WETLAND ASSESSMENT TECHNIQUE FOR ENVIRONMENTAL REVIEW

OVERVIEW

INTRODUCTION:

This Wetland Assessment Technique for Environmental Review (WATER) has been created to provide a tool for evaluating the restoration potential of the Everglades Mitigation Bank, as proposed by Florida Power and Light (FPL). The mitigation bank area comprises approximately 13,455 acres of freshwater and brackish wetlands, with small interspersed upland areas, in southeastern Dade County. The assessment methodology has been assembled from some of the better known wetland evaluation techniques developed in the past. It incorporates attributes from some of the most sophisticated and modern techniques to form a comprehensive ecological evaluation procedure. This procedure can be utilized to further the new science of wetland functional assessment. Thus, while the technique outlined here focuses upon the mitigation bank area, it also has potential application throughout the state of Florida.

The assessment technique consists of two separate and distinct procedures. The first is a *Functional Evaluation* and is purely ecological in nature. The second is a *Value Evaluation* and reflects the mitigation bank's site suitability, as measured by criteria rating the social significance provided by the area in question.

THE FUNCTIONAL EVALUATION MATRIX:

Habitat Assessment Parameters

The functional evaluation matrix is broken into four main categories which are further subdivided into ecologically distinct sub-groups. The main categories are: (1) **Fish and Wildlife**, (2) **Vegetation**, (3) **Landscape/Hydrology** and (4) **Salinity**. These inter-related categories contain, either directly or indirectly, most of the important ecological components and factors of Everglades and coastal ecosystems.

Fish and Wildlife is divided into five sub-categories which represent ecologically distinct groupings with traits or effects which produce specific functions or values of the ecological system:

Aquatic invertebrates and amphibians serve as primary prey species for fish and wading birds that live and forage in wetland areas. While higher taxa diversity may indicate numerous microhabitats or high productivity, overall abundance of appropriate forage species is of primary importance to the higher trophic levels. For this reason, more numerous species are given a higher rating score in these sub-categories.

Fish are primarily low-level consumers of plant and animal material, as well as detritus. Larger species comprise the next higher trophic level. Along with invertebrates, small fish provide the prey base for wading birds, while larger fish are commonly preyed upon by raptors.

Aquatic reptiles are given separate consideration because of the unique wetland habitat created by the American alligator (*Alligator mississippiensis*). This species creates aquatic refugia for aquatic and semiaquatic animals by digging "gator holes" that enable both alligators and other species to survive during dry periods. In moving through wetlands, alligators also clear vegetation from flow ways which may allow more efficient water transport and, consequently, better species translocation for fish and other aquatic animals. Other reptiles (i.e., snakes and turtles) serve as mid-level predators on invertebrates, fish, amphibians, birds and one another.

The abundance and relative diversity of birds are visual indicators of habitat conditions and lower order productivity. Specifically, bird utilization is indicative of hydrologic conditions, which determine the abundance of prey species and the degree to which prey are concentrated for easier foraging.

The complement of mammal species present is indicative of the habitat mosaic in an area, and particularly the presence of suitable uplands or raised elevation adjacent to productive wetlands. Top predators such as bobcat (*Felis rufus*) and panther (*Felis concolor*) can indicate the overall integrity of an area, since they represent the successful transfer of matter and energy up through the food web.

Vegetation provides the energy base of an ecosystem by converting inorganic molecules to organic compounds as a result of the photosynthetic conversion of light energy to chemical energy. The physical structure provided by vegetation is an important determinant of animal habitat. The composition of a wetland vegetative community also typically indicates the hydrologic pattern in an area. Vegetation characteristics are divided into six categories:

The overstory/shrub canopy considers the importance of the climax community trees to the productivity of wetlands through the deposition of detrital material. The age and stature of the climax community may be indicative of the stability of conditions in a specific wetland. While the climax vegetation may persist after disturbances to the wetland, they can indicate a degree of hydrologic alteration that may not otherwise be apparent. These indicators include, but are not limited to, chlorotic vegetation, reduced biomass, pest damage, etc. In some instances, an overstory/shrub canopy is not appropriate for a specific wetland type. The lack of this stratum, should not necessarily be perceived as undesirable if historical evidence indicates that the specific wetland being evaluated is not at a successional stage which should support an overstory or shrub canopy.

Vegetative ground cover is an assessment of the nature of the herbaceous vegetation found within an area. Native plant species are predominant in more pristine areas, while abundant exotic species, or undesirable native species, indicate systems that may have been detrimentally affected through such recruitment. The relative amount of inappropriate native herbaceous ground cover represents the degree to the character of a specific wetland has changed. One example is higher water and nutrient levels causing cattails to recruit into sawgrass flats.

Periphyton mat coverage, or algal mat coverage, is an assessment of the most widely distributed plant community in South Florida. It is the assemblage of algae that grows on shallow, submerged substrates. This material provides forage for a broad array of herbivorous invertebrates and vertebrates.

The Category 1 exotic plant (non-native) species list includes numerous exotic plants listed by the Florida Department of Environmental Protection's Exotic Pest Plant Council as problematic and likely to invade wetlands. The flora of South Florida has been substantially altered by exotic plant species, especially Australian pine (*Casuarina litorea syn equisetifolia*), melaleuca (*Melaleuca quinquenervia*) or Brazilian pepper (*Schinus terebinthifolius*).

Habitat diversity is the number of macrophyte species within a wetland system. Protection of natural biodiversity is a primary goal of conservation and restoration efforts.

Biological habitat diversity within 3,000 feet allows for inclusion of lands within approximately 1/2 mile from the subject site that may have a direct impact on the productivity and/or stability of the wetland in question. This subcategory does not include man-made developments that remove the land from natural productivity and limit the inclusion of some types of inappropriate or impacted (exotic) alternate habitats for inclusion as additional habitat diversity. If the subject site does not include all of a particular wetland, this sub-category would allow for the subjective inclusion of the remainder of productive wetlands. The 3,000-foot buffer begins at the perimeter of the wetland being evaluated.

Landscape/Hydrology is divided into six sub-categories which consider important aspects of the physical and chemical nature of the wetland systems.

Surface water hydrology/sheet flow documents the degree to which wetlands store, attenuate, and convey water over the landscape. The uniformity of the site gradient makes it relatively easy to predict sheet flow. Anthropogenic alterations have interrupted these original sheet flows over much of Florida's wetlands. It is the degree of interruption and or blockage that becomes the limiting factor for this process. While a hydrologically isolated wetland may still provide some wetland functions, its ability to provide nutrient uptake for sheet flow across the landscape is limited.

Hydroperiod (normal year) is a measure of the duration of inundation. This sub-category recognizes that inundation within appropriate temporal ranges is ecologically important. It includes periods of ground saturation, as this condition greatly influences the distribution of wetland plants and limits that of upland plants. Alternative rankings are provided for brackish systems since they rely upon the energy input of the tidal waters for their characteristic flushing and nutrient transport. Another alternative ranking applies to high marsh systems which are characterized by swings in fresh or saline inundation, dependent upon season. A third alternative applies specifically to tidal creek systems. This habitat is controlled by the mixing of fresh and saline water inputs. It is the ability of these systems to maintain water that provides a critical function of aquatic refugia for organisms.

Hydropattern (fresh systems) is a measure of water depth for optimum productivity for sawgrass and sawgrass/mosaic systems (riverine systems are not a part of this sub-category). These depths reflect the

optimum water depths for fish dispersal and subsequent reproduction, followed by drying down of sufficient duration to concentrate fish for the greater efficiency of capture by predator species. A water level greater than 2.5 feet of sufficient duration is also recognized as detrimental to the optimal health of the tree islands. As with hydroperiod, alternative rankings are provided for brackish areas, high marsh, and tidal creeks.

Water quality is included in the evaluation because of the direct effect it has on various other wetland functions. The optimum condition is that which indicates no Anthropogenic changes in water quality.

Intactness of historic topography (soil disruption) is a direct measure of the degree of prior site disturbance. It quantifies the degree of any attempts to alter, control, or drain wetland areas, or contour land for agriculture or other purposes. This criterion indicates that level of alteration relative to the degree that undisturbed areas are easier to restore, or enhance to regain normal ecological functions for that wetland resource.

Soils (fresh systems) considers the ability of hydration and saturation to modify the physical and chemical processes that result in the formation of a hydric soil. It is recognized that the formation of organic (hydric) soils requires many years of inundation for six to twelve months a year.

Alternative ranking applies to brackish (tidal) systems. This alternative recognizes that not all hydric soils are carbon-based remnants of decomposed plant material. The calcareous base for this soil is processed by the action and energy of the sea. Periphyton of the type found in association with brackish systems has the ability to form calcium deposits which accumulate under appropriate geologic and hydrologic conditions.

Salinity addresses the major role that dissolved salts play in the functions of wetlands that lie near saline waters (ocean, bay, sound, etc.). A relatively small number of plants have evolved to tolerate elevated salinity. Although minimal deleterious effects are realized by vegetative communities for short periods of reduced salinity, the opposite is true for brief periods of adversely high salinity as it affects vegetative communities.

WETLAND ASSESSMENT TECHNIQUE FOR ENVIRONMENTAL REVIEW (W.A.T.E.R.)-- SPECIFIC GUIDANCE RECOMMENDATIONS FOR THE EVALUATION MATRIX

This section specifies the point values to be assigned to an assessment area based upon the physical and biological constituents of the area. Scores range from 0 to 3 for each category in the evaluation matrix. Fractional increments may also be used to provide additional flexibility in the rating system. The overall value of an area is determined based upon the sum of the assigned scores, relative to the maximum possible score.

