potential - water is diverted

Pest Management Mitigation Techniques	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Drainage Water Management (554)	++/--	++	++	Seasonal saturation may reduce the need for pesticides, drainage reduces storm water runoff, drainage increases infiltration and aerobic pesticide degradation in the rootzone during the growing season (++ leaching), seasonal saturation may bring the water table in contact with pesticide residues from the previous growing season (-- leaching)
Field Border (386)		+	++	Increases infiltration and traps adsorbed pesticides, often reduces application area resulting in less pesticide applied, can provide habitat for beneficial insects which reduces the need for pesticides, can provide habitat to congregate pests which can result in reduced pesticide application, also can reduce inadvertent pesticide application and drift to surface water
Filter Strip (393)		++	+++	Increases infiltration and traps adsorbed pesticides, often reduces application area resulting in less pesticide applied, can provide habitat for beneficial insects which reduces the need for pesticides, can provide habitat to congregate pests which can result in reduced pesticide application, also can reduce inadvertent pesticide application and drift to surface water
Forage Harvest Management (511)	++	++	++	Reduces exposure potential - timely harvesting reduces the need for pesticides
Forest Stand Improvement (666)	++	++	++	Reduces the potential for pest damage and the need for pesticides
Grade Stabilization Structure (410)			++	Traps adsorbed pesticides
Grassed Waterway (412)		+	++	Increases infiltration and traps adsorbed pesticides (should be applied with Filter Strips at the outlet and on each side of the waterway)
Grazing Land Mechanical Treatment (548)	-	+	+	Increases infiltration and deep percolation. Promotes healthier plants, which can better tolerate pests.
Hedgerow Planting (442)			(+) ^{4/}	Reduces adsorbed pesticide deposition in surface water, also can reduce inadvertent pesticide application and drift to surface water

Pest Management Mitigation Techniques	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Absorbed Runoff	
Herbaceous Wind Barriers (603)			(+) ^{4/}	Reduces wind erosion, traps adsorbed pesticides, can provide habitat for beneficial insects which reduces the need for pesticides, can provide habitat to congregate pests which can result in reduced pesticide application, also can reduce pesticide drift to surface water
Irrigation Land Leveling (464)	++	+	++	Reduces exposure potential - uniform surface reduces pesticide transport to ground and surface water
Irrigation System, Microirrigation (441)	++	+++	+++	Reduces exposure potential - efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation System, Sprinkler (442)	++	++	++	Reduces exposure potential - efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation System, Surface and Subsurface (443)	+	+	+	Reduces exposure potential - efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation System Tail Water Recovery (447)		+++	+++	Captures pesticide residues and facilitates their degradation
Irrigation Water Management (449)	+++	+++	+++	Reduces exposure potential - water is applied at rates that minimize pesticide transport to ground and surface water, promotes healthy plants which can better tolerate pests
Land Smoothing (466)	+	+	+	Reduces exposure potential - uniform surface reduces pesticide transport to ground and surface water
Mole Drain (482)	+	+	+	Increases infiltration and aerobic pesticide degradation in the rootzone *Note – avoid direct outlets to surface water
Mulching (484)	+	+/-	+/-	Often reduces the need for pesticides, natural mulches increase infiltration and reduce soil erosion (+ solution and adsorbed runoff), artificial mulches may increase runoff and erosion (- solution and adsorbed runoff)
Nutrient Management (590)	++	++	++	Promotes healthy plants which can better tolerate pests
Pasture and Hay Planting (512)	++	++	++	Retiring land from annual crop production often reduces the need for pesticides, builds soil organic matter, and reduces soil erosion.
Precision Land Forming (462)	++	+	++	Reduces exposure potential - uniform surface reduces pesticide transport to ground and surface water
Prescribed Burning (338)	++	++	++	Often reduces the need for pesticides

Pest Management Mitigation Techniques	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Prescribed Grazing (528A)	++	++	++	Improves plant health and reduces the need for pesticides
Range Planting (550)	++	++	++	Increases infiltration and uptake of subsurface water, reduces soil erosion, builds soil organic matter
Recreation Area Improvement (562)	++	++	++	Increases infiltration and uptake of subsurface water, reduces soil erosion, builds soil organic matter
Residue Management, No-till and Strip-Till (329A)	+	++	+++	Increases infiltration, reduces soil erosion, builds soil organic matter
Residue Management, Mulch-Till (329B)	+	++	+++	Increases infiltration, reduces soil erosion, builds soil organic matter
Residue Management, Ridge Till (329C)	+	++	+++	Increases infiltration, reduces soil erosion, builds soil organic matter
Residue Management, Seasonal (344)	+	+	+	Increases infiltration, reduces soil erosion, builds soil organic matter
Riparian Forest Buffer (391)	+	+++	+++	Increases infiltration and uptake of subsurface water, traps sediment, builds soil organic matter
Row Arrangement (557)	-	+	+	Increases infiltration and deep percolation, reduces soil erosion
Sediment Basin (350)			++	Captures pesticide residues and facilitates their degradation
Stripcropping, Field (586)		+	+	Increases infiltration, reduces soil erosion
Structure For Water Control (587)	-	++	+++	Captures pesticide residues and facilitates their degradation, increases infiltration and deep percolation
Subsurface Drainage (606)	+	++	++	Increases infiltration and aerobic pesticide degradation in the rootzone *Note – avoid direct outlets to surface water
Surface Drainage, Field Ditch (607)	+	+	+	Increases infiltration and aerobic pesticide degradation in the rootzone
Terrace (600)	--	++	+++	Increases infiltration and deep percolation, reduces soil erosion
Tree and Shrub Establishment (612)	+++	+++	+++	Retiring land from annual crop production often reduces the need for pesticides, increases infiltration and uptake of subsurface water, builds soil organic matter, and reduces soil erosion.
Vegetative Barriers (601)			++	Reduces soil erosion, traps sediment, increases infiltration
Waste Storage Facility (313)	+	++	++	Captures pesticide residues
Waste Treatment Lagoon (359)		+++	+++	Captures pesticide residues and facilitates their degradation

Pest Management Mitigation Techniques	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Waste Utilization (633)	++	++	++	Increases soil organic matter
Water and Sediment Control Basin (638)	-	++	+++	Captures pesticide residues and facilitates their degradation, increases infiltration and deep percolation
Well Decommissioning (351)	+++			Reduces potential for point source contamination
Wetland Creation (658)	+	+	+	Captures pesticide residues and facilitates their degradation
Wetland Enhancement (659)	+	+	+	Captures pesticide residues and facilitates their degradation
Wetland Restoration (657)	+	+	+	Captures pesticide residues and facilitates their degradation

^{1/} Additional information on pest management mitigation techniques can be obtained from Extension pest management publications, pest management consultants and pesticide labels.

^{2/} The pesticide label is the law - all pesticide label specifications must be carefully followed, including required mitigation. Additional mitigation may be needed to meet NRCS pest management requirements for identified resource concerns.

