2023 COASTAL MASTER PLAN

FUTURE WITHOUT CURRENTLY FUNDED PROJECTS

ATTACHMENT H1

REPORT: VERSION 01
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COASTAL PROTECTION AND
RESTORATION AUTHORITY
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COASTAL PROTECTION AND RESTORATION AUTHORITY

This document was developed in support of the 2023 Coastal Master Plan being prepared by the Coastal Protection and Restoration Authority (CPRA). CPRA was established by the Louisiana Legislature in response to Hurricanes Katrina and Rita through Act 8 of the First Extraordinary Session of 2005. Act 8 of the First Extraordinary Session of 2005 expanded the membership, duties, and responsibilities of CPRA and charged the new authority to develop and implement a comprehensive coastal protection plan, consisting of a master plan (revised every six years) and annual plans. CPRA's mandate is to develop, implement, and enforce a comprehensive coastal protection and restoration master plan.

CITATION

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ACKNOWLEDGEMENTS

This document was developed as part of a broader Model Improvement Plan in support of the 2023 Coastal Master Plan under the guidance of the Modeling Decision Team:

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EXECUTIVE SUMMARY

This report uses outputs from the Integrated Compartment Model (ICM) under two scenarios of possible future environmental conditions to evaluate one of the assumptions used in the 2023 Coastal Master Plan Future Without Action (FWOA) analysis. FWOA assumes that all projects for which funding was currently in hand are already constructed and operating. By comparing FWOA to a Future Without Currently Funded Projects (FWOCFP), the effects of these projects can be identified.

The FWOCFP model runs serve to demonstrate the possible future of coastal Louisiana if all future planned restoration efforts were halted and the coastal program only continued to operate existing projects. Given that funding for future projects is not guaranteed and that unforeseen circumstances could complicate the process of implementing projects that are already funded, comparing these model runs to those with projects that have funding but are not yet constructed can provide insight into the long-term effects of ongoing investments in the coastal program.

The estimated cost of the restoration projects included in FWOA is just over $4.3 billion. By Year 50 under the lower environmental scenario there are 74 sq mi more land than if the projects had not been implemented, which increases to 122 sq mi for the higher environmental scenarios. The biggest differences between FWOCFP and FWOA are in Lower Barataria northeast and northwest ecoregions – those most directly benefitted by the Mid-Barataria Sediment Diversion. The diversion of freshwater and sediment into the Barataria Basin has a greater effect than into the Breton Basin as there are fewer existing connections to the Mississippi River.

One of the largest marsh creation projects included in FWOA is the Lake Borgne Marsh Creation - Increment 1 project on the southeast shore of Lake Borgne. The results show consistently higher land area in the Lake Borgne ecoregion for FWOA compared to FWOCFP for both environmental scenarios.

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LIST OF ABBREVIATIONS

ATD .... ATCHAFALAYA DELTA ECOREGION
BFD .... BIRD'S FOOT DELTA ECOREGION
CAL .... CALCASIEU ECOREGION
CHR .... CHENIER RIDGES ECOREGION
CHS .... CHANDELEUR SOUND ECOREGION
CPRA .... COASTAL PROTECTION AND RESTORATION AUTHORITY
DEM .... DIGITAL ELEVATION MODEL
ETB .... EASTERN TERREBONNE ECOREGION
FWOA .... FUTURE WITHOUT ACTION
FWOCFP .... FUTURE WITHOUT CURRENTLY FUNDED PROJECTS
ICM .... INTEGRATED COMPARTMENT MODEL
LBANE .... LOWER BARATARIA (NE) ECOREGION
LBANW .... LOWER BARATARIA (NW) ECOREGION
LBASE .... LOWER BARATARIA (SE) ECOREGION
LBASW .... LOWER BARATARIA (SW) ECOREGION
LBO .... LAKE BORGNE ECOREGION
LBR .... LOWER BRETON ECOREGION
LPO .... LAKE PONTCHARTRAIN ECOREGION
MBA .... MID BARATARIA ECOREGION
MEL .... MERMENTAU LAKES ECOREGION
MRP .... MAUREPAS ECOREGION
PEN .... PENCHANT ECOREGION
QAQC .... QUALITY ASSURANCE AND QUALITY CONTROL
SAB .... SABINE ECOREGION
TVB .... TECHE VERMILION ECOREGION
UBA .... UPPER BARATARIA ECOREGION
UBR .... UPPER BRETON ECOREGION
UVR .... UPPER VERRET ECOREGION
VRT .... VERET ECOREGION
WTE .... WESTERN TERREBONNE ECOREGION