1) Fish and Wildlife Functions

A) Aquatic Macroinvertebrates, Amphibians: This sub-category includes aquatic insects, crayfish, freshwater prawn (*Palaemonetes paludosus*) and apple snail (*Pomacea paludosa*). Also included are freshwater mussels and clams, as well as brackish and estuarine species of clam, mussel and/or oyster. Amphibians include larval and adult stages. As this parameter may be difficult to measure toward the end of the dry season, extrapolated counts may be taken from within aquatic refugia that would be situated within 300 ft. of the area under evaluation. Any obvious evidence of occupation from past wet season inundation may be used to quantify the inclusion of a species into the matrix (e.g., apple snail egg shells attached to vegetation, crayfish exoskeleton remains, crab burrows, etc.). Shellfish presence should be determined by performing random digs, or from shell fragments left from predation. The evaluation of an area should be performed by the assessment team at the same time of the year for the initial pre-enhancement baseline and the post-enhancement success monitoring. This portion of the evaluation matrix is based upon the principle of increased diversity as a positive measure of wetland function however, relative abundance should also be considered when evaluating a wetland. Quantified species count taken during peak utilization times may track specific population dynamics. Targeted species would require count census prior to mitigation activity and again after restoration efforts have been completed. Increases of 12 percent in population numbers may be considered as statistically significant and will allow the next higher rating for the matrix. Habitat enhancement that led to site utilization by increased numbers of a particular species would be deemed a successful mitigation effort. This type of quantification would be justified as appropriate toward scoring for a wetland system that prior to restoration supported only marginal populations of species. This type of quantification would also be justified for an assessment area that supported a wide variety of aquatic macroinvertebrates and amphibian species however, the degraded nature of the assessment area prior to enhancement kept population numbers lower than historically they were known to be

A score of **3** is given to an area having 7 or more species commonly observed. A score of **2** is given to an area having 3 to 6 species commonly observed. A score of **1** is given to an area having 1 to 2 species commonly observed. A score of **0** is given to an area having no invertebrates or amphibians.

B) Fish: This sub-category includes fish species found within fresh, brackish, saline and hypersaline environments. When using the count quantification for this sub-category, additional species

shall be included only if a species is represented by more than a single captured individual and it is felt that the assessment area has been colonized by breeding individuals. A qualified biologist familiar with the assessment area ecosystem may add a species to the matrix through the collection of a single individual specimen if best professional judgment warrants such inclusion and it is felt that the specimen is part of a breeding colony. The term "commonly observed" is defined as "present in sufficient numbers to maintain a viable population." Specimens may be collected or trapped by using weighted throw nets and counting species within the confines of the net. This should be repeated at least three times in each major habitat. The evaluation of an area should be performed at the same time of the year as for the initial pre-enhancement baseline and the post-enhancement success monitoring. For the analysis of fish or shellfish, the water ring surrounding the tree island will be included as part of the tree island for the purpose of measuring the fish and / or shellfish parameter. This portion of the evaluation matrix is based upon the principle of increased diversity as a positive measure of wetland function however, relative abundance should also be considered when evaluating a wetland. Quantified species count taken during peak utilization times may track specific population dynamics. Targeted species would require count census prior to mitigation activity and again after restoration efforts have been completed. Increases of 12 percent in population numbers may be considered as statistically significant and will allow the next higher rating for the matrix. Habitat enhancement that led to site utilization by increased numbers of a particular species would be deemed a successful mitigation effort. This type of quantification would be justified as appropriate toward scoring for a wetland system that prior to restoration supported only marginal populations of species. This type of quantification would also be justified for an assessment area that supported a wide variety of fish species however, the degraded nature of the assessment area prior to enhancement kept population numbers lower than historically they were known to be

A score of **3** is given to an area having 7 or more species commonly observed. A score of **2** is given to an area having 3 to 6 species commonly observed. A score of **1** is given to an area having 1 to 2 species commonly observed. A score of **0** is given to an area having no fish.

C) Aquatic Reptiles: This sub-category includes some of the top predator species that can be found within a wetland area. This division includes the American alligator and American crocodile (*Crocodylus acutus*). Sea turtles, which may nest on appropriate shorelines, as well as freshwater turtles, which utilize the freshwater habitats for their life cycles, are included. This division does not include the gopher tortoise (*Gopherus polyphemus*) or the box turtle (*Terrapene carolina*), as these species are less dependent on the wetland functions for survival. Aquatic snakes are given higher priority since these species require much of their life cycle to be centered around aquatic habitats. Species that use major portions of wetland habitat but are not considered true aquatic snakes are given less importance. Lizards are included with this sub-category, as they comprise an important component of the food web without being wetland dependent. The inclusion of exotic species should be avoided as an indicator of wetland function. The Cuban anole (*Anolis sagrei*) is an example of an exotic species that may serve as prey for some predators, but should not be considered as desirable as the green anole (*Anolis carolinensis*). This portion of the evaluation matrix is based upon the principle of increased diversity as a positive measure of wetland function however, relative abundance should also be considered when evaluating a wetland. Quantified species count taken during peak utilization times may

track specific population dynamics. Targeted species would require count census prior to mitigation activity and again after restoration efforts have been completed. Increases of 12 percent in population numbers may be considered as statistically significant and will allow the next higher rating for the matrix. Habitat enhancement that led to site utilization by increased numbers of a particular species would be deemed a successful mitigation effort. This type of quantification would be justified as appropriate toward scoring for a wetland system that prior to restoration supported only marginal populations of species. This type of quantification would also be justified for an assessment area that supported a wide variety of aquatic reptile species however, the degraded nature of the assessment area prior to enhancement kept population numbers lower than historically they were known to be. The evaluation of an area must be performed at the same time of the year for the initial pre-enhancement baseline and the post-enhancement success monitoring.

A score of **3** is given to an area having large reptile species(i.e., alligator or crocodile). A score of **2** is given to an area having aquatic turtles but no large reptile species. A score of **1** is given to an area with snakes and/or lizards but no large reptiles or turtles. A score of **0** is given to an area having few or no aquatic reptiles.

D) Waterfowl, Wading Birds or Aquatic Birds of Prey: This sub-category includes those species of bird commonly considered as ducks, coots and, for the purpose of this matrix, the water turkey (*Anhinga anhinga*) will also be included within this category. Wading birds include all herons, egrets, ibis, woodstork, spoonbills, etc. that forage on animal and live material that utilize wetlands for habitat. The aquatic birds of prey include the Everglades snail kite (*Rostrhamus sociabilis*), northern harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*), and bald eagle (*Haliaeetus leucocephalus*). The inclusion of a species needs to be based on more than just a random occurrence for the sighting of a species (i.e., a specimen completely out of its normal range). This sub-category does allow for species inclusion of winter residents that use a wetland for foraging or resting for a duration of more than 36 hours during migration. This portion of the evaluation matrix is based upon the principle of increased diversity as a positive measure of wetland function however, relative abundance should also be considered when evaluating a wetland. Quantified species count taken during peak utilization times may track specific population dynamics. Targeted species would require count census prior to mitigation activity and again after restoration efforts have been completed. Increases of 12 percent in population numbers may be considered as statistically significant and will allow the next higher rating for the matrix. Habitat enhancement that led to site utilization by increased numbers of a particular species would be deemed a successful mitigation effort. This type of quantification would be justified as appropriate toward scoring for a wetland system that prior to restoration supported only marginal populations of species. This type of quantification would also be justified for an assessment area that supported a wide variety of bird species however, the degraded nature of the assessment area prior to enhancement kept population numbers lower than historically they were known to be. The evaluation of an area should be performed at the same time of the year for the initial pre-enhancement baseline and the post-enhancement success monitoring.

A score of **3** is given to an area having 7 or more bird species commonly observed. A score of **2** is given to an area having 3 to 6 species commonly observed. A score of **1** is given to an area having 1 to

2 species commonly observed. A score of **0** is given to an area having no waterfowl or wading birds.

E) Mammals: This sub-category comprises three divisions. The large mammal division includes the large cats (e.g., bobcat and panther), and the black bear (*Ursus americanus*), as well as large prey of the panther such as the white-tailed deer (*Odocoileus virginianus*). The medium mammal division includes the river otter (*Lutra canadensis*), raccoon (*Procyon lotor*), etc., and other mammals that, at their adult weight, are over 6 lbs. The small mammal division includes the round-tailed muskrat (*Neofiber alleni*) and marsh and cottontail rabbits (*Sylvilagus* spp.). The adult weight for the average member of this division is less than 6 lbs. A species' presence may be documented by tracks or scat in the event that direct observance is not possible. Background research of available material on the assessment area may reveal documented observances of the more elusive mammals. Again, the qualified biologist's best professional judgment may be utilized to determine if a given species should be included in baseline or post-enhancement matrix inclusions. Quantified species count taken during peak utilization times may track specific population dynamics. Targeted species would require count census prior to mitigation activity and again after restoration efforts have been completed. Increases of 10 percent in population numbers may be considered as statistically significant and will allow the next higher rating for the matrix. Habitat enhancement that led to site utilization by increased numbers of a particular species would be deemed a successful mitigation effort. This type of quantification would be justified as more appropriate toward scoring for a wetland system that prior to restoration supported only marginal populations of species. A direct result of mitigation activities increased the population numbers of these species. This type of quantification would also be justified for an assessment area that supported a wide variety of mammal species however, the degraded nature of the assessment area prior to enhancement kept population numbers lower than historically they were known to be. The evaluation of an area should be performed at the same time of the year for the initial pre-enhancement baseline and the post-enhancement success monitoring.

A score of **3** is given to an area having top predators and/or large mammals. A score of **2** is given to an area having medium-sized mammals but no top predators and/or large mammals. A score of **1** is given to an area having only small mammals. A score of **0** is given to an area having no mammals present.

A written methodology should be included with both the baseline and the post-enhancement monitoring. Included within the methodology should be the inventory type (i.e., transects, random sampling, etc.), time of year, times of day, and weather and wind conditions during the monitoring. Any unusual circumstances or findings should also be noted as part of the methodology.