^{3/} Details regarding the effects of conservation practices on ground and surface water contamination by pesticides are contained in the Conservation Practice Physical Effects matrix found in the National Handbook of Conservation Practices.

^{4/} Mitigation applies to adsorbed pesticide losses being carried to surface water by wind.

REFERENCES

Chapter 5E-2 and 5E-9 (F.A.C.)
 Conservation Buffers to Reduce Pesticide Losses
 Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)
 Florida Statue (F.S.), Chapter 487
 FOTG, Section III
 Material Safety Data Sheets (MSDS) (www.cpppress.com)
 National Agriculture Pesticide Risk Analysis (NAPRA)
 NRCS conservation practice standards:
 Agrichemical Handling Facility, Code 702
 Agrichemical Mixing Station, Code 703
 Brush Management, Code 314
 Conservation Crop Rotation, Code 328
 Field Border, Code 386
 Filter Strip, Code 393
 Forage Harvest Management, Code 511
 Forest Site Preparation, Code 490

Grazing Land Mechanical Treatment, Code 548
 Mulching, Code 484
 Prescribed Burning, Code 338
 Prescribed Grazing, Code 528A
 Residue Management, Codes 329A&B and 344
 Upland Wildlife Habitat Management, Code 645
 Wetland Wildlife Habitat Management, Code 644
 Revised Universal Soil Loss Equation (RUSLE 2)
 Soil Conditioning Index (SCI)
 UF, IFAS, Applying Pesticides Correctly (SM - 1)
 UF, IFAS, Circular Numbers 961-1015
 UF, IFAS, Private Applicator Agricultural Pest Control (SM - 53)
 USDA Pesticide Recordkeeping Requirements for Certified Private Applicators of Federal Restricted Use Pesticides; July 1996.
 Wind Erosion Prediction System (WEPS 1.0)

Windows Pesticide Screening Tool (WIN-PST)

([http://www.wcc.nrcs.usda.gov/water/quality/comm
on/pestmgt/winpst.htm](http://www.wcc.nrcs.usda.gov/water/quality/comm
on/pestmgt/winpst.htm))

Worker Protection Standard (WPS)

Appendix C

Forage Harvest Management

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

FORAGE HARVEST MANAGEMENT

(Acre)
CODE 511



DEFINITION

The timely cutting and removal of forages from the field as hay, haylage, green-chop, or ensilage.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- Optimize the quality and quantity of harvested forage to meet the producer's management objectives.
- Promote vigorous plant regrowth.
- Maintain forage crop stand life for the desired time period.
- Maintain desired forage species composition of the stand.
- Use forage plant biomass as a nutrient uptake tool.
- Control insects, diseases and weeds.
- Maintain and/or improve wildlife habitat.

- Prevent soil erosion.

CONDITIONS WHERE THIS PRACTICE APPLIES

This practice applies to all land uses where machine harvested forage crops are grown.

CRITERIA

General criteria applicable to all purposes stated above

Forage harvest management shall comply with all local, state and Federal laws and regulations.

Forage shall be harvested at a frequency and height that will maintain a desired healthy plant community through its life expectancy. Harvest interval and minimum stubble heights are shown in Table 1 and Table 2.

Fertilizer shall be applied according to UF/IFAS recommendations and NRCS conservation practice standard Nutrient Management, Code 590. Applications of animal waste and bio-solids shall be in accordance with the NRCS, Agricultural Waste Management Field Handbook (AWMFH).

Forage shall be harvested at the stage of maturity that provides the best combination of quality and quantity to meet the producers management objective. Refer to section 600.0507 of the NRCS National Range and Pasture Handbook (NRPH) for additional information.

Forages shall be harvested in such a manner that will promote desired plant regrowth and protect the soil throughout the year to prevent water and wind erosion.

If plants show signs of short-term environmental stress (e.g. drought, flooding), management shall

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

be modified in a manner that ensures continued health and vigor of the forage species.

Delay harvest if prolonged or heavy precipitation is forecast that would seriously damage cut forage materials or cropland.

When weather conditions make it difficult to harvest the desired quality of forage, consider use of mechanical or chemical conditioners and/or ensile forage.

Stubble Height or Stage of Maturity. Cut forage plants at a height that will promote the vigor and health of the desired species. Cutting heights will provide adequate residual leaf area; adequate numbers of terminal, basal, or auxiliary tillers or buds; insulation from extreme heat or cold; and/or unsevered stem bases that store food reserves needed for full, vigorous recovery. Tables 1 and 2 show the harvest recommendations and cutting heights for forages commonly grown in Florida. Harvest timing and cutting heights will be manipulated to ensure germination and establishment of desired reseeding or seeded annuals.

Moisture Content. Harvest silage/haylage crops at the ideal moisture range for the type of storage structure(s) being utilized (see below).

Treat direct cut hay crop silage (moisture content > 70%) with chemical preservatives or add dry feed stuffs to avoid fermentation and seepage losses of digestible dry matter.

For optimal forage quality, rake, ted, or invert swaths, and bale when hay has sufficient moisture to prevent leaf loss.

Bale at optimum moisture levels to preserve forage quality and quantity. Approximate percent moisture should be as follows:

- Bale field-cured hay at 12 to 15 percent moisture. Hay baled at 16 to 20 percent moisture may result in the loss of quality due to heating and molding.
- Bale forced air-dried hay at 20 to 35 percent moisture.
- Rake hay at 30 to 40 percent moisture.
- Ted or invert swaths when moisture is above 40 percent.

Length of Cut. When harvested for silage, or haylage the forage will be chopped to a size that

allows adequate packing to produce the anaerobic conditions necessary to ensure the proper ensiling process.

Contaminants. Forage shall not contain contaminants at levels injurious to the health of the livestock class and type being fed.

Contaminants are any objectionable matter or toxin that can cause illness, death, or rejection of the offered forage material by livestock.

Harvested forages to be fed to pregnant animals or that were produced on fields fertilized with high levels of nitrogen or animal waste will be tested to determine the potential for poisoning by nitrates, prussic acid and grass tetany. Refer to the guidelines in Table 3 when feeding forages containing nitrates.

Additional criteria to promote vigorous plant regrowth or maintain the life of the stand for the desired time period.

Cut forage plants at a harvest interval that will provide adequate food reserves and/or basal or auxiliary tillers or buds for regrowth and/or reproduction to occur without loss of plant vigor.

Cut reseeding annuals at a stage of maturity and frequency that ensures the production of viable seed or ample carryover of hard seed to maintain desired stand density.

Refer to Table 1 for the recommended stage of maturity and harvest intervals.

Additional criteria for forage crops used as nutrient uptake tools.

Employ a harvest regime that utilizes the maximum amount of available or targeted nutrients. For specific nutrient uptake, select species that can maximize uptake.

Forage harvest shall be managed to preserve the longevity of the forage species.

Additional criteria to control disease, insect, and weed infestations.

Fields will be regularly inspected to determine the level of disease, insects and weed infestations.

