INTRODUCTION

1. Overview

An extensive inventory of plant communities within Northeast Shark River Slough was conducted in 1978-79 by Hofstetter and Hilsenbeck (1980), resulting in a vegetational map and accompanying descriptions of twelve primary community types. The dynamics of these communities with respect to critical environmental influences, such as hydrology and fire, have been investigated by several authors (Hofstetter and Hilsenbeck, 1980; Wade, Ewel and Hofstetter, 1980; Loope and Urban, 1980; Olmsted, Loope and Rintz, 1980), and we now have a reasonable understanding of how the slough's vegetational communities may react to variations in such environmental influences. The baseline information therefore exists to adequately assess the potential wetland ecological impacts upon Northeast Shark Slough from the proposed West Wellfield.

The intent of this study was to use this baseline information, in concert with computer model-predicted shifts in slough hydrology, to determine potential wellfield-induced vegetational changes in the slough. The ultimate goal of the study is to provide the Dade County West Wellfield Technical Advisory Committee with a sufficient basis for assessing overall slough ecological impacts from the proposed wellfield.

2. Vegetation/Hydrology Relationships in Wetland Assessments

Wetland vegetational communities, and the potential compositional and structural sequences that characterize them, have long been used as a basis for assessing wetland environmental impacts. This assessment technique is generally based on two fundamental concepts. The first concept is that vegetational communities represent the primary trophic level within the wetland ecosystem. Shifts in higher trophic levels can be correlated to shifts within the vegetation (Galloway, 1978). For example, if changing hydological conditions cause emergent marshlands to be replaced by mesic seasonal prairies, then habitat value of the area for feeding by wading birds will have been reduced, while habitat value may have been enhanced for upland species. Populations of these animals within the affected area would be expected to respond accordingly.

The second concept is the well-documented relationship between wetland communities and hydrological influences. This relationship has been studied in many regions of the South Florida area. In particular, vegetational/hydrology studies have been conducted in Lake Okeechobee-Kissimmee River wetlands (Ager and Kerce, 1956; Sincock, 1957; Sincock, Powell, Hyde and Wallace, 1957), the Big Cypress region (Gunderson and Loope, 1982; Gunderson, Loope and Maynard, 1982), the Water Conservation Areas (Worth, 1983; Zaffke, 1983; Worth, 1987; Milleson, 1987), and the East

Everglades/ Shark Slough system (Hofstetter and Hilsenbeck 1980; Gunderson, 1987; Herndon and Stenberg, 1987). These authors have found that wetland community composition and structure can be related to a complex of hydrological variables. This complex, which can be termed "hydropattern," encompasses the following variables: mean depth, minimum and maximum depths, hydroperiod, total depth, range of depths, surface flow rates and surface flow patterns (Hofstetter and Hilsenbeck, 1980; Gunderson, 1987). Research has indicated that individual wetlands vary with respect to the relative influences of each of these variables, and the degree to which the variables interact and can be correlated to one another.

Additionally, a host of other environmental influences interact with hydropatterns to shape vegetational communities. Fire, assumes a prominent role in many wetland communities, and either maintains the existing vegetation under normal fire regimes or promotes vegetational changes under altered regimes (Wade et al. 1980). Fire regimes in wetlands are strongly correlated to hydropatterns, and changed hydropatterns can react synergistically with fire to cause profound vegetational changes.

Soil type also influences vegetational community composition and different soil types form under diferent hydrological conditions. For example organic peat soils, which support the sawgrass/flat/slough associations of Northeast Shark River Slough, form only under conditions of long inundation (Davis, 1943; Hofstetter and Hilsenbeck, 1980). Marl soils, which support the more mesic Muhlenbergia associations of the Taylor Slough area, are promoted under short hydroperiod conditions and loss of organics soils within Taylor Slough can be tied to reduced hydroperiods (Hofstetter and Hilsenbeck, 1980).

Vegetational composition often seems to be a function of several environmental influences that together have may have complimentary or opposing effects under differing hydrological situations. For example, Gunderson and Loope (1982) found that if fire enters bald cypress strands in the Big Cypress Preserve during a particularly dry season, all vegetation and organic soils can be consumed, resulting in lowered surface elevations, longer hydroperiods and altered substrates. Post-burn conditions will not favor the re-establishment of Bald Cypress. Under wetter conditions however, fire within cypress strands leave the fire-resistent bald cypress trees, as well as soils, intact. Only understory woody vegetation gets consumed, thereby maintaining cypress associations.

Another example of synergism between hydrological influences and related environmental influences is colonization of East Everglades wetlands by the exotic tree species, Melaleuca. Colonization of East Everglades marshes is favored under conditions of reduced hydroperiods. Moreover Melaleuca's seed-out response is promoted by the increased fire frequency and intensity associated with reduced hydroperiods (Wade et al. 1980).

The best approach to predicting wetland vegetational changes under conditions of altered hydrology would be to employ all of the hydropattern variables as well as the other related environmental influences that may be relevant to a study area. Unfortunately the level of information necessary to quantify all these variables rarely exists, nor have wetland systems been adequately modeled to take this approach. This is the situation with respect to wetlands within the potential drawdown area of the proposed West Wellfield.

An acceptable alternative approach is to use the single hydropattern variable that seems to be most directly associated with vegetation composition and structure, and to which the other hydropattern variables seem to be correlated. Gunderson (1987) found that mean water depth was a good variable to use in this context because it is correlated with many of the other hydrological parameters such as water level and yearly duration of flooding. Several other authors however have presented evidence which suggests that hydroperiod (ie. the period of time that water levels are at or above the soil surface) is the variable that best suits this role, because community gradients and successional patterns appear to correspond to hydroperiod gradients (Gunderson and Loope, 1982; Zaffke, 1983; Milleson, 1987).

The hydrological computer model for the proposed Dade County West Wellfield is designed only to model groundwater dynamics and cannot predict surface water depths. Mean water depth could not therefore be used to predict potential vegetational changes within Northeast Shark River Slough and Gunderson's recommended approach would not be applicable. The model can however provide groundwater elevations in relation to topographic elevations in the slough, and is further capable of providing the period of time groundwater is at or above the soil surface, based on monthly intervals. This allows reasonable estimates of yearly hydroperiods. The hydroperiod approach was therfore employed in this study.