1.0 INTRODUCTION

Analysis for the 2023 Coastal Master Plan focused on understanding the dynamics of a changing coastal Louisiana landscape in response to assumptions about future conditions, including restoration and protection projects. This report uses outputs from the Integrated Compartment Model (ICM) under two scenarios of possible future environmental conditions: the lower (S07) and higher (S08) environmental scenarios (Pahl et al., 2023).

Specifically, it evaluates one of the assumptions used in the Future Without Action (FWOA) analysis. FWOA assumes that all projects for which funding was currently in hand are already constructed and operating. By comparing FWOA to a Future Without Currently Funded Projects (FWOCFP), the effects of these projects can be identified.

The FWOCFP model runs serve to demonstrate the possible future of coastal Louisiana if all future planned restoration efforts were halted and the coastal program only continued to operate existing projects. Given that funding for future projects is not guaranteed and that unforeseen circumstances could complicate the process of implementing projects that are already funded, comparing these model runs to those with projects that have funding but are not yet constructed can provide insight into the long-term effects of ongoing investments in the coastal program.

Table 1 lists the projects that are included in FWOA but not in FWOCFP:

Table 1. List of currently funded projects included in FWOA, but not included in FWOCFP.

Project ID	Project Name	Project Type	Current Cost Estimate
BA-0125	Northwest Turtle Bay Marsh Creation	Marsh Creation	$33,664,671
BA-0171	Caminada Headlands Back Barrier Marsh Restoration	Marsh Creation	$37,568,201
BA-0197	West Grand Terre Beach Nourishment and Stabilization	Barrier Island Restoration	$102,009,216

Project ID	Project Name	Project Type	Current Cost Estimate
BA-0202	Queen Bess Island Restoration	Barrier Island Restoration	$18,710,000
BA-0203	Barataria Basin Ridge and Marsh Creation - Spanish Pass Increment	Marsh Creation	$100,290,142
BA-0207	Large-Scale Barataria Marsh Creation	Marsh Creation	$181,380,000
BA-0153	Mid-Barataria Sediment Diversion	Sediment Diversion	$1,982,910,000
BS-0030	Mid-Breton Sediment Diversion	Sediment Diversion	$798,609,888
CS-0049	Cameron-Creole Freshwater Introduction	Hydrologic Restoration	$26,776,735
CS-0054	Cameron Creole Watershed Grand Bayou Marsh Creation	Marsh Creation	$28,707,688
CS-0066	Cameron Meadows Marsh Creation and Terracing	Marsh Creation	$32,081,560
CS-0080	Rabbit Island Restoration	Island Restoration	$16,440,000

Project ID	Project Name	Project Type	Current Cost Estimate
ME-0018, ME-0037	Rockefeller Refuge Gulf Shoreline Stabilization	Shoreline Protection	$44,696,741
PO-0029	Mississippi River Reintroduction into Maurepas Swamp	Freshwater Diversion	$199,854,326
PO-0075	LaBranche East Marsh Creation	Marsh Creation	$56,935,926
PO-0169	New Orleans Landbridge Shoreline Protection and Marsh Creation	Marsh Creation	$25,446,125
PO-0174	Biloxi Marsh Living Shoreline	Oyster Barrier Reef	$69,820,460
PO-0180	Lake Borgne Marsh Creation - Increment 1	Marsh Creation	$114,642,153
TE-0072	Lost Lake Marsh Creation and Hydrologic Restoration	Marsh Creation	$37,119,324
TE-0134	West Fourchon Marsh Creation and Nourishment	Marsh Creation	$30,655,764
TE-0138	Bayou Decade Ridge Restoration and Marsh Creation	Marsh Creation	$24,781,121

