5.0. ENVIRONMENTAL RESOURCES

This section compares the results of the no-action projections for the study area and the projected landscape alterations associated with Alternatives 1 and 2. In all cases, except where specifically stated, the no-action projections for 30- and 100-years are also described in Step H (LADNR 1998h.i). Where deviations have been made, usually because of development and refinement of the approach, these refined methodologies are described. As in Step H (LADNR 1998h.i), the interaction between emergent and open water habitats and aquatic and other fauna will be addressed by examining three types of changes between the no-action and Alternatives 1 and 2 projections.

Section 5.1 discusses changes from current emergent (largely coastal wetland) habitats to projected open water under no-action and the effect of the alternatives on this change. Section 5.2 deals with changes in emergent habitat type based upon physical changes within the study area, such as those associated with alterations to water level or salinity. Section 5.3 discusses changes in the habitat and faunal utilization of open water areas as these change from their projected no-action status to that projected for the alternatives.

The assumption made in Step H (LADNR 1998h.i) was that there was unlikely to be conversion from current open water to emergent habitat in the future. This section considers where land is created in association with the alternatives.

5.1. Emergent Habitat To Open Water

5.1.1. Derivation of No-Action Land Loss Projections

As discussed in Section 2.1.1, land loss projections for the no-action scenario developed under Step H (LADNR 1998h.i) were modified for use in preparing Step J. The rate of land loss along the marsh shoreline was determined so that any change in wave height could be assessed. In addition, a new boundary was used for generating the habitat acreage numbers. This is slightly different from that used in Step H (LADNR 1998h.i); therefore, new habitat acreages for no-action are also presented here to make the comparisons consistent.

5.1.2. Derivation of Alternative Projections

There are two main differences between the no-action and Alternatives 1 and 2 projections: 1) change in land loss rates to account for protection of bay shorelines, and 2) change in land masses along the barrier shorelines directly associated with the construction of Alternatives 1 and 2.

In order to estimate the effect of the alternatives on shoreline erosion around the coastal bays, wave models (Section 4.0) were used to provide data on the height of waves affecting these shorelines under no-action conditions (30- and 100-year projections) and for each alternative. For each shoreline polygon used in the projection of land loss, the change in wave height was assessed. It was assumed that waves less than 10 cm (3.9 inches) in height had an insignificant effect on erosion of the marsh edge. Thus, where waves were below this threshold under no-action, no changes were applied for the alternatives. However, several polygons did show changes in wave height and on the basis of these changes associated with the alternatives land loss rates in the shoreline polygons were modified. An 80% reduction in wave height resulting in a reduction in land loss of 96% is usually associated with the combined use of barrier restoration and wave absorbers in Alternative 1. Smaller reductions in land loss occur for most of the polygons in Alternative 2 as the barrier restoration configuration is different and there are no wave absorbers to effect regenerated waves in the coastal bays. Table 5-1 shows the modification to land loss in the various shoreline polygons for Alternative 1 and Alternative 2 for both 30- and 100-year projections.

Table 5-1. Approach and Calculations for Loss Prevention Along Bay Shorelines Associated with Alternatives 1 and 2.

Polygon	**No-Action 30-Year**	**Percent reduction in wave height for average wave height > 10 cm (30-Year)**		**Loss Prevention 30-Year (hectares)**	
Area	**Land Loss (hectares)**	**Alternative 1**	**Alternative 2**	**Alternative 1**	**Alternative 2**
F1	213	-80%	0%	204	0
F2	708	-59%	-21%	589	266
F3	2,543	-80%	0%	2,441	0
F4	472	0%	0%	0	0
F5	4,232	0%	0%	0	0
S1	1,294	0%	0%	0	0
S2	395	-80%	0%	379	0
S3	1,261	0%	-2%	0	50
Total	**11,118**			**3,613**	**316**

Polygon	**No-Action 100-Year**	**Percent reduction in wave height for average wave height > 10 cm (100-Year)**		**Loss Prevention 100-Year (hectares)**	
Area	**Land Loss (hectares)**	**Alternative 1**	**Alternative 2**	**Alternative 1**	**Alternative 2**
F1	512	-80%	-10%	491	97
F2	1,480	-81%	-63%	1,427	1,278
F3	4,862	-80%	-31%	4,668	1,332
F4	1,070	-55%	-49%	853	792
F5	12,294	0%	0%	0	0
S1	2,851	0%	0%	0	0
S2	727	-80%	-6%	698	85
S3	3,142	0%	0%	0	0
Total	**26,938**			**8,137**	**3,584**

1 ha = 2.47 acres

In addition, changes in the barrier shoreline configuration associated with the design of the alternatives results in an increase in emergent habitat. Table 5-2 shows the habitat change associated with the two alternatives.

Table 5-2. Modifications to Emergent habitats associated with Construction of Alternatives (ha)

	Alternative 1	Alternative 2
Island habitat		
Beach	967	977
Vegetated Dune	391	394
Saline Marsh	4,990	2,637
Total Land	**6,348**	**4,008**

1 ha = 2.47 acres

5.1.2.1. Alternative 1

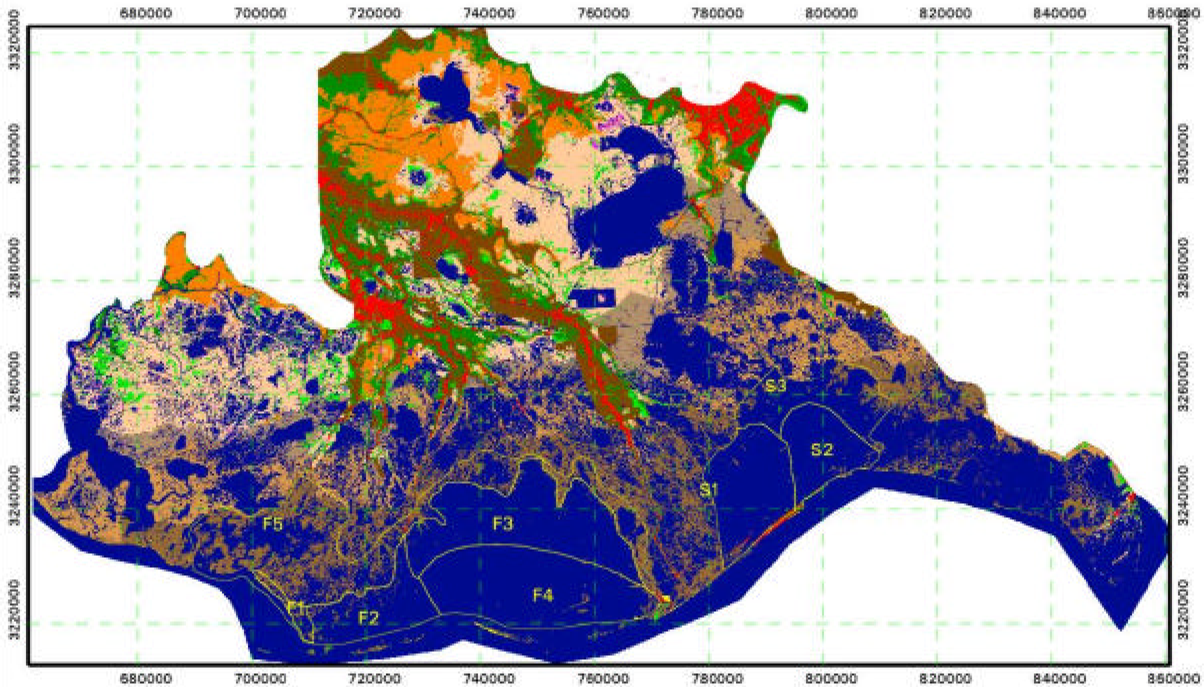
In Figure 5-1, the 30-year no-action projection is overlain on the 1988/90 habitat data using the procedures described in Step H (LADNR 1998h.i). Figure 5-2 shows the same approach applied to the 100-year projection. The 30-year and 100-year projections for land-water associated with Alternative 1 are shown in Figures 5-3 and 5-4 respectively. They are also overlaid on this habitat map. In addition, Figures 5-3 and 5-4 include habitats created along the barrier shorelines. Table 5-3 shows the difference in acreage of various emergent habitats for the 30- and 100-year no-action and Alternative 1 comparisons.