3. Northeast Shark River Slough Vegetational Communities and Associated Hydroperiods

The vegetational communities of Northeast Shark River Slough have been described by Hofstetter and Hilsenbeck (1980) and the reader is referred to that paper for details on community composition and structure. However, for the purposes of this paper, Northeast Shark River Slough communities can be characterized as follows:

> Graminoid mosaics - consisting of hydric flats interspersed with sawgrass marshlands. In drier areas, hydric flats and sawgrass marshes are replaced by more mesic associations dominated by muhly grasses and broomsedges. The relative dominance of graminoid type appears to be related to degree of wetness along a northwest-southeast gradient in the

slough. Graminoid mosaics include communities Nos. 1,2,7 and 9 on Table 1.

Woody thickets - Generally dense stands of hydric shrub and small tree species occurring adjacent to tree islands or within open marshlands adjacent to seasonal ponds. Includes communities Nos. 4,6 and 10 on Table 1.

Marsh thicket mosaics - Consisting of sawgrass marsh, flats, semi-open water zones and woody thickets occurring in close proximity to one another. Considered by Hofstetter and Hilsenbeck (1980) to be a result of "hummocky" differentials in elevation over limited areas as a result of past fire disturbances. They often occur in association with tree islands. Community No. 3 on Table 1.

Tree islands - Various successional stages (including post-burn stages) of closed canopy hydric and mesic tree stands that ultimately can become tropical hammock forests. Includes community Nos. 8,11 and 13 on Table 1.

Exotic communities - Generally *Melaleuca* invaded phases of any of the above communities, representing deflected seral sequences.

A number of studies that relate vegetational composition to hydroperiod have been performed in wetland communities within Northeast Shark River Slough or within similar communities elsewhere in South Florida (Hofstetter and Hilsenbeck, 1980; Olmsted, Loope and Rentz, 1980; Gunderson and Loope, 1982; Gunderson, 1987; Herndon and Stenberg, 1987; Zaffke, 1983, Deuver, 1976; Milleson, 1987). Table 1 summarizes the results of these studies by listing each Northeast Shark Slough community type (Hofstetter and Hilsenbeck, 1980) and the range of hydroperiods found for each community under the studies. Note that a wide range of monthly hydroperiods were found for some community types. This variability was due to several factors. First, a number of the community types are mosaics, encompassing three or more vegetational associations. For example, community type #1 is a mosaic containing *Eleocharis*/*Rhynchospora* flats interspersed with *Cladium* glades and *Panicum* flats. Hydroperiods for *Cladium* range from 3.9 months to 12 months while *Eleocharis*/*Rhynchospora* flats range from 6 to 12 months. For the purposes of this study, the predominant (or primary) association (in this case, flats) is used to characterize the mosaic's hydroperiod. Column 4 therefore provides the mean hydroperiod, from the various studies, for the primary association within each mosaic.

A second source of variability is that some species (*Salix* is a prime example) have a wide range of hydroperiod tolerances and can be found associated with more mesic species in short hydroperiod settings and with more hydric species in long hydroperiod settings. In these instances, the mean value

Community Type	Range of Hydroperiods (months)	Range of $\bar{x}$ Hydroperiods (months)	$\bar{x}$ of primary type	Hydric Category
1) Mosaic Eleocharis & Rhynchospora dom.	3.9 - 12	6.9 - 10.3	10.3	semi permanent
2) Mosaic - Cladium dominant	3.9 - 12	6.9 - 10.3	9.6	semi permanent
3) Mosaic - marsh thicket	6.5 - 9.2	8.6 - 9.6	9.6	semi permanent
4) Salix - Annona - Myrica thicket	1.0 - 10.7	8.0	-	long seasonal
5) Typha thicket	3.0 - 12	9.3	-	semi permanent
6) Salix thicket	4.1 - 12	5.3	-	long seasonal
7) Mosaic - Muhlenbergia/Andropogon	1.0 - 4.3	2.6	-	mesic
8) Bayhead forest	< 3.0	< 3.0	-	mesic
9) Mosaic - Muhlenbergia/Cladium	1.0 - 12	2.6 - 10.3	3.0	short seasonal
10) Chrysobalanus thicket	4.0 - 5.0	4.0 - 5.0	-	short seasonal
11) Post-burn bayhead	< 3.0	< 3.0	-	mesic
12) Melaleuca forest	-	-	-	**
13) Successional bayhead forest	< 1.0	< 1.0	-	ephemeral

** Hydroperiods of Melaleuca stands vary depending upon the particular communuity that has been colonized. However, short seasonal wetlands are more susceptible to Melaleuca colonization than long seasonal.

TABLE 1: SUMMARY OF HYDROPERIOD CHARACTERISTICS FOR MAJOR COMMUNITY TYPES WITHIN THE PROJECTED DRAWDOWN AREA OF THE OF THE PROPOSED WEST DADE WELLFIELD.

provided is based only on those studies where the species occurred in similar associations and growth patterns as in Northeast Shark Slough. For example, Salix/Annona/Myrica thickets in Shark Slough typically occur in zones of reduced soil elevations following severe burns (Hofstetter and Hilsenbeck, 1980). Hydroperiods in these area tend to be on the wet limits of tolerance for Salix. Therefore the mean value for such thickets in Table 1 is based only on Salix associations in similar hydric situations.

