13.0 CONSERVATION ELEMENT

(1) DATA REQUIREMENTS

a) Inventory Of The Following Existing And Environmental Resources, Where Present On The University Campus And Within The Context Area

1. Rivers, lakes, bays, wetlands (including estuarine marshes), and bottom lands:

Rivers, lakes and bays:

MODESTO A. MAIDIQUE

A physical inventory was completed in December 2000 that identified 15 small bodies of water on the campus, all of which appear to be artificial (see Figure 13.1: Conservation Element). None of these small lakes are connected to canals or other bodies of water. The littoral zones of most of these lakes are sparsely vegetated with a variety of wetland plants.

One lake located off campus falls within the context area, located near the intersection of SW 122th Avenue and SW 11th Street, is surrounded by residential units and landscaped lawn areas and has a reasonably well-developed littoral zone. Canals bordering Modesto A. Maidique and the Miami-Dade County Fair and Exposition to the north, west and south are vegetated primarily with the aquatic weed Hydrilla (Hydrilla verticillata). The canals are steep sided, and as such have no littoral zone.

BISCAYNE BAY CAMPUS

Fresh and brackish water: Bodies of fresh or brackish water on the Biscayne Bay Campus are restricted to two lakes on campus. A shoreline investigation of these lakes was conducted on December 2000. The larger of the two lakes (west lake) is located immediately to the west of the main parking areas on campus (see Figure 13.3: Conservation Element). The lake appears to have little or no submerged aquatic vegetation other than algal growth that coats most visible surfaces; there is approximately a 40 square-foot patch of emergent vegetation on one shoreline. Along the entire perimeter of the lake, shoreline vegetation has been mowed to the water's edge, except for a few planted bald cypress trees (Taxodium distichum). The second lake (east lake) is located immediately to the south of the built-up area of campus. The shore of this lake has been landscaped and has emergent aquatic vegetation lining its entire shoreline, and extending up to 10 feet into the water in some areas.

An inspection of the campus in December 2000 revealed that the previously described conditions in the 1994 Master Plan still exist on the site.

Within the context area of Biscayne Bay Campus, the Oleta River is the only river. The Oleta River extends into the context area to the north of Biscayne Bay Campus and is an important site for the endangered West Indian manatee (Trichechus manatus latirostris). Visual surveys of the river from adjacent roadways conducted and analysis of aerial photographs show that the river is bordered by apparently healthy stands of mangroves which show little or no human disturbance. The exception to this is the 30 acre Terama Tract, located between the Sunny Isles Causeway and the Oleta River, which has been filled and is now dominated by Australian pine (Casuarina sp.) (Figure 13.3).

The only other bodies of fresh or brackish water located within the context area are several small lakes located within the Munisport Landfill site. These lakes were dug to a depth of 35 feet below mean sea level sometime in the 1970s. For descriptions of these lakes the reader is referred to the EPA Record of Decision (EPA,-1990)

Salt water: The northeastern, eastern, and southern sides of Biscayne Bay Campus are bounded by Biscayne Bay, the Intracoastal Waterway, and mangrove channels that join with the Bay. The northeastern edge of Biscayne Bay Campus also abuts a small estuary that extends northward from the Intracoastal Waterway and Biscayne Bay.

Within the context area of Biscayne Bay Campus, both the Oleta River State Recreation Area and the state mangrove preserves are bounded by portions of Biscayne Bay and the Intracoastal Waterway. Further, a flow-through pond system has been constructed within Oleta River State Recreation Area to enhance mangrove habitat.

The principal concern regarding potential surface water and development conflicts involves the need to ensure that development of the campus does not negatively impact the habitat of the West Indian manatee. There are opportunities to enhance the habitat values of the lakes and shoreline. These should be considered in devising goals for campus development.

Wetlands:

Although, to our knowledge, no jurisdictional wetland determinations have been carried out at either Modesto A. Maidique or Biscayne Bay Campuses, several areas on these campuses may qualify as jurisdictional wetlands under current Federal and State wetlands regulations. Determination and delineation of jurisdictional wetlands is a complicated process, involving analysis and interpretation of hydrology, soils and vegetation data, and is beyond the scope of work for this project. An inventory of flora at the Modesto A. Maidique and Biscayne Bay Campus is listed in Table 13.1.

MODESTO A. MAIDIQUE

The entire Modesto A. Maidique campus was probably a sawgrass wetland prior to development of the Tamiami Airport, previously developed on this site. The context area was also historically a wetland. Potential wetlands at Modesto A. Maidique can be classified into the following categories:

Exotic-invaded hardwood hammocks containing wetland vegetation: In the southeast corner, the four largest tree islands (Figure 13.1) contain a mix of native and exotic hardwood trees and shrubs, wetland herbs and graminoids, and other disturbance-adapted plants. At least one of the small hammocks appears to be an old pond that has been overgrown.

Sweet bay-dominated hardwood hammock): An oval-shaped hammock , located near the southwestern corner of Modesto A. Maidique, appears to be an old bay head that has been partially cleared. Wetland vegetation appears in the hammock and along its margins. This area has been designated as an on campus botanical and wildlife area, and portions of it may be jurisdictional wetlands. The hammock represents a valuable natural botanical feature of Modesto A. Maidique.

One lake located off campus falls within the context area. This artificial lake, located near the intersection of SW 122th Avenue and SW 11th Street, is surrounded by residential units and landscaped lawn areas and contains a reasonably well-developed littoral zone. This lake was not inspected during the December 2000 site visit.

Wetland soils: Only one of the three soil types that the Miami-Dade County Soil Conservation Service lists as present at Modesto A. Maidique can be considered a hydric (wetland) soil. Hallandale fine sand, located in the northern third of the campus and in two smaller areas in the east and southeast portions of the campus, are classified as a hydric soil by the USDA Soil Conservation Service (USDA, 1987). This soil type is level, poorly drained sandy soil underlain by limestone 7-20 inches deep. The remaining two soil types, Urthodents/Urban land complex and Urban land are well drained, either by nature of the base material (excavated limestone material) or by topography and drainage systems. Hydric soils were undoubtedly more extensive on site prior to the construction of Tamiami Airport.

Virtually all of Modesto A. Maidique Campus was historically a wetland. An accurate determination of the hydric nature of the on-site soils will be made during future jurisdictional wetland delineations conducted prior to development. To our knowledge, no jurisdictional wetland determinations have been carried out on campus or within the context area, and, at least for the campus, lack of such a determination could lead to problems and conflicts as new facilities are developed. Jurisdictional determinations should be carried out prior to proceeding with any new building construction.

In the absence of clearly defined jurisdictional wetland areas within the campus, development may result in an avoidable loss of wetland areas and any potential wetland mitigation or restoration. For this reason, it is necessary to pursue a jurisdictional determination from the appropriate regulatory agencies.

BISCAYNE BAY CAMPUS

Most, if not all of the Biscayne Bay Campus was wetland prior to the development of the Interama Tract. Potential wetlands at Biscayne Bay Campus can be classified into the following categories:

Mangrove forests: The mangrove forests on the Biscayne Bay Campus are most certainly jurisdictional wetlands; however, the definitive boundaries of these areas are unclear. A complex analysis beyond the scope of work is required to determine the boundaries**.**

Mangrove forests located on the Biscayne Bay Campus are restricted to thin bands of mangroves that line an estuary on the north, as well as canals and ditches on the north and northeastern edges of the campus, and along the western edge of the campus (Figure 13.3). Extensive mangrove forests occur in state mangrove preserves located to the north and west of the Biscayne Bay Campus, and within the Oleta River State Recreation Area, located to the north and east of the Biscayne Bay Campus. Mangrove mitigation work has been completed or is in progress at several sites in the Oleta River State Recreation Area. Currently, mangrove mitigation planting is being conducted at the southern edge of Biscayne Bay Campus. For a discussion of mitigation sites and descriptions of mitigation projects at Biscayne Bay Campus and context area, see Section (1) 4. These mitigation projects are not related to Biscayne Bay Campus construction activities.

Back-mangrove associations: Back-mangrove vegetation associations occur in those areas that transition between mangrove forest and upland plant communities. On the Biscayne Bay Campus, back-mangrove associations occur on the land adjacent to the mangrove-lined canals at the north and west boundaries of the campus (Figure 13.3). Within the context area, back-mangrove associations occur on the land adjacent to the side of mangrove forests in the Oleta River State Recreation Area and in the State mangrove preserves.

Beach strand: Beach strand vegetation dominates the eastern edge of the Biscayne Bay Campus which is primarily shoreline, a portion of which is stabilized with rip-rap for erosion control. Beach strand also occurs along portions of the south edge of Biscayne Bay Campus. Within the context area, beach strand occurs along portions of the shorelines within the Oleta River State Recreation Area and may occur in the State mangrove preserves.

Disturbed areas containing wetland plant species: In the southeast corner of the Biscayne Bay Campus, a large area was cleared of vegetation sometime prior to January 1993 (Figure 13.3). Since that time, the scraped area has been recolonized by a mix of upland and transitional wetland weeds (Table 13.1 Preliminary Plant Species List). This area can be classified as a low-grade wetland, although it should be analyzed to determine if it is a jurisdictional wetland. The previously described area was examined during the December 2000 inspection of the campus. Currently, a portion of this area is being planted with mangroves, as compensatory mitigation for previous wetland impacts at the campus.

Wetland soils: Only one of the four soil types that the Miami-Dade County Soil Conservation Service lists as present on the Biscayne Bay Campus can be considered a hydric (wetland) soil. Terra Ceia muck, located to the north and northwest of the central building area of the campus, are classified as a tidal hydric soil by the United States Department of Agriculture Soil Conservation Service (USDA, 1987). Terra Ceia muck is tidally inundated and supports mangrove vegetation associations at the Biscayne Bay Campus and within the context area. Two of the remaining soil types, Urthodents (excavated limestone material) and Urban land (the built-up portion of campus) are well drained, either by the nature of the base material, or by topography and drainage systems. Urthodents occur to the northeast of the built-up campus area, and to the south and west. The final soil type, Opa-locka Rock outcrop complex, occurs in an area immediately south of the campus building area, and is bounded by Biscayne Bay to the east and by Urthodents to the west. This soil type is also well-drained.

It should be noted that most, if not all, of the Urthodents and Urban land areas of Biscayne Bay Campus were likely underlain by hydric soils prior to the development of the Interama Tract in 1962.

Prior to development, the Biscayne Bay Campus was predominately wetlands, most likely mangrove forest. These wetlands were cleared during the development of the site as the Interama project. An analysis of the campus and context area would likely indicate that these areas are historical wetlands. An accurate determination of the hydric nature of the on-site soils will be made during future jurisdictional wetland delineations conducted prior to development.