Table 5-3. Alternative 1 Habitat Distribution (hectares)

	30-year No-Action	30-year Alternative 1	Change	100-year No-Action	100-year Alternative 1	Change
Water	602809	593066	-9743	727451	712624	-14827
AB floating	2206	2206	0	1325	1325	0
AB Submerged	1703	1704	1	905	907	2
Fresh marsh	131897	131896	-1	106419	106419	0
Intermediate marsh	37318	37318	0	28755	28755	0
Brackish marsh	64308	64294	-14	46625	46617	-8
Saline marsh	12162	130220	8,599	71301	84422	13121
Cypress forest	63127	63127	0	54785	54785	0
Bottomland forest	58295	58294	-1	53985	53985	0
Upland forest	6127	6136	9	5428	5453	25
Dead forest	95	95	0	51	51	0
Bottomland scrub	21951	21903	-48	18283	18404	121
Upland scrub	3725	3636	-89	2285	2369	84
Shore/flat	812	2098	1286	474	959	485
AG/pasture	71724	71775	51	70333	70386	53
Upland barren	303	253	-50	240	227	-13
Developed	29535	29535	0	28922	28922	0
Other	14	13	-1	4	6	2
TOTAL	1217569	1217572		1217570	1217572	

1 hectare = 2.47 acres
1 square mile = 259 hectares

Figure 5-1. Projected Coastal Habitat (30-year, No-Action)



Habitat	Area (Acres)
Water------------:	1489569
AB Floating-------:	5452
AB Submerged------:	4207
Fresh Marsh-------:	325923
Intermediate Marsh:	92214
Brackish Marsh----:	158908
Saline Marsh------:	300531
Cypress Forest----:	155989
Bottomland Forest-:	144050
Upland Forest-----:	15139
Dead Forest-------:	234
Bottomland Shrub--:	54242
Upland Shrub------:	9204
Shore/Flat-------:	2006
AG/Pasture-------:	177232
Upland Barren-----:	749
Developed--------:	72983
Other Land--------:	35

Prepared By NSEL/LSU, 1998

Figure 5-2. Projected Coastal Habitat (100-Year, No-Action)

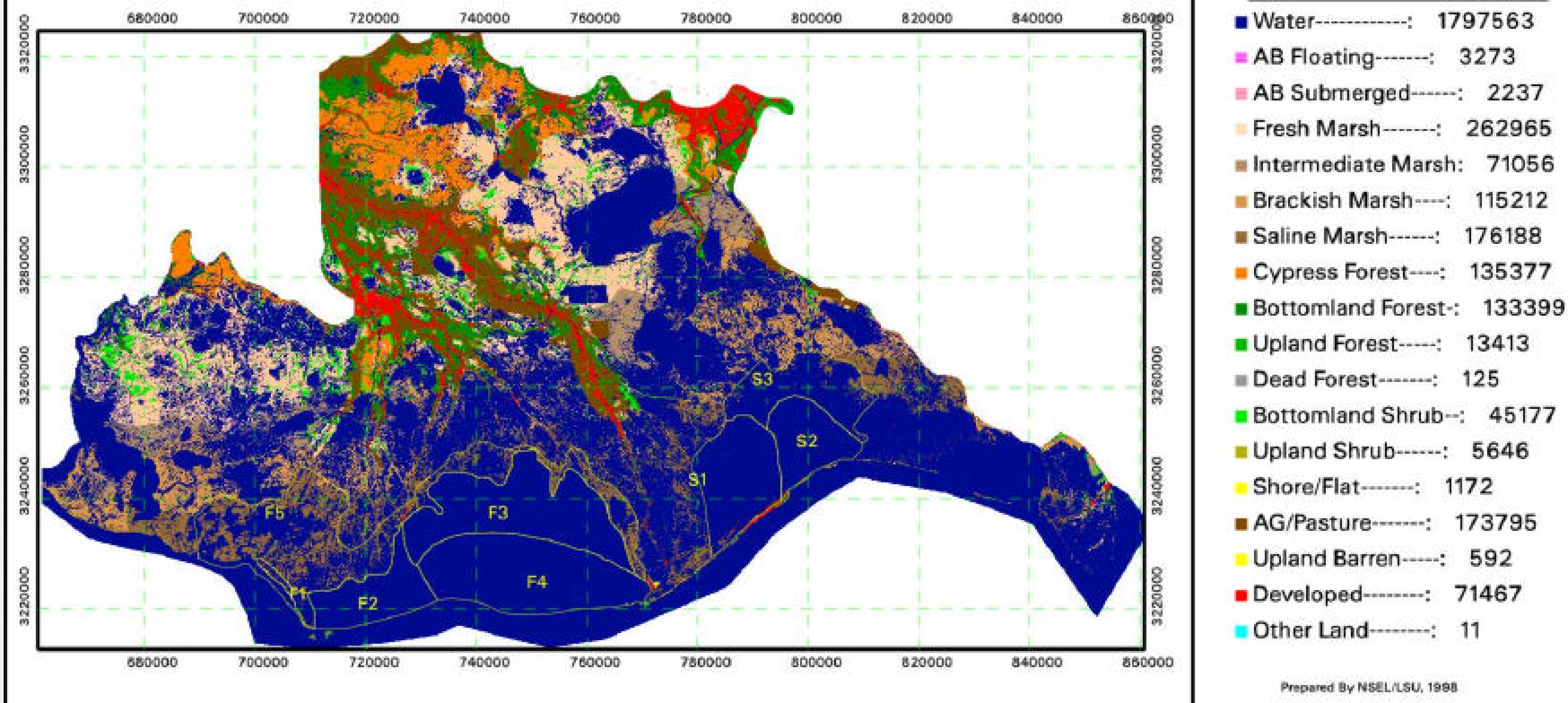


Figure 5-3. Projected Coastal Habitat (30-year, Alternative 1)

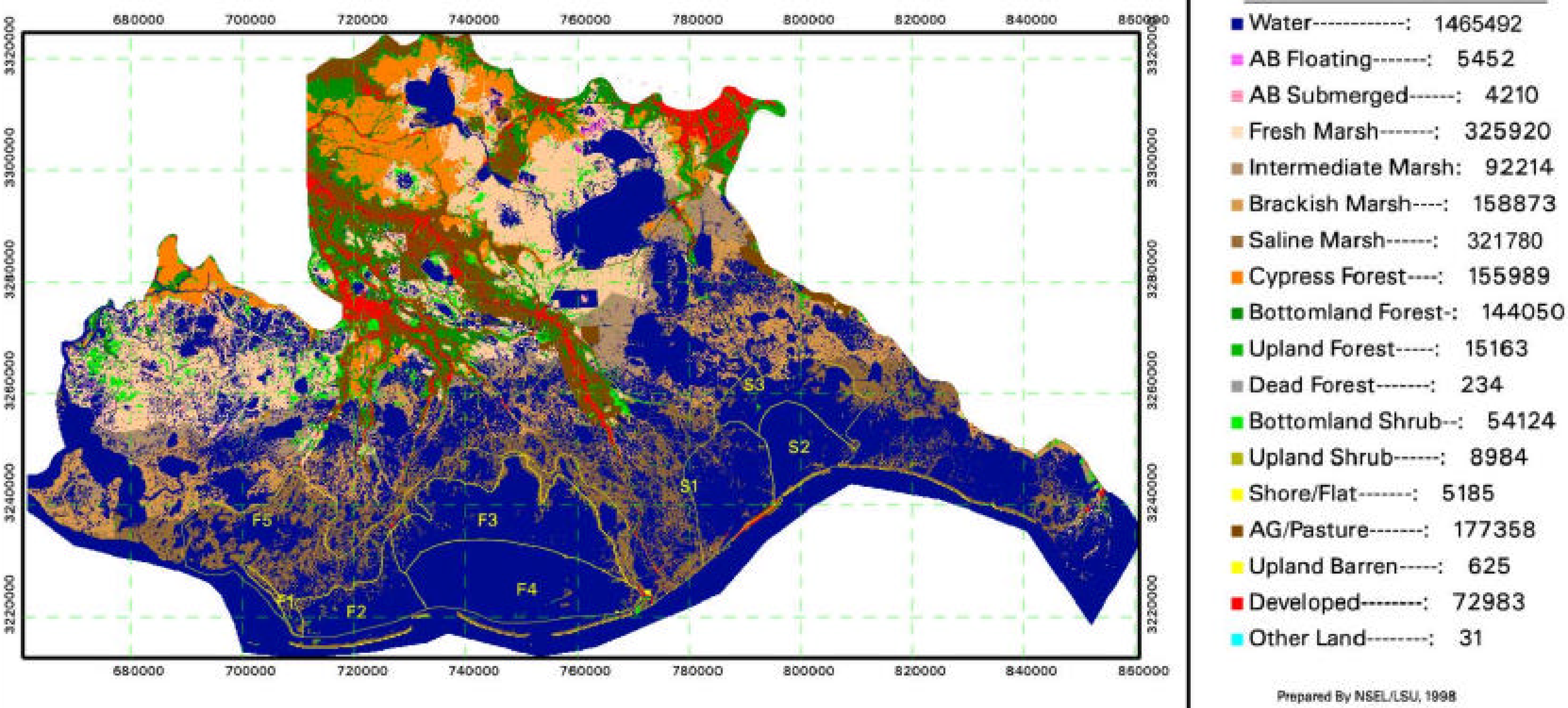
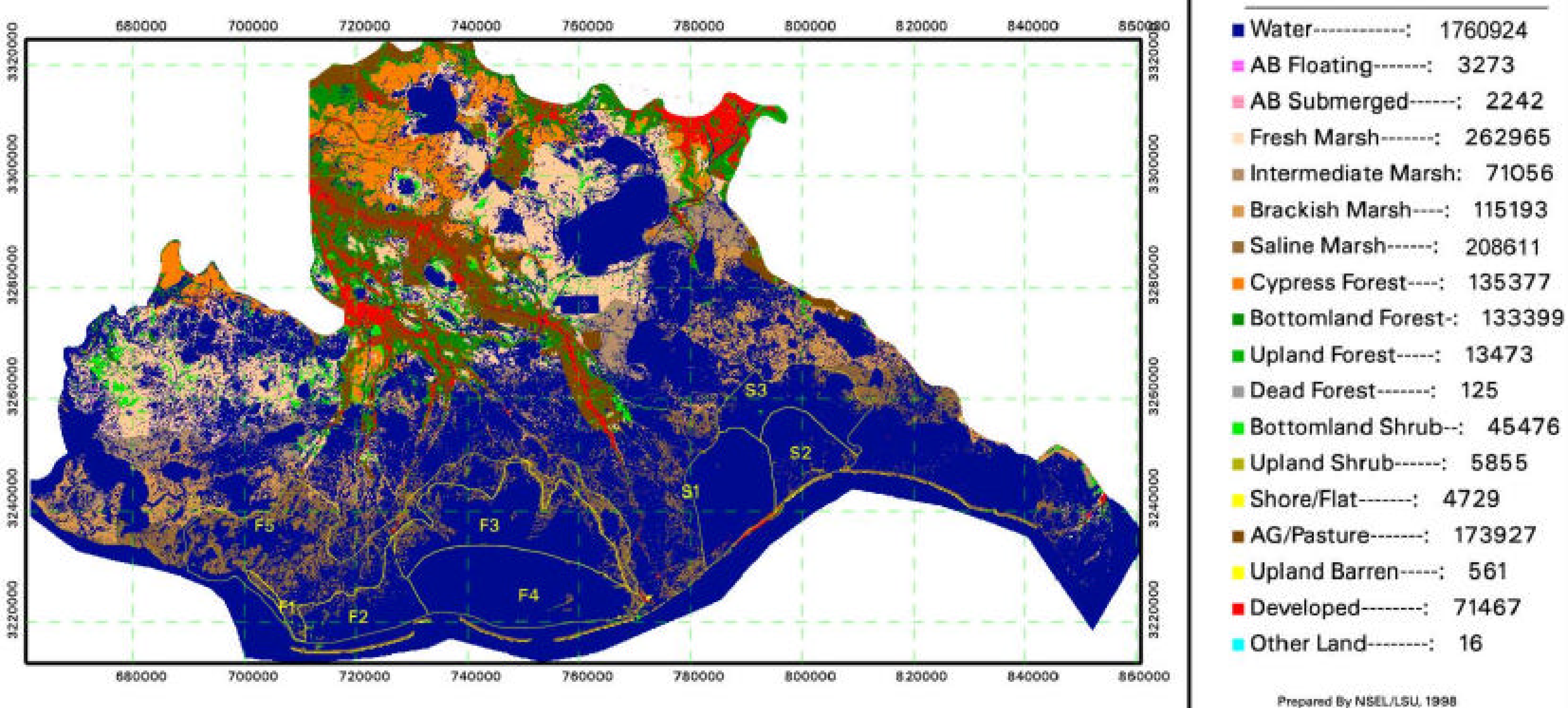