If a foliar disease, insects, or weeds threaten stand survival or production objective, schedule

harvest periods as needed to control disease, insect, and weed infestations.

When disease, insect and weed infestations exceed the economic threshold and are uncontrollable by forage harvest management alone, weed control shall be planned and applied. Pesticide applications shall be planned and applied in accordance with NRCS conservation practice standard Pest Management, Code 595, and all pesticide label instructions

Additional criteria to maintain or improve wildlife habitat.

Maintain appropriate harvest schedule(s), cover patterns, and plant height to provide suitable habitat for the desired wildlife specie(s).

Schedule forage harvests to avoid the peak nesting season or other critical periods in the life cycle of the desired wildlife species.

Pesticide use shall be reduced to the maximum amount possible while maintaining the health and vigor of the forage crop. All pesticides will be applied in accordance with the label instructions.

Leave a portion of the field (10 to 30%) unharvested to provide nesting, foraging and escape cover for wildlife if possible.

CONSIDERATIONS

When pastures produce forage in excess of livestock demand during high growth rate periods, consider preserving forage quality by machine harvesting a portion of the standing crop. Coordinate this practice with the NRCS conservation practice standard Prescribed Grazing, Code 528A.

Well-fertilized plants withstand more intense harvest schedules and may produce a higher quantity and quality of forage. Coordinate this practice with the NRCS conservation practice standard Nutrient Management, Code 590.

To control forage plant diseases, insects, and weeds, clean harvesting equipment after harvest and before storing.

Do not cut forages until dew, rain, or irrigation water on leaves has evaporated.

Take care not to produce stored forages whose quality is less than that needed for optimum performance of the animal being fed. For

example, over mature forage is usually low in Crude Protein and low in Digestible Organic Matter. The over mature forage will reduce animal performance and result in the producer importing supplemental feed to meet his/her management objectives.

Direct cut grass and legume silage can create silage leachate (seepage). Consider the collection, storage, and disposal of this leachate as part of an agricultural waste management system.

In conjunction with harvest options, explore storage and feeding options that will retain acceptable forage quality and minimize digestible dry matter loss.

When rainfall and/or humidity levels cause unacceptable forage quality losses in at least one harvest during the year, consider ensiling the forage to reduce or eliminate field-drying time. Other options include: green-chopping, grazing, the use of desiccants, preservatives, conditioners, macerating implements, or barn curing techniques to reduce field drying time. These techniques can improve the timeliness of harvest and preserve forage quality.

To reduce safety hazard, avoid operating harvesting and hauling equipment on steep field slopes (over 15 percent), particularly on cross slope traffic patterns.

Lessen incidence of disease, insect damage, and weed infestation by managing for desirable plant vigor.

PLANS AND SPECIFICATIONS

Plans and specifications for forage harvest management shall be site specific and shall be in keeping with this standard and shall describe the requirement for applying the practice to achieve its intended purpose(s).

Provide the landowner/manager detailed specifications in a site-specific job sheet, or in the practice narrative of the conservation plan.

These plans and specifications shall be consistent with this standard

OPERATION AND MAINTENANCE

Before forage harvest, clear fields of debris that could damage machinery, or if ingested by

livestock, lead to sickness (for example, hardware disease) or death.

Monitor weather conditions and take action accordingly before and after cutting. This will optimize forage wilting or curing time to preserve feed quality and prevent forage swaths or windrows from smothering underlying plants.

Inspect and repair harvest equipment following manufacturer's preventative maintenance procedures.

All safety shields shall be in place during machine operation to prevent injury or death. Shut off machinery before working on or unclogging moving parts.

Select equipment sizes and capacities that will handle the acreage normally harvested in a timely and economically feasible manner.

Operate all forage harvesting equipment at the optimum settings and speeds to minimize loss of leaves.

Set shear-plate on forage chopper to the proper cutting height cut for the crop being harvested. Keep knives well sharpened. Do not use recutters or screens unless forage moisture levels fall below recommended levels for optimum chopping action.

Regardless of silage/haylage storage method, ensure good compaction and an airtight seal to exclude oxygen and mold formation.

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- NRCS Conservation Practice Standards:
Nutrient Management, Code 590
Pest Management, Code 595
Prescribed Grazing, Code 528A
- National Range and Pasture Handbook
- Agricultural Waste Management Field Handbook

Table 1 – Hay Harvesting Guide

Forage Species	Harvest	Growth Stage or Height to Harvest	Regrowth Period (days)	Minimum Cutting Height (inches)
Alfalfa ^{1/}	1st cutting	Full bud	30-35	3
	Other cuttings	1/10 bloom	30-35	3
Arrowleaf Clover	Only one cutting	Early bloom	---	2
AlyceClover	All cuttings	Early bloom (or just before flowering) 18-24 inches	---	3
Bahiagrass ^{2/}	1st cutting	12 inches	28-35	2
	Other cuttings	Every 3 - 4 weeks or when regrowth is 12 inches high	21-28	2
Hybrid Bermudagrass	1st cutting	14 to 16 inches height	28-42	3
	Other cuttings	Every 4 to 5 weeks or when regrowth is 15 inches high	28-35	3
Carpon desmodium	All cuttings	Early bloom	---	3
Clovers	All cuttings	Early bloom	35-42	3
Dallisgrass	Usually only one cutting	Boot to bloom	---	3
Eastern Gamagrass ^{1/}	All cuttings	Boot to early head 16-36 inches	28-42	8
Fescue, Tall	1 st cutting	Boot to early head	28-42	3
	Other cuttings	When regrowth is 10 inches.	28-42	3
Indigo (hairy)	All cuttings	30-36 inches	---	4
Johnsongrass ^{1/}	All cuttings	Boot	---	8
Limpograss (Hemarthria)	All cuttings	16 to 24 inches	35-42	8
Lespedeza, Annual	Only one cutting	Early bloom & before bottom leaves begin to fall	---	2
Millet, Pearl	All cuttings	Height of 30 to 40 inches	---	6
Pangolagrass	All cuttings	12 to 18 inches height	28-35	3
Perennial Peanut	All cuttings	Early to full bloom or when regrowth is 10-12 inches	42-56	2
Rhodesgrass (callide)	All cuttings	14-16 inches	28-35	3
Ryegrass	One cutting	Boot to early head	---	2
Sericea Lespedeza ^{1/}	All cuttings	15 to 18 inches high	---	5
Small Grains	One cutting	Boot to early head	---	2
Soybean or Cowpea	All cuttings	Mid- to full bloom	---	
Stargrass	1st cutting	14 to 18 inches height	28-35	4
	Other cuttings	When regrowth is 15 inches tall	28-35	3
Sudangrass & Sorghum-Sudan Hybrids -	All cuttings	Height of 30 to 40 inches	---	6
Switchgrass ^{1/}	All cuttings	Boot	28-35	6

^{1/} The last cutting should be early enough to allow for sufficient regrowth to store carbohydrates within the plant before frost. The regrowth may be cut or grazed, after frost or the dormant period begins

^{2/} Bahiagrass is not recommended for hay or haylage due to the low quality at recommended harvest height.