2) Vegetation

A) Overstory/shrub canopy: This sub-category is an evaluation of the health and appropriateness of the overstory canopy and wetland shrub. The functions attributed to this value are food, cover, nesting potential, substrate stabilization and appropriateness of the vegetative community. This sub-category is to be omitted for the Sawgrass analysis as there is no overstory shrub canopy in a true sawgrass prairie. This parameter will not count toward the final total cumulative score for Sawgrass.

- The highest score rating of **3** is given to desirable native wetland trees (overstory) and/or native shrub species that are healthy and exhibit minimal evidence of disease or insect damage. There should be neither exotics nor inappropriate native canopy nor shrub species present. An example of inappropriate native canopy or shrub species would be realized if historical or photographic evidence indicated that sweet bay (*Magnolia virginiana*) was the dominant canopy species and is currently replaced by pond willow (*Salix caroliniana*). The pond willow stand would be considered an inappropriate species for this particular wetland assessment area. A qualified biologist may determine if historically a specific wetland supported an overstory/shrub canopy, or it may be determined that the assessment area wetland was not at a successional stage to warrant an overstory or shrub canopy. There should also be obvious evidence of seedlings from the desirable overstory or shrub species present.

- The score rating category of **2** is given to an overstory and/or shrub canopy that was composed of desirable native wetland trees (overstory) and/or native shrub species, but these are showing some signs of stress. The signs of stress may include minimal to no seedling establishment of the overstory or shrub species present. There may be chlorotic leaf yellowing due to fluctuations in hydrology or minor presence of disease or insect damage. There should be no inappropriate canopy or shrub species present.

- The score rating category of **1** is given to a desirable overstory or shrub canopy that is being overcome by inappropriate trees/shrubs. In this case, the term inappropriate should include non-desirable natives or exotic species. An example of a non-desirable native would be the pond willow overcoming young cypress (*Taxodium* spp.) Another example, in this case a non-desirable exotic, would be the Australian pine (*Casuarina litorea*) scattered throughout the habitat and shading the shorter swamp hardwoods.

- The score rating category of **0** is given to a wetland under evaluation where there are very little (<5%) or no desirable tree/shrubs present at the time of evaluation, but there is conspicuous evidence that there was prior tree/shrub canopy. Prior tree/shrub canopy existence may be verified by identification of snags or photographic and historical documentation.

This variable may not be applicable to freshwater marsh or wet prairie habitats where this type of canopy is not typically present. If this is the case, the score may have the base 3 points subtracted from the total 57 points available for an optimum score of 54. This sub-category may also receive a half score increment to achieve a "best fit" for site conditions that do not adequately fall into a specific variable.

B) Vegetative Ground Cover: This sub-category utilizes the presence of inappropriate herbaceous ground cover to indicate the health of a functional vegetative wetland system. Inappropriate herbaceous ground cover would consist of invasive native species such as cattail (*Typha* spp.), and/or natives that have displaced the documented historical herbaceous ground covers that grew in the assessment

wetland.

- The highest rating for this category is a **3**, which represents less than 2% inappropriate herbaceous ground cover mixed among the appropriate native herbaceous ground cover. This should be a relative rating and represents a minimal amount of inappropriate vegetation.

- The next highest rating is a **2**, indicating less than 30% inappropriate native ground cover.

- The rating of **1** is achieved if the assessment area contains more than 30%, but less than 70% inappropriate ground cover within the evaluated wetland.

- The lowest rating of **0** is given to an assessment area that contains greater than 70% inappropriate herbaceous ground cover.

The amount of inappropriate ground cover may be determined by experienced biologists through the use of scaled aerials. Areas of inappropriate ground cover can be drawn on the aerials and planimetered to give area sizes. Percentage of inappropriate vegetation can then be determined against the total assessment area size.

Inappropriate herbaceous ground cover may also apply to vegetation that may not be classified as typical ground cover. An example of this would be an area that formerly supported sawgrass (*Cladium jamaicense*) and because of impoundment is now supporting dense colonies of white waterlily (*Nymphea odorata*). White waterlily is not considered an invasive native, but it is inappropriate for the habitat being evaluated.

C) Periphyton Mat Coverage

This sub-category may be used to categorize the amount of periphyton that is commonly found colonizing the substrate or plant surfaces within sawgrass wetland systems. This is the most widely distributed plant community in South Florida and is also referred to as aufwuchs or algal mats. Periphyton is composed of three major taxonomic groups of algae: Cyanophyceae (blue-green algae), Bacillariophyceae (diatoms) and Chlorophyseae (green algae). This community is important because, along with detritus and aquatic macrophytes, periphyton forms the base of the aquatic food web. This sub-category is to be omitted from the matrix evaluation when the assessment area contains wetland systems where periphyton is not commonly found i.e., Hardwood Tree Islands. When this parameter is omitted the maximum possible score is to be adjusted by 3.

The periphyton category requires measuring the thickness of the "mat". To perform this function it is necessary to gently tease up the new active or living layer coupled with past season layers of dead deposited material. There is a level of cohesion that will make the periphyton mat easily removed in the field. Several representative and random samples should be taken within the assessment area to obtain an average thickness measurement. The mat shall have its thickness measured in cross-section, including the living and dead material. Samples collected during the "dry season" may be more

compressed depending on water levels at the time of sampling. In these instances it may be necessary to soak the excised samples in water for a period of time sufficient for their rehydration.

- The highest rating for this category is a 3 which indicates the presence of periphyton on significant surface area within the assessment area, and the average thickness of the mat (living and dead) should be greater than 1¼ inches.
- The next highest rating is a 2 which represents algal mats on significant surface area within the assessment area, and the average thickness of the mat (living and dead) should be between ¾ inch and 1¼ inches.

- The next highest rating is a 1 which represents algal mats on significant surface area within the assessment area, and the average thickness of the mat (living and dead) should be between ¼ inch and ¾ inch.

- The lowest rating of 0 is given to an assessment are that has no periphyton present or if present, the average thickness of the mat is less than ¼ inch of combined living and dead material comprising the mat.

D) Category 1 - Exotic Plant (Non-native) Species: This sub-category quantifies the extent of noxious exotic plants. Such exotics are recognized as having harmful impacts on natural wetlands. Category 1 exotic plants include those aquatic, herbaceous, vine, shrubs and canopy species of plants capable of infesting natural Florida ecosystems. Category 2 exotic (non-native) plant species are most often found infesting disturbed, open soil and abandoned areas, or there is not yet enough evidence for inclusion in Category 1 listings. It may be appropriate to include Category 2 exotic (non-native) plant species if areas of the assessment area wetland have documented or verifiable disturbed areas. Examples of Category 1 exotic plants are represented by the following:

Scientific Name	**Common Name**
Casuarina litorea	Australian pine
Casuarina glauca	suckering Australian pine
Melaleuca quinquenervia	melaleuca
Neyraudia reynaudina	Burma reed
Rhodomyrtus tomentosus	down myrtle
Sapium sebiferum	Chinese tallow tree
Schinus terebinthifolius	Brazilian pepper

- The highest rating of 3 is given to the variable where exotic plant cover is one (1) percent or less.
- The second highest rating of 2 is given to the variable where exotic plant cover is ten (10) percent or less but greater than one (1) percent.
- The score of 1 is given to the variable where exotic plant cover is sixty-five (65) percent or less but greater than ten (10) percent.
- A zero is assigned to an area where exotic plant coverage for the assessment area is greater

than sixty-five (65) percent.

Exotic aquatic plants are also included within the scope of this sub-category. A list of currently controlled aquatic plants are provided by the Florida Department of Environmental Protection (DEP) Bureau of Aquatic Plant Management under 62C-52, F.A.C. Included within W.A.T.E.R. as Appendix 1 is the Exotic Pest Plant Council's Category 1 and Category 2 exotic listed plant species.

E) Habitat Diversity (Vegetative): This sub-category measures the number of plant community associations found within an area. Different individual plant species within an area are considered as one community. If the community is, for example, sawgrass with associated crinum lily and aster (*Aster* spp.), etc., and another area is predominantly spikerush (*Eleocharis* spp.) with white waterlily and some sawgrass, these would be considered separate plant communities. This could be summarized by describing the communities as having a pronounced patchiness within the marsh area being assessed. If the communities are found in a distinctly patchy distribution, they should be considered as separate communities. The presence of tropical hardwoods on tree islands would be considered a third plant community within the example previously described, thus the scoring of three communities on site.

- The highest rating of **3** is given to the variable that included four or more separate communities, recognizing that greater diversity equates to greater stability and productivity.

- The second highest rating of **2** is given to the variable that included two or three communities.

- The score of **1** is given to an area that included one community covering more than 75%, but less than 90% of the surface area of the assessment area.

- A **0** is assigned to an area where one community covers more than 90% of the total assessment area. An example of this would be dense sawgrass domination in the Everglades. Not only is the species diversity low, but there is minimal animal use in these dense sawgrass areas.

Exotic species should not be counted as part of the plant community. While some of the environmental regulatory agencies consider that the exotic tree species melaleuca contributes to wetland function and/or provides habitat, for the purposes of the W.A.T.E.R. evaluation technique, melaleuca will not be considered as a species that contributes to habitat diversity.

F) Biological Habitat Diversity within 3,000 ft.: This sub-category shall be used to evaluate alternative habitats within slightly more than a half mile-radius that offers significantly different conditions from the particular community within the assessment area. Areas dominated by melaleuca, Australian pine, or Brazilian pepper are not to be included as an alternative habitat. As mentioned previously, some of the regulatory agencies consider melaleuca a species that contributes to wetland function and/or provides habitat support. The mitigation banking task force has decided that melaleuca shall be

included as a species that provides alternate habitat within 3,000 ft. if it is mixed with other wetland species and does not comprise more than 75% of the total wetland vegetation for the alternative habitat. Melaleuca stands where canopy species composition is greater than 75% will not counted as alternative habitat and will be excluded from the matrix scoring. Habitat alternative examples that qualify are: native uplands, open water or open water that contains submerged and floating aquatic plants that dominate instead of emergent plants, marsh, wet or dry prairies, wetland tree islands, cypress heads or swamps, slough systems, riverine systems, mangrove flats and mangrove-buttonwood ridges. Conditions that should not be counted as alternative habitat for this segment of the matrix are: housing developments, commercial development, non-previous surfaces and any impervious asphalt types, golf courses, agricultural endeavors (e.g., fruit and vegetables, etc.), recreational areas (e.g., sporting fields) and cattle production (e.g., meat or dairy).