Figure 5-4. Projected Coastal Habitat (100-Year, Alternative 1)



The most prominent change shown in Table 5-3 is the decrease in open water and the increase in saline marsh and shore/flat habitat. Minor changes in brackish marsh, upland barren and agricultural/pasture lands are associated with the overlay of the new barrier configurations on the existing National Wetlands Research Center (NWRC) categorized habitats. Changes in upland forest are probably associated with the prevention of loss (maintenance of shoreline integrity) in the Caminada-Moreau areas where the maritime forest habitat on the beach ridges will be retained under Alternative 1. The decrease in scrub habitat and then increase in scrub habitat for the 30- and 100-year projections respectively is probably associated with the prevention of loss at the bay shoreline. Due to the remnants of the barrier shorelines in the 30-year no-action projection (Figure 5-1), the effect of Alternative 1 on bay shoreline erosion is maximized under the 100-year projection - when all the existing barriers have eroded in the no-action scenario (Figure 5-2). It appears there is some scrub habitat at the bay shoreline, as may be expected along dredged material levees or perhaps natural levees. Under the 30-year comparison some of this is lost. However, some land loss in these polygons is prevented in 100-years, as the effect of the alternative becomes more prominent against an increasing wave climate. Some of the prevention appears to be allocated to the "scrub" category. This is likely an artifact of the methodology used to prevent loss in the shoreline polygons, rather than an intended habitat impact associated with the alternative.

The net effect of Alternative 1, when compared to no-action, is an increase in marsh acreage by over 10,677 hectares (41.2 mi2). Shore/flat habitat (beach and dune in this case) increased by more than 1,415 hectares (5.5 mi2). The distribution of these enhanced habitats can be seen by comparing Figures 5-1 and 5-2 with Figures 5-3 and 5-4. Apart from the barrier shoreline, the main effect of Alternative 1 is to maintain the marsh shoreline integrity on the landward side of the coastal bays. The patterns shown in Figures 5-3 and 5-4 may not project the exact land configuration, due to the methods used to manipulate the Geographic Information System (GIS) and impartially depict land loss prevention. These benefits are located in the saline marsh areas landward of the coastal bays. At present, no substantial land loss effects to interior marshes associated with the alternatives is anticipated.

5.1.2.2. Alternative 2

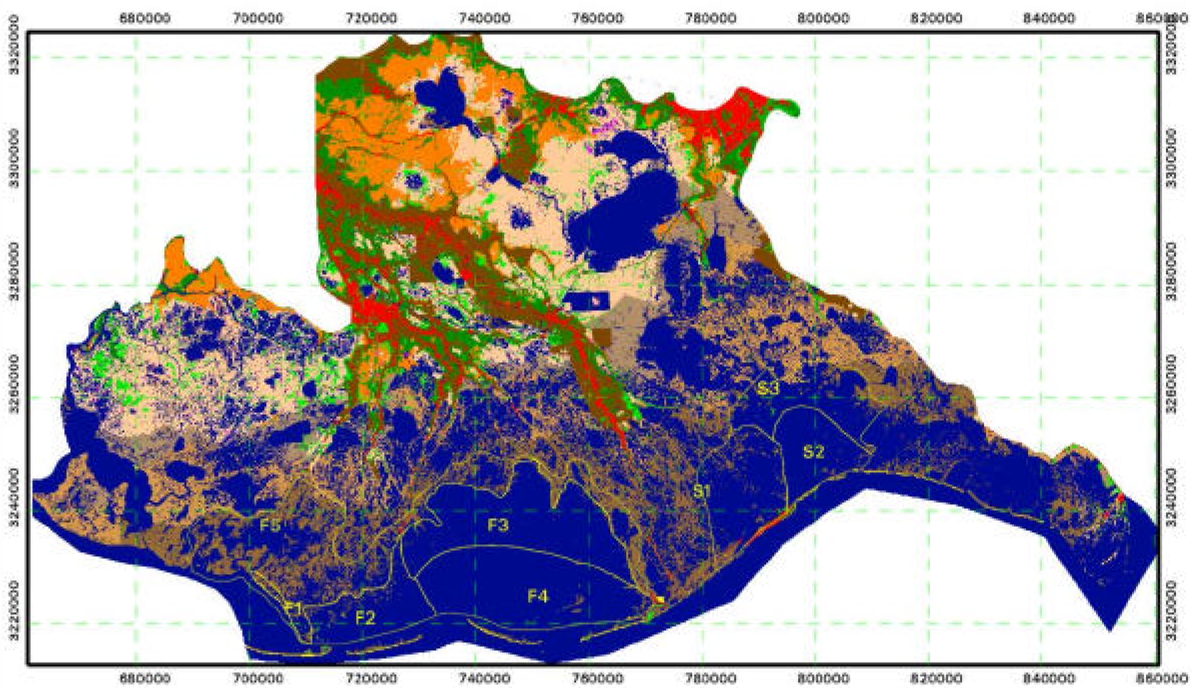
Figures 5-5 and 5-6 show the 30- and 100-year projections of land-water associated with Alternative 2 and are overlain on the 1988/90 habitat map. Figures 5-5 and 5-6 also include habitats created along the barrier shorelines in Alternative 2. Table 5-4 indicates the difference in acreage of various emergent habitats for the 30- and 100-year no-action and Alternative 2 comparisons.

Table 5-4. Alternative 2 Habitat Distribution (hectares)

	30-year No-Action	30-year Alternative 2	Change	100-year No-Action	100-year Alternative 2	Change
Water	602810	598889	-3921	727451	719712	-7739
AB floating	2206	2206	0	1325	1325	0
AB Submerged	1703	1703	0	905	907	2
Fresh marsh	131897	131896	-1	106419	106418	-1
Intermediate marsh	37318	37318	0	28755	28756	1
Brackish marsh	64308	64300	-8	46625	46618	-7
Saline marsh	121621	124574	2953	71301	77520	6219
Cypress forest	63127	63128	1	54785	54786	1
Bottomland forest	58295	58296	1	53985	53986	1
Upland forest	6127	6127	0	5428	5450	22
Dead forest	95	95	0	51	51	0
Bottomland scrub	21951	21898	-53	18283	18397	114
Upland scrub	3725	3625	-100	2285	2339	54
Shore/flat	812	1965	1153	474	1798	1324
AG/pasture	71724	71756	32	70333	70369	36
Upland barren	295	256	-39	239	227	-12
Developed	29535	29532	-3	28922	28912	-10
Other	14	13	-1	4	6	2
TOTAL	1217569	1217591		1217570	1217591	