Table 13.1 Preliminary Plant Species List for the FIU Campuses

N=Native, E=Exotic, BBC=Biscayne Bay Campus, MAM=Modesto A. Maidique
* listed as present in the landscape design manual (Modesto A. Maidique campus only)

COMMON NAME	SCIENTIFIC NAME	PRESENCE			
		N	E	BBC	MAM
Ear-leaf acacia	Acacia auriculaeformis		X	X	X
Paurotis palm	Acoeloraphe wrightii	X			X
Leather fern	Acrostichum danaeifolium	X		X	
Woman's tongue	Albizia lebbeck		X	X	X
Golden trumpet	Allamanda cathartica		X	X	
Ginger lily*	Alpinia zerumbet				X
Alligator weed	Alternanthera maritima		X	X	
Slender amaranth	Amaranthus viridis	X		X	
Ragweed	Ambrosia artemesiifolia		X	X	X
Toothcups	Ammania coccinea	X		X	
Cashew	Anacardium sp.		X		X
Broomsedge	Andropogon glomeratus	X			X
Pine fern	Anemia adiantifolia	X			X
Sugar apple*	Annona squamosa			X	X
Anthurium*	Anthurium heiglii		X		X
Alexander palm*	Archoneophoenix alexandrae		X		X
Asian marlberry	Ardisia elliptica		X	X	X
Queen palm*	Arecastrum romanzofianum	X		X	
Scarlet milkweed	Asclepias curassavica		X		X
Asparagus fern	Asparagus plumosus		X		X
Carambola, Starfruit*	Averrhoa carambola		X		X
Black mangrove	Avicennia germinans	X		X	
Saltbush	Baccharis halimifolia	X		X	X
Water hyssop	Bacopa monnieri	X			X
Orchid tree	Bauhinia sp.		X	X	X
Beggar's tick	Bidens pilosa		X	X	X
Bishopwood	Bischofia javanica		X	X	X
Akee*	Blighia sapida		X		X
Kapok tree	Bombax sp.		X		X
Borreria	Borreria laevis		X	X	X
Silver sea oxeye*	Borrichia frutescens	X		X	X
Bougainvillea*	Bougainvillea spectabilis		X	X	X
Black olive	Bucida buceras	X			X
Willow bustic	Bumelia salicifolia	X			X
Pindo palm*	Butia capitata		X		X
Beauty berry	Callicarpa americanum	X			X
Bottlebrush	Callistemon vinninalis		X	X	X
Ylang-ylang*	Cananga odorata		X		X
Seaside bean	Canavalia rosea	X		X	
Papaya	Carica papaya		X		X
Dwarf carissa*	Carissa macrocarpa		X		X
Natal plum*	Carissa macrocarpa		X		X
Fishtail palm*	Caryota mitis		X		X
Seven-year apple	Casasia clusiifolia	X		X	
Cassia	Cassia sp.		X		X
Australian pine*	Casuarina cunninghamianni	X		X	
Australian pine*	Casuarina equisetifolia		X	X	X
Australian pine*	Casuarina lepidophloid		X		X
Madagascar periwinkle	Catharanthus roseus		X	X	X
Silk cotton tree*	Ceiba pentandra		X		X
Sandspur	Cenchrus sp.	X		X	X
Coin-wort	Centella asiatica		X	X	X
Day jasmine	Cestrum diurnum		X	X	
Night blooming jasmine*	Cestrum nocturnum		X	X	X

Table 13.1 Preliminary Plant Species List (continued)

COMMON NAME	SCIENTIFIC NAME	PRESENCE			
		N	E	BBC	MAM
Spurge	Chamaesysce hypericifloia	X		X	X
Spurge	Chamaesyce hyssopifolia	X			X
European fan palm*	Chamaerops humilis		X		X
Spiderplant*	Chlorophytum comosum		X		X
Silk floss tree*	Chorisa speciosa		X		X
Areca palm*	Chrysalidocarpus lutescens		X		X
Coco plum (Red Tip)*	Chrysobalanus icaco	X			X
Satin leaf	Chrysopyllum oliviforme	X			X
Thistle	Cirsium horridulum	X			X
Lime, Orange, etc.*	Citris aurantiifolia		X		X
Sawgrass	Cladium jamaicensis	X			X
Bleeding heart*	Clerodendron thomsoniae		X		X
Pitch apple	Clusia rosea	X			X
Pigeon plum	Coccoloba diversifolia	X			X
Big-leaf sea-grape*	Coccoloba grandifolia	X			X
Sea grape	Coccoloba uvifera	X		X	X
Silver palm*	Coccothrinax argentata	X			X
Old man palm*	Coccothrinax crinita		X		X
Buttercup tree*	Cochlospermum vitifolium		X		X
Coconut*	Cocos nucifera	X		X	X
Croton*	Codiaeum variegatum		X		X
Taro	Colocasia esculenta		X		X
Buttonwood*	Conocarpus erectus	X		X	X
Silver buttonwood*	Conocarpus erectus (sericeus)	X		X	X
Geiger*	Cordia sebestena	X		X	X
Ti plant*	Cordyline terminalis		X		X
Queen sago*	Cycas circinalis		X		X
Dwarf/King sago*	Cycas revoluta		X		X
Bermuda grass*	Cynodon dactylon		X		X
Flat sedge	Cyperus haspan	X		X	X
Flat sedge	Cyperus ligularis	X		X	X
Indian rosewood*	Dalbergia sissoo		X		X
Royal poinciana	Delonix regia		X	X	X
White-tops	Dichromena floridensis	X			X
Diodea	Diodea virginiana	X			X
Black sapote*	Diospyros digyna		X		X
Varnish leaf*	Dodonaea viscosa	X			X
Tree dracaena*	Dracaena arborea		X		X
Dracaena “Janet Craig”	Dracaena deremensis		X		X
Corn plant*	Dracaena fragrans		X		X
Dracaena*	Dracaena marginata		X		X
Golden dew drop*	Duranta repens		X		X
Oil palm	Elais guineensis		X		X
Spike rush	Eleocharis geniculata	X		X	X
Soft rush	Eleocharis interstincta	X		X	X
Pothos*	Epipremnum aureum	X		X	
Loquat*	Eriobotrya japonica		X		X
Coral bean	Erythrina herbacea		X		X
Variegated tiger claw*	Erythrina variegata		X		X
Gum tree*	Eucalyptus spp.		X		X
White stopper	Eugenia axillaris	X			X

Surinam cherry*	Eugenia uniflora		X		X

Table 13.1 Preliminary Plant Species List (continued)

COMMON NAME	SCIENTIFIC NAME	PRESENCE			
		N	E	BBC	MAM
Dog fennel	Eupatorium capillifolium	X		X	X
Mistflower	Eupatorium coelestinum	X			X
Blue daze*	Evolvulus glomerata	?			X
Strangler fig	Ficus aurea	X			X
Weeping fig*	Ficus benjamina		X		X
	Ficus carica		X		X
Indian rubber tree	Ficus elastica		X		X
Strangler fig	Ficus microcarpa		X		X
Cuban laurel*	Ficus nitida		X		X
Yellowtops	Flaveria linearis	X		X	X
Forestiera*	Forestiera segregata	X			X
Lignum vitae*	Guaiacum sanctum	X			X
Manatee grass	Halodule wrightii	X		X	
Firebush	Hamelia patens	X			X
Tulipwood*	Harpullia arborea		X		X
Scorpiontail	Heliotropium polyphyllum	X		X	X
Day lily*	Hemerocallis sp.		X		X
Hibiscus*	Hibiscus rosa-sinensis		X		X
Mahoe	Hibiscus tiliaceus	X		X	
Forster sentry palm*	Howeia forsteriana		X		X
Elodea	Hydrilla verticillata		X	X	X
Water pennywort	Hydrocotyle bonariensis		X	X	X
Marsh pennywort	Hydrocotyle umbellata		X	X	X
Bottle palm*	Hyophorbe lagenicaulis		X		X
Spindle palm*	Hyophorbe verschaffetltii		X		X
Musky mint	Hyptis alata	X		X	X
Dahoon holly*	Ilex cassine	X			X
Yaupon*	Ilex vomitoria	X			X
Railroad vine	Ipomoea pes-caprae	X		X	
Morning glory	Ipomoea spp.		X	X	X
Red ixora*	Ixora coccinea		X		X
Jacaranda*	Jacaranda mimosaefolia		X		X
Rush	Juncus megacephalus	X			X
Southern red cedar*	Juniperus siliciola	X			X
Life plant	Kalanchoe sp.		X	X	
Golden rain tree*	Koelreuteria formosana		X	X	X
Black ironwood*	Krugiodendron ferreum	X			X
Crape myrtle*	Lagerstroemia indica		X		X
Queen crape myrtle*	Lagerstroemia speciosa		X		X
White mangrove	Laguncularia racemosa	X		X	
Lantana	Lantana camera		X	X	X
Lantana	Lantana depressa	X			X
Lantana	Lantana involucrata	X		X	X
Lantana*	Lantana montevidensis		X		X
Lead tree	Leucaena leucocephala		X	X	X
Southern wax privet*	Ligustrum japonicum		X		X
Lippia	Lippia nodiflora	X		X	X
Liriope*	Liriope muscari		X		X
Chinese fan palm*	Livistona chinensis		X		X
Primrose willow	Ludwigia peruviana	X		X	X

Wild tamarind	Lysiloma bahamensis	X			X
Macadamia nut*	Macadamia tetraphylla		X		X
Sweet bay*	Magnolia virginiana	X			X
Apple*	Malus pumila (ana)		X		X
Mango*	Mangifera indica		X	X	X

Table 13.1 Preliminary Plant Species List (continued)

COMMON NAME	SCIENTIFIC NAME	PRESENCE			
		N	E	BBC	MAM
Sapodilla*	Manilkara zapota		X		X
Mastic	Mastichodendron foetidissimum	X		X	
Melaleuca*	Melaleuca quinquernervia		X	X	X
Melanthera	Melanthera nivea	X		X	
Small-leaved cat tongue	Melanthera parvifolia	X			X
Creeping cucumber	Melothria pendula	X		X	X
	Metopium toxiferum	X			X
Climbing hemp vine	Mikania scandens	X		X	X
Spanish cherry*	Mimusops elengii		X		X
Mimusops*	Mimusops roxburghii		X		X
Mitrewort	Mitreola angustifolia	X			X
Balsam apple	Momordica balsamina	X			X
Monstera*	Monstera deliciosa		X		X
Orange jasmine*	Murraya paniculata		X		X
Banana	Musa paradisiaca		X		X
Simpsons stopper*	Myrcianthes fragrans	X			X
Wax myrtle	Myrica cerifera	X			X
Myrsine	Myrsine guianensis	X			X
Triangle palm*	Neodypsis decaryi		X		X
Sword fern*	Nephrolepis exaltata		X	X	X
Common reed	Neyraudia reynaudiana		X	X	X
Guinea chestnut*	Pachira aquatica		X		X
Screw pine*	Pandanus utilis		X		X
Maiden-cane	Panicum hemitomon	X			X
Jerusalem thorn*	Parkinsonia aculeata		X		X
Bahia 'Argentine' sod*	Paspalum notatum		X		X
Salt jointgrass	Paspalum vaginatum	X		X	
Corky passionflower	Passiflora suberosa	X		X	X
Egyptian starclusters	Pentas lanceolata		X		X
Avocado*	Persea americanum		X	X	X
Sweet bay	Persea borbonia	X			X
Yellow Poinciana*	Petophorum pterocarpum		X		X
Queen's wreath*	Petrea volubilis		X		X
Philodendron*	Philodendron selloum		X		X
Senegal date palm*	Phoenix reclinata		X		X
Pygmy date palm*	Phoenix roebelenii		X		X
Wild date*	Phoenix sylvestris		X		X
Pokeweed	Phytolacca americana	X		X	X
All spice*	Pimenta officinalis		X		X
Slash pine	Pinus elliottii var. densa	X			X
Jamaica dogwood	Piscidia piscipula	X			X
Black bead*	Pithecellobium keyense	X			X
Camphor weed	Pluchea odorata	X		X	
Camphor weed	Pluchea rosea	X		X	X
Leadwort	Plumbago capensis		X	X	

Frangipani*	Plumeria rubra		X		X
Japanese yew*	Podocarpus macrophyllus		X		X
Painted leaf	Poinsettia cyathophora	X		X	X
Fiddler's spurge	Poinsettia heterophylla	X		X	
Procession flower	Polgala incarnata	X			X
Pongam*	Pongamia pinnata		X		X
Peach*	Prunus persica		X		X
Buccaneer palm*	Pseudophoenix sargentii		X		X
Guava*	Psidium guajava		X		X
Whisk fern	Psilotum nudum	X		X	

Table 13.1 Preliminary Plant Species List (continued)