Project ID	Project Name	Project Type	Current Cost Estimate
TE-0139	Terrebonne Basin Ridge and Marsh Creation - Bayou Terrebonne Increment	Marsh Creation	$162,345,000
TE-0143	Terrebonne Basin Barrier Island and Beach Nourishment	Barrier Island Restoration	$160,147,615
TV-0063	Cole's Bayou Marsh Restoration	Marsh Creation	$24,930,426
		TOTAL	$4,310,523,082

Some of these projects are included in the existing conditions coastwide digital elevation model (DEM), which captures the location and elevation of these projects along with the rest of the landscape features. The characteristics of other projects or features that were constructed after data were collected for the DEM were imposed on the model based on engineering design documents, conversations with local landowners, institutions like levee boards, and others who have knowledge of their community and these features.

2.0 COASTWIDE CHANGES

2.1 LAND AREA

The projects included within FWOA (Table 1) include those that directly build new land through placement of dredged material and river diversion and hydrologic restoration projects that seek to restore natural connectivity in the system. The net effect of the FWOA projects compared to FWOCFP is shown in Figure 1. The net effect of the FWOA projects increases over time. By Year 50 under the lower environmental scenario there are 74 sq mi more land than if the projects had not been implemented, which increases to 122 sq mi for the higher environmental scenario.

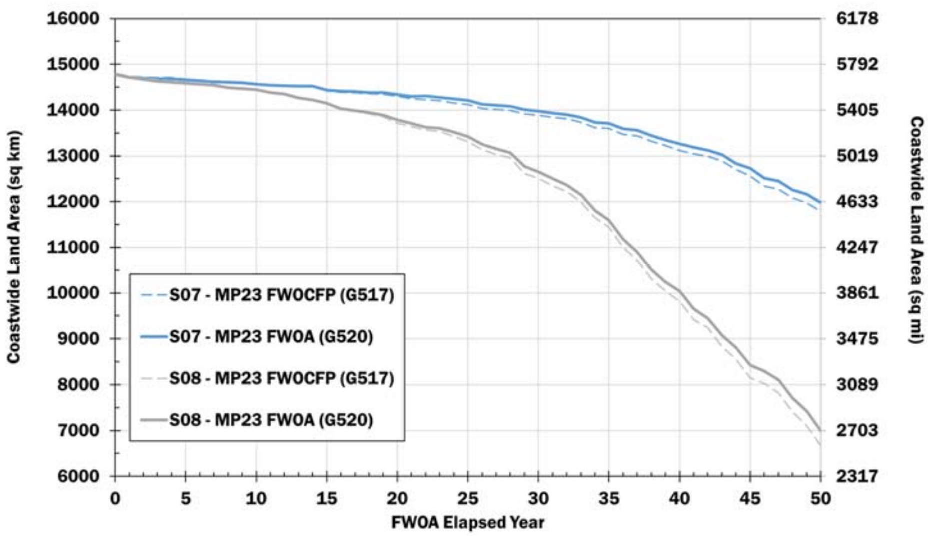

Figure 1. Land area change over time for the lower (S07) and higher (S08) environmental scenarios for FWOA and FWOCFP.

These differences represent land built or maintained by the projects. Figure 2 plots the differences between the FWOCFP and FWOA curves shown in Figure 1, reflecting how the net project benefits change over time. Note that Figure 2 shows some initial loss of land. This is associated with increased inundation of existing marshes by the Mid-Barataria Sediment Diversion and the Mid-Breton Sediment Diversion. However, as discussed in the next section, these projects fill open water over time and land emerges, especially under the lower environmental scenario.