1 hectare = 2.47 acres
1 square mile = 259 hectares

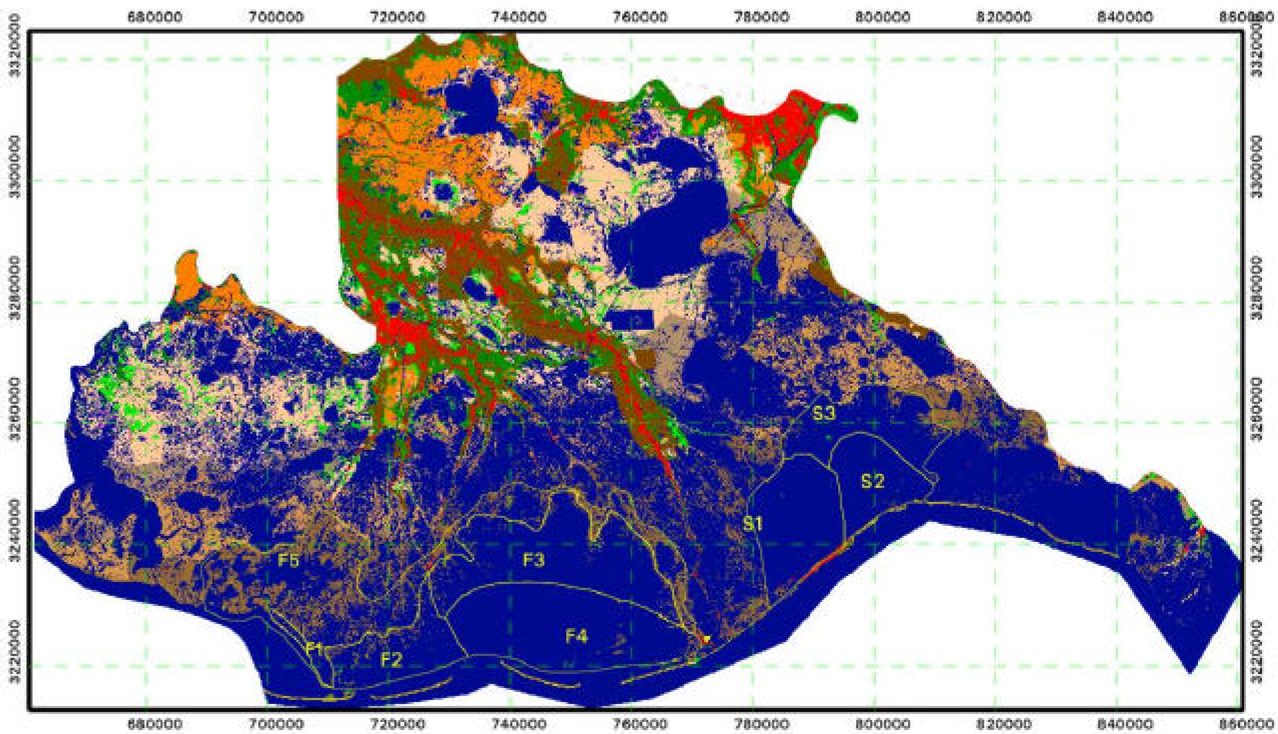
Figure 5-5. Projected Coastal Habitat (30-Year, Alternative 2)



Habitat	Area (Acres)
Water------------:	1479882
AB Floating-------:	5452
AB Submerged------:	4209
Fresh Marsh-------:	325916
Intermediate Marsh:	92214
Brackish Marsh----:	158886
Saline Marsh------:	307827
Cypress Forest----:	155989
Bottomland Forest-:	144050
Upland Forest-----:	15139
Dead Forest-------:	234
Bottomland Shrub--:	54110
Upland Shrub------:	8958
Shore/Flat-------:	4855
AG/Pasture-------:	177310
Upland Barren-----:	632
Developed--------:	72973
Other Land--------:	32

Prepared By NSEL/LSU, 1998

Figure 5-6. Projected Coastal Habitat (100-Year, Alternative 2)



Habitat	Area (Acres)
Water-------------:	1778441
AB Floating-------:	3273
AB Submerged------:	2242
Fresh Marsh-------:	262960
Intermediate Marsh:	71056
Brackish Marsh----:	115193
Saline Marsh------:	191555
Cypress Forest----:	135377
Bottomland Forest-:	133399
Upland Forest-----:	13466
Dead Forest-------:	125
Bottomland Shrub--:	45459
Upland Shrub------:	5779
Shore/Flat-------:	4443
AG/Pasture-------:	173883
Upland Barren-----:	560
Developed--------:	71442
Other Land--------:	16

Prepared By NSEL/LSU, 1998

Again, the most prominent change shown in Table 5-4 is the decrease in open water and the increase in saline marsh and shore/flat habitat. Minor changes in brackish marsh, upland barren and agricultural/pasture lands are associated with the overlay of the new barrier configurations on the existing NWRC categorized habitats. Changes in upland forest are probably associated with the prevention of loss (maintenance of shoreline integrity) in the Caminada- Moreau areas where the maritime forest habitat on the beach ridges will be retained under Alternative 2. The decrease in scrub habitat and then increase in scrub habitat for the 30- and 100-year projections respectively is probably associated with the prevention of loss at the bay as described for Alternative 1. However, the changes in Alternative 2 are of different magnitude because of the different restoration configuration at the barrier and bay shorelines.

The net effect of Alternative 2, when compared to no-action, is an increase in marsh acreage by over 9,218 hectares (35.6 mi2) and shore/flat habitat (beach and dune in this case) by over 1,295 hectares (5.0 mi2). The distribution of these enhanced habitats can be seen by comparing Figures 5-1 and 5-2 with Figures 5-5 and 5-6. The main effect of Alternative 2 is to increase habitat at the barrier shoreline with some impact on the integrity of the marsh shoreline along the landward side of the coastal bays. At present, no significant direct effects on land loss in interior marshes of the Phase 1 Study Area are anticipated.

5.2 Changes In Emergent Habitats

5.2.1. Modeled Changes in Water Level

Similar modeling approaches to those used in Step G (LADNR 1998g) were used to project mean tidal levels across the study area associated with the alternatives. The analysis presented in Step H (LADNR 1998h.i) showed that, although there were projected changes in the flooding regime of some marsh areas, over 30- and 100-years these were unlikely to be ecologically significant. Repetition of this analysis shows no

change in the pattern of flooding associated with the alternatives. Sites that were flooded by average tidal activity under no-action
are also flooded under the alternatives; any changes in magnitude are not considered ecologically significant for either alternative.

These analyses were conducted for scenarios that included the Davis Pond diversion operating (i.e., delivering water to upper Barataria Basin) and not operating (i.e., a time of year when the structure is closed). The results showed no difference between water levels in the study area (at the scale resolvable by the model) associated with the operation of the Davis Pond freshwater diversion structure. This implies there are no interactions between operation of Davis Pond and Alternatives 1 and 2 that will produce ecologically important changes in water level.

5.2.2. Modeled Changes in Salinity

The two-dimensional hydrologic model described above was used to project salinity changes associated with Alternatives 1 and 2. As discussed in Section 3.0, the model was run for both alternatives and a no-action scenario with and without Davis Pond operational. This provides an indication of the annual variation in salinities within the study areas associated with enhanced spring freshwater inputs from the structure and limited freshwater during fall. As this type of modeling had not been possible in Step H (LADNR 1998h.i), no-action scenarios were regenerated. The changes in salinity will be described here in terms of the possible effect on emergent habitat types.

5.2.2.1. Salinity Distribution for No-Action

The effect of the Davis Pond project on salinities in the Phase 1 Study Area is shown in Section 3.0 in Figures 3-13 to 3-16. These figures show the salinity distribution for the 30- and 100-year no-action projections. For no-action in 30-years, the marshes in the Little Lake and Bayou Perot/Rigolettes area are subjected to salinity variations over a year from effectively fresh to at least 3 ppt. With Davis Pond , decreased salinities occur on the western side of Barataria Bay and the 3 ppt isohaline extends to the back of the barrier shoreline. For no-action in 100-years, the central Barataria Basin has opened up considerably with the loss of marshes between Little Lake and the bay constrictions at the north end of Bayou Perot preventing much exchange with Lake Salvador. With Davis Pond, large areas of the central Barataria basin will be 5-7 ppt, well within the tolerance of the area's existing brackish marshes.

These results confirm the conclusions of the analysis using the one-dimensional model of this part of the Barataria Basin used in Step H (LADNR 1998h.i). Given the salinity tolerances of marsh vegetation in these areas (Visser et al. 1996) no changes in emergent habitat are expected to occur under no-action conditions.

5.2.2.2. Alternative 1

The effect of the barrier shoreline configuration under Alternative 1 on salinities can be examined in association with the operation of the Davis Pond project. During the spring, when Davis Pond is assumed to be operating, the effect of maintaining the integrity of the barrier shoreline at the seaward margin of Barataria Basin are shown in Figures 5-7 and 5-8 (30- and 100-year projections respectively). As the interior wetlands deteriorate, lower salinities penetrate lower south into the basin as the shoreline limits the amount of higher salinity water penetrating from the south. The effect is most pronounced in the 100-year projection (Figure 5-8) where salinities between 1 and 3 ppt extend to the back of Grand Isle. However, in the fall condition when Davis Pond is not operating, salinities within the lower portion of Barataria Bay are greater than 15 ppt as shown in Figure 5-9. The net effect of these salinity changes is unlikely to be a change in the type of emergent habitat.