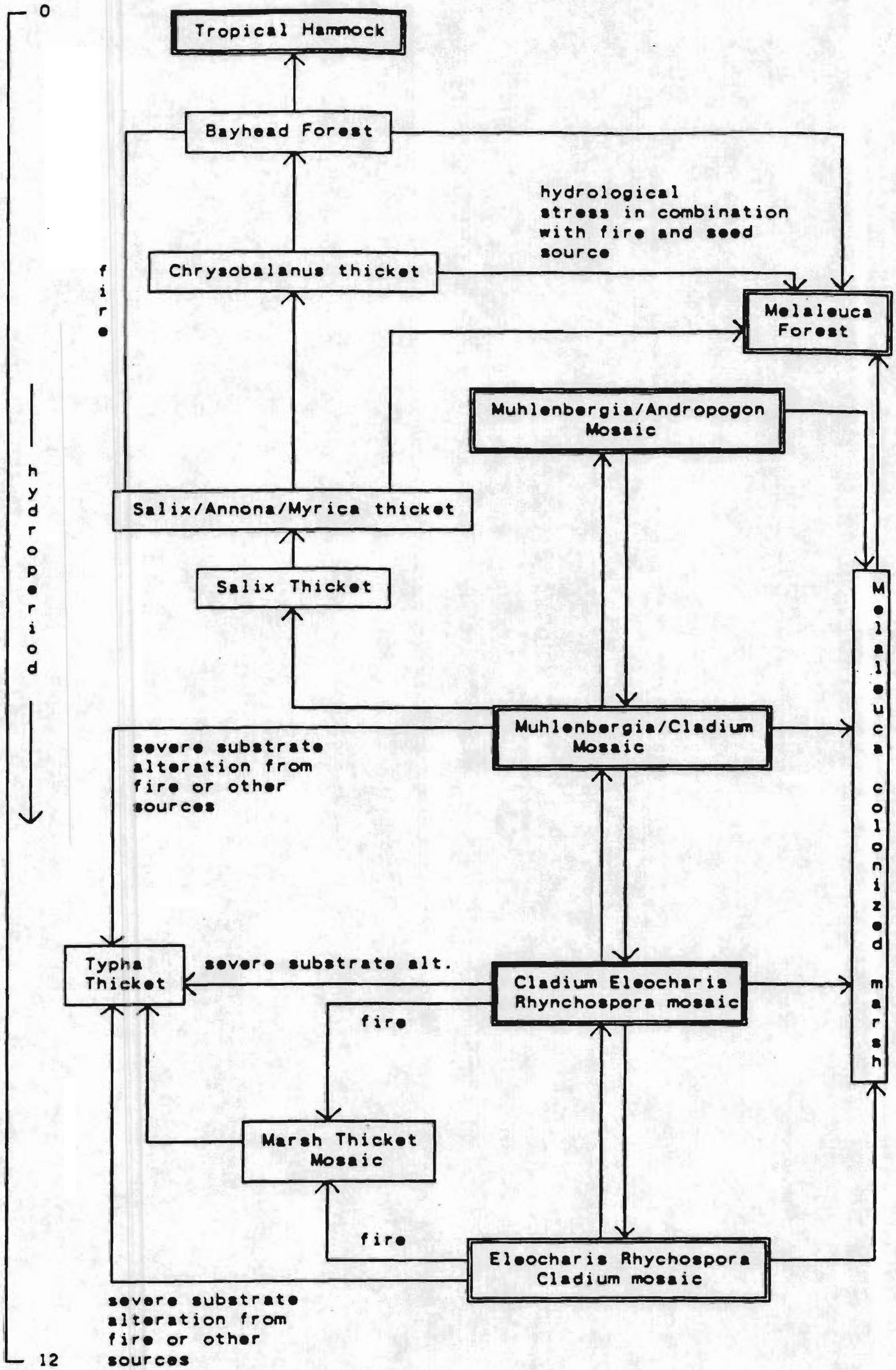
Column 5 of Table 1 organizes this highly variable hydroperiod data into a usable form by categorizing mean hydroperiods into five discrete classes: semi-permanent (9-12 months), long seasonal (5-8 months), short seasonal (3-4 months), mesic (1-2 months) and ephemeral (<1 month). These classes were selected because they seem to mirror the broad hydric/seral relationships that are known to characterize the slough's vegetational communities.

4. Northeast Shark River Slough Successional Relationships

The successional relationships of Northeast Shark River Slough vegetational communities have been discussed by Davis (1943), Hofstetter and Hilsenbeck (1980), and Herndon and Stenberg (1987). Figure 1, shows hydric/seral relationships within the slough based on these studies. The figure also shows the influence of various other environmental factors that act either in concert with or parallel to hydroperiod (ie. fire, substrate alteration, exotic seed source). Note that a dynamic relationship exists between the four major graminoid mosaics (indicated by double lines on the figure). These mosaics apparantly shift between one another based on moderate shifts in hydroperiod in the slough (Hofstetter and Hilsenbeck, 1980). In the case of the Eleocharis dominant and the Cladium dominant mosaics, the hydrologic distinction is so fine that it is filtered out by the categorization process (Table 1).

It also should be noted that virtually all the communities are susceptible to colonization by the exotic tree species, Melaleuca. Increased hydrologic stress and the accompanying increased frequency and duration of wildfires can convert all community types into dense Melaleuca forests.

Figure 2 provides a simplified successional sequence based solely on hydroperiod relationships. It provides a view of the general role of hydroperiod in Northeast Shark Slough hydric community types.



Note: Major graminoid mosaics are indicated by double lines.

FIGURE 1: CONCEPTUAL SUCCESSIONAL RELATIONSHIPS OF NORTHEAST SHARK RIVER SLOUGH VEGETATIONAL COMMUNITIES.