The 3,000 ft. will be measured from the perimeter of the designated assessment area. The direction from the assessment area must be ascertained and recorded for each alternative habitat on the initial pre-enhancement baseline. The direction should be the same for each alternative habitat during the post-enhancement success monitoring, and again included on data sheets.

An area of mixed herbaceous plants shall be considered as a single community. However, an area of herbaceous wetland plants that are growing in multiple adjacent monocultures (pronounced patchiness) shall be considered as separate alternative habitats as a measure of plant communities [see Habitat Diversity (Vegetative)].

- The highest rating of **3** is given to the variable that includes four or more alternative habitats. One of the alternative habitats would need to be native upland habitat to receive this rating.

- The second highest rating of **2** is given to the variable that includes two to three alternative habitats.

- The rating of **1** is assigned to the variable that provides only one alternative habitat to that of the assessment area.

- The rating of **0** is assigned if there is no biological habitat diversity within 3,000 ft. or the habitat within this distance is composed mostly of exotic species (greater than the 75% impacted for melaleuca).

3) Landscape/Hydrology

A) Surface water hydrology/sheet flow: This sub-category is considered important due to the ability this function provides in taking advantage of a wetland's ability to accomplish nutrient uptake and contribute to energy transport (productivity).

- The highest rating within this sub-category is a **3**. To achieve this rating, there

must be flowing water during inundation associated with a slough, riverine or stream type system, or for floodplains with uniformity of elevation and lack of obstructions and an overall gradual reduction in topography.

- The second highest rating within this sub-category is a **2**. To achieve this rating, during inundation there must be flowing water through natural systems. This variable recognizes that most of South Florida has been hydrologically controlled by a complex system of berms, levees and canals. Reconfiguring these control measures (hydrologic engineering) to allow flow from natural or unnatural systems to natural systems would quantify this rating.

- The rating of **1** is given to an assessment area in which the historical flow patterns had been altered but not entirely blocked during periods of inundation (wet season). There should be evidence of past assessment area alteration, but the level and degree of such activity allow some surface water to flow during periods of inundation.

- The lowest rating of **0** is given to an assessment area that is hydrologically isolated to the point were there is no net lateral movement of water during periods of inundation. A system of this type would neither receive water from nor deliver water to a natural or unnatural system.

B) <u>Hydroperiod</u> (normal year) fresh systems:

- The highest rating for a variable within this sub-category is a 3. To achieve this rating there would need to be at least 8 months or greater of continuous inundation. This condition precludes reversals, there can be no reversals during this 5 month period. There should be a dry down every year and during wetter climatic cycles there should be a dry down at least once in five years for an assessment area to achieve this score.

- The second highest rating for a variable within this sub-category is a 2. To achieve this rating the assessment areas should experience continuous inundation for greater than 5 months but less than 8 months. An alternative condition for this scoring would be if continuous inundation lasted more than 5 years without dry down.

- The rating of 1 is given to an assessment area that experiences continuous inundation for a duration of between 1 month but less than 5 months. During this period of inundation there should be no reversals or dry downs for the assessment area to receive this score.

- The lowest rating of 0 is given to an assessment area that experiences inundation for less than 4 weeks cumulative or less than 2 weeks continuous inundation.

- Occasionally data derived from monitoring or a qualified biologists first hand knowledge are unavailable for determining the duration of the Hydroperiod for an assessment area. In

these instances an inferred method may be used to extrapolate these values. The stained water mark present on the trunks of woody persistent vegetation can indicate the duration water remained at a particular level. Strong (dark rings) are indicative of water levels of at least 5 months. Water needs to remain at least 2½ months at a particular level to produce even a light stain. There will occasionally be two stain water marks, usually one darker and one lighter. The darker stain will indicate the most prevalent stage of water levels. (Note: These duration times are only indicators as water hardness or dissolved minerals may fluctuate, affecting the stain.)

B-a) [Substitute for B] Short Hydroperiod (normal year) fresh systems: This substitute is intended to quantify the annual period of inundation without regard to depth. This includes saturation of the soil but is intended to document the shorter hydrological wetland. This substitute is used to determine the quality of the short hydroperiod wetland, and may be used instead of **C** if the assessment team feels the assessment wetland area better fits this type of functional wetland.

- The highest rating for a variable within this substitute category is a **3**. To achieve this rating, there should be greater than ten weeks of continuous inundation which includes saturation of the soil.

- The second highest rating for a variable is a **2**. To achieve this rating, there should be between five and ten weeks of continuous inundation which includes saturation of the soil.

- The rating of **1** is given to an assessment area that experiences inundation for between two and six weeks which includes saturation of the soil.

- The lowest rating of **0** is given to an assessment area that experienced continuous inundation for less than two weeks.

Note: This substitute is not depicted on the tables but may be used for **C** if the assessment team feels it is warranted for inclusion of short hydroperiod wetlands.

B-1) Alternate for 'B' for saltwater, brackish systems only: This alternate sub-category addresses tidally-influenced or estuarine systems. This sub-category recognizes that inundation of coastal lands by sea water and the mixing of fresh water to form brackish systems together form some of the most productive habitat in Florida. The frequency of tidal inundation has a pronounced effect on the faunal and floral colonization of these coastal areas. The floral colonization is the most sensitive to changes in saline inundation. The abnormal advance of saline water has deleterious effects on fresh water communities not adapted to such stresses.

- The highest rating for a variable within this sub-category is a **3**. To achieve this rating, the assessment area would require saline inundation by greater than 90% high tides.

- The next highest rating within this sub-category is a **2**. To achieve this rating, the assessment area would require saline inundation of high tides twice monthly, about three days after the new and full moons. This is called a spring tide and provides a large tidal range when the earth, moon and sun are in line.

- The rating of **1** is assigned to an assessment area that received saline inundation only by extreme high tides. This condition usually occurs during the season of early spring and late fall and are the result of high tide bulges due to the equilibrium water surface.

- The lowest rating of **0** is given to an assessment area that received saline inundation during storm events only. The tidal surges resulting from storm events are rare enough to severely stress plant or animal communities not adapted for such an occurrence.

B-2) Alternate for 'B' for High Marsh (*Juncus distichlis*): This sub-category is intended to quantify the optimum inundation without regard to depth for the older high marsh systems. These systems are typically of slightly higher elevations and are more influenced by fresh inputs than are mangrove flats or low marsh areas.

- The highest rating for a variable within this sub-category is a **3**. To achieve this rating, the optimum conditions would occur if there is tidal inundation only by high spring tides. This would correspond to an approximately once-per-month saline inundation. There would need to be fresh water sheet flow from adjacent lands during the active growing season of at least once every ten days.

- The second highest rating for a variable within this sub-category is a **2**. To achieve this rating, the assessment area would be inundated only by high spring tides and be flushed by fresh water sheet flow from adjacent lands during the active growing season at least once every thirty (30) days.

- The rating of **1** is given to an assessment area that experiences inundation by high spring tides, and did not receive any fresh water sheet flow due to natural or unnatural blockages of flow (berms, etc.). The only fresh water inputs for this variable would be water from rain.

- The lowest rating of **0** is assigned if the assessment area is inundated by greater than 50% of the high tides during the growing season and, because of natural or unnatural blockages (berms, etc.), did not receive any fresh water sheet flow. The only fresh water input for this variable would be rain.

B-3) Alternate for 'B' for Riverine Systems: This sub-category is intended to quantify the optimum inundation without regard to depth for the riverine or tidal creek systems. These systems are typically of slightly lower elevations and benefit from fresh water input, due to this lower elevation, as well as scouring and mixing of water from tidal input on a regular basis.

- The highest rating for a variable is a **3**. To achieve this rating, the system would require daily inundation by high tides while receiving fresh water inputs during the rainy season that continue well into the dry season as the surrounding lands drain into the riverine system.

- The second highest rating in this category is a **2**. To achieve this rating, a system would require daily inundation by high tides while receiving fresh water inputs only during the rainy season.

- The lower rating of **1** is given to a riverine system that is inundated by high tides on a daily basis yet receives no fresh water inputs except those from rain. There would be no fresh water sheet flow with this system. This could be the result of barriers such as berms, levees or other physical obstructions.

- The lowest rating of **0** is assigned to a riverine system if it is inundated by spring tides that occur bi-monthly and there is no fresh water input except from rain with no fresh water acquired from sheet flow.

C) Hydropattern (freshwater)

This sub-category is used to quantify the importance of water depth in addition to the previously described hydroperiod. The actual water depth is vitally important to fish, alligators, crocodiles, and many other aquatic and semi-aquatic animals. The depth of two feet is the cut-off for optimal conditions for most wetland systems due to limitations imposed upon wading birds, herbaceous plant cover, light penetration for periphyton, and tree islands. When evaluating tree islands typically consisting of raised peat or limestone outcroppings that are not normally inundated, this matrix will utilize the depressional ring, surrounding and directly contiguous to, the tree island assessment area. The water depth parameters are to be considered from the rainy season depth and duration. Dry season parameters shall be extrapolated from hydrologic indicators.

- The highest rating for a variable within this sub-category is a 3. To achieve this rating, the assessment area should have a rainy season water depth between 1.0 and 2.0 feet for at least 3.5 months, and this should be followed by a depth between 1.0 and 6.0 inches for greater than a month during normal years. This condition allows aquatic prey concentration and is crucial for initiating breeding behavior for many avian species.