COMMON NAME	SCIENTIFIC NAME	PRESENCE			
		N	E	BBC	MAM
Wild coffee	Psychotria nervosa	X			X
Pineland brake fern	Pteris vittatta	X		X	X
Solitaire palm*	Ptychosperma elegans		X		X
Macarthur palm*	Ptychosperma macarthuri	X		X	
Laurel oak*	Quercus laurifolia	X			X
Live oak	Quercus virginia	X		X	X
	Randia aculeata	X			X
Travellers palm*	Ravenela madagascarensis	X		X	
Lady palm*	Rhapis excelsa		X		X
Red mangrove	Rhizophora mangle	X		X	?
Oyster plant	Rhoeo spathacea		X	X	X
Winged sumac	Rhus copallina	X			X
Beak rush	Rhynchospora sp.	X			X
Castor bean	Ricinus communis		X	X	X
Royal palm*	Roystonea elata	X			X
Firecracker plant*	Russelia equisetiformis		X	X	X
Cabbage palm	Sabal palmetto	X		X	X
Duck potato	Sagittaria falcata	X		X	X
Willow	Salix carolinensis	X			X
Beach naupaka*	Scaevola frutescens		X	X	X
Umbrella tree	Schefflera actinophylla		X	X	X
Brazilian pepper	Schinus terebinthifolius		X	X	X
Bullrush	Scirpus sp.	X		X	X
Saw palmetto	Serenoa repens	X			X
Sesban	Sesbania punicea		X	X	
Sea purslane	Sesuvium portulacastrum	X		X	
Bristlegrass	Setaria geniculata	X		X	X
Indian mallow	Sida rhombifolia	X		X	X
Paradise tree	Simarouba glauca	X			X
Goldenrod	Solidago sp.	X			X
Necklace pod*	Sophora tomentosa	X			X
Cordgrass	Spartina sp.	X		X	X
Peace lily*	Spathiphyllum 'Mauna Loa'	X		X	
African tulip tree*	Spathodea campanulata		X		X
Buttonweed	Spermacoce verticillata	X		X	X
Dropseed	Sporobolus spp.	X		X	X
Blue porterweed	Stachytarpheta jamaicensis	X			X
St. Augustine grass	Stenotaphrum secundatum	X		X	
Pencil flower	Stylosanthes hamata	X		X	
Sea blite	Suaeda linearis	X		X	

Mahogany	Sweitenia mahogani	X		X	X
Syngonium	Syngonium podophyllum	X	X		
Rose apple*	Syzygium jambos		X		X
Silver trumpet-tree/yllow*	Tabebuia caraiba		X		X
Silver trumpet-tree/pink*	Tabebuia heterophylla		X		X
Indian tamarind*	Tamarindus indica		X		X
Pond cypress*	Taxodium ascendens	X			X
Bald cypress	Taxodium distichum	X			X
Indian almond	Terminalia catappa		X	X	X
Tetrazygia	Tetrazygia bicolor	X			X
Turtle grass	Thalassia testudinum	X		X	
Shield fern	Thelypteris palustris	X			X
Seaside mahoe	Thespesia populnea		X	X	
Key thatch*	Thrinax morrisii		X		X

Table 13.1 Preliminary Plant Species List (continued)

COMMON NAME	SCIENTIFIC NAME	PRESENCE			
		N	E	BBC	MAM
Thatch palm*	Thrinax radiata		X		X
Cardinal air plant	Tillandsia fasciculata	X			X
Air plant	Tillandsia sp.	X		X	X
Spanish moss	Tillandsia useoides	X		X	
Sea lavender	Tournefortia gnaphalodes	X		X	
West Indies trema	Trema lamarckianum	X			X
	Trema micrantha	X		X	X
Walking iris*	Trimezia martinicensis		X		X
Turnera*	Turnera ulmifolia		X		X
Cattail	Typha latifolia	X		X	X
Manila, Christmas palm*	Veitchia merrillii		X		X
Montgomery's palm*	Veitchia montgomeryana		X		X
Muscadine grape	Vitis rotundifolia	X			X
Mex. Washingtonia palm*	Washingtonia robusta	X		X	
Wedelia	Wedelia trilobata		X	X	X
Coontie	Zamia pumila	X			X
Wild lime*	Zanthoxylum fagana	X			X
Wandering Jew*	Zebrina pendula		X	X	X

Bottom Lands:

No bottom lands are known to occur at either Modesto A. Maidique or Biscayne Bay Campus or in their respective context areas.

2. Floodplains:

MODESTO A. MAIDIQUE

According to Flood Insurance Rate Maps (revised 16 October 1992), Modesto A. Maidique is designated as Zone X. This zone is an area of 500-year flood, or of 100-year flood with average depths of less than one foot or with drainage areas less than one square mile, and areas protected by levees from 100-year flood. The campus itself is designated as a hurricane evacuation site for Monroe County.

BISCAYNE BAY CAMPUS

According to Flood Insurance Rate Maps (revised 16 October 1992), the entire Biscayne Bay Campus is at an elevation of 9 feet, and is zoned AE. This area is characterized as a special flood hazard area inundated by 100-year flood. According to undocumented sources at FIU, a SLOSH model run in the 1960's indicated a 15-foot hurricane flood elevation for the area.

3. Known unique geological features (springs, sinkholes, etc.):

No unique geological features are known to occur at either Modesto A. Maidique or Biscayne Bay Campus or in their respective context areas.

4. Existing mitigation sites:

MODESTO A. MAIDIQUE

There are no mitigation projects at Modesto A. Maidique. However, there is a hardwood hammock area that is being restored/enhanced by the Environmental Studies program as well as maintenance of littoral vegetation at Hennington Lake. While not for mitigation, oak trees were planted in a small area in the northeastern part of the campus. This area is presently known as the Earth Day 1990 Hammock.

BISCAYNE BAY CAMPUS

Within the Biscayne Bay Campus context area there are several areas that have either undergone or are slated for restoration/replanting. Most of these areas have been enhanced as a part of the Miami-Dade County Beach Restoration and Preservation Program, which is funded by mitigation bank payments.

A shoreline stabilization project along Biscayne Bay was carried out by Dade County Department of Environmental Resources Management (DERM) at Biscayne Bay Campus from 1989-1991. This project involved placement of boulder rip-rap along 1,225 linear feet of shoreline along the southern and southeastern edges of campus property; constructing mangrove planters totaling 1,525 linear feet along the southern and southeastern edges of FIU property (mangroves interspersed with rip-rap); 1,200 linear foot cordgrass (Spartina sp.) planter on the southeast edge; and planting of cordgrass along 500 feet of shoreline (no rip-rap) along the southeast edge. The December

2000 site inspection revealed that the above-referenced project appears to have been completed.

Another mangrove mitigation project was planned by DERM for Biscayne Bay Campus. This project involved scraping an area of 1.65 acres to an elevation of +1 foot above mean sea level, excavation of drainage channels to a height of 0 feet above mean sea level, and planting of red mangroves (Rhizophora mangle) and black mangroves (Avicennia germinans) on 3 foot centers in the areas between the drainage channels. The December 2000 site inspection revealed that the above-referenced project has been completed.

Construction of an access road to the Kovens Center required the filling of a section of a mangrove-dominated, tidally influenced canal. As mitigation for this activity, the University planted a buffer zone of native vegetation adjacent to mangroves near the impact site. The specifics are contained in DERM Permit # CC 95-056. The December 2000 site inspection confirmed that this project has been completed.

Security concerns necessitated the trimming of mangroves adjacent to the conference center (DERM Permit # 95–218; CC 99–053). The planting of mangroves at the southwestern end of campus was required for compensatory mitigation. The December 2000 site inspection revealed that this project was in progress. The design of this mitigation area allows for the expansion of additional mangrove plantings to the east if required by future development on campus. This project has been completed.

Several mitigation projects have been carried out at Oleta River State Recreation Area since its creation in 1986. The first of these was initiated by DERM in 1986 and involved placement of boulder rip-rap along 990 linear feet of Biscayne Bay shoreline for shoreline stabilization, construction of an 80-foot x 9-foot fishing pier extending into Biscayne Bay at the southwest corner of park, construction of a 935 linear foot sand beach along Biscayne Bay, shallowing and interconnecting 4 existing ponds and connecting the ponds to Biscayne Bay to create a shallow flow-through lagoon system, and repairing an existing bridge over the Oleta River at the north end of the park. A mangrove restoration project was carried out by DERM in Oleta River State Recreation Area from 1989 to 1991. This project involved clearing and grading approximately 15 acres of previously filled wetland area (the filled area was dominated by Australian pine), reducing elevation from +3 feet to between 0 and +1 foot above mean sea level, stockpiling graded material on park property in the west-central portion of the park (see Figure 13.2), planting approximately 75,000 red mangroves on 3-foot centers, and monitoring the planting sites and replanting to maintain at least 80% survival over a 2 year period. A roseate spoonbill (Ajaia ajaja) was observed in the mitigation area, along with several white ibis (Eudocimus albus), both of which are listed as species of special concern (see Table 13.2 for a complete

list of County, State and Federally listed plant and animal species known to occur within the two campuses and their respective context areas).

In 1991, DERM carried out a mitigation project in Oleta River State Recreation Area that involved the construction of mangrove planters totaling 1800 linear feet of shoreline in three sections along the western side of the park. Red mangroves and black mangroves were planted.

Mangrove planters were observed on December 2000 and found the mangroves to be healthy and growing well, with apparent good survival of planted seedlings. The mangrove planters facing Biscayne Bay are planted with red mangroves and white mangroves (Laguncularia racemosa), while the shores of the flow-through lagoon are planted with black mangrove and buttonwood (Conocarpus erecta). In addition, other mangrove-associated plant species are becoming established. In both of these areas and along the extensive rip-rapped sections of shoreline there appears to be considerable natural establishment of mangrove seedlings.

A mitigation project on Sandspur Island (a part of the Oleta River State Recreation Area), located immediately south of Biscayne Bay Campus and within the context area, involved shoreline stabilization and mangrove reclamation. Specifically, boulder rip-rap and mangrove planters are being placed along the entire north, east, and south shorelines of the island (i.e., those shorelines facing the Intracoastal Waterway and thus most impacted by boat traffic in the Intracoastal).

Table 13.2 Animals-Threatened and Endangered Species System(TESS)/Florida

Scientific Name	Common Name	Status	FIU
Alligator, American	Alligator mississippiensis	T(S/A)	N/A
Bankclimber, purple (mussel)	Elliptoideus sloatianus	T	N/A
Bat, gray	Myotis grisescens	E	N/A
Butterfly, Schaus swallowtail	Heraclides aristodemus ponceanus	E	N/A
Caracara, Audubon's crested FL pop.	Polyborus pancus audubonii	T	N/A
Crane, whooping U.S.A.	Grus americana	XN	N/A
Crocodile, American	Crododylus acutus	E	N/A
Darter, Okaloosa	Etheostoma okaloosae	E	N/A
Deer, key	Odocoileus virginianus clavium	E	N/A
Eagle, bald lower 48 States	Haliaeetus leucocephalus	T	N/A
Jay, Florida scrub	Aphelocoma coerulescens	T	N/A
Kite, Everglade snail FL pop.	Rostrhamus sociabilis plumbeus	E	N/A
Manatee, West Indian	Trichechus manatus	E	BBC
Moccasinshell, Gulf	Medionidus penicillatus	E	N/A
Moccasinshell, Ochlockonee	Medionidus simpsonianus	E	N/A
Mouse, Anastasia Island beach	Peromyscus polionotus phasma	E	N/A
Mouse, Choctawhatchee beach	Peromyscus polionotus allophrys	E	N/A