Table 2 – Guidelines for Harvesting and managing Forages Harvested as Silage ^{1/}

Crop	Stage of Harvest		Yield potential tons DM/ acre/year	Dry matter at harvest %	WSCHO ^{a/} % DM	Management suggestions
	1 st harvest	Additional harvests				
Warm-season Annuals						
Corn	Grain in dent, black layer forming	---	4-8	28-35	10-20	Direct cut
Forage Sorghum	Boot or soft dough	---	3-8 per harvest	20-35	10-20	Select varieties with higher dry matter at harvest (>28% DM)
Sudan, Sorghum- Sudan, Millet	36" height to boot	36' height to boot	2-4 per harvest	15-30	10-15	Wilt if <25% DM
Soybeans	Pre-pod to bean fill, before leaf drop	Usually 1 harvest	1-3	25-40	2-4	Wilt if < 30% DM
Cowpea	Pre-pod to pea fill	Usually 1 harvest	1-3	15-30	5-8	Wilt if < 30% DM
Cool-season Annuals						
Rye, Oats, Wheat, Triticale	Boot to soft dough	---	2-4	20-30	8-12	Wilt if <25% DM
Ryegrass	Boot to heading	Every 30 days	2-4	15-30	8-12	Wilt if <25% DM
Warm-season Perennials						
Bermudagrass, Stargrass	Pre-head (12-15" tall)	Every 4-5 weeks	6/10	18-30	2-4	Wilt if < 30% DM
Bahiagrass	Pre-head	Every 4-5 weeks	3-5	20-30	<5	Wilt if < 30% DM
Limpograss (Hemarthria)	12-15" tall	Every 5-7 weeks	4-8	20-30	<5	Wilt if < 30% DM
Perennial Peanut	8-12" tall	Every 5-7 weeks	2-4	18-30	1-4	Wilt if < 30% DM
Cool-season Perennial						
Alfalfa	Bud to 10% flower	Bud to 10% flower	4-6	22-35	4-7	Wilt if < 30% DM

^{1/} Chambliss, C. G., ed. 1999. Florida Forage Handbook. SP 253. University of Florida, Gainesville, Florida

^{a/} Water-soluble carbohydrates – sugars fermented to lactic and other acids during ensiling.

Table 3 "Guidelines for nitrate in feedstuffs (% dry-matter basis) complete ration ^{a/ 1/}

Nitrate Content ^{b/}	Comments
0.0 - 0.44	This level is considered safe to feed under all conditions.
0.44 - 0.66	This level should be safe to feed non-pregnant animals under all conditions. It may be best to limit its use for pregnant animals to 50% of the total ration on a dry matter basis.
0.66 - 0.88	Feeds safely fed if limited to 50% of the total dry matter in the ration.
0.88 - 1.54	Feeds should be limited to about 35% to 40% of the total dry matter in the ration. Feeds containing over .88% nitrate should not be used for pregnant animals.
1.54 - 1.76	Feeds should be limited to 25% of the total dry matter in the ration. Do not use for pregnant animals.
> 1.76	These feeds are potentially toxic. Do <i>NOT</i> feed.

^{1/} Halsey, L. A., Nitrates in Forage Cause Cattle Deaths: A common Weed and Uncommon Circumstances. 1998 Florida Beef Cattle Short Course. Gainesville, FL

^{a/} (Faulkner & Hutjens, 1989).

^{b/} (% NO₃⁻)

Appendix D

Prescribed Grazing

NATURAL RESOURCES CONSERVATION SERVICE

PRESCRIBED GRAZING

(Acre)
Code 528A

DEFINITION

The controlled harvest of vegetation with grazing or browsing animals.

PURPOSES

This practice may be applied as part of a conservation management system to accomplish one or more of the following:

- * Maintain a stable and desired plant community, or improve or maintain the health and vigor of selected plant(s).
- * Provide or maintain food, cover and shelter for animals of concern.
- * Improve or maintain animal health and productivity.
- * Maintain or improve water quality and quantity.
- * Reduce accelerated soil erosion and maintain or improve soil condition.

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied on all lands where grazing and/or browsing animals are managed.

CRITERIA

General Criteria Applicable For All The Purposes Stated Above.

The level of herbage removal or grazing intensity by animals will be applied within the acceptable tolerance of the key forage species present upon the site and management goals of the landowner or manager. This level of herbage removal will be plant species specific, and will reflect the growth/maturity and season of year that

grazing occurs. In addition, the health and vigor of non-key forage plants common to the site will not be sacrificed in the application of this practice standard.

Management goals will be developed by incorporating the land owners or managers goals with the quality criteria in Section III of the Field Office Technical Guide (FOTG). Refer to Sections I and II of the FOTG for additional guidance.

On rangeland, grazed forest, and/or native pasture, no more than 50% by weight of the total annual production of key forage species will be grazed by livestock and/or wildlife. For criteria in selecting key forage species refer to Chapter of the National Range and Pasture Handbook, 1997. If prescribed grazing is applied to a field, pasture or paddock for which herbage removal by livestock will only occur during the dormant season, then 65% by weight of the total annual production of key forage plants may be grazed. Document utilization of key forage species on form SCS-RANGE-414.

For domestic or tame forage species managed on pasture or hay lands, do not graze below the minimum height during the grazing period to maintain plant health and vigor. The criteria for common forage crops are shown in Table 1:

Table 1

Grazing Height for Common Forages

Forage Crop	Min. Ht. To Begin Grazing (Inches)	Min. Ht. During Grazing (Inches)
Jointvetch (Aeschynomene)	12	8
Bahiagrass	6	2
Imp. Bermudagrass	6	4

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

and Stargrasses		
Carpon Desmodium	6	2
Clover, Arrow/Crimson	6	3
Clover, White	6	3
Indigo, Hairy	24	12
Limpograss (Hemarthria spp.)	12	4
Oats	6	4
Perennial Peanut (Arbrook)	12	6
Perennial Peanut (Florigraze)	6	4
Pangola Digitgrass	8	6
Pearlmillet	24	12
Rye	10	4
Ryegrass	6	3
Forage Sorghum	24	12
Wheat/Triticale	6	4

Base the frequency of defoliation (grazing) on the rate and physiological conditions of plant growth. Length of grazing periods will be based on the rate of growth.

A Prescribed Grazing plan will be developed for use as an initial guide and modified as conditions warrant.

Additional Criteria for Maintaining or Improving Plant Health and Vigor.

Duration and intensity of grazing will be based on plant health requirements and expected productivity of key forage species to meet the management unit (pasture or paddock) objectives.

Enough vegetative cover will be maintained to prevent accelerated soil erosion due to wind or water and to maintain soil moisture.

Additional Criteria to Improve Animal Health and Productivity.