- The second highest rating is a 2. To achieve this rating the assessment area should have a water depth during the rainy season of between 0.5 and 1.0 feet for at least 3.5 months. There should not be a water depth of greater than 2.0 feet for longer than 4 weeks during the year.

- The rating of 1 is assigned to an assessment area that has a water depth during the rainy season of less than 0.5 feet for 3.5 months or has at least 1 reversal to dryness during

this time frame, or the water depth exceeds 2.5 feet on a regular basis for normal years. It is recognized that a depth of greater than 2.5 feet on a regular basis contributes to the drowning of alligator and/or crocodile nests as well as the destruction of tree islands.

- The lowest rating of 0 is given to an assessment area that has a water depth of less than 0.5 feet, coupled with frequent reversals to dryness for the duration of the period of inundation. This area would most likely have this unnatural condition as a result of canals, ditches, swales, culverts, pumps, and/or well fields.

C-a) [Substitute for C] Shallow Hydropattern (fresh system): This substitute is intended to quantify the annual average water depth of the previously mentioned hydroperiod. Water depth is important to the plant and animal communities that inhabit the short hydroperiod wetlands.

- The highest rating for a variable within this substitute category is a **3**. To achieve this rating, the assessment area should have an average water depth of not greater than 7.0 inches for the period of inundation.

- The second highest rating is a **2**. To achieve this rating, the assessment area should have an average water depth of between 4.0 and 7.0 inches for the period of inundation.

- The rating of **1** is assigned to an assessment area that would have an average water depth of greater than ground saturation but less than 4 inches for the period of inundation.

- The lowest rating of **0** is given to an assessment area that does not exhibit standing water inundation or shows ground saturation only by capillary action.

Note: This substitute is not depicted on the tables but may be utilized for **D** if the assessment team warrants its inclusion for shallow hydropattern wetlands.

C-1) Alternate to 'C' for saltwater, brackish (tidal) systems only: This alternate sub-category is used to quantify the importance of water depth for saline systems. The actual water depth during tidal inundation produces a causative effect on faunal and floral speciation, as well as on progressive saline concentration (hypersaline zone).

- The highest rating within this alternate sub-category is a **3**. This scoring is achieved for water depth of between 1.0 and 2.0 feet during 90% of high tide inundation.

- The second highest rating is a **2**. This scoring is given to areas where water depth is between 0.5 and 1.0 feet on greater than 50% of high tide inundation.

- The rating of **1** is assigned to an assessment area that receives tidal inundation on a periodic and regular basis, the depth of which is less than 0.5 feet but greater than

substrate saturation only.

- The lowest rating of **0** is given to an assessment area that did not receive any periodic and regular inundation yet has site soils that are saturated by the saline water table. This condition is known to concentrate salts to extremely high levels as evaporation leaves accumulated salts within the top few inches of substrate.

C-2) Alternate to 'C' for High Marsh (*Juncus distichlis*) only: This alternate sub-category is used to quantify the importance of water depth for high marsh systems. The depth of inundation is important in maintaining the species present within this specialized ecosystem. Growing season can be verified by the local county extension agents.

- The highest rating within this alternate sub-category is a **3**. This scoring is achieved if water depth is greater than 10.0 inches at least once every ten days during the growing season.

- The second highest rating is a **2**. This scoring is achieved if water depth is between 5.0 and 10.0 inches at least once every ten days during the growing season.

- The rating of **1** is assigned if water depth is between 1.0 and 5.0 inches at least once every thirty days during the growing season.

- The lowest rating of **0** is given to an assessment area that experiences between 0.0 and 1.0 inch water depth sporadically during the growing season. Sporadically means less frequently than once every 30 days.

C-3) Alternate to 'C' for Riverine Systems only.

- The highest rating within this alternate sub-category is a 3. To achieve this rating the riverine portion of the assessment area should have a water depth of between 14 inches to 4.0 feet within the main channel for at least eight months out of a normal year. These water depth parameters need not be considered for the same system greater than 3 miles from the coast.

- The second highest rating is a 2. This scoring is achieved if the water depth within the main channel is between 6 inches to less than 14 inches within the main channel for at least 6 months out of a normal year. These water depth parameters would remain valid for rating a system at a point not greater than 3 miles from the coast.

- The rating of 1 is assigned to an assessment area that has a water depth within the main channel of between 6 inches to 14 inches for a period of less than 2 ½ months for a normal year.

- The rating of 0 is given to an assessment area that has a main channel depth of less than 6 inches and is completely dry for greater than 7 consecutive weeks out of a normal year. The term completely dry references a condition where there is no free-standing water and the top 3 inches of substrate are not saturated. There can not be refugia within 50 feet of the system for this parameter.

D) Water Quality: Many parameters influence the chemical composition of water in the environment. As it enters the mitigation bank area, runoff from adjacent lands can affect water quality on the site. For example, elevated turbidity is easily observed, low dissolved oxygen levels may be indicated by fish gulping at the surface, and excessive nutrients may be indicated by blooms of plant species like duckweed (*Lemna* spp.).

The approved method for sampling of surface water is as follows:

1) Dark brown, plastic screw top sample vials (color inhibits light penetration).
2) Washed in phosphate-free reagent-grade detergent.
3) Fill vials from 2 inches below surface of water.
4) Avoid contamination of sample by fingers and excessive plant material.
5) Fill vials to top (little to no air left in vials); cap tightly.
6) Avoid excessive heat.
7) Label vials with location, date and time of sample collection.
8) Deliver to qualified laboratory within 24 hours of collection.

The water quality parameters that most directly affect the productivity of a wetland are:

1)Nitrogen levels
2)Potassium levels
3)Phosphorus levels
4)Iron levels
5)pH range
6) Dissolved oxygen level
7) Turbidity levels
8) Pesticide levels
9) Herbicide levels
10) Coliform bacteria counts

- The highest rating for a variable within this sub-category is a **3** for systems with no indicators of poor water quality (e.g., large surface mats of duckweed or water spangles, excessive turbidity, grease or oil sheens, etc.). Furthermore, there should be quantified laboratory verification of selected parameters. To receive this score, all parameters must be within state standards for Class III Waters.

- The second highest rating is a **2**. To achieve this rating, there should be no visual indications of poor water quality. In this variable, all but one parameter must be within

acceptable limits for acceptable water quality. The one outlying parameter must be near the top or bottom of acceptable limits for that parameter and may only vary by one standard deviation of the acceptable range.

- The rating of **1** is assigned to an assessment area that exhibits visual indicators of poor water quality. There should not be any extreme indications present. In this variable, all but two parameters must be within acceptable limits for the ranges of acceptable water quality. The two outlying parameters may be over or under the acceptable limits and must vary by one standard deviation of the acceptable range.

- The lowest rating of **0** is given to an assessment area that exhibits prominent visual indications of poor water quality. This rating could also be achieved if lab results indicate at least two water quality parameters exceed state standards. Examples of extreme visual indicators include fish die-off, trash dumping, obvious signs of sewage seepage, and siltation deposition in excess of typical conditions. In this variable, most or all of the accepted parameters for water quality are outside of the limits of acceptable water quality and may vary by more than one standard deviation from the acceptable range.

E) Intactness of Historic Topography (Soil Disruption): This sub-category quantifies the degree of historic disturbance in the assessment area. It is generally recognized that undisturbed areas are easier to enhance in order to achieve or regain normal ecological functions. The term unaltered indicates that the assessment area provides native vegetative habitat and maintains native wildlife as it did in a pristine condition, or that it has been enhanced to a point where it is stable and providing these functions. If the assessment area has been degraded by hydrologic alteration, causing either too short or too long of a hydroperiod, this effect may be score rated appropriately. This sub-category addresses soil horizon disruption that may have occurred as a result of prior agricultural activity or manipulation of the soil for purposes of draining or altering former wetlands. These disruptive conditions can be graded according to the following terms: slightly corresponds to a measurement of soil disruption that does not exceed 10% of the total area of the wetland assessment area. Moderately corresponds to a measurement of soil disruption that does not exceed 25% of the total area of the wetland assessment area. Extremely corresponds to a measurement of soil disruption that does not exceed 50% of the total area of the wetland assessment area. These terms would mirror the degraded nature of the assessment area and might be directly proportioned to the level of degradation or inappropriateness of the wetland plant communities. This sub-category allows the use of half point increments to obtain best fit within the available categories.

- The highest rating within this sub-category is a **3**. To achieve this rating, the assessment area should exhibit an unaltered status, as previously described.

- The second highest rating of **2** is given to areas which exhibit only a slight soil disturbance. If the soil is disrupted, the disturbance should be minimal and the scoring would need to drop to a **1.5**.

- The rating of **1** is assigned to an area that exhibits moderate amounts of soil disturbance. Moderate amounts of soil disturbance coupled with sheet flow disruption as a result of the soil disturbance may justify dropping this scoring a half-point. For example, a former tomato field could have had the farm rows oriented opposite the natural slope of the land causing water to flow in a manner inconsistent with the natural sheet flow. In this case, because the disruption caused the natural sheet flow to diverge from the historic catchment, the area would achieve a rating of **1**.

- The lowest rating of **0** is assigned to an assessment area that exhibits extreme amounts or an extreme degree of soil disturbance.

F) Soils (fresh systems): This sub-category addresses the soils within the assessment area and recognizes the effects that historic patterns of inundation play on the alteration or formation of site soils. Wetland soils fall in different categories, one of which is a peat/muck soil layer. This type of hydric soil is considered important for its ability to reduce the harmful effects of various pollutants in a system.

- The highest rating within this sub-category is a **3**. This scoring is given to areas with organic soil (peat/muck) classified as hydric by the Soil Conservation Service (SCS). The organic layer should be greater than 12.0 inches in thickness (excluding the top detrital leaf layer). Any thickness of peat/muck over bedrock or caprock qualifies for this rating, as this condition causes a perched water level which is atypical for normal groundwater translocation. Either condition must be present over 90% of the surface area of the assessment area.