Table 13.2 Animals-Threatened and Endangered Species System(TESS)/Florida			
Mouse, Key Largo cotton	Peromyscus gossypinus allapaticola	E	N/A
Mouse, Perdido Key beach	Peromyscus polionotus trissyllepsis	E	N/A
Mouse, southeastern beach	Peromyscus polionotus niveiventris	T	N/A
Mouse, St. Andrew beach	Peromyscus polionotus peninsularis	E	N/A
Panther, Florida	Puma(=Felis)concolor coryi	E	N/A
Pigtoe, oval	Pleurobema pyriforme	E	N/A
Plover	Chardrius melodus	T	N/A
Pocketbook, shinyrayed	Lampsilis subangulata	E	N/A
Puma (=mountain lion) FL	Puma(=Felis) concolor (all subsp. Exp.coryi)	T(S/A)	N/A
Rabbit, Lower Keys marsh	Sylvilagus palustris hefneri	E	N/A
Rice rat lower FL Keys	Oryzomys palustris natator	E	N/A
Salamander, flatwoods	Ambystome cingulatum	T	N/A
Sawfish, smalltooth U.S.A.	Pristis pectinata	E	N/A
Sea turtle, green FL,	Chelonia Mydas	E	N/A
Sea turtle, green	Chelonia Mydas	T	N/A
Sea turtle, hawksbill	Eretmochelys imbricata	E	N/A
Sea turtle, Kemp's ridley	Lepidochelys kempii	E	N/A
Sea turtle, leatherback	Dermochelys coriacea	E	N/A
Sea turtle, loggerhead	Caretta caretta	T	N/A
Seal, Caribbean monk	Monacus tropicalis	E	N/A
Shrimp, Squirrel Chimney Cave	Palaemonetes cummingi	T	N/A
Skink, bluetail mole	Eumeces egregius lividus	T	N/A
Skink, sand	Neoseps reynoldsi	T	N/A
Slabshell, Chipola	Elliptio chipolaensis	T	N/A
Snail, Stock Island tree	Orthalicus reses	T	N/A
Snake, Atlantic salt marsh	Nerodia clarkii taeniata	T	N/A
Snake, eastern indigo	Drymarchon corais couperi	T	N/A
Sparrow, Cape Sable seaside	Ammodramus maritimus mirabilis	E	N/A
Sparrow, Florida grasshopper	Ammodramus savannarum floridanus	E	N/A
Stork, wood AL, FL, GA, SC	Mycteria american	E	N/A
Sturgeon, gulf	Acipenser oxyrinchus desotoi	T	N/A
Sturgeon, shortnose	Acipenser brevirostrum	E	N/A
Tern, roseate	Sterna dougallii dougalliii	T	N/A
Three-ridge, fat (mussel)	Amblema neislerii	E	N/A
Vole, Florida salt marsh	Microtus pennylvanicus dukecampbelli	E	N/A
Whale, finback	Balaenoptera physalus	E	N/A
Whale, humpback	Magaptera novaeangliae	E	N/A
Whale, right	Balaena glacialis	E	N/A
Wolf, red except where XN	Canis rufus	E	N/A
Woodpecker, red-cockaded	Picoides borealis	E	N/A
Woodrat, Key Largo	Neotoma floridana smalli	E	N/A

Plants-Threatened and Endangered Species System(TESS)/Florida			
Scientific Name	**Common Name**	**Status**	**FIU**

Plants-Threatened and Endangered Species System(TESS)/Florida			
Amorpha crenulata	crenulated lead-plant	E	N/A
Asimina tetramera	four-petal pawpaw	E	N/A
Bonamia grandiflora	Florida bonamia	T	N/A
Campanula robinsiae	Brooksville bellflower	E	N/A
Cereus eriophorus var. fragrans	fragrant prickly-apple	E	N/A
Cereus robinii	Key tree-cactus	E	N/A
Chamaesyce deltoidea ssp. deltoidea	deltoid spurge	E	N/A
Chamaesyce garberi	Garber's spurge	T	N/A
Chionanthus pygmaeus	pygmy fringe tree	E	N/A
Chrysopsis floridana	Florida golden aster	E	N/A
Cladonia perforata	Florida perforate cladonia	E	N/A
Clitoria fragrans	pigeon wings	T	N/A
Conradina brevifolia	short-leaved rosemary	E	N/A
Conradina etonia	Etonia rosemary	E	N/A
Conradina glabra	Apalachicola rosemary	E	N/A
Crotalaria avonensis	Avon Park harebells	E	N/A
Cucurbita okeechobeensis ssp. okeechobeensis	Okeechobee gourd	E	N/A
Deeringothamnus pulchellus	beautiful pawpaw	E	N/A
Deeringothamnus rugelii	Rugel's pawpaw	E	N/A
Dicerandra christmanii	Garrett's mint	E	N/A
Dicerandra cornutissima	longspurred mint	E	N/A
Dicerandra frutescens	scrub mint	E	N/A
Dicerandra immaculata	Lakela's mint	E	N/A
Eriogonum longifolium var. ghaphalifolium	scrub buckwheat	T	N/A
Eryngium cuneifolium	snakeroot	E	N/A
Euphorbia telephioides	Telephus spurge	T	N/A
Galactia smallii	Small's milkpea	E	N/A
Halophila johnsonii	Johnson's seagrass	T	N/A
Harperocallis flava	Harper's beauty	E	N/A
Hypericum cumulicola	Highlands scrub hypericum	E	N/A
Jacquemontia reclinata	beach jacquemontia	E	N/A
Justicia cooleyi	Cooley's water-willow	E	N/A
Liatris ohlingerae	scrub blazing star	E	N/A
Lindera melissifolia	pondberry	E	N/A
Lupinus aridorum	scrub lupine	E	N/A
Macbridea alba	white birds-in-a-nest	T	N/A
Nolina brittoniana	Britton's beargrass	E	N/A
Paronychia chartacea	papery whitlow-wort	T	N/A
Pinguicula ionantha	Godfrey's butterwort	T	N/A
Polygala lewtonii	Lewton's polygala	E	N/A
Polygala smallii	tiny polygala	E	N/A
Polygonella basiramia	wireweed	E	N/A
Polygonella myriophylla	sandlace	E	N/A
Prunus geniculata	scrub plum	E	N/A
Rhododendron chapmanii	Chapman's rhododendron	E	N/A

Plants-Threatened and Endangered Species System(TESS)/Florida			
Ribes echinellum	Miccosukee gooseberry	T	N/A
Schwalbea americana	American chaffseed	E	N/A
Scutellaria floridana	Florida skullcap	T	N/A
Silene polypetala	fringed campion	E	N/A
Spigelia gentianoides	gentian pinkroot	E	N/A
Thalictrum cooleyi	Cooley's meadowrue	E	N/A
Torreya taxifolia	Florida torreya	E	N/A
Warea amplexifolia	clasping warea	E	N/A
Warea carteri	Carter's warea	E	N/A
Ziziphus celata	scrub ziziphus	E	N/A

STATUS CODES:
E: Endangered
T: Threatened
LISTING AGENCIES:
FGFWFC: Florida Game and Fresh Water Fish Commission
FDA: Florida Department of Agriculture and Consumer Services
USFWS: United States Fish and Wildlife Service
CITIES: Convention on International Trade in Endangered Species of Wild Fauna and Flora
BBC: Biscayne Bay Campus

The existing mitigation areas previously identified in the context area were not examined during the December 2000 campus inspection. No conflicts regarding mitigation have been identified. Existing and planned mitigation areas should be factored into development plans for the Biscayne Bay Campus.

5. Fisheries, wildlife marine habitats and vegetative communities, indicating dominant species present and species listed by Federal, State or local agencies as endangered, threatened or species of special concern:

All species that were observed during the December 2000 inspections have been previously documented. Table 13.2 lists threatened, endangered and species of special concern likely to occur at Modesto A. Maidique and Biscayne Bay Campus while Tables 13.3 and 13.4 list the more common avian species and other fauna, respectively.

BISCAYNE BAY CAMPUS

Australian pine-dominated upland forest: The Australian pine-dominated forest has limited value as wildlife habitat for either birds or mammals. There is little or no food available for frugivorous, granivorous or nectarivorous species, and little cover available for species which prefer dense foliage cover. Woodpeckers and introduced exotics such as starlings, mynahs and parrots may use dead trees as nesting sites, but other species are unlikely to so. During migration, flocks of warblers and other insectivorous birds may

forage in Australian pines, but they are probably a resource-poor habitat even for these species. No County, State or Federally listed plant or animal species were found in the Australian pine-dominated forests at the Biscayne Bay Campus.

Mangrove forest: The total area of these mangroves is relatively small, and although the mangroves present appear to be in good health, the carrying capacity for mangrove-frequenting species is likely to be small. Extensive mangrove areas exist to the north, east, and west of the campus. The mangrove-lined banks of the estuary and various canals may be important corridors for bird and mammal species traveling between these larger mangrove areas. Mangrove areas immediately adjacent to the campus may be important roosting and/or nesting sites for several species of wading birds, including little blue herons, green-backed herons, yellow-crowned night herons and white ibis.

Beach strand: Many of the plants making up the beach strand vegetative association are relatively small, having been recently planted or established following completion of rip-rap placement. The beach strand vegetation serves as an important corridor for land bird species traveling along the coast, but is probably most important as a barrier between the littoral zone and jogging/maintenance paths located inland of the strand vegetation. This barrier may reduce disturbance to wading and pelagic birds utilizing the littoral zone and adjacent waters and may also provide roosting and nesting sites for some species, although nearby mangrove areas are likely to be more important in this respect.

Lakes and littoral zones: The two lakes located on the Biscayne Bay Campus do not appear to be very important wildlife habitat. The west lake is depauperate of both vegetation and animal life. The east lake has a well vegetated littoral zone but is smaller in size and depauperate in animal life.

Wildlife associated with Biscayne Bay and estuary: Vertebrate species in and adjacent to Biscayne Bay and associated waterways were observed during visits to the Biscayne Bay Campus and the Oleta River State Recreation Area. Bird species observed in and adjacent to the Bay included several species of herons, cormorants, gulls and ibis (Table 13.3). Fish species observed included various food and sport fish (snapper, mullet, and a sighting of what was likely to have been a tarpon or snook) as well as a variety of smaller fish species (Table 13.4). No mammals were observed in the Bay, although it is known to be an important area for the West Indian manatee. Atlantic bottlenose dolphins (Tursiops truncatus) and several species of sea turtles also occur in the area.

The shoreline on the Biscayne Bay Campus facing Biscayne Bay is of mixed habitat quality. The extensive area of rip-rap may be used by some species

of herons, but is unlikely to be a suitable feeding habitat for most shorebirds or wading birds, or for mammals such as raccoons. The rip-rap does provide considerable cover and foraging area for various fish and invertebrate species. The shallow waters of the Bay adjacent to the shoreline appear to be good habitat for a variety of wildlife. Although this area was only surveyed from shore, turtle grass and manatee grass beds were visible, along with several species of algae. The sea grass areas in particular appear to be good habitat for a wide range of invertebrates and fishes, and should consequently be valuable feeding grounds for diving and aerially fishing birds (cormorants, mergansers, gulls, terns and pelicans). Additionally these areas support important game and food fish (mullet, snapper, tarpon and snook) and are important feeding/wintering grounds for the West Indian manatee.

Landscaped areas: Tree islands and landscaped areas at Biscayne Bay Campus are likely to be important primarily for common resident bird species such as bluejays (Cyanocitta cristata), mockingbirds (Mimus polyglottos), loggerhead shrikes (Lanius ludovicianus), gray kingbirds (Tyrannus dominicensis) and boat-tailed grackles (Quiscalis major). The tree islands are not large enough to provide nesting habitat for less aggressive or more secretive species.

An inspection of the campus during December 2000 revealed little change since the last master plan. Exotic plant removal (i.e., Brazilian pepper, Australian pine) has led to a decrease in forested areas with a concurrent increase in grassland. Additionally since the mangrove mitigation planting at the south end of the campus is now complete, there is a net increase in this habitat type with benefits to associated wildlife. All wildlife species observed during the December 2000 inspection have been previously documented at FIU.