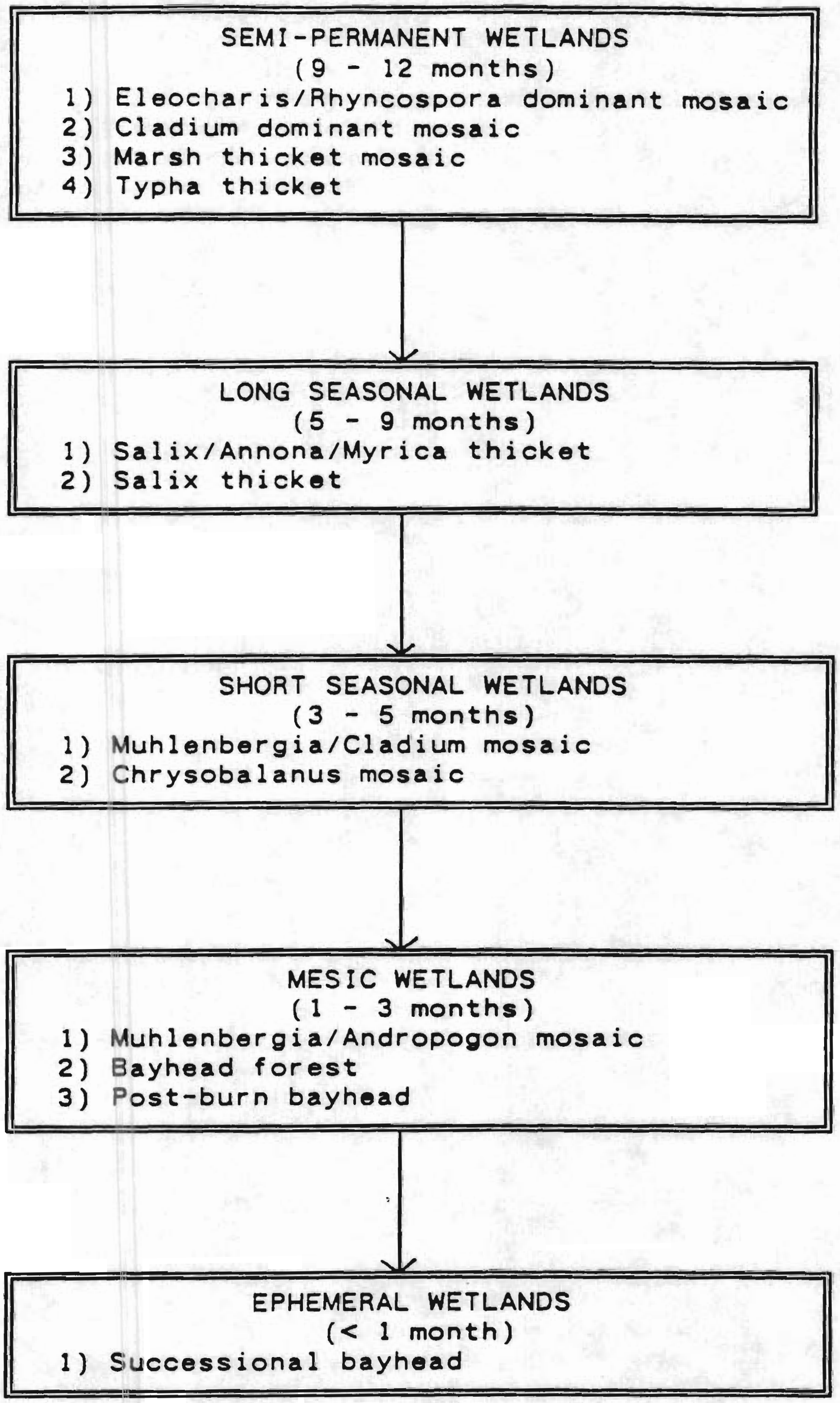


Figure 2: Simplified successional sequences based on hydroperiod relationships.

MATERIALS AND METHODS

The conceptual study design was to predict likely changes in Northeast Slough vegetational communities by comparing vegetational base maps (Hofstetter and Hilsenbeck, 1980) with computer model-predicted hydroperiod changes. This process involved the following five tasks:

1) Verification of the accuracy of existing East Everglades vegetational base maps within Northeast Shark Slough.

2) Refinement or updating of the maps, if necessary.

3) Classification of verified communities into simplified hydric community types and preparation of a hydric community map.

4) Overlaying of model-predicted hydroperiod reductions atop the hydric community map to determine the extent of change that will affect each Northeast Shark Slough community.

5) Predictions on the direction of vegetational change that will likely be induced by the projected hydroperiod reductions, and quantification of the aerial extent of hydric communities under the reduced hydroperiods.

Map verification entailed random site visits within all major community types in the slough. A sampling grid overlay, utilizing latitude and longitude coordinates, was placed over the vegetation maps, and random site visit locations were selected for all communities in the grid. Sites were visited by helicopter and independent assessments of wetland community types were made by two biologists at each site. These were then compared to the community types that would be expected from the vegetation maps. It should be noted that, for the purposes of the study, the slough area of concern was the area that the computer model predicts at least a one foot drawdown under 140 MGD withdrawal.

Overall vegetational patterns were viewed through stereoscopic analysis of false color infrared aerial photography (1985, scale 1" = 1000') of the slough. Special attention was paid to the discernible boundaries between the aforementioned community mosaics that reflect hydrological gradations in the slough.

A total of five random square mile segments were chosen for analysis of Melaleuca infestation. Analysis consisted of tree counts within infrared photos and comparison to the number of trees counted by Hofstetter and Hilsenbeck, (1980) in the same square mile in 1978.

Upon completion of baseline map verification and completion of any baseline map adjustments found to be necessary, simplified vegetation maps were prepared. These simplified maps categorized all slough vegetation into the five basic hydric community types listed on Table 1. The aerial extent of each of these hydric community types was then determined by using an electronic digitizer.

The computer model provided overlay maps that estimated background hydroperiods for the slough based on the number of months that groundwater levels are at or above the surface. The model also provided overlays for predicted hydroperiods under an eastern (Bird Drive Basin) and western (Northeast Shark Slough) alignment. These predicted hydroperiod overlays were compared to the background overlays to determine zones of hydroperiod reduction. For example, if the background hydroperiod was 12 months within a given region of the slough, and the predicted hydroperiod was 6 months, then this region would be within a 50% reduction zone.

Hydroperiod reduction zones of 100%, 80%, 60%, 40%, 20% and 0% were mapped on an additional set of overlays. Vegetational communities within each of these zones would be expected to experience accordant reductions in hydroperiod. The aerial extent of each hydric community was then determined for each hydroperiod reduction zone and the new hydric category that this reduction would imply was determined. For example, if the hydric community map and hydroperiod reduction overlay showed that the 60% reduction zone contained 500 acres of semi-permanent wetland community, then these 500 acres would now become long seasonal wetlands under model predictions (ie. 9 - 12 month hydroperiod would be reduced to 5.4 - 7.2 month hydroperiod).