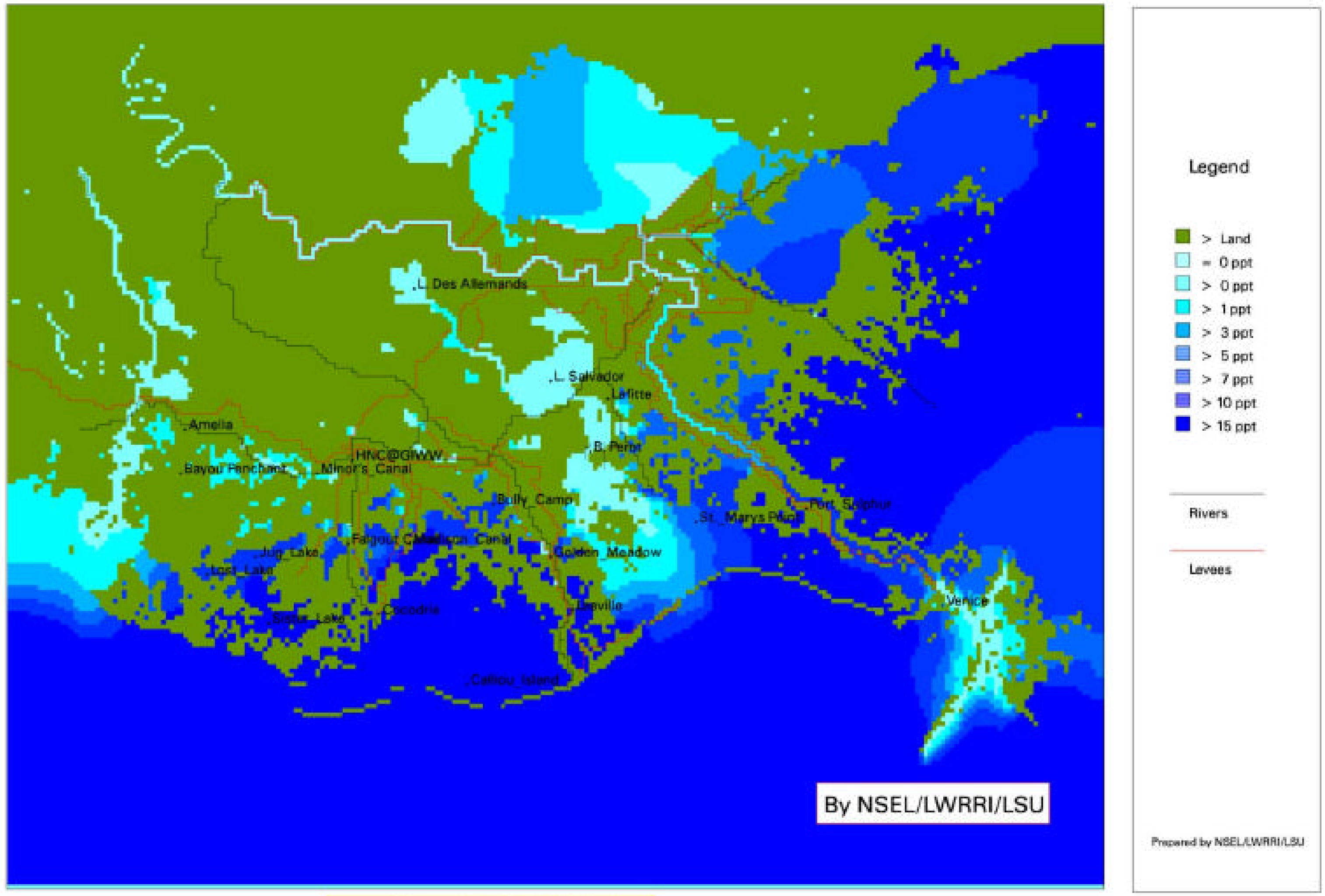
For the rest of the study area, and for the Barataria basin when Davis Pond is not operating (due to season, river stage, or other reasons), the changes in salinity associated with Alternative 1 compared to no-action are shown in Section 3.0 Figures 3-17 and 3-18. Within the basin the main changes are in lower Plaquemines Parish, south of Port

Sulphur, where increasing the integrity of a deteriorated shoreline will decrease the salinity penetration into the bays behind the shoreline. Small areas behind the barrier islands could experience salinity decreases as well. During the highest salinity times of the year, this could result in changes between 2-3 ppt. This is in addition to any effects caused by Davis Pond. In the lower part of the basin, these salinities are unlikely to change Spartina alterniflora marsh to Spartina patens. There may also be effects on fauna.

For the Terrebonne basin, the effect is more extensive. Closing the inlet between East Timbalier Island and the West Belle Pass headland area, as well as the constriction of Little Pass between East Timbalier and Timbalier Islands, will reduce salinities by more than 3 ppt. A similar, but less intense effect is shown in Lake Pelto behind the Isles Dernieres. Increases in salinity outside the barrier shorelines are artifacts of the modeling technique; they are not projected environmental effects of the alternative.

These salinity changes are unlikely to result in changes in emergent vegetative habitats. These changes occur in the basin, where salinity levels support salt marsh, because there are limited freshwater inputs to the coastal bays. The changes demonstrate the important interactions between maintaining the barrier shoreline configuration and enhancement of low salinity inputs to the basin's upper reaches. The model shows how barrier shorelines work to reduce salinity inputs and modulate exchanges. It is not known at present how these interactions are modified as freshwater increases into either Terrebonne or Barataria basins due to diversion projects.

Figure 5-7. Salinity Distribution (with Davis Pond, 30-year, Alternative 1)



Time = 2160 Hr. (90 Days)

Figure 5-8. Salinity Distribution (with Davis Pond, 100-year, Alternative 1)

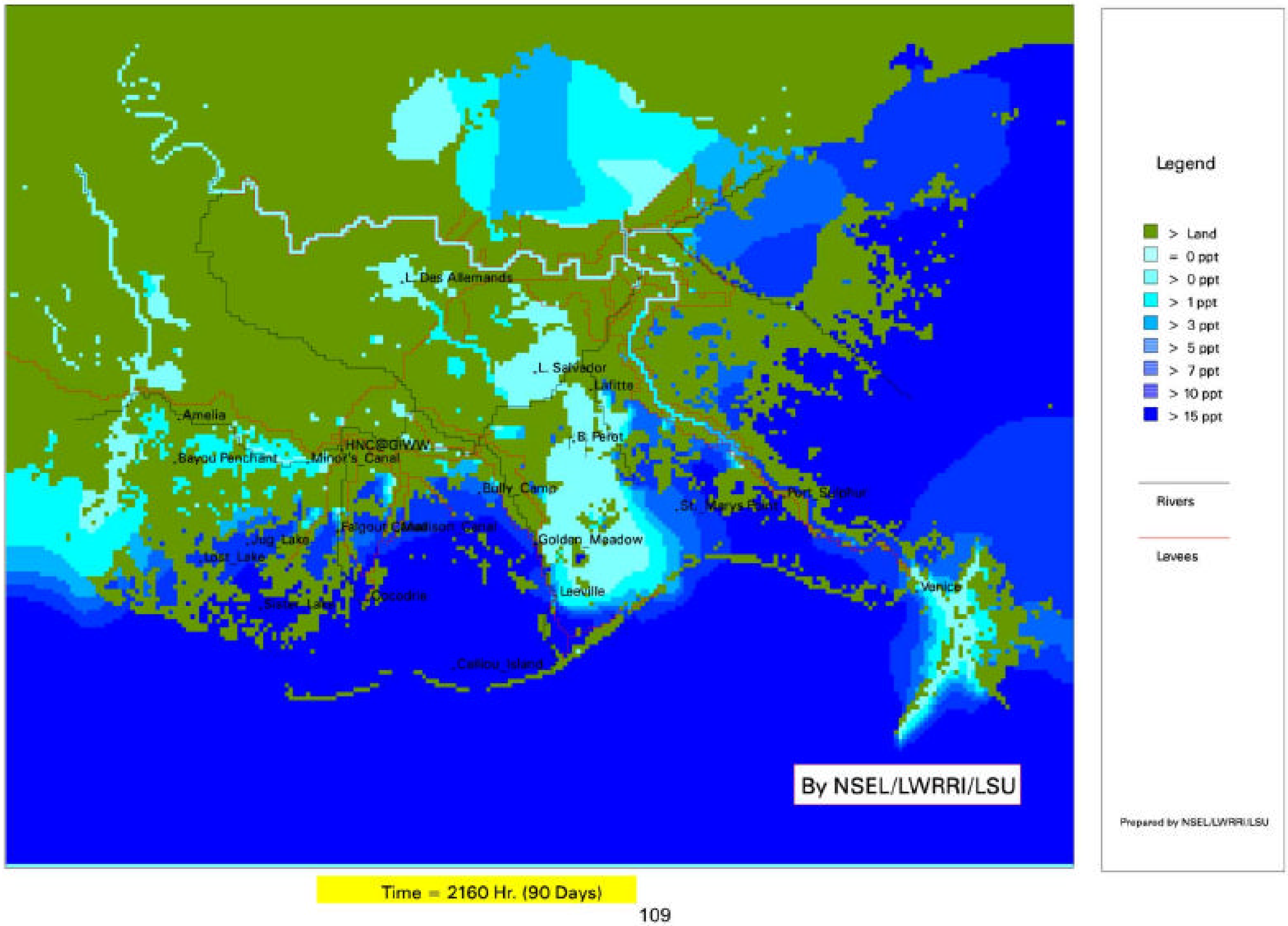
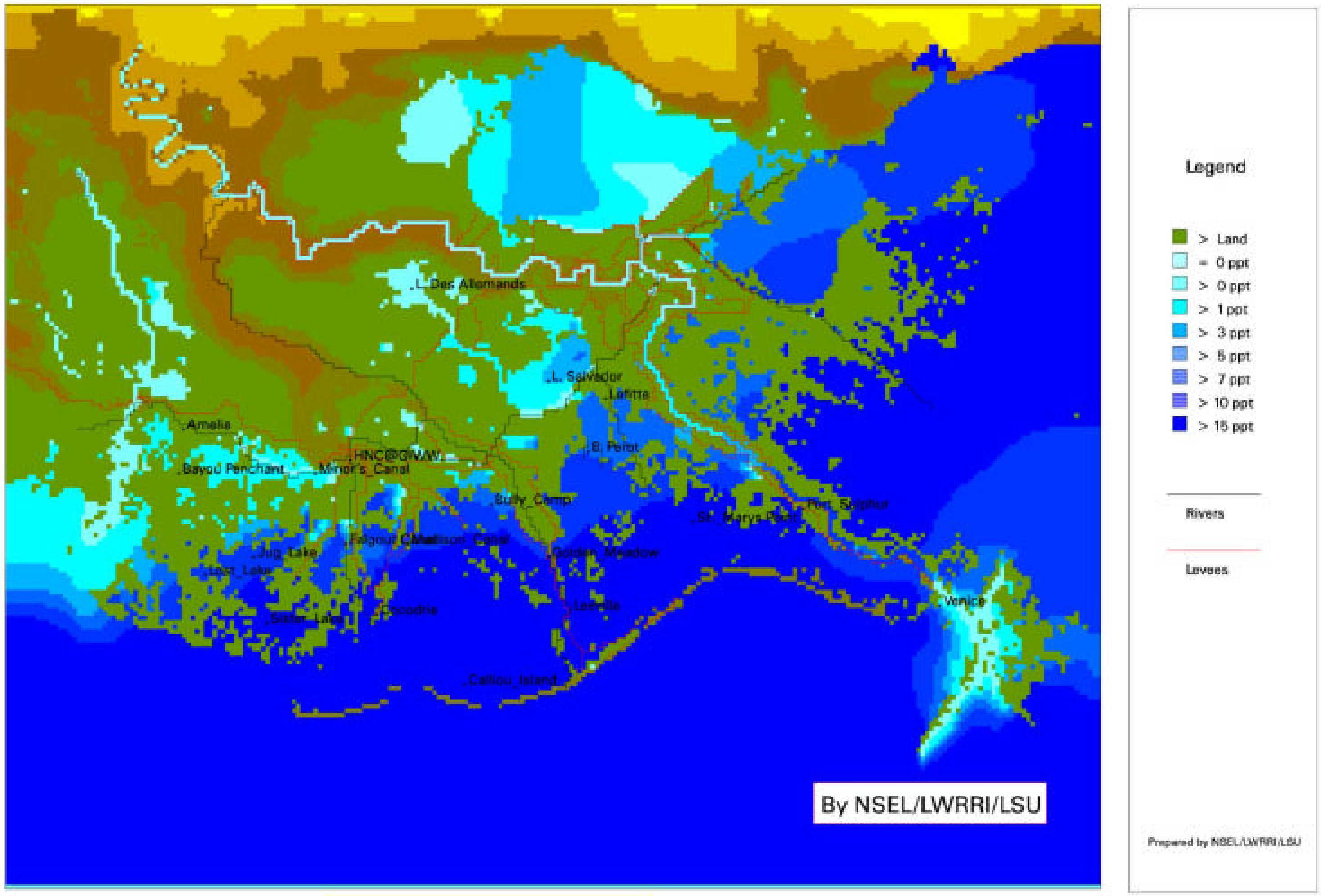