Table 13.3 Preliminary Bird Species List for the FIU Campuses

MAM=Modesto A. Maidique, BBC=Biscayne Bay Campus

COMMON NAME	SCIENTIFIC NAME	Presence		
		MAM	BBC	CODE
Pied-billed Grebe	Podylimbus podiceps	X		pc
Dble-crested Cormorant	Phalacrocorax auritus	X	X	c/f
Anhinga	Anhinga anhinga	X		pc
Great blue heron	Ardea herodias	X	/f	
Little blue heron	Egretta caerulea	X	/I	
Cattle egret	Bubulcus ibis	X	X	c
Green-backed heron	Butorides striatus	X	X	pc
Yllw-crowned nt-heron	Nyctanassa violacea		X	
Blck-crowned nt-heron	Nycticorax nycticorax	X		p
White ibis	Eudocimus albus	X	X	/ia
Roseate spoonbill[b]	Ajaia ajaja		X	
Turkey vulture	Cathartes aura	X		c
Osprey	Pandion haliaetus	X	X	pc/f
Sharp-shinned hawk	Accipiter striatus	X		p

Cooper's hawk	Accipiter cooperii	X		pc
Red-shouldered hawk	Buteo lineatus	X		
Broad-winged hawk	Buteo platypterus		X	p
American kestrel[c]	Falco sparverius	X		pc
Common moorhen	Gallinula chloropus	X		c*
American coot	Fulica americana	X		c
Killdeer	Charadrius vociferus	X	X	pc
Greater yellowlegs	Tringa melanoleuca	X		c
Spotted sandpiper	Actitis macularia		X	
Laughing gull	Larus atricilla	X	X	pc
Ring-billed gull	Larus delawarensis	X		c
Least tern	Sterna antillarum	X		c
Black skimmer	Rynchops nigra	X		c
Rock dove	Columba livia	X	X	c
White-crowned pigeon	Columba leucocephala	X	/f	
Mourning dove	Zenaida macroura	X	X	p*
Eurasian collared dove	Streptopelia decaocto	X		p
Common ground-dove	Columbina passerina		X	
Monk parakeet	Myiopsitta monachus	X		pc*
Red-masked parakeet	Aratinga erythrogenys	X		pc
Cockatiel	Nymphicus hollandicus	X		c
Smooth-billed ani	Crotophaga ani	X		p
Burrowing owl	Speotyto cunicularia	X		c
Common nighthawk	Chordeiles minor		X	
Chuck-will's widow	Caprimulgus carolin.	X		p
Rufous hummingbird	Selasphorus rufus	X		p
Belted kingfisher	Ceryle alcyon	X	X	pc
Red-bellied woodpecker	Melanerpes carolinus	X	X	pc
Yllw-bellied sapsucker	Sphyrapicus varius	X		c
er	Colaptes auratus	X		c*
.	Empidonax sp.	X		p
Gt-crested flycatcher	Myiarchus crinitus	X		c
Eastern kingbird	Tyrannus tyrannus	X		p
Gray kingbird	Tyrannus dominicensis	X	X	pc*
Barn swallow	Hirundo rustica	X	X	pc
N. rugh-winged swallow	Stelgidopteryx serri.	X		pc
Blue jay	Cyanocitta cristata	X	X	p
Fish crow	Corvus ossifragus	X	X	c
House wren	Troglodytes troglody.	X		p
Blue-gray gnatcatcher	Polioptila caerulea	X	X	pc*
American robin	Turdus migratorius	X		p
Grey catbird	Dumetella carolinen.	X		p
Northern mockingbird	Mimus polyglottos	X	X	pc*

Table 13.3 Preliminary Bird Species List for the FIU Campuses (continued)

Brown thrasher	Toxostoma rufum	X		p
Cedar waxwing	Bombycilla cedrorum	X		p
Loggerhead shrike	Lanius ludovicianus	X	X	pc*
European starling	Sternus vulgaris	X	X	c
White-eyed vireo	Vireo griseus	X		p
Red-eyed vireo	Vireo olivaceus	X		p
Northern parula	Parula americana	X		pc
Prairie warbler	Dendroica discolor	X	X	pc

Palm warbler	Dendroica palmarum	X		pc
Black-and-white wrblr	Mniotilta varia	X	X	p
American redstart	Setophaga ruticilla	X	X	pc
Ovenbird	Seiurus aurocapillus	X		p
Common yellowthroat	Geothlypis trichas	X		p*
Northern cardinal	Cardinalis cardinalis	X	X	p*
Painted bunting	Passerina ciris	X		p
Red-winged blackbird	Agelaius phoeniceus	X		p*
Boat-tailed grackle	Quiscalus major	X	X	pc*
Common grackle	Quiscalus quiscula	X		pc*

[a] List compiled since 4 December, 1992. [b] Observed at the Oleta River State Recreational Area
[c] Subspecies undetermined

CODES: Codes given after a slash (/) refer to Biscayne Bay Campus,
all other codes refer to Modesto A. Maidique.

a = Adult c = Observed on campus other than in the preserve
f = Seen only in flight i = Immature
p = Observed in the preserve, including the adjacent pond
= Species that bred or went through the motions of doing so
Note: Unless otherwise noted, all birds were adults.

Table 13.4 Animal Species (Excluding Birds) Observed or Reported at the FIU Campuses and in the Surrounding Context Areas

COMMON NAME	SCIENTIFIC NAME	Presence	
		BBC	MAM
MAMMAL SPECIES:			
Bobcat[a]	Lynx rufus		X
Raccoon	Procyon lotor	X	
West Indian manatee	Trichechus manatus	X	
Atl. bottlenose dolphin	Tursiops truncatus	X	
	Vulpes vulpes		X
FISH SPECIES:			
Snook	Centropomus sp.		X
Mosquito fish	Gambusia sp.	X	X
Mojarra	Gerres sp.	X	
Herring	Jenkinsia sp.	X	
Pinfish[b]	Lagodon rhomboidesX		
Bluegill	Lepomis macrochirus		X
Tarpon	Megalops atlantica	X	
Largemouth bass	Micropterus salmoides		X
Mullet	Mugil curema	X	
Tillapia sp.	Oreochromis spp.		X
Barracuda	Sphyraena barracuda	X	
Mangrove snapper	Serranidae	X	
Needlefish	Belonidae	X	
Silversides	Atherinidae	X	

Table 13.4 Animal Species (Excluding Birds) Observed or Reported at the FIU Campuses and in the Surrounding Context Areas (continued)

		Presence

COMMON NAME	SCIENTIFIC NAME	BBC	MAM
Pufferfish		X	
AMPHIBIAN SPECIES:			
Cane toad	Bufo marinus		X
East. Narrw-mouthed			
Toad	Gastrophryne carolinensis		X
REPTILE SPECIES:			
Carolina anole	Anolis carolinensis	X	X
Cuban Brown anole	Norops sagrei	X	X
Bark anole	Norops distichus	X	X
NOTABLE INVERTEBRATE SPECIES:			
Limpet	Acmaea sp	X	
Gulf fritillary	Agraulis vanillae		X
Battalaria snail	Battalaria sp.	X	
Barnacle	Chthamalus sp.	X	
Queen butterfly	Danaus gilippus berenice		X
Julia butterfly	Dryas iulia	X	
Blue sponge[b]	Dysidea etherea	X	
Florida atala butterfly	Eumaeus atala florida		X
Zebra butterfly	Heliconius charitonius		X
Sulfur butterfly	Phoebis spp.		X
Orange sponge	Demospongiae	X	
Sea cucumber	Holothuroidea	X	
Periwinkle	Gastropoda	X	
Mussel	Bivalvia	X	
Amphipods	Amphipoda	X	
Fiddler crab	Decapoda	X	
Sea urchin	Echinoidea	X	

Vegetation and Wildlife Composition:

MODESTO A. MAIDIQUE

Exotic vegetation has continued to invade the teaching and research area south of the Pharmed Arena as well as the island at Hennington Lake. With regard to wildlife, all species that were observed during the December 2000 inspection had been previously documented. A large communal nest of Monk Parakeets was observed on a floodlight platform of the recreational field west of the teaching and research area. Also, it appears that the burrowing owls previously found on campus have been extirpated.

Brief surveys were conducted of the vegetation. These surveys were limited to: an examination of the exterior vegetation of tree islands; the paths through the hardwood hammock preserve; inspection of littoral zone vegetation in the manmade ponds and lakes; other potential wetland sites on campus; and an examination of the grassed areas along the south edge of the campus, where burrowing owl burrows had been reported.

Modesto A. Maidique contains relatively few naturally vegetated areas. Non-landscape vegetation associations (see Table 13.1) can be classified into the following categories:

Tree islands: This association consists of isolated natural or landscape trees that have been overgrown with viny herbaceous and woody vegetation. In most cases, the "understory vegetation" (i.e., herbs and low shrubs growing under the crown of the tree) has been left intact, often to a radius of 10 feet or more. Tree islands are scattered throughout Modesto A. Maidique.

Exotic-invaded hardwood hammocks: In the southeast corner of Modesto A. Maidique, four wooded areas are interspersed with the tree islands (Figure 13.1). These small hammocks contain a mix of native and exotic hardwood trees and shrubs, wetland herbs and graminoids, and other disturbance-adapted plants.

Sweet bay-dominated hardwood hammock An oval shaped hammock is located near the southwestern corner of the Modesto A. Maidique Campus (Figure 13.1), which appears to be an old bay head that has been partially cleared. A central portion of the hammock contains a shelter and planted "butterfly garden" vegetation. In the relatively undisturbed portions of this area, canopy vegetation is dominated by sweet bay (Persea borbonia; some quite large), live oak (Quercus virginiana), mastic (Mastichodendron foetidissimum), wild tamarind (Lysiloma bahamensis), pigeon plum and white stopper (Eugenia axillaris). This area has been designated as an on-campus botanical and

wildlife area. An interpretive trail system has been established, and individuals of several species are flagged throughout the zone.

This zone represents the most botanically valuable natural feature of Modesto A. Maidique. It is used by faculty to conduct research of reclaimed land. However, it should be noted that an inspection of the site in 2001 did not reveal the presence of any threatened or endangered fauna or nests during the site inspection. Due to these findings and the scarcity of developable land at Modesto A. Maidique, FIU has placed a 10-year limit on the "conservation" designation of the area. If within the next ten years funding cannot be identified to develop the zone as recommended in the 2003 Charette, the university will reconsider the "conservation" status. The Faculty Senate has committed to raising the funds. The 2003 Charette calls for the creation of a small research facility, gardens, trails, a jogging track, picnic areas and some development.

Littoral zone and submerged vegetation associated with lakes: Modesto A. Maidique contains 15 ponds and lakes, all apparently artificial (Figure 13.1). The littoral zones of most of these lakes are sparsely vegetated with a variety of wetland plants, including soft rush, flat sedge (Cyperus haspan), duck potato, primrose willow (Ludwigia peruviana) and cattail. Additionally, a few wetland trees, including willow (Salix carolinensis) and bald cypress appear to have been planted. Elodea abounds in the shallow-water portions of these lakes.

The vegetation of Hennington Lake, located near the northeast corner of Modesto A. Maidique (Figure 13.1), was examined in some detail. This lake contains a spoil island called Hennington Island, which is apparently intended to serve as a "rainforest island". Design team personnel were unable to access the island, but visual examination of Hennington Island from the shore of the lake indicates that the island is dominated by a mix of native and exotic hardwood hammock trees, including Indian almond (Terminalia catappa), wild tamarind, royal poinciana (Delonix regia), Indian rubber tree (Ficus elastica), paurotis palm (Acoelorraphe wrightii), oil palm (Elaeis guineensis), umbrella tree (Schefflera actinophylla), paradise tree (Simarouba glauca), ear-leaf acacia (Acacia auriculaeformis), and kapok tree (Bombax spp.). Littoral zone vegetation in this lake includes Florida white-tops, soft rush, primrose willow, camphor weed, water hyssop (Bacopa monnieri), coinwort (Centella asiatica), miterwort and diodia, with scattered planted bald cypress and wax myrtle.

Littoral zone vegetation also occurs in association with the off campus lake within the context area (west of Highway 821), consisting of extensive areas of cattail and soft rush which extend away from the shoreline for up to 20-30 feet in some places. Submerged vegetation consists of dense

beds of elodea.