Grazing should be applied in accordance with the needs of wildlife populations present within the operating unit. Requirements of food, water, cover, and nesting and/or breeding habitat shall be considered in the application of this practice standard. Guidance on the habitat requirement of wildlife may be found in the "[Management for](#)

[Wildlife, a Supplement to Wildlife Standards and Specifications for Florida](#)" in your reference file. Additional guidance can be obtained from the Local Agricultural Extension Agent, Institute of Food and Agricultural Sciences (IFAS), Florida Game and Freshwater Fish Commission (FG&FWFC), or the U.S. Fish and Wildlife Service.

Movement of domestic animals will be in a manner to improve and/or maintain animal health and performance, and reduce or prevent spread of disease, parasites, and contact with harmful insects.

Grazing should be applied in accordance with forage quality and quantity criteria that best meets the production requirements for the kind and/or class of animal.

Duration, intensity, frequency, and season of grazing in or near surface waters will be applied in such a manner that the impacts to vegetative and water quality will be positive.

Duration, intensity, frequency, and season of grazing will be applied to enhance nutrient cycling through improved manure distribution and increased rate of decomposition

Additional Criteria to Improve Water Quality and Quantity.

Application of this practice will manipulate the intensity, frequency, duration, and season of grazing to:

1. Ensure optimum water infiltration,
2. Maintain or improve riparian and upland area vegetation,
3. Protect stream banks from erosion,
4. Manage for deposition of fecal material away from water bodies,
5. Promote ecological and economical stable plant communities throughout the management unit, which meet landowner objectives.

Duration, intensity, frequency, and season of grazing in or near surface waters will be applied in such a manner that the impacts will not degrade the vegetative and/or water quality resources.

Additional Criteria to Reduce Soil Erosion and Maintain or Improve Soil Condition.

Duration, intensity, frequency, and season of grazing shall be managed to minimize compaction or other detrimental effects.

Duration, intensity, frequency, and season of grazing shall be managed to sustain an adequate vegetative cover to prevent accelerated soil erosion as measured by the Revised Universal Soil Loss Equation (RUSLE). For assistance with the RUSLE, refer to Chapter 6 of the Florida Agronomy Field Handbook.

Grazing shall be planned and managed to ensure healthy vigorous plants that can improve soil tilth, and store nitrogen and carbon in the soil.

CONSIDERATIONS

Supplemental feed may be necessary to meet the desired nutritional levels for animals of concern. The location of supplemental feed, salt and minerals should be considered to reduce negative impacts to soil, water, air, plant, and animal resources. It is advisable to locate salt and supplement feeders away from water sources.

Use of natural or artificial shelter or shade will be included as part of this practice when conditions demand.

Animal husbandry requirements, which may affect the design of the grazing prescription, will be considered.

Prescribed Grazing should consider the needs of other enterprises utilizing the same land, such as hunting, camping and other recreational uses.

Prescribed grazing schedules should be designed to account for variations in the growth and amount of forage available due to seasonal or annual variations in temperatures, precipitation and hydrology.

Grazing periods should be short (1-8 days) provided enough pastures are available in the grazing system to allow an adequate forage regrowth period. The regrowth period is usually 15 to 28 days in the early summer and 30 to 42 days in the late summer and fall.

PLANS AND SPECIFICATIONS

A Prescribed Grazing plan will be prepared for all fields, pastures, or paddocks. Incorporate any additional feed supplementation needed for the operating unit or portion of an operating unit being addressed in the Prescribed Grazing schedule. Grazing schedules will be recorded on form FL-ECS-1 or another manner that is readily understood and useable by the decision-maker in their daily operations. The manner of documentation will depend upon the size and complexity of the operating unit and the details required for a grazing prescription.

A prescribed grazing schedule will include the following information:

1. Documentation of the expected forage quantity and quality for each management unit(s), i.e., pastures during the grazing season.
2. Documentation of the number of domestic livestock by kinds and class, and the number of grazing/browsing wildlife of concern anticipated within the management unit(s), if applicable.
3. The grazing plan should identify the dominant forage species or mixture, the minimum grazing height for the forage species used and the grazing season for each forage species.
4. Documentation of nutritional surpluses and deficiencies from the forage resources for each kind and class of livestock and grazing/browsing wildlife of concern in the management unit(s).
5. Supplemental feed requirements needed to meet the desired nutritional level for the kind and class of livestock and grazing/browsing wildlife of concern in the management unit(s).
6. Development of a planned grazing schedule for livestock, which identifies periods of grazing, resting, and other treatment activities for each management unit(s).
7. A contingency plan that details potential problems, i.e., drought, and a guide for adjusting the grazing prescription to

insure resource management and economic feasibility without resource degradation will be developed.

8. The Prescribed Grazing schedule will specify when evaluations of the current feed and forage supply should be made.

OPERATION AND MAINTENANCE

The manager will apply prescribed grazing on a continuing basis in accordance with the Prescribed Grazing plan and make adjustments as needed to ensure that the concept and objectives of its application are met.

If an imbalance is determined the Prescribed Grazing plan shall be adjusted accordingly or other harvesting techniques applied.

REFERENCES

FOTG Sections I, II, III,
National Range and Pasture Handbook
Management for Wildlife, a Supplement to
Wildlife Standards and Specifications for
Florida.
Form SCS-RANGE-414
Form FL-ECS-1
Florida Agronomy Handbook

Appendix E

Prescribed Burning

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
PRESCRIBED BURNING**

(acre)
CODE 338



DEFINITION

Applying controlled fire to a predetermined area.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- to control undesirable vegetation,
- to prepare sites for harvesting, planting or seeding,
- to control plant disease,
- to reduce wildfire hazards,
- to improve wildlife habitat,
- to improve plant production quantity and/or quality,
- to remove slash and debris,
- to enhance seed and seedling production,
- to facilitate distribution of grazing and browsing animals, and/or
- to restore and maintain ecological sites.

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied on all land uses, as appropriate.

CRITERIA

General Criteria Applicable to All Purposes

The planning and application of prescribed burning shall comply with applicable Federal, state, and local laws, rules and regulations. Florida Statute Chapter 590.125 and Chapter 5I-2 of the Florida Administrative Code (FAC) grant the Florida Division of Forestry (FDOF) the authority and responsibility to regulate prescribed burning in Florida.

Official definitions from Florida Statute 590.125 and FAC 5I-2:

“Prescribed burning means the controlled application of fire in accordance with a written prescription for vegetative fuels under specified environmental conditions while following appropriate precautionary measures that ensure that the fire is contained to a predetermined area to accomplish the planned fire or land-management objectives”.

“Prescription means a written plan establishing the criteria necessary for starting, controlling, and extinguishing a prescribed burn”.

“Smoke sensitive areas are areas within which, for reasons of visibility, health or human welfare, smoke could have an adverse impact.”

All individuals responsible for assisting landowners plan and approve this practice in accordance with this standard shall meet the minimum NRCS certification requirements as specified in the Florida NRCS Conservation Planning Policy and the NRCS Prescribed Burning Job Approval Authority.

Prescriptions for prescribed burning shall be completed in accordance with the rules and procedures established by the FDOF.