The total acreages of each hydric community type under background, eastern alignment and western alignment scenarios were then compared in order to obtain relative estimates of the extent of potential wetland impacts. The potential effects of such hydric community changes on colonization trends by Melaleuca were also estimated.

RESULTS

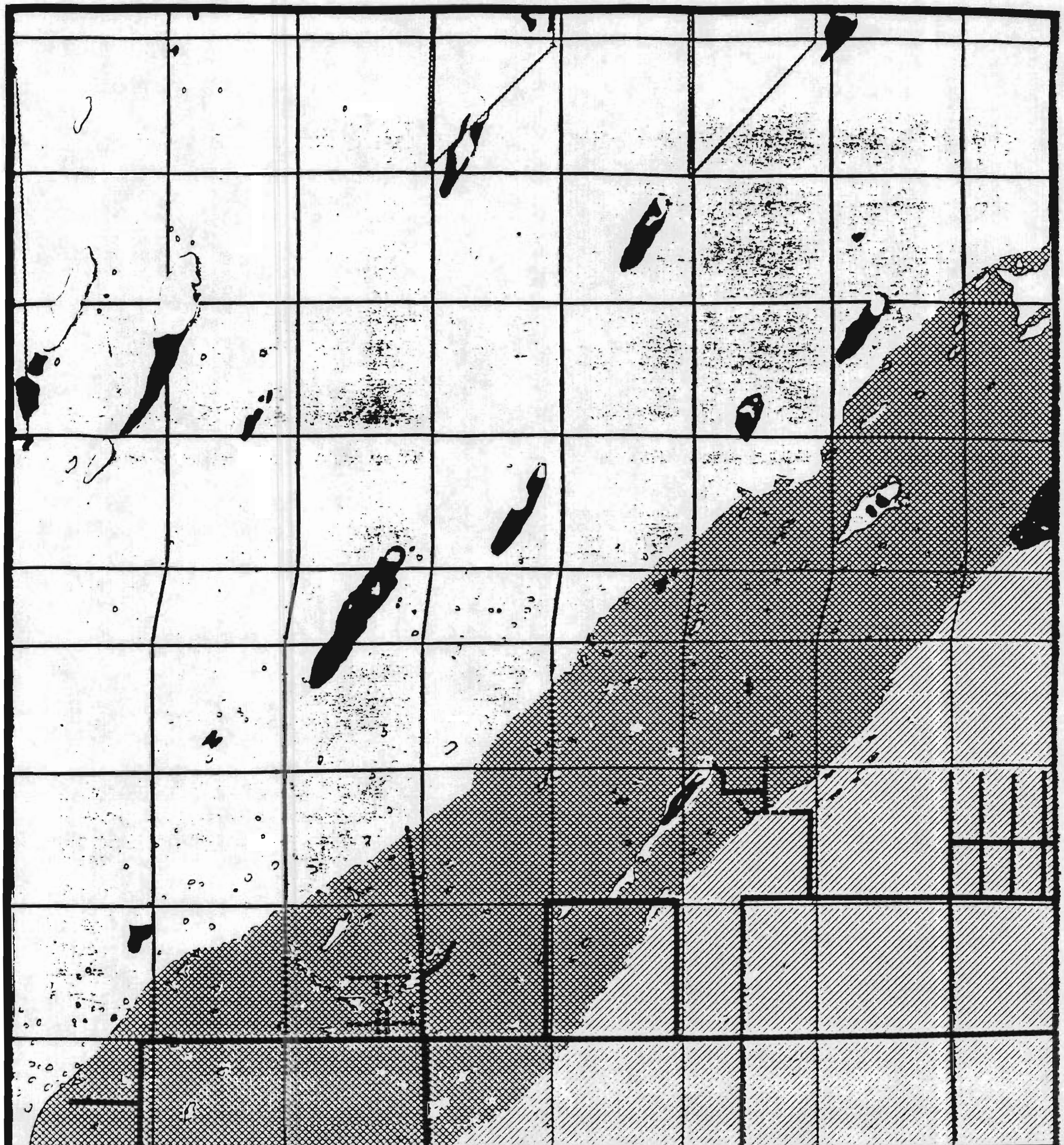
A total of twenty-five random observation sites in the slough were visited in July, 1987 (see Figure 3). Out of the total 25 sites, the observed vegetational communities corresponded with the baseline map-predicted communities (Hofstetter et al, 1979) at 23 sites. In the two sites where such correspondence did not occur, the observed community was post-burn bayhead that had become infested with Melaleuca and other opportunistic exotic species. This replacement vegetation is consistent with the successional trends for the East Everglades described previously (Hofstetter and Hilsenbeck, 1980; Loope and Urban, 1980).

Infrared aerial photographic analysis revealed general correspondence between baseline map vegetational patterns and actual patterns. In particular, the delineations between the slough's graminoid mosaic communities (Muhlenbergia/Andropogon, Muhlenbergia/Cladium, Cladium/Eleocharis/Rhynchospora, and Eleocharis/Rhynchospora/Cladium) were confirmed.

Analysis of Melaleuca infestation however revealed that the extent of colonization may have increased dramatically since Hofstetter and Hilsenbeck's work of 1978. Melaleuca trees were observed in densities exceeding twenty-five trees per square mile in 1978 in only two of the random square miles chosen for analysis (see Table 2). By 1985, all five of the analyzed square miles had trees at this minimum density. Two square miles showed particularly large increases in Melaleuca (1978 - 3 and 6 trees; 1985 - 46 and 170 trees respectively). It should be noted that the scale of aerial photography used in both 1978 and 1985 allowed detection only of trees larger than approximately 10 feet in height. This suggests that some of trees observed in 1985 could have been present as seedlings in 1978 and would therefor have gone unobserved. However Melaleuca trees at heights of 10 feet are generally seedbearing, and therefore this increase in maturity alone represents a noteworthy threat to the slough.