Periodically inundated lawn areas overgrown with wetland vegetation: The northwest corner of Modesto A. Maidique is somewhat lower than the rest of the site and consequently experiences some degree of ponding during the rainy season. Two general areas have been identified in this portion of the campus where marshy areas have been undisturbed (i.e., unmowed) long enough to develop a reasonable wetland vegetative cover.

BISCAYNE BAY CAMPUS

Since the last master plan in 1995, a program for removal of exotic vegetation has been implemented as well as mangrove mitigation planting initiated. Exotic plant removal (i.e., Brazilian pepper, Australian pine) has led to a decrease in forested areas with a concurrent increase in grassland. There is a net increase in this habitat type, which benefits the associated wildlife, due to the mangrove mitigation planting at the south end of the campus. All wildlife species observed during the December 2000 inspection have been previously documented at the Biscayne Bay Campus. All wildlife species that were observed during the December 2000 inspection have been accurately documented at the campus.

Brief surveys were conducted of the vegetated areas at Biscayne Bay Campus. Vegetation surveys were largely restricted to brief walking surveys of the "forested" areas surrounding the main building area and the replanting zone near Biscayne Bay, and "windshield surveys" of additional portions of the campus and surrounding areas readily accessible by roads.

Biscayne Bay Campus contains relatively few naturally vegetated areas. Non-landscape vegetation associations at the Biscayne Bay Campus can be classified into the following categories:

Australian pine-dominated upland forest: Much of the non-landscape vegetation at the Biscayne Bay Campus, including the forested parcels to the southwest of the main building area and to the north of the canal at the north edge of the building area (Figure 13.3), is dominated by Australian pine (Casuarina equisetifolia and C. glauca). No County, State or Federally listed plant species were found in the Australian pine-dominated forests at Biscayne Bay Campus.

Mangrove Forest: Mangrove vegetation at the Biscayne Bay Campus is restricted primarily to two areas (Figure 13.3): a narrow band along approximately 2100 feet of an internal canal; and along approximately 2200 feet of the estuary at the east edge of the campus. A few scattered trees also occur in the rip-rapped section of shoreline along Biscayne Bay.

Mangrove associations at the Biscayne Bay Campus are dominated by red mangrove, with buttonwood, black mangrove, white mangrove, and seaside mahoe (Thespesia populnea) also commonly found.

Back-mangrove associations: Back-mangrove associations are found on the Biscayne Bay Campus in areas that are transitional between mangrove forests and upland vegetation; i.e., along the edges of the mangrove forest, interior to the mangrove-lined portion of the estuary (Figure 13.3), and landward of mangrove forests elsewhere in the context area of Biscayne Bay Campus. Back-mangrove canopy is dominated by a mix of upland and wetland trees, including Australian pine, buttonwood, seaside mahoe, and sea grape.

Beach strand: Most of the eastern and southern edge of the Biscayne Bay Campus is Biscayne Bay shoreline, a portion of which has been rip-rapped for shoreline stabilization (Figure 13.3). Behind the rip-rap areas, and in those portions of the shoreline that lack rip-rap, beach strand vegetation dominates. In addition, scattered buttonwood trees and a few red mangroves occur along the shoreline behind the rip-rap.

Within the context area of the Biscayne Bay Campus, beach strand vegetation also occurs along portions of the shorelines in the Oleta River State Recreation Area and may occur in the State mangrove preserves.

Littoral zone and submerged vegetation associated with lakes: The Biscayne Bay Campus contains two lakes, both apparently manmade (Figure 13.3). The western of the two lakes has a very sparsely vegetated littoral zone, with vegetation consisting almost exclusively of soft rush (Eleocharis interstincta), a few planted bald cypress (Taxodium distichum) and a few landscape grasses and lawn weeds. No deep-water vegetation was observed in the western lake. The eastern of the two lakes has a landscaped edge, and emergent vegetation occupies nearly the entire littoral zone of the lake. Dominant littoral zone vegetation in the eastern lake includes soft rush, duck potato (Sagittaria falcata), cattail (Typha latifolia).

Submerged vegetation associated with Biscayne Bay and estuary: A visual survey of aquatic vegetation from the shoreline, and inspection of vegetation washed up by tidal action were conducted along a portion of the Biscayne Bay shoreline and at several points along the estuary. In the estuary the predominant aquatic vegetation consists of Caulerpa spp. and several unidentified species of green algae and red algae. The shallow waters facing Biscayne Bay have a rubble bottom in most places, interspersed with turtle grass (Thalassia testudinum) and manatee grass (Halodule wrightii) beds.

Disturbed areas containing wetland plant species: In the southeast corner of Biscayne Bay Campus, a large area was cleared of vegetation. Since that time, the scraped area has been recolonized by a mix of upland and transitional wetland weeds.

6. Aquifers and aquifer recharge areas:

Technically, all of Miami-Dade County is an aquifer recharge area because an impermeable layer does not lie between the surface and the aquifer. However, aquifer recharge areas of concern to South Florida Water Management District (SFWMD) are the major wetland systems in western and southern Miami-Dade County. Neither campus is considered an important aquifer recharge area.

MODESTO A. MAIDIQUE

Modesto A. Maidique and context area receive water from the Miami-Dade Water and Sewer Authority Department (MDWASAD) which draws its water from the Biscayne aquifer. The Modesto A. Maidique campus and context area lack extensive wetland systems, and are thus not important aquifer recharge areas.

BISCAYNE BAY CAMPUS

The Biscayne Bay Campus and context area receive water from the Miami-Dade Water and Sewer Authority Department (MDWASAD), which draws its water from the Biscayne aquifer. However, potable water is not drawn from the Biscayne aquifer within Biscayne Bay Campus context area because of saltwater intrusion.

7. Air quality, including but not limited to the pollutants subject to National Ambient Air Quality Standards:

Air quality information was obtained from Miami-Dade County DERM. The Miami-Dade County Ambient Air Monitoring Network consists of National Air Monitoring Stations (NAMS) and State and Local Air Monitoring Stations (SLAMS). The primary purpose of the network is to measure ambient air levels of criteria pollutants, the air pollutants for which National Ambient Air Quality Standards (NAAQS) have been established by the Federal government.

MODESTO A. MAIDIQUE

The Air Quality Index (AQI) scale ranges from 0 to 500 with the following descriptor words and ranges:

Good	0	to	50
Moderate	51	to	100
Unhealthful	101	to	199
Very unhealthful	200	to	299
Hazardous	300	to	500

The index uses a scale based on the National Ambient Air Quality Standards for the five pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, lead, and total suspended particulates). The actual standard for each pollutant represents 100 on the AQI scale, which is unitless. The standards are aimed at protecting sensitive populations. If the AQI is over 100, generalized health effects and cautionary statements may also be provided. These statements were issued in 1989 when the Everglades fires were causing breathing problems for some people.

The reported Daily Index is done on working days using a PM10 sampler at the Miami Fire Station (1200 NW 20th Street), and all operational carbon monoxide, ozone, nitrogen dioxide and sulfur dioxide sites. The data for nitrogen dioxide and sulfur dioxide are recorded but have never been high enough to be used for the AQI. After converting the concentrations to AQI values, the highest AQI value of all the pollutants for the day is reported. After all the continuous monitoring data for the month are corrected and verified, a corrected AQI is calculated for every day in the month using all air monitoring sites. This is called the Total AQI and is reported to the Florida Department of Environmental Protection every quarter.

BISCAYNE BAY CAMPUS

Very few Miami-Dade County air quality monitoring sites are located close to the Biscayne Bay Campus. The closest site is approximately 8.1 miles southwest of the campus. All of the monitoring sites are located to the south of the Biscayne Bay Campus except the Thompson Park site, which is located nearly 19 miles west-northwest of the campus.

8. Surface water quality, including the water quality for each lake, river and other surface water, and the identification of any such water body designated as an Outstanding Florida Water:

Water quality data for Modesto A. Maidique Campus and Biscayne Bay Campus were obtained from two sources: (1) DERM monitoring wells in the vicinity of the two campuses, and (2) data compiled by the EPA from surface water quality assessments done in and around the Munisport Landfill.

DERM monitors a variety of parameters, including ammonia, nitrate/nitrite, organic PO_4, total PO_4, chloride, barium, iron, calcium, magnesium, potassium, sodium, manganese, zinc, sulfate, cadmium, chromium, copper, lead, mercury, turbidity, total dissolved solids, arsenic, nickel, selenium, silver, phenol, cyanide, alkalinity, total Kjeldahl nitrogen, color, and fluoride. DERM uses the 1993 DER drinking water standards, Chapter 17-550, F.A.C. Phenol is monitored by DERM.

MODESTO A. MAIDIQUE

There are five groundwater wells monitored by DERM within three miles of Modesto A. Maidique Campus. For two of the five wells data are available from 1981 through 1983 and 1989 through 1990. Data for two of the remaining wells are available only from 1992. Only data from 1989 were available for the final well.

In the wells near Modesto A. Maidique, there was one exceedance of lead in 1992. The lead level in the well was measured as 0.041 mg/L; the DER standard is 0.015 mg/L.

There were three exceedances of acceptable levels of iron in two wells near the Modesto A. Maidique Campus. These iron levels were, respectively, 1.0, 1.4, and 1.4 mg/L; the DER standard for iron is 0.3 mg/L. Two of these exceedances occurred in the fall of 1989; the third was in the fall of 1990. All other parameters monitored by DERM were within DER standards for these five wells.

BISCAYNE BAY CAMPUS

There are two groundwater wells monitored by DERM near the Biscayne Bay Campus each located two and one half miles from the campus. Data for one of the two wells is available from 1981 through 1990. Data for the other well is available from 1992.

EPA surface water data for the Munisport Landfill: The EPA, in cooperation with State and local regulatory agencies, has compiled an enormous amount of water and soil quality data for the Munisport Landfill (currently an EPA Superfund site), which is adjacent to the western boundary of Biscayne Bay Campus and falls within the context area for this campus. For details, the reader is referred to the EPA Record of Decision (EPA, 1990) for the Munisport site.

In June 1989, the EPA undertook a study to evaluate the emergence of toxic leachate from the Munisport Landfill into the surface waters of the mangrove preserve (EPA, 1989). Surface water quality within Munisport and the State mangrove preserve (adjacent to the southwest edge of Biscayne Bay Campus) was monitored at five sampling sites along the canal separating Munisport from the mangrove preserve and at two sites

along the two culverts at the southeast boundary of the preserve. Surface water samples were analyzed for a variety of parameters including ammonia, nitrate/nitrite, phosphates, dissolved oxygen, metals and extractable and purgeable organics. EPA uses both State and Federal ambient water quality standards.

At all sampling sites, ammonia levels were much higher (maximum = 15 mg/L) in the portion of the preserve adjacent to the landfill than they were in the culverts at the east edge of the preserve (maximum = 2.0 mg/L). Ammonia concentrations at both sites varied directly with tidal stage, with dilution occurring with incoming high tide. The EPA concluded that the most likely source of increased ammonia levels in the mangrove preserve was the encroachment of leachate from the adjacent landfill.

Results of the organic and metal analyses of surface water samples revealed no detectable heavy metals and only a few extractable and purgeable organic compounds, none of which exceeded State or Federal water quality standards. Analysis of sediments extracted from the same sampling sites, however, revealed increased amounts of metals and organic compounds in the sites adjacent to the landfill compared with the sites nearer the Bay. However, the concentration of metals in sediments was generally within the ranges observed in marine sediments far removed from urbanization and industrial effects.

There are no water quality monitoring stations on or very near either campus. The absence of monitoring precludes the determination of whether or not campus activities are significantly affecting ground or surface water quality.

Storm water runoff from roadways and parking lots and other impervious surfaces is probably the principal source of water pollution on campus. Runoff from landscaped and grassed areas also, no doubt, contributes to water pollution. Presumably, fertilizers and pesticides are used in maintenance of landscaped areas on campus; no data relating to this matter was found. There are mulch storage areas on University property, and these likely contribute some leachate to the nearby waters.

There are areas along the waterfront away from the developed portions of the campus where a considerable amount of clearing has occurred. No doubt some of these areas contribute to turbidity in the adjacent portion of Biscayne Bay.