Specific consent of the landowner or their designee shall be obtained before requesting a FDOF burn authorization and prior to ignition of any prescribed burn, in accordance with procedures established by the FDOF.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

The procedure, equipment, and the number of trained personnel shall be adequate to accomplish the intended purposes stated in the prescribed burn prescription.

The following items shall be considered when developing recommendations for a prescribed burn:

- the expected weather conditions,
- human and vehicular traffic that may be impeded by heat or smoke,
- the presence and significance of historic and/or cultural resources, and
- liability issues, such as the location of known hazards (e.g., utility lines, natural gas pipelines, etc.).

The appropriate method(s), timing and frequency of prescribed burns to achieve the desired objective(s) shall be selected using the general guidelines contained in this standard and Amendment FL-2 of the National Range and Pasture Handbook (NRPH).

Safety and health precautions shall be integrated into the timing, location and expected intensity of the burn.

An emergency action plan shall be developed for each treatment area. The plan shall include escape routes for all personnel and actions to be taken in the event of unexpected weather changes or fire behavior.

Timing and intensity of burning will be commensurate with soil and site conditions to sustain productivity, minimize soil erosion and adverse effects to soil properties (organic matter, soil moisture), wildlife habitat and to accomplish all of the intended purpose(s).

Weather conditions shall be monitored to ensure that the prescribed burn remains within prescription. The fireboss is the individual responsible for ensuring that weather parameters, such as wind speed, relative humidity and other data that affect fire behavior is monitored during the burn, and that the burn is executed in accordance with the site specific burn prescription.

Adequate fire lines and/or firebreaks will be prepared prior to initiation of a prescribed burn. All firebreaks shall be planned and installed in accordance with this standard and Florida NRCS conservation practice standard Firebreak Code 394. Dimensions and types of firebreaks, (e.g., plowed, disked, burned, mowed, or other treatment) will be designed for each burn and recorded as noted under the Plans and Specifications section of this

standard. The width of firebreaks shall be estimated based upon on-site estimations of fuels loads and weather conditions.

Fuel loads may be determined by on-site evaluations of the vegetation. Refer to Amendment FL-2 of the NRHP for guidance in evaluating the fuel load. Procedures accepted by other agencies or organizations, such as, the FDOF, the University of Florida (UF), USDA – Forest Service (FS), USDI-Bureau of Land Management (BLM), and The Natural Conservancy (TNC) may be used to estimate fuel loads.

Special precautions to contain prescribed burns shall be taken when burning tall, dense vegetation, volatile fuels that occur in the burning area, or other fuels that could act as ladder fuels increasing the potential for crown fires. These precautions may include removal of the ladder fuels, mechanical treatment to reduce fuel load and vegetation height, increasing the width of the firebreak, or all of the above.

Volatile fuels are those fuels, which exude volatile oils and petroleum-like substances. These substances will increase the intensity and unpredictability of a prescribed burn. Many native trees and shrubs in Florida, such as the saw palmetto, wax myrtle, and sand pine, are considered to be volatile fuels.

Use of fire plows to construct firebreaks shall be minimized when other less disruptive means of firebreak construction are available such as blacklining. A blackline is an area adjacent to a natural or constructed firebreak where the vegetation has been burned prior to ignition of the main burn. Blacklines are generally created under safer burning conditions when lower air temperatures and higher relative humidity reduce the risk of the fire escaping.

Other precautionary measures to protect sensitive wildlife habitat, headquarters, windbreaks, highly erodible areas, archeological/cultural, or other areas that would be unsafe or undesirable to burn shall be planned and installed prior to ignition of the prescribed burn.

Evaluation of expected smoke impacts shall be conducted using the "smoke screening" procedure as described in Amendment FL-2 of the NRHP when planning the burn. Critical smoke sensitive areas shall be identified and documented recorded as noted under the Plans and Specifications section of this standard. Smoke management impacts shall be monitored during and after the burn.

Prescribed burning is not allowed if smoke will impact any smoke sensitive areas, or restricts visibility including but not limited to:

- reduce visibility at a public airport,
- when the Department of Environmental Protection (DEP) determines that ambient air concentrations of total regulated particulate matter or ozone exceeds or potentially may exceed the primary or secondary standards for these pollutants,
- when the DEP has issued an air quality/stagnation advisory that pertains to the National Ambient Air Quality Standards,
- during a National Weather Service Air Stagnation Advisory,
- if visibility on public roadways is reduced to less than 1,000 feet,
- if smoke accumulates in smoke sensitive areas between one hour before sunset and 9:00 A.M. the next day, and/or
- when the fire poses a threat to public health, safety, and property protection.

Monitoring of the prescribed burn shall continue until such time that smoke no longer presents a potential hazard.

This practice may involve soil disturbance if fire plows or other equipment is used to create firebreaks or roads for vehicles. The area of potential effect for each undertaking must be investigated for cultural resources under Section 106 of the National Historical Preservation Act of 1966. Refer to Section I of the NRCS Florida Field Office Technical Guide for additional information.

Potential damage to threatened and endangered (T&E) plants and animals shall be evaluated when planning this practice using current NRCS and U.S. Fish and Wildlife Service (FWS) policy, procedures, and guidelines. Refer to NRCS Threatened and Endangered Species Policy contained in General Manual, Part 410.22 and National Planning Procedures Handbook Part FL600.11(g) and Part FL600.5 for additional information.

The burned area shall be incorporated into a system of management allowing for the response of the desired plant community. The management system should include Florida NRCS conservation practices Prescribed Grazing, Code 528A, Forage Harvest Management, Code 511, Upland Wildlife Habitat Management, Code 645, and Wetland Wildlife Habitat Management, Code 644 as applicable.

All prescribed burns shall be planned and applied with consideration for wildlife needs in order to maintain or improve; nesting, brood rearing, and escape cover. Refer to Florida NRCS conservation practice standards for Wetland and Upland Wildlife Habitat Management, Codes 644 and 645, respectively.

Prescribed burns on sites with organic (muck) soils shall be limited to periods when the soil surface is in a saturated condition.

When prescribed burning is applied to grazing land, a deferment from grazing shall be provided to restore vigor of key plants and improve the condition of the plant community. Deferment periods shall be shown on the "Annual Grazing Plan" and the burn plan. Deferment periods shall meet the following criteria:

- The deferment period shall be a minimum of 30 consecutive days during the growing season. A longer deferment period may be needed if the vigor of the desirable plants is low prior to the burn or if the vegetation does not recover as quickly as expected.
- Growing season burns (March 1-Sept. 30) shall have a minimum 30 day grazing deferment period beginning immediately after the burn.
- Winter burns (Nov-Feb) on areas containing wiregrass (*Aristida* spp.) shall have a grazing deferment beginning within 45 days following the burn or March 15, whichever is earlier. No more than 30 days of grazing are allowed during the 45-day period following the burn. The grazing deferment shall continue for a minimum of 90 consecutive days or until the vegetation has recovered to the point that grazing will not damage the plants.
- Grazing deferment periods following timber harvest or site preparation shall be for an entire growing season. This will allow desirable plants to recover from the combined stress of burning and timber management activities.