- The second highest scoring of **2** is achieved if the soil has an organic layer that ranges in depth from 6.

- The rating of **1** is achieved if the organic soil layer ranges from a depth of 1.0 to 6.0 inches and covers between 50% and 90% of the assessment area's surface.

- The lowest rating of **0** is given to an assessment area that has soils containing some organics at less than 1.0 inch depth covering more than 50% of the surface area and not classified as hydric by the SCS.

F-1) Alternate to 'F' for Saltwater, brackish (tidal) systems only: This alternate sub-category is used to quantify a specific hydric soil type typically found in estuarine environments in South Florida. Much of this calcareous loam is covered by attached algae known as periphyton. Filamentous blue-green algae are the major periphyton type with the capacity to precipitate calcite. The two major filamentous blue-green algal species that perform this function are *Scytonema hofmannii* and *Schizothrix calcicola*. The assessment area does not need to have both the calcareous loam and associated periphyton to qualify for a high rating. The inclusion of both may justify raising the score rating by half-point increments to achieve an appropriate score.

- The highest rating within this sub-category is a **3**. This scoring is given to areas with calcareous loam only or for loam and periphyton together. Soil depth should be at least 12.0 inches and should cover more than 90% of the assessment area.

- The second highest rating of **2** is given to areas with either calcareous loam or calcareous loam and periphyton together that measure between 6.1 and 12.0 inches while covering more than 90% of the assessment area.

- The rating of **1** is achieved if the calcareous loam or calcareous loam and associated periphyton measure between 1.0 and 6 inches in depth while covering between 50% and 90% of the surface area of the site.

- The lowest rating of **0** is given to an assessment area that contained less than 1.0 inch of calcareous loam that covered over 50% of the surface area of the site. There should not be any associated periphyton observed in order to qualify for this score rating.

4) Salinity

This category addresses one of the most formative factors governing plant colonization and subsequent animal utilization. Past channelization of natural rivers and the network of inland canals have allowed, in some areas, salt water intrusion during the dryer climatic conditions that are sometimes experienced in Florida. Coastal wetland systems are often subjected to great fluctuations in the degree of salinity they experience. As a result, these coastal freshwater and brackish systems may be drastically affected if salinity levels are elevated for a prolonged period of time. (Note: When measuring salinity levels for a particular ecosystem, great care needs to be taken to prevent skewed readings due to a phenomena known as "fresh-water lensing." This condition is more readily encountered during the rainy season and typically occurs when several inches of fresh water remain on top of more saline water.) It is also important to note that salinity levels occurring during the active growing season have the greatest effect on plant adaptation. During less active growth, (December through February), fluctuations in salinity levels are less likely to impact plant communities. During the active growing season, (March through November), levels of salinity, expressed as parts per thousand, are less detrimental to a system if they are less saline than is normally encountered. This is not true if saline levels rise above normal ranges for an extended period of time. The term mean high salinity is defined as the average of the upper 33% of salinity readings taken during a specified period of record.

A-1) Optimum salinity for fresh systems during growing season based on mean high salinity for a normal year: This sub-category defines optimum and the range of conditions that are acceptable for fresh water wetland systems.

- The highest rating within the fresh systems sub-category is a **3**. This score is given if the salinity readings are less than 2.0 parts per thousand (ppt).

- A rating of **2** is given if the salinity readings are from 2.0 to 3.0 ppt.

- A rating of **1** is given if salinity readings are between 4.0 and 5.0 ppt.

- A rating of **0** is given if salinity readings are 6.0 ppt or greater.

A-2) Optimum salinity for brackish systems during the growing season based on mean high salinity for a normal year: This sub-category defines optimum conditions and the range of conditions that are acceptable for brackish wetland systems.

- The highest rating within the brackish systems sub-category is a **3**. This score is given if the salinity readings are 6.0 to 8.0 ppt.

- A rating of **2** is given if the salinity readings are 9.0 to 13.0 ppt.

- A rating of **1** is given if salinity readings are 14.0 to 16.0 ppt.

- A rating of **0** is given if salinity readings are 17 ppt or greater.

A-3) Optimum salinity for saline systems during growing season based on mean high salinity for a normal year: This sub-category defines optimum conditions and the range of conditions that are acceptable for the saline wetland systems.

- The highest rating within the saline systems sub-category is a **3**. This score is given if the salinity readings are 17.0 to 19.0 ppt.

- A rating of **2** is given if salinity readings of 20.0 to 22.0 ppt are recorded.

- A rating of **1** is given if salinity readings of 23.0 to 25.0 ppt are obtained.

- A rating of **0** is given if salinity readings of 26.0 ppt or greater are obtained.

A-4) Optimum salinity for hypersaline systems during growing season based on mean high salinity for a normal year: This sub-category alternate defines optimum conditions and the range of conditions that are acceptable for the hypersaline wetland systems.

- The highest rating within the hypersaline systems sub-category is a **3.** This score is given if the salinity readings are 26.0 to 41.0 ppt.

- A rating of **2** is given if the salinity readings are 42.0 to 46.0 ppt.

- A rating of **1** is given if salinity readings of 47.0 to 51.0 ppt are obtained.

- A rating of **0** is given if salinity readings of 52.0 ppt or greater are obtained.

A5) Optimum salinity for riverine systems during the growing season based on mean high salinities for a normal year

- The highest rating for a riverine /tidal creek system sub-category is a 3. To achieve this score an evaluation of the entire riverine system must be considered. The entire system should be divided into topographic segments relating to surrounding vegetative systems. The lower (bottom third) of the system should have salinity levels between 12 to 25 ppt. The middle third of the system should have salinity levels between 5 to 11 ppt. The upper (top third) should have salinity levels between 0 to 4 ppt.

- The second highest rating for a riverine/tidal creek system is a 2. To achieve this score an evaluation of the entire riverine system must be considered. The system should be divided into topographic segments relating to surrounding vegetative systems. The lower (bottom) of the system should have salinity levels between 25 to 32 ppt. The middle third of the system should have salinity levels between 6 to 25 ppt. The upper (top third) should have salinity levels between 0 to 5 ppt.

- The next rating for a riverine/tidal creek system is a 1. To achieve this score an evaluation of the entire riverine system must be considered. The entire system should be divided into topographic segments relating to surrounding vegetative systems. The lower (bottom-saline) segment of the system should have salinity levels between 30 to 40 ppt. The middle third of the system should have salinity levels between 8 to 29 ppt. The upper (top-fresh) segment should have salinity levels between 0 to 7 ppt.

- The rating of 0 is given as the lowest score for a riverine/tidal creek. To achieve this score an evaluation of the entire riverine system must be considered. The entire system should be divided into topographic segments. The lower (bottom-saline) segment of the system should have salinity levels between 35 to 52 ppt. The middle third of the system should have salinity levels between 10 to 34 ppt. The upper (top-fresh) segment should have salinity levels between 0 to 9 ppt.

THE SITE SUITABILITY EVALUATION MATRIX

Introduction

The following site suitability evaluation has been designed to provide a quantifiable means of determining the value-related parameters attributed to the specific mitigation bank in question. The functional analysis only measures the functional ecological improvements resulting from restoration activities. Value-related parameters are those values determined to be important to society and therefore are not measurable in a purely functional analysis. The site suitability evaluation matrix measures the societal values that distinguish one mitigation bank from the another, and in this manner provides credit to the mitigation bank for these values.

Site Suitability Justification

The value parameters are divided into ten (10) evenly weighted categories. Matrix inclusion would warrant one (1) point per category. If the category was not applicable for the bank, a zero (0) is recorded.

The first value parameter considers whether the bank is adjacent to lands or waters designated as being of regional importance. Examples include (but are not limited to): State Parks, Federal Preserves, National Sanctuaries, Outstanding Florida Waters (OFW), and Aquatic Preserves.

The second value parameter considers whether the property is within the boundary of an acknowledged state, local, or regional acquisition program. This category assumes that, if a property has been targeted by a bona-fide acquisition program, then time and effort have been previously expended to determine the need for this site's preservation. Money targeted and appropriated for acquisition of property could be reinstated into the program to acquire additional surrounding properties, if appropriate environmental conditions warrant such inclusion. To be included within this category, the property (bank site) must be at least fifty percent (50%) within the set boundary of the state, local, or regional acquisition program. Sites which have merely been proposed or considered for acquisition do not qualify for this category.

The third value parameter considers whether the property contains ecological or geological features generally considered by regional scientists or federal and state agencies to be unusual, unique, or rare in the region and is of sufficient size. This category considers the overall nature of the lands comprising a mitigation bank. Conditions that make most ecological settings unusual, unique or rare are often attributed to geological features influenced by climatological conditions over time. These ecological or geological features need to be of sufficient size for these unusual, unique or rare features to be sustainable. A 25 acre pond apple (*Annona glabra*) slough would be an example of a rare ecological feature of sufficient size relative to the historic acreage and would still be sustainable for the foreseeable future. However, the rocky glade plant communities and associated animal populations would require a much larger acreage to qualify as sufficient size in relation to the total historic acreage. The appropriate size criterion should be determined on a site-by-site basis by regional experts or qualified scientists.

The fourth value parameter considers whether the property is designated as being of critical state or federal concern and/or contains special designations. This applies to areas that the state or federal government has determined are vitally important to ensure continuity of threatened or vital environmental systems. An example would be lands considered as Federally-designated Critical Habitat for the American crocodile.

The fifth value parameter considers whether the property is important to acknowledged restoration efforts. This value incorporates the role the proposed mitigation bank area would play in a larger-scale restoration effort. For example, if the mitigation bank is adjacent to or within boundaries of a parcel purchased under the Florida's Save Our Rivers Program, the restoration of adjacent lands would ecologically benefit a larger area.