Figure 5-9. Salinity Distribution (w/o Davis Pond, 100-Year, Alternative 1)



Time = 2160 Hr. (90 Days)

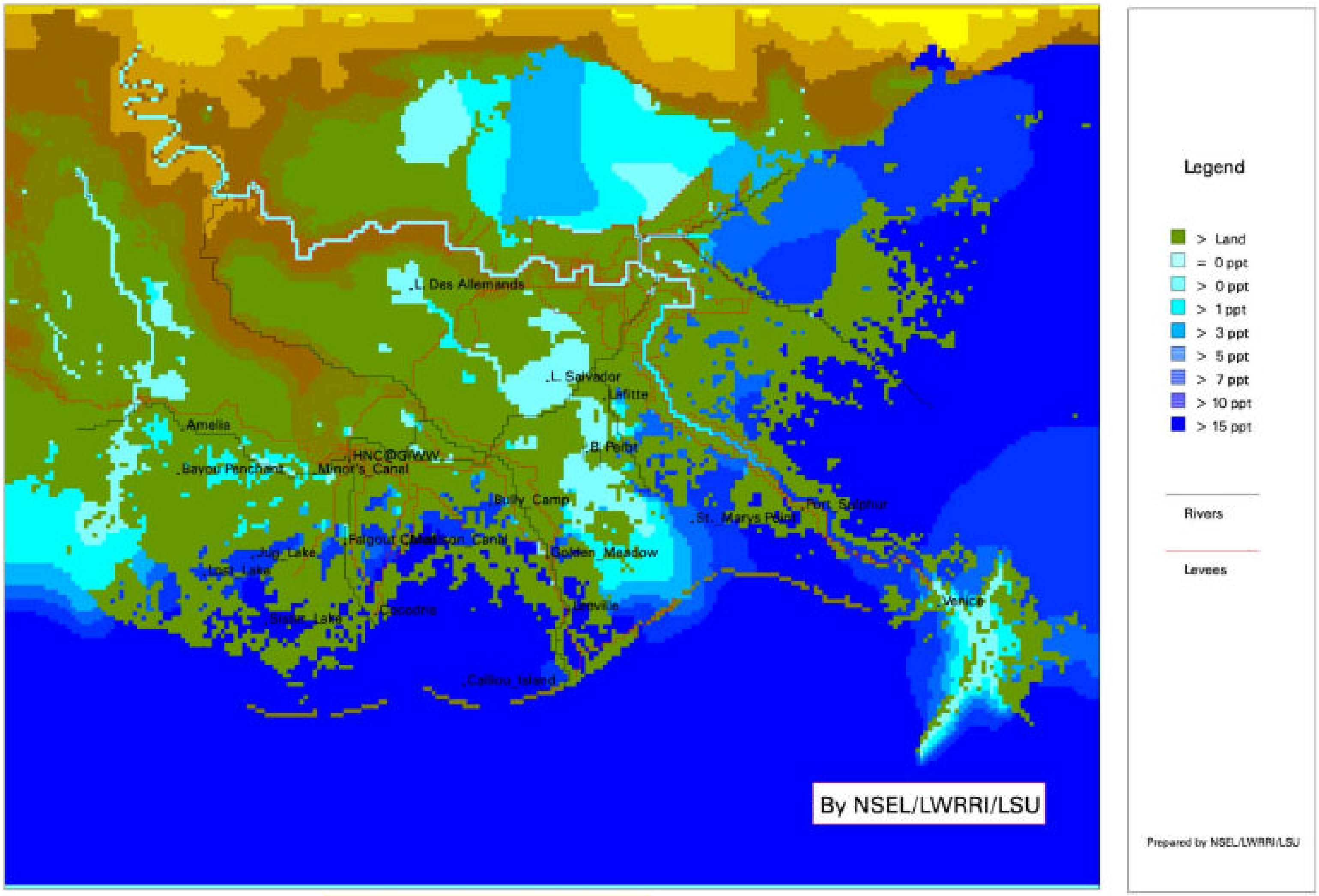
5.2.2.3. Alternative 2

Salinity changes associated with Alternative 2 are similar, but of lesser magnitude than those for Alternative 1. During the spring, when Davis Pond is assumed to be operating, the effect of maintaining the integrity of the barrier shoreline at the seaward margin of Barataria Basin is shown in Figures 5-10 and 5-11 (30- and 100-year projections respectively). As the interior wetlands deteriorate, lower salinities penetrate lower south into the basin as the shoreline limits the amount of higher salinity water penetrating from the south. The effect is most pronounced in the 100-year projection (Figure 5-11) where salinities between 3 and 5 ppt extend to the back of Grand Isle. However, in the fall when Davis Pond is not operating, salinities within the lower portion of Barataria Bay are greater than 15 ppt as shown in Figure 5-12. The net effect of these salinity changes is unlikely to be a change in the type of emergent habitat.

For the rest of the study area, and for the Barataria basin when Davis Pond is not operating (due to season, river stage, or other reasons), the changes in salinity associated with Alternative 2, as compared to no-action, can be seen in Section 3.0 - Figures 3-21 and 3-22. The effects appear to be greater for the 30-year projection than for the 100-year projection. Figure 3-22 shows a small area of decreased salinity in lower Plaquemines Parish. This is apparently associated with lesser penetration of salinity in Alternative 2 as compared to the degraded barrier shoreline in the no-action scenario. There are similar effects behind East Timbalier and Timbalier Islands, as well as the Isles Dernieres. However, salinity decreases of up to 3 ppt in places have largely disappeared by the 100-year projection. Although the design of the alternatives calls for maintenance of the barrier shoreline during this period, the main effect here seems to be the continued opening of the interior wetlands. There is a larger volume of water in the system; the effect of limiting exchange through a few passes has less of an effect in such an open interior system.