Simplified vegetational maps depicting the five basic hydric community types in the slough were completed (Figure 4). Acreage results are summarized in Table 3. Overlays of hydroperiod reduction zones (Figures 5 and 6) showed substantial impacts (> 50%) on slough vegetation communities as far west as five miles from Levee L31 under the proposed western wellfield alignment, and as far west as three miles under the proposed eastern alignment. These reductions translated into the hydric community shifts listed in Table 3.

FIGURE 3: LOCATIONS OF SHARK SLOUGH VEGETATIONAL ANALYSIS SITES.



HYDRIC COMMUNITY TYPES - NE SHARK SLOUGH

FIGURE 4

EPHEMERAL	<1	MONTH
MESIC	1 - 3	MONTHS
SHORT SEASONAL	3 - 5	MONTHS
LONG SEASONAL	5 - 9	MONTHS
SEMI - PERMANENT	9 - 12	MONTHS

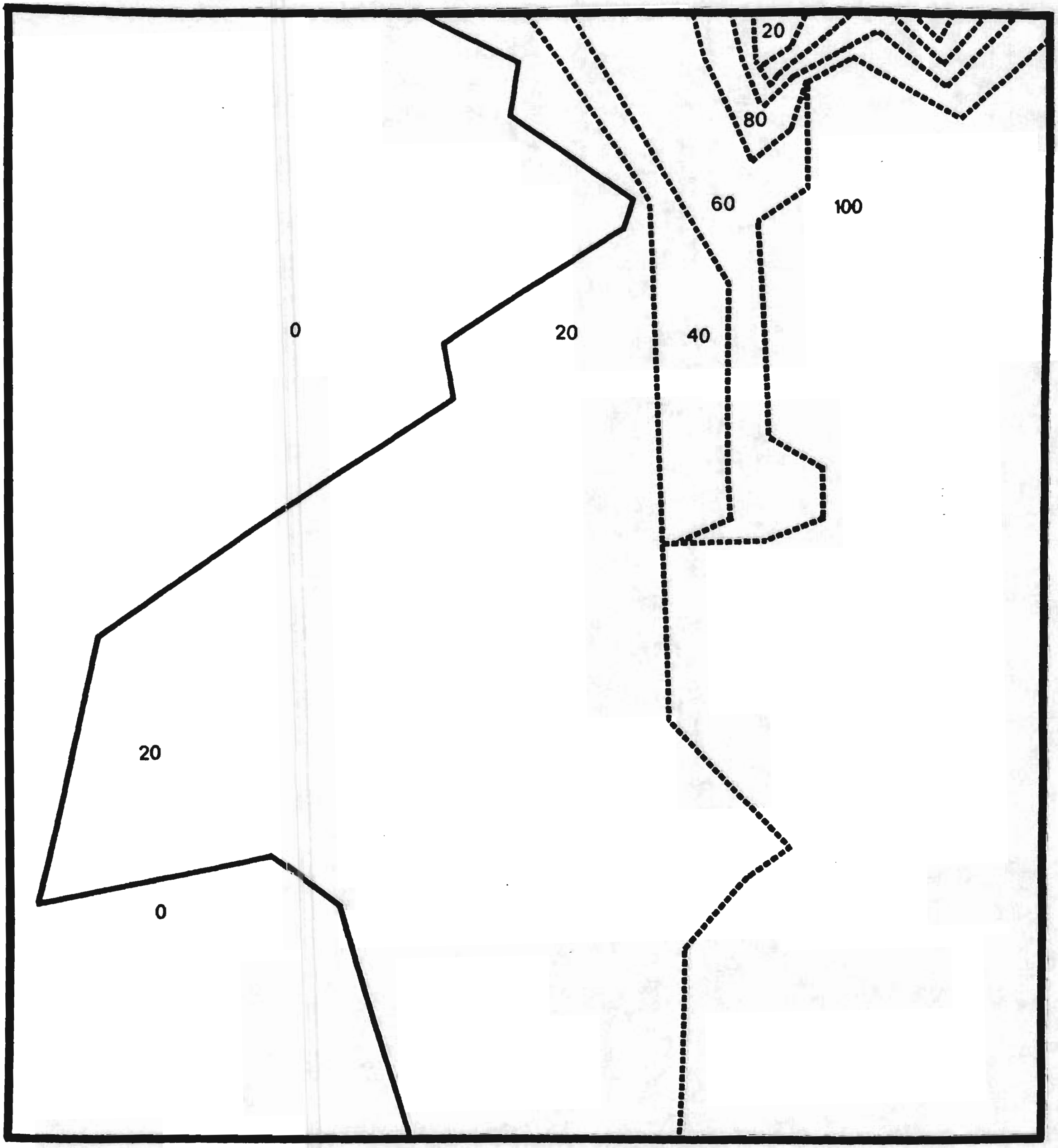


FIGURE 5: PERCENT CHANGE IN HYDROPERIODS - EASTERN ALIGNMENT

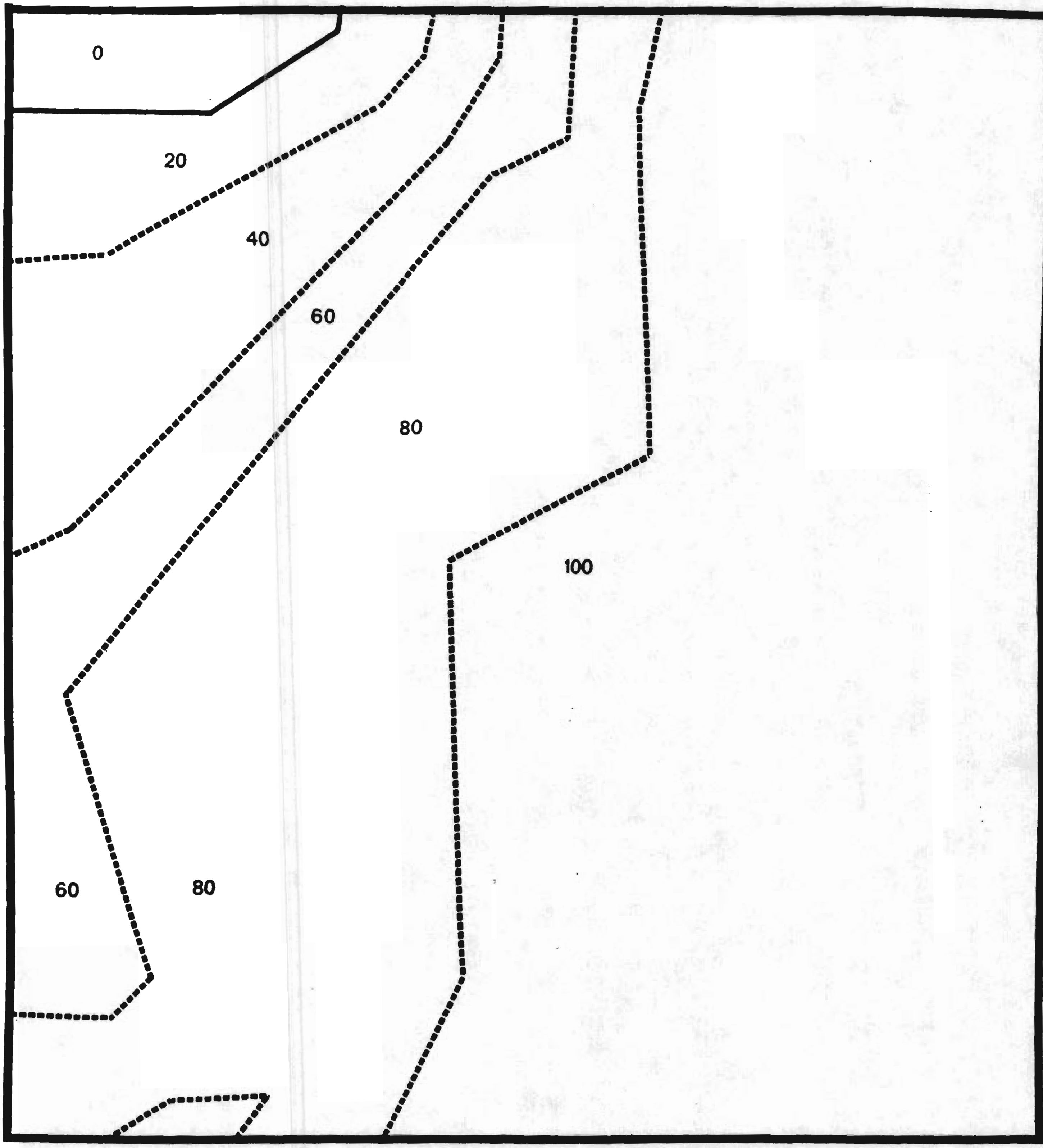


FIGURE 6: PERCENT CHANGE IN HYDROPERIODS- WESTERN ALIGNMENT

Section/Town-ship/Range	Estimated Tree Density (# inds/square mile)*	
	1978	1985
7 55 38	32	30
6 55 38	170	6
30 54 38	46	3
36 54 37	70	27
14 55 37	32	0

Note: 1985 estimates are based on the assumption that each mapped individual represented at least 3 trees. 1985 estimates are based on actual counts.

TABLE 2: MELALEUCA COUNTS WITHIN RANDOM SHARK SLOUGH SECTIONS.

Wellfield Location	Hydric Community Type				
	Semi Permanent	Long Seasonal	Short Seasonal	Mesic	Ephemeral
Existing Slough	20689	554	9719	5359	275
Eastern Alignment	15053	2812	6220	914	11597
acreage change	-5636	+2258	-3499	-4445	+11322
Western Alignment	2586	2991	3804	10447	16766
acreage change	-18103	+2437	-5915	+5088	+16491

TABLE 3: HYDRIC COMMUNITY ACREAGE SHIFTS PREDICTED UNDER EASTERN AND WESTERN WELLFIELD ALIGNMENTS.

DISCUSSION

Results suggest that both an eastern and western wellfield alignment will cause vegetative community shifts within Northeast Shark River Slough. Both alignments can be characterized as replacing the wettest slough communities with the driest, most marginal communities. The difference between the two alignments involves the relative magnitude of impact. Substantially more wetlands would be affected, and to a far greater degree, under a western alignment than under an eastern alignment, and the long-term ecological effects upon the slough would more likely be irreversible under a western alignment.