The sixth value parameter considers the ownership and control of the property. Currently, there is a substantial benefit when privately owned land is ecologically improved and then placed under the stewardship of an appropriate state agency. Responsibilities and commitments are typically more certain for private sector efforts since public priorities often change during implementation of long-term projects, causing original goals to be missed.

The seventh value parameter considers the presence of animal species designated by state and federal agencies as threatened, endangered, and species of special concern. There is substantial documented evidence supporting the need to assist the survival of animal species that have experienced habitat reductions and have had their numbers drastically reduced. The preservation and enhancement of lands where these protected species are found should be encouraged.

The eighth value parameter considers the presence of plant species designated by state and federal agencies as threatened, endangered, and listed species. The logic for including this parameter is the same as that for listed animals given above.

The ninth category considers the threat of loss or destruction from development activities (Development Pressure). The more densely populated areas of our state conversely place additional pressure to develop unimproved land. As improved land (i.e., agricultural) becomes less available, the value of unimproved land rises. When the value reaches a certain point, mitigation costs can be more readily justified. Placement of these lands into a conservation easement for use as a mitigation bank will protect them from development.

The tenth category measures the extent to which lands are subject to local, state and federal dredge and fill/ ERP regulations. Various grandfathering clauses may affect an area if platting allows for more development than would be possible under current regulations. Indian reservations may also exhibit a degree of exclusion from normal dredge and fill/ ERP

regulations.

W.A.T.E.R. Prepared by: William Maus and Donaldson Hearing

Bibliography

Bell, F. W. and V. R. Leeworth, 1986. An Economic analysis of the importance of saltwater beaches in Florida. Report Number 82, Florida Sea Grant College, Gainesville, FL 166 pp.

Boyle, K.A. and Fendley, T. T. 1987. Habitat suitability index models: bobcat. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.147).16 pp.

Breen, C. M., C. Everson & K. Rogers, 1977. Ecological studies of *Sporobahrs virginicus* (L.) Kemp. With particular reference to salinity and inundation. Hydrobiologia 54:135-140.

Broome, S. W., E. D. Seneca and W. W. Woodhouse, Jr. 1988. The effects of source, rate and placement of nitrogen and phosphorus fertilizers on growth of *Spartina* alteriflora transplants in North Carolina. Estuaries 6:212-226.

Brotherson, J. D. & S. R. Rushforth. 1985. Invasion and stabilization of recent beaches by salt grass (*Distichlis spicata*) at Mono Lake, Mono County, California. Great Basin Naturalist 45:542-545.

Broward County Department of Natural Resource Management. Wetland Benefit Index. Ft. Lauderdale, 4 pages, 1993.

Carlton, J. 1974. Land building and stabilization by mangroves. Environmental Conservation 1:285-294.

Carlton, J. 1975. A guide to common Florida salt marsh and mangrove vegetation. Florida Marine Research Publication Number 6, Florida Department of Natural Resources, Marine Research Laboratory, St. Petersburg, FL 30 pp.

Cole, D. P. (ed.) 1980. Proceedings of the Sixth Annual Conference on Wetland Restoration and Creation. Hillsborough Community College, Tampa, FL 357 pp.

Cole, D. P. (ed.) 1980. Proceedings of the Seventh Annual Conference on Wetland Restoration and Creation. Hillsborough Community College, Tampa, FL 293 pp.

Cowardin, L. M., V. Carter, F. G. Golet and E. T. LaRoe. 1979. Classification of wetlands and deep water habitats of the United States. U.S. Fish and Wildlife Service, FWS/OBS-79/31. 103 pp.

Davis, J. H. 1940. The ecology and geologic role of mangroves in Florida. Papers from the Tortugas Laboratory, Vol. 32. Carnegie Institute Publication NN517, Washington, DC 412 pp.

Eleuterius, L. N. 1975. The life history of the salt marsh rush, Juncus roemerianus. Bulletin of the Torrey Botanical Club 102:135-140.

Eleuterius, L. N. 1978. An Illustrated Guide to Tidal Marsh Plants of Mississippi and Adjacent States. Mississippi-Alabama Sea Grant Consortium Publication Number MASGP-77-039, Ocean Springs, MS; 128 pp.

Evans, R. K. 1981. Guide to the Wetland Plants of Submerged and Transitional Zone Lands. Florida Department of Environmental Regulation, Tallahassee, FL (original 1979) 294 pp.

Gallagher, J. L., D. Grant and M. Siegel. 1982. Effect of temperature and day length on the growth of four species of halophytes. Abstract, 33rd Annual AIBS Conference, University Park, PA 8-12 August.

Gill, A. M. and P. B. Tomlinson. 1969. Studies on the growth of red mangrove (*Rhizophora mangle* L.) 1. Habitat and general morphology. Biotropica 1:1-9.

Gill, A. M. and P. B. Tomlinson. 1971. Studies on the growth of red mangrove (*Rhizophora mangle* L.) 2. Growth and differentiation of aerial roots. Biotropica 3:63-77.

Hansen, D. J., P. Dayanandan, P. B. Kaufman and J. D. Brotherson 1976. Ecological adaptations of salt marsh grass, *Distichlis spicata* (Gramineae), and environmental factors affecting its growth and distribution. American Journal of Botany 63:635-650.

Harbour, R. I. and R. E. Dahl. 1981. Determining vigor of a natural and planted stands of sea oats on the Texas Gulf coast. Southwest Naturalist 26:117-123.

Jiminez, J. A. and A. E. Lugo. 1985. *Avicennia germincus* (L.) black mangrove: Avicenniaceae, Verbena family. U.S. Forestry Service, Institute of Tropical Forests, Silview Manual, Issue 3: 4 pp.

Johnson, A. F. and M. G. Barbour. In press. Dune and maritime forests. in Myers, R. I. and J. J. Eivel (eds.), Ecosystems of Florida. Academic Press.

Kemp, P. R. and G. L. Cunningham. 1981. Light, temperature and salinity effects on growth, leaf anatomy and photosynthesis of *Distichlis spicata* (L.) Greene. American Journal of Botany 68:507-516.

Kusler, J. A. and M. E. Kentula (eds.) 1989. Wetland Creation and Restoration: The Status of the Science. EPA/600/3-89/038. Environmental Research Laboratory, Corvallis, OR.

Lewis, R. R. (ed.) 1982. Creation and Restoration of Coastal Plant Communities. CRC Press, Inc., Boca Raton, FL 219 pp.

Lewis, J. C. 1983. Habitat suitability index models: roseate spoonbill. U.S. Dept. of Fish. Wildl. Serv. FWS/OBS-82/10-50. 16 pp.

Lodge, T.E., Darling, R. B., Fall, D. J. and Hillestad, H. O. Seminar entitled "A Wetland Evaluation Method for the Everglades: Impact to Mitigation. Law Companies" A presentation by Law Companies, Inc. at the Florida Water Policy and Management, Telluride, Colorado, January 15-22, 1994.

Newsom, J. D. Joanen, T. and Howard, R. J. Habitat suitability index models: American alligator. U.S. Fish Wildlife Service, Biological Report 82(10.136). 14 pp. 1987.

Odum, W. E., 1988. Comparative ecology of tidal freshwater and salt marshes. Annual Review of Ecology and Systematics 19:147-176.

Peterson, A. 1985. Habitat suitability index models: Bald eagle. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.126). 25 pp.

Powell, G.V.N. 1987. Habitat use by wading birds in a subtropical estuary: implications of hydrography. The Auk 104:740-749.

Provost, M. W. 1973. Mean high water mark and use of tidelands in Florida. Florida Scientist 36:50-66.

Pulver, T. R. 1976. Transplant techniques for sapling mangrove trees, *Rhizophora mangle*, *Laguncularia racemosa* and in Florida. Florida Marine Research Publication Number 22, Florida Department of Natural Resources, Marine Research Laboratory, St. Petersburg, FL 14 pp.

Reed, P. B., Jr. National List of Plant Species that occur in Wetlands: Southeast (Region 2). U.S. Fish and Wildlife Service, Biological Report 88(26.2). 124 pages. 1988.

Rozzas, L. P. and C. T. Hackney. 1983. The importance of oligohaline wetland habitats to fisheries resources. Wetlands 3:77-89.

Seaman, W., Jr. (ed.) 1985. Florida Aquatic Habitat and Fishery Resources. Florida Chapter of the American Fisheries Society, Kissimmee, FL 543 pp.

Smart, R. M. and J. W. Barko. 1980. Nitrogen nutrition and salinity tolerance of *Distichlis spicata* and *Spartina alterniflora*. Ecology 61:630-638.

Snedaker, S. C.. 1982. Mangrove species zonation: why? Pp. 111-125 in Sen, D. N. and K. Rajpurohit (eds.), Contributions to the Ecology of Halophytes. Dr. Junk Publishers, The Hague.

South Florida Water Management District. 1992. Land Evaluation Matrix in Save Our Rivers 1992 Five Year Plan, Appendix F.

Stern, W. I. and G. K. Voigt. 1959. Effect of salt concentration on growth of red mangrove in culture. Botanical Gazette 121:36-39.

Twomey, K. A., Gebhart, G., Maughan, O.E. and Nelson, P.E. 1984. Habitat suitability index models and instream flow suitability curves: Redear sunfish. U.S. Fish Wildl. Serv. FWS/OBS-82/10.79.29 pp.

U.S. Fish and Wildlife Service, National Ecology Research Center, 1980. Habitat Evaluation Procedures Workbook.

Webb, J. W., J. D. Dodd and H. Koerth. 1980. Establishment and growth of grass species transplanted on dredged material. Texas Journal of Science 32:247-258.