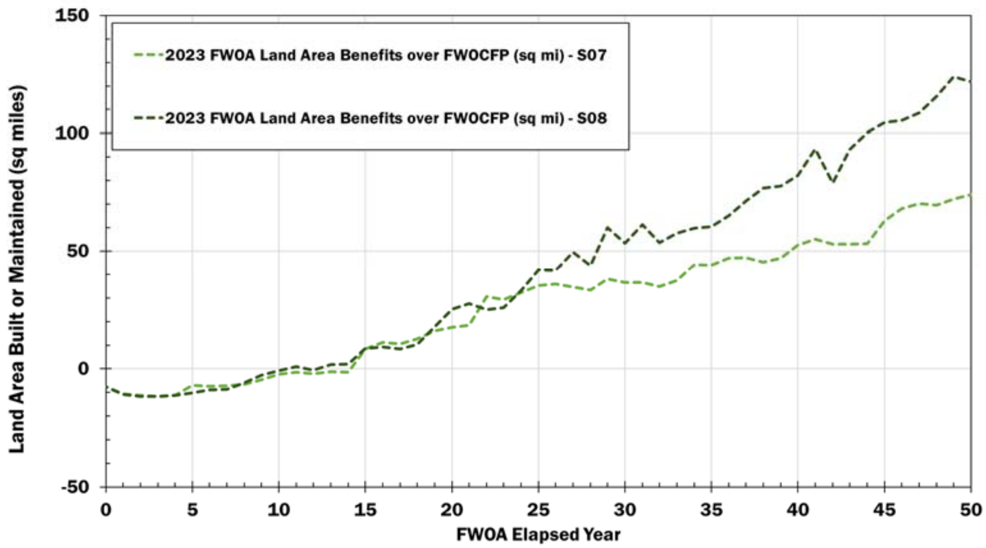

Figure 2. Land area benefits of FWOA over FWOCFP over time for the lower (S07) and higher (S08) environmental scenarios.

2.2 VEGETATION

The effects of FWOA projects on the distribution of vegetation across the coast is shown in **Error! Reference source not found.** for the lower environmental scenario. There is very little difference between FWOA and FWOCFP in the Chenier Plain as the few hydrologic restoration projects have only local effects. However, there is a substantial difference in parts of the Delta Plain influenced by the three river diversions: Mississippi River Reintroduction into Maurepas Swamp, Mid-Barataria Sediment Diversion, and Mid-Breton Sediment Diversion. For the lower environmental scenario, there is little difference in vegetation in the Lake Pontchartrain area. There are differences in the Lake Borgne and Biloxi marsh area, where there is a greater extent of brackish marsh with FWOA projects. The Mid-Breton Sediment Diversion keeps extensive areas of the Breton marsh as intermediate, versus brackish for FWOCFP, and there is little change in the Bird's Foot Delta. In the Barataria Basin, the Mid-Barataria Sediment Diversion in FWOA results in less saline marsh in the lower basin and more intermediate marsh in the vicinity of Lake Salvador.

The vegetation distribution at Year 50 for the high environmental scenario is shown in Figure 4. As expected, based on Figure 1, there is less land in many areas. As for the lower environmental scenario, vegetation patterns in the Chenier Plain are similar for FWOA and FWOCFP. The River Reintroduction to Maurepas Swamp results in a slightly greater extent of fresh versus intermediate marsh around Lake Pontchartrain, e.g., in the LaBranche wetlands. Extensive land loss in the Lake Borgne area and Biloxi marshes means the effects on vegetation at Year 50 are difficult to detect. However, land remaining near the Mississippi River Gulf Outlet is brackish in FWOA versus saline in

FWOCFP. In Barataria, the effect of the Mid-Barataria Sediment Diversion is to maintain extensive areas of fresh marsh between Highway 90 and Lake Salvador, which is mostly intermediate under FWOCFP, and there is more fresh marsh in the vicinity of the diversion itself, near Myrtle Grove.