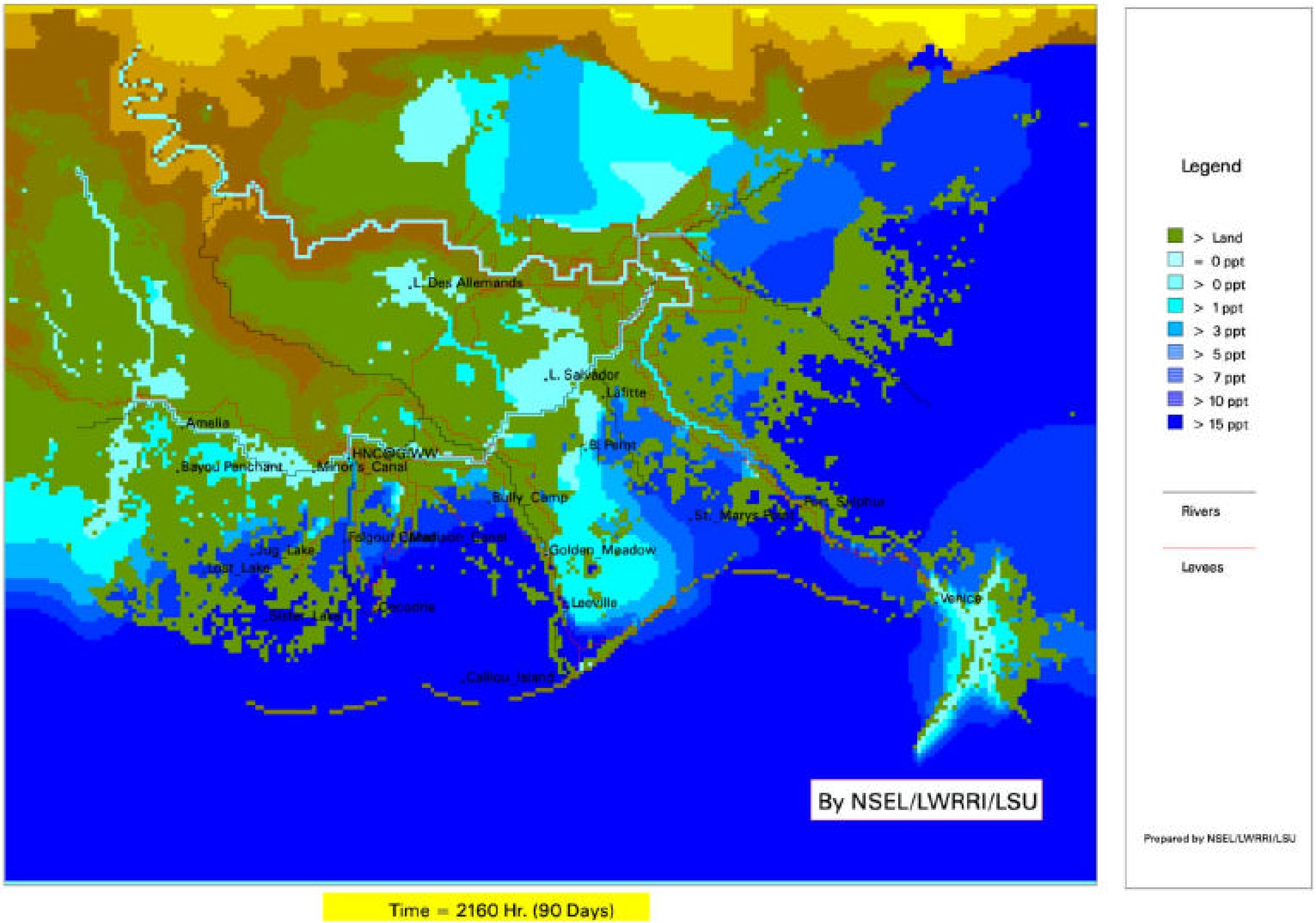
These salinity changes are unlikely to result in changes in emergent vegetative habitats. These changes occur in the basin, where salinity levels support salt marsh, because there are limited freshwater inputs to the coastal bays. The changes demonstrate the important interactions between maintaining the barrier shoreline configuration and enhancement of low salinity inputs to the basin's upper reaches. The model shows how barrier shorelines work to reduce salinity inputs and modulate exchanges. It is not known at present how these interactions are modified as freshwater increases into either Terrebonne or Barataria basins due to diversion projects.

Figure 5-10. Salinity Distribution (with Davis Pond, 30-year, Alternative 2)



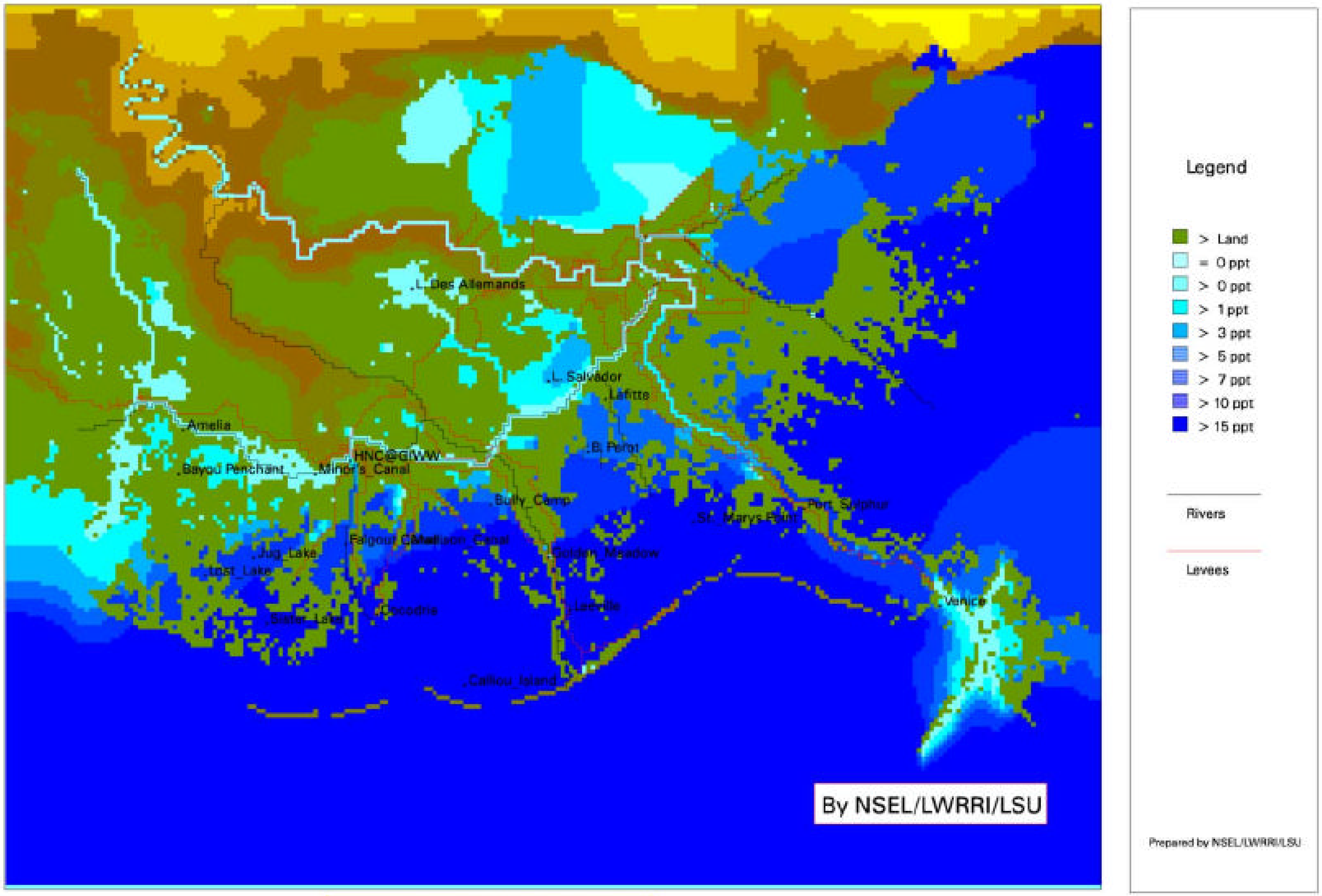
Time = 2160 Hr. (90 Days)

Figure 5-11. Salinity Distribution (with Davis Pond, 100-year, Alternative 2)



Time = 2160 Hr. (90 Days)

Figure 5-12. Salinity Distribution (w/o Davis Pond, 100-year, Alternative 2)



Time = 2160 Hr. (90 Days)

5.3. Changes In Open Water Habitats

Open water faunal habitats created as a result of land loss in part depends in part on their physiography (shape, size, depth, relation to other open water bodies) and regional salinities. Changes in the properties associated with the alternatives will be assessed for the wetland components based on the habitat images described in Section 5.1. As noted in Sections 5.1 and 5.2, changes associated with the alternatives, when compared to no-action, are in the lower parts of the study area. Effects on the upper parts of the system (intermediate, fresh marshes and wetland forests) will not be discussed. Trends in the following landscape parameters will be assessed:

* fragmentation/interspersion
* depth
* connectivity to open bay

5.3.1. Alternative 1

5.3.1.1. Barrier Islands

Rebuilding barrier islands will increase dune area, beach and marsh habitats, as described in Section 5.1. There will be no change in salinity, with the exception of a seasonal decrease up to 3 ppt on the backside of the barrier shoreline. The trends are:

* fragmentation/interspersion - reduced as inlets are closed and newly created back barrier marsh is likely include fewer channels and ponds than exists currently
* depth - similar to present
* connectivity - reduced due to nature of created marsh and closing of some inlets.