Wetland Evaluation Methodologies:

Wetland HGM - Wetland Matrix
WQI - Wetland Matrix
WET - Wetland Matrix
WRAP - Wetland Matrix
HEP - Wetland Matrix
4th Priority Project List (PPL) - Wetland Matrix

APPENDIX 1

EXOTIC PEST PLANT COUNCIL'S
1995 LIST OF FLORIDA'S MOST INVASIVE SPECIES

The Exotic Pest Plant Council (EPPC) was established in 1984 for the purpose of focusing attention on: (1) the impacts exotic pest plants have on biodiversity; (2) the impact of exotic plants on the integrity of native plant community composition and function; (3) habitat loss due to exotic plant infestations; (4) the impacts of exotic plants on endangered species primarily due to habitat loss and alteration (e.g., Cape Sable seaside sparrow); (5) the need to prevent habitat loss and alteration by comprehensive management for exotic plants; (6) the socioeconomic impacts of exotic pest plants (e.g., increased wildfire intensity and frequency in *Melaleuca*); (7) changes in the seriousness of exotic pest plants and to indicate which are the worst problems; and (8) informing and educating resource managers about which species require monitoring, and helping managers set priorities for management.

The list is based on the designations of invasive exotic species made by the EPPC Committee on Invasive Species.

The following definitions are used on the list:

Category 1: Exotic pest plants that invade and disrupt Florida native plant communities. This designation is given without regard to the economic severity or geographic extent of the problem.

Category 2: Exotic pest plants that have the potential to invade and disrupt native plant communities as indicated by: (1) aggressive weediness; (2) a tendency to disrupt natural successional processes; (3) a similar geographic origin and ecology to Category 1 species; (4) a tendency to form large vegetative colonies; and/or (5) sporadic but persistent occurrence in natural communities.

Exotic: an alien organism, purposefully or accidentally introduced to a geographic region to which it is not native and which establishes itself outside of domestication and/or cultivation through sexual or asexual reproduction.

Native: a species that occurred in Florida at the time of European contact i.e., before 1500. This definition has been adopted from Stevenson (1993).

(N): when following a species name, indicates a species listed as noxious on the United State Department of Agriculture and the Florida Department of Agriculture and Consumer Services lists.

(P): when following a species name, indicates a species listed as prohibited by the Florida Department of Environmental Protection under Rule 62C-52, F.A.C. For additional information, contact: FDEP Bureau of Aquatic Plant Management, Innovation Park, Tallahassee, Florida 32310 (904) 488-5631.

Table 1. Category 1 Exotic Pest Plants

Scientific Name	Common Name
Abrus precatorius	rosary pea, crab's eye, blackeyed-susan
Acacia auriculiformis	earleaf acacia
*Ardisia crenulata (*syn. *A. crenata)*	coral ardisia
Ardisia elliptica (syn. *A. humilis*)	shoebutton ardisia
Asparagus densiflorus	asparagus fern
Bischofia javanica	bischofia
Brachiaria mutica	paragrass
Calophyllum calabra (syn. *C. inophyllum* of auth.)	mast wood, Alexandrian laurel
Cassia coluteoides (syn. *Senna pendula*)	climbing cassia, Christmas cassia, Christmas senna
Casuarina litorea	Australian pine
Casuarina glauca	suckering Australian pine
Cestrum diurnum	day jasmine
Cinnamomum camphora	camphor tree
Colocasia esculentum	wild taro
Colubrina asiatica	lather leaf
Cupaniopsis anacardioides	carrotwood
Dioscorea bulbifera	air-potato
Eichornia crassipes (P)	water hyacinth
Eugenia uniflora	Surinam cherry
Ficus benjamina	laurel fig
Hydrilla verticillata (P)	hydrilla
Hygrophila polysperma	green hygro
Hymenachne amplexicaulis	West Indian marsh grass, tromptilla
Imperata brasiliensis (syn. *I. cylindrica*)	cogongrass
Ipomoea aquatica (P)	water spinach
Jasminum dichotomum	gold coast jasmine
Jasminum fluminense	jasmine
Lantana camara	lantana, scrub verbena
Ligustrum sinense	hedge privet
Lonicera japonica	Japanese honeysuckle
Lygodium japonicum	Japanese climbing fern
Lygodium microphyllum	Old World climbing fern
Macfadyena unguis-cati	cat's claw, claw-vine
Melaleuca quinquenervia (P)	melaleuca, punk tree, cajeput
Melia azedarach	chinaberry
Mimosa pigra (N)(P)	catclaw mimosa, black mimosa
Nandina domestica	nandina, heavenly bamboo
Nephrolepis cordifolia	sword fern, Boston fern

Neyraudia reynaudiana	Burma reed, cane grass
Oeceoclades maculata	ground orchid
Paederia foetida	skunk-vine
Panicum repens	torpedograss
Paspalum notatum	bahiagrass
Pennisetum purpureum	napiergrass, elephantgrass
Pistia stratiotes	water-lettuce
Psidium guajava	guava
Psidium littorale (syn. P. *cattleianum*)	strawberry guava
Pueraria montana (syn. *P. lobata*)	kudzu vine
Rhodomyrtus tomentosus	down myrtle
Rhoeo spathacea (syn. *R. discolor*)	oyster-plant, boat-lily
Sapium sebiferum	popcorn tree, Chinese tallow tree
Scaevola taccada var. *sericea* (syn. *S. frutescens, S. sericea)*	scaevola, half-flower, beach naupaka
Schefflera actinophylla (syn. *Brassaia actinophylla*)	Australian umbrella tree, schefflera
Schinus terebinthifolius	Brazilian pepper
Solanum torvum (N)	turkey berry
Solanum viarum	tropical soda apple
Syzygium cumini	jambolan plum
Tectaria incisa	incised Halberd fern
Thespesia populnea	seaside mahoe
Tradescantia fluminensis	wandering-Jew

Total Category 1 Species = 60

Table 2. Category 2 Exotic Pest Plants

Scientific Name	**Common Name**
Adenanthera pavonina	red sandalwood
Agave sisalana	sisal
Albizia julibrissin	mimosa, silk tree
Albizia lebbeck	woman's-tongue
Aleurites fordii	tung-oil tree
Alstonia macrophylla	devil tree
Alternanthera philoxeroides (P)	alligator weed
Antigonon leptopus	coral vine
Aristolochia littoralis	calico flower, birthwort
Asystasia gangetica	ganges primrose

Bauhinia variegata	orchid tree
Broussonetia papyrifera	paper-mulberry
Callisia fragrans	inch plant, spironema
Casuarina cunninghamiana	Cunningham's Australian pine
Cereus undatus	night-blooming Cereus
Cryptostegia grandiflora	Palay rubber vine
Dalbergia sissoo	Indian rosewood
Dioscorea alata	white yam
Enterolobium contortisiliquum	earpod tree
Epipremnum pinnatum	pothos
Eucalyptus camaldulensis	Murray red gum
Ficus altissima	false banyan
Ficus benghalensis	Bengal fig
Ficus benjamina	weeping fig, Cuban laurel
Ficus religiosa	bo tree
Flacourtia indica	governor's plum
Flueggea virosa	Flueggea
Hibiscus tiliaceus	mahoe, sea rosemallow
Hyptage benghalensis	Hyptage
Jasminum sambac	Arabian jasmine
Koelreuteria elegans	golden shower tree
Leucanea leucocephala	lead tree
Ligustrum japonicum	Japanese privet
Ligustrum lucidum	Chinese privet
Melinis minutiflora	molasses grass
Merremia tuberosa	wood-rose
Murraya paniculata	orange-jasmine
Myriophyllum spicatum (P)	Eurasian water-milfoil
Nephrolepis multiflora	Asian sword fern
Ochrosia parviflora (syn. *O. elliptica*)	kopsia
Paederia craddasiana	skunk-vine, onion-vine
Passiflora foetida	stinking passion-flower, maypop
Pittosporum pentandrum	pittosporum
Pittosporum tobira	Japanese pittosporum, pittosporum
Rhynchelytrum repens	natalgrass
Sansevieria hyacinthoides (syn. *S. trifasciata)*	African bowstring hemp
Solanum diphyllum	twinleaf nightshade
Syngonium podophyllum	arrowhead vine
Syzygium jambos	rose-apple
Terminalia catappa	tropical-almond
Tribulus cistoides	puncture vine, burnut
Triphasia trifoliata	lime berry
Urena lobata	Caesar weed

Wedelia trilobata	wedelia, creeping oxeye
Wisteria sinensis	Chinese wisteria

Total Category 2 Species = 55

Total Category 1 & 2 Species = 115

APPENDIX 2

Environmental Professionals

Environmental Professionals chosen to coordinate and/or supervise environmental assessment and restoration activities should exhibit certain credentials. There are four basic qualifications that environmental professionals must exhibit:

1. A degree from a four-year accredited college or university in the field of biology, zoology, environmental science or ecology, or a Masters or Doctorate degree in one of these fields.
2. Ecological knowledge of the wetlands for the areas to be assessed, including:
   - a- proven professional work experience in these wetlands, or
   - b- proven scientific education concerning specific wetlands, or
   - c- experience concerning these wetlands based on authorship of published articles regarding the Everglades ecosystem in recognized refereed journals, proceedings of symposiums, or comparable works.
3. A minimum of one certification or registration including, but not limited to:
   - a- Certified Environmental Professional with the National Association of Environmental Professionals;
   - b- Certified Wildlife Biologist with the Wildlife Society;
   - c- Ecologist or Senior Ecologist with the Ecological Society of America; or
   - d- Certified Fisheries Scientist with the American Fisheries Society.
4. Demonstrated knowledge of hydric soils as evidenced by the following credentials:
   - a- Certified Professional Soil Scientist with the American Society of Agronomy; or
   - b- Wetland Delineator Certification in accordance with Section 307(e) of the Water Resources Development Act of 1990.
   - c- Verifiable training or experience seminars in recognizing hydraulic soils.

*Adapted from Thomas Lodge -- WQI 1994

TABLE OF CONTENTS