Other post burn management activities shall be planned and applied as needed to ensure the practice accomplishes the intended purpose(s).

Additional Criteria to Control Undesirable Vegetation

Prescribed burns to control brush or other undesirable vegetation shall consider the anticipated seed production and re-sprouting response of the target specie(s).

The frequency and intensity of the planned burn shall be based on the re-growth of the target species, weighed against forage and/or wildlife habitat considerations.

Prescribed burns planned to control or manage woody or non-woody plants as an objective shall meet the criteria and specifications shown in Florida NRCS conservation practice standard Pest Management Code 595.

Prescribed burns planned for areas with known infestations of noxious and/or non-invasive species shall address the anticipated response of those species during and following the prescribed burn.

Re-establishment of desirable vegetation shall be planned for burned areas where re-establishment is needed to prevent encroachment of undesirable plants, control soil erosion, and restore historic plant communities. Re-planting or seeding activities shall be consistent with Florida NRCS conservation practice standards; Critical Area Planting, Code 342, Pasture and Hay Planting, Code 512, Range Planting, Code 550 and Tree/Shrub Establishment, Code 612, as applicable.

Additional Criteria to Improve Wildlife Habitat

Prescribed burns applied to maintain or improve wildlife habitat shall meet the criteria and specifications contained in Florida NRCS conservation practice standards Upland Wildlife Habitat Management, Code 645, and Wetland Wildlife Habitat Management, Code 644.

The appropriate season of burning, burning technique, burning frequency, and size of burn shall be selected based on the wildlife habitat needs and site limitations. Refer to the Amendment FL-2 of the NRPH recommendations to meet specific goals and objectives.

Where practical, prescribed burns shall be planned and applied in a manner that creates a "patchy" mosaic of burned and unburned vegetation. Conditions with higher relative humidity and soil moisture are likely to assist in creating a patchy burn.

Additional Criteria to Improve Plant Production Quantity and/or Quality.

Prescribed burns shall be planned to provide optimum benefit to the plant species of concern.

When possible prescribed burns shall be conducted during periods of adequate soil moisture for plant recovery following the burn.

Appropriate protection from livestock, human, and wildlife activities shall be implemented to allow the vegetation to recover from the stress of the burn. Burned areas shall be protected until the vegetation has recovered sufficiently to allow use to be restored. This may require installation or modification of other conservation practices such as Fence, Code 382 and Prescribed Grazing, Code 528A.

Additional Criteria to Facilitate Distribution of Grazing and Browsing Animals.

The location, timing, frequency and extent of the burn shall be planned with consideration given to the sites vegetative characteristics (species composition, distribution, and forage quality), animal nutritional requirements, and the overall management objectives.

Appropriate protection from grazing and browsing animals shall be implemented. Burned areas shall be protected until the vegetation has recovered sufficiently to allow use to be restored. This may require installation or modification of other conservation practices such as Fence, Code 382 and Prescribed Grazing, Code 528A.

The location of livestock fences, working facilities, watering facilities, and other structures shall be considered when planning the prescribed burn.

Historical management activities, including prescribed burning and grazing shall be considered when planning prescribed burns. If possible, avoid conducting prescribed burns during the same time of year in consecutive burns.

CONSIDERATIONS

Where practical, the season, frequency, and intensity of prescribed burning should mimic the natural occurrence of fire typical of the ecological sites being managed.

Consider the use of existing barriers such as lakes, streams, wetlands, roads, and constructed firebreaks in the design and layout of this practice.

Adjacent landowners, local fire departments, local law enforcement agencies, and public safety officials in areas likely to be affected should be notified prior to ignition of the prescribed burn.

Florida law provides reduced liability to individuals who hold current certification as a "Certified Prescribed Burner" from the FDOF. To be eligible for this reduced liability the landowner must meet the conditions of Florida Statute 590.125 (3) (b).

Florida law also allows "Certified Burners" in some areas of the state to conduct "nighttime" burning under specific conditions. Refer Florida Statute Chapter 590.125 and Chapter 5I-2 of the Florida Administrative Code for additional information.

To minimize carbon release and associated smoke management problems reduce the amount of fuel to be burned, delay burning until acceptable weather conditions exist, alter the method of burn and intensity of the burn, and complete the burn as quickly as possible.

PLANS AND SPECIFICATIONS

Individuals who are currently certified in accordance with FDOF procedures and/or who hold the appropriate NRCS Job Approval Classification shall prepare written prescribed burning recommendations and/or prescriptions.

Specifications for applying this practice shall be prepared for each treatment area and recorded using approved:

- FDOF Prescribed Burn Plan forms,
- NRCS specification sheets,
- NRCS job sheets, and
- narrative statements in the conservation plan,
- or other acceptable documentation.

Refer to Amendment FL-2 of the NRPH for exhibits of approved forms.

All necessary permits and authorizations shall be obtained by the landowner or authorized agent before implementation of the practice.

At a minimum, NRCS recommendations for conducting a prescribed burn plan will include the following sections:

I. General Planning Information

Because this information may be compiled several years before a prescribed burn will be applied to a specific land unit, the material in this section should be limited to information that can be easily obtained and provided based on aerial photos and the conservation-planning process.

II. Site-specific Recommendations

This information will be used to plan to apply a prescribed burn to a specific area during a specified time period. Therefore, the information and recommendations contained in this section shall be based on a thorough on-site evaluation of the proposed burn area.

Section I shall be completed by individuals holding NRCS Prescribed Burning Job Approval Level 1 or higher, or who are Certified Prescribed Burners in accordance with FDOF procedures and policies.

Section II shall be completed by individuals holding NRCS Prescribed Burning Job Approval Authority Level II or higher, or who are Certified Prescribed Burners in accordance with FDOF procedures and policies, or the landowner.

I. General Planning Information

At a minimum this section shall include:

1. A written description of the specific purpose and objective(s) for the prescribed burn.
2. A written recommendation for the best season or month for conducting the prescribed burn, for each ecological site to be burned to meet the objective(s).
3. A brief, written description of the ecological communities and type of fuel to be burned. Include an estimate of the fuel load (tons/acre), or average vegetation height and density, or the number of years since the last burn.
4. Describe on the conservation plan map or practice narrative the planned sequence of prescribed burns by year and season to meet the overall management objectives.
5. Describe on the plan map the location of potential hazards (e.g. high voltage power lines, natural gas pipelines, etc.), critical smoke sensitive areas (e.g. hospitals, roads, schools, etc), and areas that will take special precautions (e.g. structures, critical habitat areas, etc.) that can be identified without a detailed on-site evaluation.
6. Provide general post-burn management requirements needed to meet the management objectives. This may include general descriptions of grazing deferments, or action needed to prevent accelerated soil erosion or degradation of the plant community.

II. Site-specific Recommendations

At a minimum this section shall include:

1. A properly labeled map which includes the specific location of:
 - a. Planned burn units
 - b. Existing and planned firebreaks.