The barrier island ecosystem will still be functioning in the study area. The system will not be gone in the Terrebonne and Timbalier basins or badly deteriorated in the Barataria basin as predicted in the no-action alternative. Important implications for local fauna will be:

* high-energy beach habitat will serve as mating, pupping and nursery grounds for several species of sharks presently under a management plan designed to remedy a decline in population.
* high-energy beach habitat will serve as nursery area for species, such as Florida pompano and Gulf Kingfish, that have no alternate nursery habitat.
* beach and dune habitat will serve as nesting area for many species of shore and sea birds.
* scrub and wooded areas will serve as important stop over habitats for migrating songbirds (and other trans-Gulf migrators), as well as nesting habitat for herons, egret and other species requiring support structures for nests.
* barrier island marsh will serve as the initial nursery for many species of young-of-the-year estuarine marine fish and macroinvertibrates that are moving inland to mainland marshes.

5.3.1.2. Open Bays

The existing open bay environments expand through time at the expense of salt marsh habitats on the bay's north side. They are less open than under no-action. There is no change in their physiography compared to present. There may be a <3 ppt decrease in salinity at the southern margins of Timbalier Bay and in the Bay Long- Bastion Bay area. No change in salinity will occur close to the Gulf margin.

In addition, new open bays form as interior marsh deterioration continues, but the wave absorbers retain the bay shoreline integrity. These bays are connected to the existing bays and have slightly lower salinity. Their depth will likely be shallower than existing bays because of fetch limitations.

Decrease in open water acreage with Alternative 1, and the relatively minor changes in other habitat types (Table 5-3), will probably mean little to the local fauna as compared to the no-action alternative. Those habitats that lost acreage, and presumably a carrying capacity for the animals that used that particular habitat, will not gain any capacity under Alternative 1 in comparison to the no-action scenario.

5.3.1.3. Salt Marsh

Within the salt marsh zone, many areas are already fragmented in 1990 (e.g., Leeville to Fourchon area, marshes north of Lake Barre). They appear to make the transition to large open water areas by the 100-year projection, but remain separate from existing bays as described above. Salt marsh areas are fragmented by the 30-year projection. Those that remain at the 100-year projection are all fragmented. Fragmentation is similar to the no-action scenarios. The trends are:

* fragmentation/interspersion - increases
* depth - increases (to 30 cm (11.8 inches) in new small ponds, to <2 meters (6.6 feet) in bays)
* connectivity - increases within marsh as areas become fragmented but not openly connected with bay.

Alternative 1 will result in a net increase in acreage of saline marsh, (i.e. not permitted to erode to open water) in comparison to the no-action alternative. Important implications for local fauna will be:

* increase in habitat available for many species of saline marsh residents, such as killifishes and gobies, that are important food items for many larger vertebrates (fish and birds) and invertebrates (blue crabs).
* increase in habitat available for many estuarine-marine transitory migrants, i.e. penaeid shrimp, blue crabs, spotted seatrout, red drum that use saline marsh as feeding and refuge areas during their first year of life.

* increase in important foraging habitat for many wading birds, seabirds, and certain ducks.

Alternative 1 includes construction of a set of hard-material wave absorbers placed along the margin of selected regions of saline marsh in Caillou Bay, Terrebonne Bay, Timbalier Bay, and Barataria Bay. Important implications for local fauna will be:

* the northcentral Gulf of Mexico has limited complex hard-bottom habitat so the wave absorbers will provide attachment potential for benthic invertebrates, as well as habitat heterogeneity for small species of both invertebrates and vertebrates.
* wave absorbers will shield the saline marsh-open water interface that has been shown to be a particularly important nursery habitat for many of the estuarine-marine animals living in the coastal waters during their first year of life.

5.3.1.4. Brackish Marsh

By 1990, much of the brackish marsh zone had degraded to large open water areas (e.g. Montegut, Madison, Wonder Lake area). The remaining brackish marsh areas increase in fragmentation. They do not, however become connected to the bays as under no-action. Trends are similar to no-action. The trends are:

* fragmentation/interspersion - increases
* depth - increases to 30 cm (11.8 inches) in new ponds and 1 meter (3.3 feet) in larger ponds (not bays)
* connectivity - increases but not direct

5.3.2. Alternative 2

5.3.2.1. Barrier Islands

Rebuilding barrier islands will increase dune area, beach and marsh habitats as described in Section 5.1. There will be no change in salinity, with the exception of a seasonal decrease up to 3 ppt on the backside of the barrier shoreline. The trends are:

* fragmentation/interspersion - reduced as inlets are closed and newly created back barrier marsh likely include fewer channels and ponds than exists currently
* depth - similar to present
* connectivity - reduced due to nature of created marsh and closing of some inlets.

The barrier island ecosystem will still be functioning in the study area. The system will not be gone in the Terrebonne and Timbalier basins or badly deteriorated in the Barataria basin as predicted in the no-action alternative. Important implications for local fauna will be:

* high-energy beach habitat will serve as mating, pupping and nursery grounds for several species of sharks presently under a management plan designed to remedy a decline in population.
* high-energy beach habitat will serve as nursery area for species such as Florida pompano and Gulf Kingfish, that have no alternative nursery habitat.
* beach and dune habitat will serve as nesting area for many species of shore and sea birds.
* scrub and wooded areas will serve as important stop over habitats for migrating songbirds (and other trans-Gulf migrators), as well as nesting habitat for herons, egret and other species requiring support structures for nests.
* barrier island marsh will serve as the initial nursery for many species of young-of-the-year estuarine marine fish and macroinvertibrates that are moving inland to mainland marshes.

5.3.2.2. Open Bays

The existing open bay environments expand through time at the expense of salt marsh habitats on the bay's north side. They are less open than under no-action. There is no change in their physiography compared to present. There may be a <3 ppt decrease in salinity at the southern margins of Timbalier Bay and in the Bay Long- Bastion Bay area. No change in salinity will occur close to the Gulf margin.

The decrease in open water resulting from Alternative 2 and the relatively minor acreage changes in other habitat types (Table 5-4) will have little impact on local fauna. The faunal groups that "lost-out" in the no-action alternative as discussed in Step H (LADNR 1998h.i) will fare no better under Alternative 2 in these habitats.

5.3.2.3. Salt Marsh

Within the salt marsh zone, many areas are already fragmented in present conditions (e.g., Leeville to Fourchon area, marshes north of Lake Barre). They appear to make the transition to large open water areas by the 100-year projection, but remain separate from existing bays as described above. Salt marsh areas are fragmented by the 30-year projection. Those that remain at the 100-year projection are all fragmented. Fragmentation is similar to the no-action scenarios. The trends are:

* fragmentation/interspersion - increases
* depth - increases (to 30 cm (11.8 inches) in new small ponds, to <2 meters (6.6 feet) in bays)
* connectivity - increases within marsh as areas become fragmented but not openly connected with bay.

Alternative 2 will result in a net increase in acreage of saline marsh, (i.e. not permitted to erode to open water) in comparison to the no-action alternative. Important implications for local fauna will be:

* increase in habitat available for many species of saline marsh residents, such as killifishes and gobies, that are important food items for many larger vertebrates (fish and birds) and invertebrates (blue crabs).
* increase in habitat available for many estuarine-marine transitory migrants, i.e. penaeid shrimp, blue crabs, spotted seatrout, red drum that use saline marsh as feeding and refuge areas during their first year of life.

* increase in important nesting habitat for many wading birds, seabirds, and certain ducks.

Alternative 2 will result in acreage of saline marsh being "salvaged" (i.e. not permitted to erode to open water) in comparison to the no-action alternative. Important implications for local fauna will be:

* increase in habitat available for many species of saline marsh residents that are important food items for many larger vertebrates (fish and birds) and invertebrates (blue crabs).
* increase in habitat available for many estuarine-marine transitory migrants that use saline marsh as feeding and refuge areas during their first year of life.
* some increase in important foraging habitat for many wading birds, seabirds, and certain ducks.

5.3.2.4. Brackish Marsh

Much of the brackish marsh zone has already degraded to large open water areas by 1990 (e.g. Montegut, Madison, Wonder Lake area). The remaining brackish marsh areas increase in fragmentation but do not become connected to the bays as under no-action. Trends are similar to no-action. The trends are:

* fragmentation/interspersion - increases

* depth - increases to 30 cm (11.8 inches) in new ponds and 1 meter (3.3 feet) in larger ponds (not bays)
* connectivity - increases but not direct

5.4. Summary of Environmental Benefits

As stated in Section 5.1, the construction of Alternative 1 would prevent the loss of 5,525 hectares (21.3 mi2) of bay shoreline marsh in 30 years and 15,944 hectares (61.6 mi2) in 100 years. In addition, Alternative 1 would create 6,349 hectares (24.5 mi2) of wetlands on the islands themselves. For Alternative 2 the loss prevented is 413 hectares (1.6 mi2) in 30 years and 8,955 hectares (34.6 mi2) in 100 years, while the wetlands created on the islands covers 4,007 hectares (15.5 mi2). The majority of the land loss prevented and created as a result of Alternatives 1 and 2 are saline marsh and shore/flat habitat.

These changes in landscape will produce changes in salinity patterns within the bay marsh systems. However, none of these changes are considered to be of sufficient magnitude to result in habitat shifts in the emergent marsh areas. Similarly, for the faunal communities, most of the changes in habitat are associated with the amount of habitat of a certain type (e.g., shoreface habitat for sharks, or marsh surface habitat for killifish) rather than a change in habitat type. Importantly, the retention of some of these habitats, such as shoreface, through construction of either of the alternatives, may be critical in relation to the no-action scenarios, when great loss of these habitats is projected to occur.