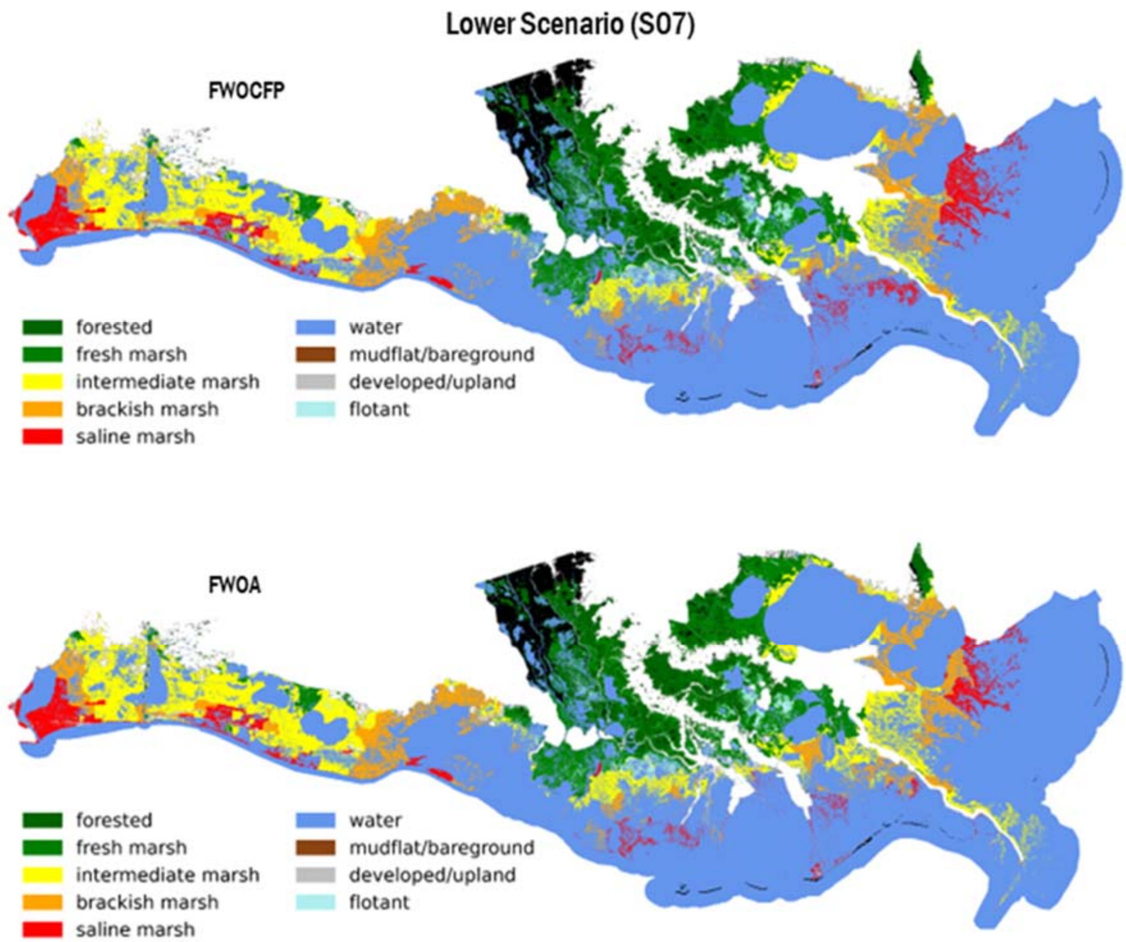

Figure 3. Distribution of vegetation types for FWOA and FWOCFP at Year 50 under the lower environmental scenario.