The Munsiport Landfill Site lies to the west of and adjacent to the campus. This is a Superfund site for which an Environmental Protection Agency (EPA) Record of Decision Declaration was issued in 1990 (EPA, 1990). Based on Munisport's impacts on the environment, the EPA prescribed a

remedial action for this site, primarily to protect the State mangrove preserve adjacent to Munisport and Biscayne Bay Campus. Evaluating the potential long-term effects of Munisport on resources in the context area is beyond the scope of this study.

Because of the smaller size of the lakes, it is likely that storm water runoff has a greater impact on the lakes on campus than it does on Biscayne Bay or the Oleta River.

9. Known septic tanks, grease traps, storage sites of hazardous, toxic or medical waste:

No known septic tanks are present at either Modesto A. Maidique or Biscayne Bay Campus. According to FIU sources, the last septic tank was removed from Biscayne Bay Campus in 1992. Grease traps have been installed on both campuses in the portions of the sewer lines associated with cafeteria facilities, and in association with the hospitality management facility on at Modesto A. Maidique.

10. Chemical and hazardous waste disposal systems:

MODESTO A. MAIDIQUE

According to information provided by the FIU Environmental Health and Safety staff, hazardous, toxic and medical wastes are collected by FIU Environmental Health and Safety staff from sources of generation and stored until pick-up and disposal can be arranged with a contracted waste disposal company. Hazardous (non-biohazardous and non-radioactive) waste is stored in the Hazardous Waste Shed located on the westside of Modesto A. Maidique.

Biohazardous wastes generated at Modesto A. Maidique are either picked up from the point of generation by the disposal company, or are stored in an outside storage container (location unknown). Biohazardous waste is presumably generated from only two sites at Modesto A. Maidique: Modesto A. Maidique Health Clinic, from which biohazardous waste is collected once per week, and the Medical Science Lab, from which biohazardous waste is collected biweekly. Waste stored in the outside container is picked up once per month.

Radioactive wastes generated at Modesto A. Maidique are currently stored in Building OE 152 to "allow decay to an acceptable level". Radioactive wastes are transported to this room by the generators themselves (professors and their graduate assistants). Because the handling of radioactive waste is a regulated activity, this is currently the only acceptable arrangement for the disposal of radioactive wastes. No further information regarding the handling of radioactive wastes was provided.

As a rule, hazardous wastes stored on campus are disposed of by a waste disposal company every 180 days. The waste disposal company handling the disposal of hazardous wastes must meet basic insurance and other permit requirements.

The largest concentration of fuel tanks is at the grounds/motor pool building at the southwest corner of the campus, where two 6,000 gallon gasoline tanks, one 500 gallon kerosene tank, and one 600 gallon diesel tank are located. One thousand gallon emergency diesel tanks are located at Viertes Haus, the library, Owa Ehan, and Engineering and Computer Science. Smaller emergency diesel tanks (550-600 gallons each) are located at Public Safety, Primera Casa, Graham Center and Deuxieme Maison.

BISCAYNE BAY CAMPUS

According to information provided by the FIU Environmental Health and Safety staff, hazardous, toxic and medical wastes are collected by FIU Environmental Health and Safety staff from sources of generation and

transported to Modesto A. Maidique for storage until pick-up and disposal can be arranged with a contracted waste disposal company. Hazardous (non-biohazardous and non-radioactive) waste is transported to Modesto A. Maidique, where it is stored in the Hazardous Waste Shed located on the west side of the campus. Only small amounts of hazardous wastes (approximately 5-20 gallons per year) are generated at Biscayne Bay Campus. Biohazardous wastes generated at Biscayne Bay Campus are presumably picked up from the point of generation by the disposal company. According to FIU Health and Safety Staff, no radioactive waste is generated at Biscayne Bay Campus.

Below-ground fuel storage tanks on Biscayne Bay Campus are associated with motor pool/vehicle maintenance areas. Presumably there are underground emergency fuel storage tanks located under the main buildings, no specific information on this was given.

11. Surface and groundwater hydrology:

MODESTO A. MAIDIQUE
Refer to 13-(1)a)1.

BISCAYNE BAY CAMPUS
Refer to 13-(1)a)1.

(2) ANALYSIS REQUIREMENTS

a) Existing Commercial, Recreational Or Conservation Uses For The Following Resources

1. Rivers, lakes, bays, wetlands (including estuarine marshes), and bottom lands:

Rivers, lakes and bays:

MODESTO A. MAIDIQUE

Commercial Uses: There are no commercial uses in the lakes and surface waters in the context area.

Recreational Uses: The canals in the context area outside Modesto A. Maidique boundaries are used primarily for water conveyance and drainage. There is limited recreational boating and fishing along the canal that borders Tamiami Trail. We have no knowledge of recreational uses of the off-campus lake.

Conservation Uses: The Environmental Studies program plans to develop a wetland area within the lake associated with the teaching and research area. No other surface water-related conservation uses were discovered.

BISCAYNE BAY CAMPUS

Commercial Uses: There are no surface water-related commercial uses within the context area.

Recreational Uses: The principal surface water-related recreational uses in the context area are boating and fishing in the Oleta River. The FIU student rowing club uses the Oleta River on a regular basis. No other surface-water-related recreational uses on campus or within the context area were discovered.

Conservation Uses: There are a number of habitat enhancement/mitigation projects that have been or will be completed along the shoreline of the Oleta River. Additional mitigation work is in progress on Sandspur Island.

Biscayne Bay and all natural waterways (including the Oleta River and the estuary at the north end of the Biscayne Bay Campus) tidally connected to the bay have been designated as the Biscayne Bay Aquatic Preserve, a Miami-Dade County preserve.

2. Floodplains:

MODESTO A. MAIDIQUE
There are no floodplains on campus or within the context area.

BISCAYNE BAY CAMPUS
The Biscayne Bay Campus and the context area are within the 100-year flood zone. No commercial uses occur within the context area; therefore, all recreational and conservation activities within the context area and discussed elsewhere within this document are present in the floodplain area.

3. Wetlands:

MODESTO A. MAIDIQUE

Commercial Uses: There are no commercial uses in the wetland areas within the context area.

Recreational Uses: There is a jogging/fitness trail adjacent to the teaching and research park on campus. The other potential wetland areas are located in vacant land and serve no recreational function.

Conservation Uses: The teaching and research park serves both conservation and educational functions. The Environmental Studies program has an ongoing conservation/restoration project here, and has plans to develop wetland areas associated with the preserve. No other conservation uses associated with on-campus wetlands have been identified.

BISCAYNE BAY CAMPUS

The majority of wetland areas on campus and within the context area are mangrove forest or back-mangrove associations.

Commercial Uses: There are no commercial uses associated with wetlands on campus or within the context area. However, seagrass and mangrove areas are important resources in the maintenance of fisheries, and as such may be important to commercial interests. There is a regional water treatment plant in an area that likely was dominated by mangroves at one time.

Recreational Uses: The dominant recreational feature within the context area is the 470-acre Oleta River State Recreation Area. The passive recreation uses in the mangrove areas of Oleta River State Recreation Area are primarily for nature study and education. Fishing and snorkling are the primary active recreational activities associated with the mangrove areas. There is a beach and fishing pier at Oleta River, but these are not associated with the mangrove areas.

On campus, a jogging/fitness recreation trail runs adjacent to mangroves and passes some of the strand areas. While there may be other occasional recreational uses in portions of the mangrove areas at Biscayne Bay Campus, no evidence was found that any of these relate to University activities. No nature trails or evidence of planned passive or active recreation activities other than the jogging/fitness trails were observed on campus.

There are two structures on the water; however, neither one appears to serve as a recreational facility. The northern one is a pier in good condition, but it is located in a "no trespassing" area. The other is a floating dock that is in disrepair. It likely is used by the student rowing club and by occasional boaters. Also, there is a launch ramp adjacent to the red drum fish hatchery on campus that is accessed from a service road; however with the absence of a parking lot and other amenities, it is of minor recreation value.

Conservation Uses: There are a number of State-owned mangrove preserves within the context area. According to the coastal element of the City of North Miami's Comprehensive Plan, there are 575 acres of mangrove preserves in or adjacent to the context area. Additional conservation uses within the context area are related to mitigation or environmental enhancement projects. These are discussed in Section (1) a) 4. existing mitigation sites.

4. Fisheries, wildlife marine habitats and vegetative communities:

MODESTO A. MAIDIQUE

Wetland plant communities on campus and within the context area are discussed in Section (1) a) 1 wetlands.

Commercial Uses: There are no commercial uses in any of the existing vegetative communities in the context area.

Recreational Uses: Other than those discussed above, there are no recreational uses associated with the vegetative communities in the context area.

Conservation Uses: Because Modesto A. Maidique is designated as a Wildlife Sanctuary by an agreement between FIU and the Tropical Audubon Society, those vegetative communities that serve as wildlife habitat (see Section (1) a) 5.) are protected. Other conservation uses are discussed under wetlands.

BISCAYNE BAY CAMPUS

Mangrove forests and back-mangrove associations, as well as beach strand communities, are discussed in Section (1) a) 5 above.

Commercial Uses: There are no commercial uses in any of the existing vegetative communities in the context area.

Recreational Uses: Other than those discussed in Section (1) a) 5, there are no recreational uses associated with the vegetative communities in the context area.

Conservation Uses: The only additional conservation uses not discussed above are an unknown contribution to the marine or estuarine ecosystem by the submerged vegetation associated with Biscayne Bay and the estuary.

Species Listed by Federal, State or Local Agencies:

MODESTO A. MAIDIQUE

The habitat values of each of the vegetation communities in the context area are discussed above as are the commercial, recreational and conservation values of each.

BISCAYNE BAY CAMPUS

The habitat values of each of the vegetation communities in the context area are discussed above, as are the commercial, recreational and conservation values of each.

The Oleta River in this area is a known habitat for the West Indian manatee. Recreational uses of the Oleta River are discussed above. Most of these activities are not associated with the campus. Nonetheless, some of the recreational uses of the Oleta River are not compatible with the survival of the West Indian manatee.

Known Corridors for the Faunal Species:

MODESTO A. MAIDIQUE

No animal corridors are known to occur on campus or within the context area.

BISCAYNE BAY CAMPUS

The only significant wildlife corridors on campus or within the context occur in mangroves, beach strand and other wetland areas, and are discussed above.

b) Available And Practical Opportunities And Methods For Protection Or Restoration Of Resources Identified In (1) A)

1. Rivers, lakes, bays, wetlands (including estuarine marshes), and bottom lands:

Rivers and lakes:

MODESTO A. MAIDIQUE

Protective measures: Protective measures for lakes are discussed in Section (2) 1. above. Methods for littoral zone protection are discussed in Section (2) 1. above.

Enhancement measures: Most of the lakes at Modesto A. Maidique would benefit from a variety of enhancement measures. Several of the lakes lack any kind of littoral zone and are steep-sided. These lakes would benefit from grading measures to produce a shallower grade. This would permit the planting of littoral vegetation around the peripheries of the lakes and would help to reduce safety hazards of steep-sided lakes. Most lakes on campus would benefit from the planting of native littoral zone plants. Such plantings would increase the value of the lakes as wildlife habitat, and, by absorbing excess nutrients could help prevent the occurrence of algal blooms.

Removal of exotic vegetation from the shorelines of lakes is also desirable as a means of enhancing their value. The species that is most problematic in this respect is Australian pine. Removal of adult trees followed by regular and systematic eradication of seedlings and saplings would reduce the control costs in the long term and prevent competition with desired native plant species.

BISCAYNE BAY CAMPUS

Protective measures: Routine monitoring of water quality at the two lakes on Biscayne Bay Campus should be initiated as a means of identifying point and non-point sources of pollution at the lakes. This is especially important for the west lake due to the potential of pollution from parking lots to the south of the lake, from the Munisport Landfill to the west, and from the maintenance and service facilities located to the north of the lake.