Table 4 shows that the total area of hydric community shifts predicted under the western alignment is 48491 acres while the total predicted acreage under an eastern alignment is 22715 acres. Therefore, if wetland predicted impacts were to be confined to those vegetational communities experiencing substantial hydrological changes (ie. those communities that would undergo shifts into shorter hydroperiod classes), then the proposed western wellfield alignment would adversely effect approximately 47% more wetlands in the slough than the proposed eastern alignment.

More significantly, an analysis of Table 4 shows that the primary shift under a western alignment involves the loss of semi-permanent (-18103 acres) and short seasonal (-5915 acres) hydric communities and the promotion of mesic (+5088 acres) and ephemeral (+16491 acres) communities. Under an eastern alignment, this shift is less dramatic. Primary losses are spread more evenly: semi-permanent (-5636 acres), mesic (-4445 acres) and short seasonal (-3499 acres). Gains are again concentrated in ephemeral communities (+11322 acres). Assuming that the wettest communities represent the most important wetland habitat in the slough, the western alignment impact is far greater than the eastern alignment. The total loss of semi-permanent and long seasonal wetlands is 15666 acres under a western alignment, and only 3378 acres under an eastern alignment.

There are many ecological implications of a shift in Northeast Shark River Slough from hydric wetland communities to marginally wet habitats. The most obvious implication of this shift is that habitat degradation, in the form of a rapid colonization by exotic tree species will occur. The essential ingredients for a gradual exotic colonization now exist in the slough. A large seed source for _Melaleuca_ now exists, particularly in the drier eastern portions of the slough and data suggests that colonization in a westerly and northerly direction has been occurring in recent years. Dry season wildfires have no doubt contributed to this _Melaleuca_ expansion, as have the slough's organic peat soils, which readily promote _Melaleuca_ germination and persistence (Wade et al. 1980).