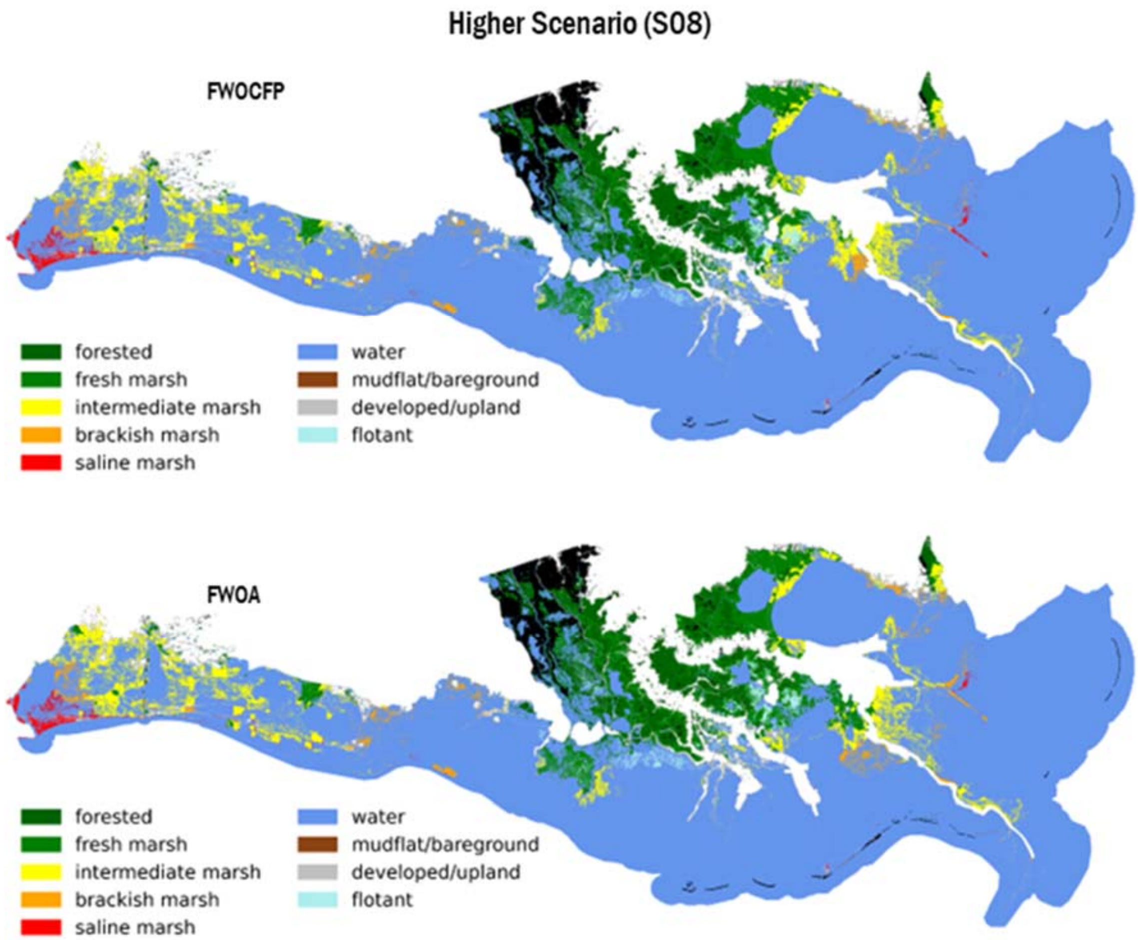

Figure 4. Distribution of vegetation types for FWOA and FWOCFP at Year 50 under the higher environmental scenario.