Within the context area, lakes located within the Munisport site were not open to public access, so an assessment of the need for protective measures for these lakes was not within the scope of this project. Furthermore, protective measures at these lakes are probably not warranted until environmental issues associated with the Munisport Landfill are resolved (EPA, 1990).

Within the context area, the Oleta River and adjacent mangrove areas and channels are protected within the Oleta River State Recreation Area and the State mangrove preserves. This waterway is already protected by various measures designed to minimize the impacts of boating and other recreational use on mangroves and on West Indian manatees that utilize the river.

Biscayne Bay and all natural waterways (including the Oleta River and the estuary at the north end of Biscayne Bay Campus) tidally connected to the bay have been designated as the Biscayne Bay Aquatic Preserve, a Miami-Dade County preserve.

Enhancement measures: The east lake on campus has a well developed littoral zone, and natural colonization of the lake by various aquatic invertebrates and vertebrates will enhance its value as wildlife habitat over time. The width and depth of the lake probably restricts its value as habitat for aquatic birds and many fish species. The west lake appears to be very poor animal habitat at present. Planting of littoral zone vegetation along the periphery of the lake would greatly enhance its habitat and visual value.

The Oleta River and associated mangrove areas appear to be in good ecological condition. The existing protective measures governing the river and associated mangroves appear to be sufficient, and no enhancement measures are recommended. The Terama Tract (Figure 13.2) is the only disturbed area abutting the river, and any mitigation work done at the site (e.g., removal of Australian pine, removal of fill) is dependent on final resolution of the development status of the tract.

Wetlands:

MODESTO A. MAIDIQUE

There are relatively few wetland areas at Modesto A. Maidique. The majority of wetlands on campus and within the context area fall into three categories: the teaching and research park and associated lake, littoral zones associated with other lakes, and periodically flooded lawn areas.

Protective measures: The teaching and research park contains patches of wetland plant vegetation and has a lake with a reasonably well-developed littoral zone. The park and associated lake are already protected as a campus nature preserve, and existing levels of protection are probably adequate to protect these wetlands.

Littoral zones associated with the 15 other lakes on campus are generally poorly developed and likely serve as only marginal habitat for birds and other animals. However, littoral zone vegetation could be better protected by limiting the use of herbicides and pesticides within those portions of the campus that drain into lakes, and by selecting herbicides and pesticides with short environmental half-lives and low toxicity to non-target organisms. University maintenance staff should also be encouraged to restrict mowing near on campus lakes to encourage the growth of transitional wetland vegetation.

Within the context area, the only wetland is the large lake near SW 122nd Avenue and SW 11th Street. This lake possesses a reasonably well-developed littoral zone and serves as habitat for a number of birds and other animals. However, plastic bottles and other debris litter much of the littoral zone and should be removed.

Periodically flooded lawn areas occur on campus to the immediate west of the main entrance to the campus from Tamiami Trail and along the periphery of the playing fields in the northwest corner of the campus. These lawn areas support wetland vegetation, primarily because mowing has been curtailed due to ponding. However, because wetland hydrology, soils and vegetation appear to be present, these areas may qualify as jurisdictional wetlands under the United States Army Corps of Engineers (ACOE) and State of Florida wetlands regulations. Delineation of jurisdictional wetlands is a complex process and is beyond the scope of work for this project.

Flooded lawn areas likely only serve as marginal foraging habitat for birds and other animals.

Enhancement measures: Wetland areas associated with the teaching and research park are currently undergoing an enhancement program, with exotic plant species being removed and littoral zone vegetation being replanted in the adjacent lake.

The remaining wetland areas would benefit most from a reduced mowing regime, allowing the establishment of disturbance-sensitive wetland species, and allowing the development of mature, reproductive plant species would benefit these areas. Additionally, limiting the application of herbicides and pesticides would enhance the value of these areas as wildlife habitats.

BISCAYNE BAY CAMPUS

The majority of wetland areas on campus and within the context area are mangrove forest or back-mangrove associations.

Protective measures: Since mangrove areas on campus are primarily located along an estuary and canal at the north end of the campus, proposed protective measures apply primarily to these areas.

The estuary located at the north end of the campus should be designated as a no-wake boating zone with signs posted at the entrance to the estuary. Recreational and other activities within the estuary should be limited to those activities which will not stir up sediment or scar the bottom, and which will not create undue wave action along shorelines. Any other activities which might damage mangrove roots and/or propagules should be prohibited or closely controlled. The mangrove-lined canal on campus is both shallow and narrow, and any recreational or other activities occurring in the canal will likely damage the mangroves growing there. Signs should be posted at potential access points of the canal designating it as a restricted-access or no-access area.

The mangrove canal and estuary should be periodically monitored to check for point and non-point sources of pollution (from parking lots, damaged sewage lines, etc.). Where possible, the University should restrict the use of herbicides, pesticides, and fertilizers within the portions of the campus that drain into mangrove and back-mangrove areas, and should carefully select herbicides and pesticides tailored to specific needs, and with short half-lives and low toxicity to non-target organisms.

Exotic plant species invading or approaching mangrove areas may pose a serious threat to the viability of these systems. The two most problematic species in this respect are Brazilian pepper and Australian pine. A policy of systematic removal of adults and seedlings of these and other exotic species from mangrove forests and back-mangrove associations is being implemented by the University.

Enhancement measures: Mangrove areas along the estuary and canal at the north end of the campus appear to be in relatively good condition. Growth of the mangroves would be enhanced by removal of shading Australian pines, especially along the north side of the canal and along the north part of the estuary. On-going shoreline stabilization and mangrove replanting programs

could create or restore mangrove vegetation in areas at the southern and south-west edges of the campus.

Bottom Lands:

MODESTO A. MAIDIQUE

There are no bottom lands on campus.

BISCAYNE BAY CAMPUS

There are no bottom lands on campus.

2. Floodplains:

MODESTO A. MAIDIQUE

There are no floodplains on campus.

BISCAYNE BAY CAMPUS

The entire Biscayne Bay Campus is within the 100-year flood zone. All protection and enhancement activities discussed elsewhere fall within the floodplain.

3. Existing mitigation sites:

MODESTO A. MAIDIQUE

There are no mitigation sites on campus.

BISCAYNE BAY CAMPUS

All of the known mitigation sites on campus are within or are adjacent to wetlands and are discussed in Section (2) 1. above.

4. Fisheries, wildlife marine habitats and vegetative communities:

MODESTO A. MAIDIQUE

Most of the natural vegetative communities on campus and within the context area are wetlands and are discussed in Section (2) 1. above.

Protective Measures: Non-wetland areas that serve as habitat for birds and other wildlife should be adequately protected under the Wildlife Sanctuary agreement between the University and the Tropical Audubon Society (see Section (2) 1. above).

Enhancement Measures: Enhancement measures for wetland communities on Modesto A. Maidique and context area are discussed in Section (2) 1. above.

Upland plant communities (hardwood hammocks and tree islands) occurring

on the campus and in the context area would benefit from a systematic program of exotic plant removal targeting Australian pine, Brazilian pepper and lead tree (Leucaena leucocephala.) Facilities management is undertaking a removal program.

BISCAYNE BAY CAMPUS

Most of the natural vegetative communities on campus and within the context area are wetlands and are discussed in Section (2) 1. above.

Protective and enhancement methods: The only upland vegetative community on the campus and in the context area is Australian pine forests. These are undesirable vegetative associations that provide little or no wildlife habitat. No protection of these areas is warranted.

Species Listed by Federal, State or Local Agencies:

MODESTO A. MAIDIQUE

The habitat values of each of the vegetative communities are discussed in Section (2) 5. above.

Wetlands provide the most of the significant habitat on campus and within the context area. Protective and enhancement measures for wetlands are discussed in Section (2) 5. above.

BISCAYNE BAY CAMPUS

The habitat values of each of the vegetative communities in the context area are discussed in Section (2) 5. The only natural vegetative communities that provide significant habitat are wetlands.

Known corridors for faunal species:

MODESTO A. MAIDIQUE

There are no known animal corridors on campus.

BISCAYNE BAY CAMPUS

The only significant animal corridors on campus or within the context area occur within the mangrove, estuarine and bay areas. Protective and enhancement measures for these areas are discussed in Section (2) 5.

c) For each of the resources identified in (1) a), identify known sources and rates of discharge or generation of pollution.

1. Air quality, including but not limited to the pollutants subject to National Ambient Air Quality Standards:

MODESTO A. MAIDIQUE

There are no air quality monitoring stations close to the campus or context area; however, data from the closest stations indicate few if any air quality violations, and it is probable that the air quality parameters measured by Miami-Dade County are within legal limits on campus.

Vehicular emissions are, no doubt, the primary source of air pollution on campus. There likely are some hydrocarbon emissions generated by on campus fuel storage.

We could find no data regarding air pollution emissions from laboratories and other chemical storage/chemical use areas; it is likely that any such emissions would have a more dramatic effect on the human environment than on natural resources.

BISCAYNE BAY CAMPUS

There are no air quality monitoring stations close to the campus or context area; however, data from the closest stations indicate few if any air quality violations, and it is probable that the air quality parameters measured by Miami-Dade County are within legal limits on campus.

Vehicular emissions are, no doubt, the primary source of air pollution on campus. There likely are some hydrocarbon emissions generated by on campus fuel storage.

We could find no data regarding air pollution emissions from laboratories and other chemical storage/chemical use areas; it is likely that any such emissions would have a more dramatic effect on the human environment than on natural resources.

2. Surface Water Quality, including the water quality for each lake, river and other surface water, and the identification of any such water body designated as an Outstanding Florida Water:

MODESTO A. MAIDIQUE

Storm water runoff no doubt has some impact on surface water quality on the campus.

BISCAYNE BAY CAMPUS

Storm water runoff from roadways and parking lots and other impervious surfaces is probably the principal source of water pollution on campus. Runoff from landscaped and grassed areas also, no doubt, contributes to water pollution. Presumably, fertilizers and pesticides are used in maintenance of landscaped areas on campus; no data relating to this matter was given.

There are mulch storage areas on University property, and these likely contribute some leachate to the nearby waters.

There are areas along the waterfront away from the developed portions of the campus where a considerable amount of clearing has occurred. No doubt some of these areas contribute to turbidity in the adjacent portion of Biscayne Bay.

The Munsiport Landfill Site lies to the west of and adjacent to the campus. This is a Superfund site for which an Environmental Protection Agency (EPA) Record of Decision Declaration was issued in 1990 (EPA, 1990). Based on Munisport's impacts on the environment, the EPA prescribed a remedial action for this site, primarily to protect the State mangrove preserve adjacent to Munisport and Biscayne Bay Campus. Evaluating the potential long-term effects of Munisport on resources in the context area is beyond the scope of this study.

Because of the smaller size of the lakes, it is likely that storm water runoff has a greater impact on the lakes on campus than it does on Biscayne Bay or the Oleta River.

d) Opportunities Of Available And Practical Technologies To Reduce Pollution Or Its Impacts Generated By University Activities For Resources Identified In (1) A)

In the absence of available data regarding pollution generated on campus or in the context area, it is not possible to recommend specific technologies to address these impacts. Strong consideration should be given to implementing air quality and water quality monitoring programs so that levels of pollutants generated by on campus activities can be documented and, if necessary, control technologies implemented.

e) Current And Projected Water Needs And Sources, Based On The Demand For Industrial, Agricultural And Potable Water Use And The Quantity And Quality Available To Meet Those Demands

Storm water runoff from roadways, parking lots and impervious surfaces is likely the principal source of water pollution for both campuses. Runoff from landscaped and grassed areas also, no doubt, contributes to water pollution. Presumably, fertilizers and pesticides are used in maintenance of landscaped areas on campus; no data relating to this matter was given. Storm water runoff no doubt has some impact on surface water quality on both campuses.

Strong consideration should be given to implementing water quality monitoring programs so that levels of pollutants generated by on-campus activities can be documented and, if necessary, control technologies implemented.