- c. Specific hazards, structures, and other items or areas that are present within or adjacent to the burn area.
2. Acceptable ranges of weather and soil moisture conditions to perform the prescribed burn, which shall include all of the following items:
 - a. Wind Speed
 - b. Wind Direction
 - c. Relative Humidity
 - d. Air Temperature
 - e. Soil Moisture
3. Techniques used to ignite the prescribed burn.
 - a. Firing technique(s), e.g., backing fire, etc.
 - b. Ignition plan and/or firing sequence(s).
 - c. Planned starting time(s).
4. Preparation of the treatment area for the burn:
 - a. Firebreak construction:
 - i. Width
 - ii. Type of firebreak
 - b. Actions necessary to reduce potential hazards (e.g., power lines, snags, structures, etc.) and precautions taken to protect personnel and property.
5. Personnel, equipment, and safety requirements.
 - a. Number of personnel needed.
 - b. Kind and amount of equipment.
 - c. Emergency action plan.
6. Personnel assignments and responsibilities.
7. Description and guidance for specific post-burn management activities. The information shall include all information necessary for successful post burn management to meet the stated purpose and objective(s), such as:
 - a. Site specific grazing deferment periods including the dates and duration.
 - b. Site specific planting information, e.g., selected varieties, planting dates, planting rates, etc.

OPERATION AND MAINTENANCE

Operation

The kinds and expected variability of site factors (e.g., fuel condition and moisture content, weather conditions, human and vehicular traffic that may be impeded by heat or smoke, liability, and safety/health precautions) shall be monitored during the operation of this practice.

Personnel should be briefed regarding escape routes and emergency precautions prior to initiation of a prescribed fire.

Where distance between personnel conducting the burn prevents effective communication, portable communication equipment (e.g., radios, cell phones, etc.) is needed to ensure the safety of the personnel and others.

Sufficient fire suppression equipment and personnel shall be on site commensurate with the size of the burn unit and the expected behavior of the fire to reduce the likelihood of a wildfire or other safety, health or liability incident. The fireboss should be prepared to contact the FDOF for assistance in extinguishing the fire, as necessary.

Prescribed burning shall be stopped and the fire extinguished as quickly as possible, if any of the following conditions exist:

1. Fire behavior is erratic.
2. Spot fires occur and are difficult to control.
3. Unforeseen changes in the weather occur such as wind shifts.
4. Smoke does not disperse as expected.
5. Smoke drifts presents a hazard to public roads or other smoke sensitive areas.
6. The prescribed burn does not comply with all laws, rules, regulations and standards.
7. Large fuels ignite, and there are not enough personnel to extinguish the fire before dark; creating a potential hazard to smoke sensitive areas.
8. The fireboss is directed to extinguish the fire by FDOF personnel or local law enforcement officials.
9. Or any other reason that puts the prescribed burn "out of prescription".

Maintenance

The monitoring and evaluation activities shall be completed by individuals holding NRCS Prescribed Burning Job Approval Level 1 or higher.

1. Monitoring of the burned site and adjacent areas until such time as ash, debris and other consumed material are at pre-burn temperatures.
2. Evaluations to determine if the stated objectives were met and to improve coordination of future burns. Initial evaluations should be conducted within 2 weeks following the burn. Long term evaluations should be conducted during or after the first growing season following the burn. Items to consider in the evaluation include:
 - a. Were the preburn preparations properly completed?
 - b. Were the initial objectives met?
 - c. Was the burn prescription followed?
 - d. Were deviations from the burn prescription documented?
 - e. Was the burning technique(s) adequate to meet the planned objectives?
 - f. Were weather conditions, fire behavior, and smoke dispersion within the planned limits of the prescription?
 - g. What were the effects on the soil, vegetation, water, and wildlife resources?
 - h. Did the fire escape the planned area?
 - i. How could future burns be improved?
 - j. Were the post burn activities (e.g. grazing deferment, re-planting, etc.) applied correctly to meet the stated purpose or objective(s) of the burn?

REFERENCES

- Florida Administrative Code, Chapter 5I-2 Rural Open Burning.
(<http://flame.fl-dof.com/Env/Laws/5I-2.html>)
- Florida's Fire Laws and Open Burning Regulations, Florida Division of Forestry, Forest Protection Bureau, 2000,
(<http://flame.fl-dof.com/Env/law.html>)
- Florida Statutes, Chapter 590.125 Forest Protection,
(http://flame.fl-dof.com/Env/Laws/590_99.html)
- NRCS conservation practices standards
Critical Area Planting, Code 342
Brush Management, Code 314
Firebreak, Code 394
Pasture and Hay Planting, Code 512
Pest Management, Code 595
Prescribed Grazing, Code 528A
Range Planting, Code 550
Tree/Shrub Establishment, Code 612
Upland Wildlife Habitat Management, Code 645
Wetland Wildlife Habitat Management, Code 644
- NRCS Field Office Technical Guide, Section I, Cultural Resources.
- NRCS General Manual, 180, Part 409, Florida Amendment 23, February. 2002.
- NRCS National Range and Pasture Handbook, 1997.
Appendix A
FL600.0505(d)
- NRCS Threatened and Endangered Species Policy:
NRCS General Manual, Part 410.22
National Planning Procedures Handbook, Part FL600.11(g)
Part FL600.5
- Section 106, National Historic Preservation Act of 1966.
- Technical Publication R8-TP 11, A Guide For Prescribed Fire In Southern Forests, U.S. Forest Service Southern Region, February 1989.

Appendix F
Inspection Checklist

Lamb Island Dairy Remediation

Inspection Checklist

Date: _____ Time: _____

Weather Condition: _____

Inspector: _____

MAINTENANCE ITEMS:	COMMENTS	CORRECTIVE ACTION REQ'D	DATE COMPLETED
HIA Emergency Overflow Culvert			
Flashboard Height?			
Max. Height 43 ft NGVD			
Visible Debris on Structure			
Visible Corrosion			
HIA Inflow and Outflow Culverts (SW1 and SW2)			
Flashboard Height?			
SW1 Max Height 43 ft NGVD			
SW1 Recommended Height - No Boards			
SW2 Max Height 43 ft NGVD			
Visible Debris on Structure			
Visible Corrosion			
Eco-Reactor Cell Culverts			
Flashboard Height?			
Recommended Height - No Boards			
Max. Height 43 ft NGVD			
Visible Debris on Structure			
Visible Corrosion			
Swale Discharge Culvert (SW3) and Outlet Discharge Culvert (SW5)			
Flashboard Height?			
SW3 Max Height 39 ft NGVD			
SW5 Max Height 37.75 ft NGVD			
Visible Debris on Structure			
Visible Corrosion			
Edge of Farm Containment Berm			
Grass Condition (Height and Cover)			
Visible Erosion or Rutting			
Bank Failure			
Settlement			
HIA Containment Berm			
Grass Condition			
Visible Erosion or Rutting			
Bank Failure			
Settlement			