The mesic and ephemeral hydric community types, that will experience dramatic expansions as a result of wellfield-induced hydroperiod reductions, are well suited for Melaleuca invasion. Melaleuca seedlings germinate and grow rapidly in saturated soils under non-inundated conditions. Such conditions are typical in short hydroperiod wetlands (Woodall, 1980). Moreover, the seedlings have a unique ability to rapidly elongate roots so that they constantly tap a lowering groundwater table in the dry season (Woodall, 1980). This allows for survival in mesic and ephemeral wetlands. Conversely, longer hydroperiod wetlands discourage Melaleuca seedling survival since the seedlings cannot tolerate extended submergence (>6 - 7 months) during the first year following germination (Woodall, 1980).

Intense dry season wildfires, particularly during drought years, are a near certainty under severely reduced hydroperiod conditions, and these fire events will serve to promote Melaleuca through increased seed release and the preparation of a favorable seed bed for germination and growth (Hofstetter and Hilsenbeck, 1980). An example of the conditions that could prevail in the slough under severely reduced hydroperiods is currently found in the historic upper limits of the slough drainage basin, east of the Dade Broward Levee in Northwest Dade County. This approximately 35 square mile area was originally characterized by wetland communities similar to those currently found in Northeast Shark Slough. Severe hydroperiod reduction over the past twenty years, resulting originally from drainage and later from the Northwest Wellfield drawdown, have promoted the establishment of an almost continuous forest of Melaleuca over 60 - 70% of the area. The remaining 40 - 50% is wetland prairie that contains mixed densities of Melaleuca seedlings and saplings.

Hofstetter and Hilsenbeck (1980) state the intense dry season fires have already left their imprint on the vegetation of the slough. For example, only 25% of the tree islands that existed a century ago have not been destroyed by fire. Since these remaining tree islands provide refuge for wildlife and support a number of rare plant species (Encyclia boothiana and Myrcianthes fragrans var simpsonii for example), preservation of the remaining islands would seem to be important to the ecological health of the slough. There is a high probability that they would be destroyed by fire under severely reduced hydroperiods. Additionally, post-burn replacement of native tree island species by undesirable exotic species such as Schinus and Casuarina can also be expected (Loope and Urban, 1980).

Hofstetter and Hilsenbeck (1980) listed the following rare and endangered plant species for Northeast Shark Slough: Chamaesyce porteriana var porteriana, Linum carteri var smallii, Schizachrium rhizomatum, Spiranthes laciniata, Zamia pumila, Tillandsia spp. Habitat loss as a result of destructive wildfires would likely affect these species.

Soil and nutrient loss can be expected to accompany hydroperiod decline in the slough. Increased exposure and dry out of soils result in decomposition and loss by ground fires and altered water and nutrient storage capacity (Hofstetter and Hilsenbeck, 1980). Additionally, the ability of the slough to produce a viable and diverse periphyton algae mat would also be negatively affected under reduced hydroperiods. This has serious implications for wildlife populations because periphyton algae form the basis of the slough's food chain.

Northeast Shark River Slough supports a large and diverse array of wildlife populations. The South Florida Research Center (1979) listed 28 fish species, 35 reptile and amphibian species, 160 bird species (including 16 wading bird species), and 16 species of mammals for the slough. More significantly, the SFRC states that the following endangered or threatened species occur in the slough either as residents or as regular visitors: American Alligator, Wood Stork, Everglades Kite, Bald Eagle and the Everglades Mink. All of these rare species rely on long hydroperiod wetlands for survival.

Schortemeyer (1980) presented optimal hydroperiods for the following animal species or guilds of species found in Northeast Shark Slough. Deer - seven months; Pig frog - twelve months; Everglades Kite - twelve months; Woodstork - ten months; Large mouth bass - twelve months; Diving Ducks - eight months; Dabbling Ducks - eight months; American Alligator - twelve months. All of these optimal hydroperiods fall within the semi-permanent or long seasonal wetland classes. Transition of the slough to mesic and epemeral wetlands will adversely affect populations of these species in the area.

The loss of certain specific semi-permanent and long seasonal wetland communities in the slough can be especially harmful. For example, the marsh thicket mosaics contain deeper slough areas that are excellent dry season refugia for aquatic animals, in particular the alligator (Hofstetter and Hilsenbeck, 1980). Although these communities represent a small portion of the total acreage in the slough, their loss can magnify wildlife population losses by eliminating critical habitat during the dry season.

Another important hydric habitat in the slough is willow thickets. Willow thickets serve as feeding, nesting and roosting habitat for wading birds. Gallinules feed heavily on willow catkins and the willow stands provide excellent habitat for alligators and other reptiles and amphibians (Hofstetter and Hilsenbeck,1980). Willow thickets also encompass a relatively small portion of the slough area, yet their loss could effect a disproportionate share of the area's wildlife.

CONCLUSIONS

1) Both the proposed eastern and western alignments of the Dade County West Wellfield will result in substantial wetland vegetational community shifts in Northeast Shark River Slough.

2) The magnitude of impact upon slough vegetational communities is far more substantial under a western alignment. A western alignment will result in the loss of 18103 acres of semi-permanent wetlands and will result in the transition of much of the slough to much drier habitat. (16491 acres of epemeral wetlands, 5088 acres of mesic wetlands). An eastern alignment will cause the loss of 5636 acres of semi-permanent wetlands and a gain of 11597 acres of ephemeral wetland habitat.

3) Under a western alignment, most of the existing semi-permanent wetlands will be converted to ephemeral or mesic communities. Under an eastern alignment the changes are less severe. Semi-permanent loss is related primarily to a gain in long seasonal wetlands. Gains in ephemeral wetland habitat are related primarily to losses in short seasonal and mesic wetlands.

4) The trend toward mesic and ephemeral wetland habitat in the slough will likely result in a rapid and devastating colonization by the exotic tree species, Melaleuca.

5) This trend will also likely have serious implications for a large number of animal species that depend on hydric habitat. In particular, sixteen species of wading birds and five endangered or threatened animals would be adversely affected.