3.0 PROJECT EFFECTS

The projects included in FWOA but not in FWOCFP are not evenly distributed across the coast. To highlight the effects of the projects included in FWOA several examples have been selected. Project effects can be identified on several scales:

- Ecoregions are an amalgamation of ICM-Hydro compartments (see Reed and White [2023] for more details) that are conterminous and all located with a specifically unique portion of the coast. They were delineated following physical barriers (such as landbridges), flowpaths (such as a bayou or river), natural demarcations such as ridges, or even human-made delineators (such as shipping lanes). Changes in total land area and vegetation coverage assessed at the ecoregion scale represent the effects of projects both within the ecoregion and those in adjacent ecoregions which influence the hydrology of wider areas.
- ICM-Hydro compartments are delineated by hydrologic features and changes in land area, salinity, and stage can be tracked annually to detect project effects at a more local scale.
- Quality assurance and quality control (QAQC) save points are pre-identified locations at which all model data, down to a specific 30 m pixel, are saved in order to conduct QAQC on model processes and simulations. See White et al. (2023a) for more information on how these were selected.

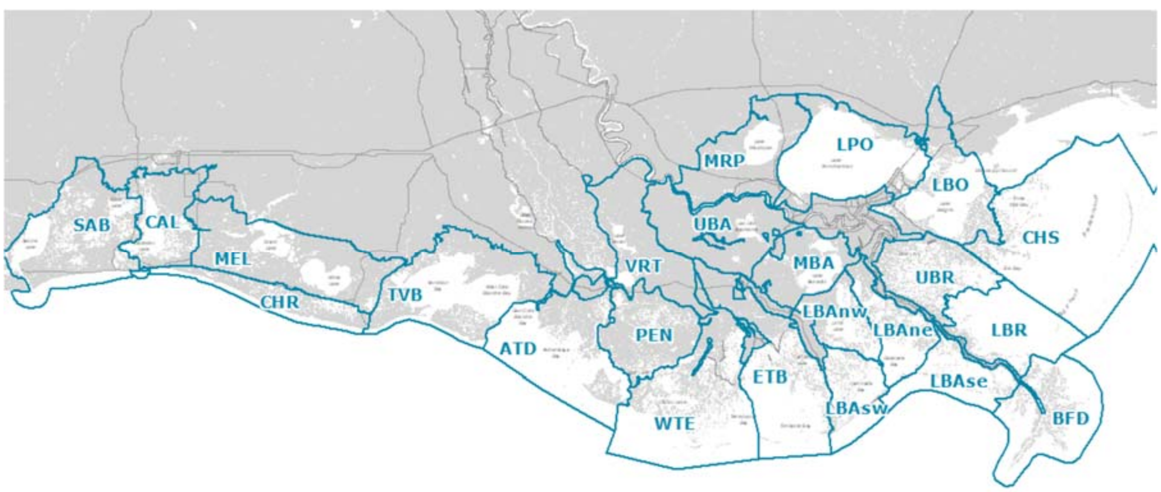

Figure 5. Ecoregions used to summarize modeling analyses for the 2023 Coastal Master Plan.

The discussion here focuses on diversion of freshwater and sediment from the Mississippi River and marsh creation projects. Many of the hydrologic restoration and shore protection projects included in Table 1, have local effects which are difficult to identify in ICM outputs.

3.1 EFFECTS OF DIVERSIONS

FWOA includes three diversions from the Mississippi River into adjacent estuarine basins: Mississippi River Reintroduction into Maurepas Swamp, Mid-Barataria Sediment Diversion and Mid-Breton Sediment Diversion. These projects divert freshwater and sediment into the Maurepas (MRP), lower Barataria northeast (LBAne) and Upper Breton (UBR) ecoregions respectively, but their effects are much larger. As salinities are reduced, vegetation type becomes fresher or is maintained as fresh in the face the sea level rise. Fresh marsh yields higher organic accretion compared to other mash types, and sediment from diversions can be deposited both on the marsh surface and in open water bodies, supporting the maintenance of existing wetlands and potentially resulting in land creation in open water.

Figure 6 illustrates the effect of the Mid-Barataria Sediment Diversion on land area change. Also shown are the footprints of several marsh creation projects included in FWOA in the vicinity of the diversion. Large areas of land are maintained, i.e., loss that would have occurred under FWOCFP is prevented in FWOA, and land is gained in open water.

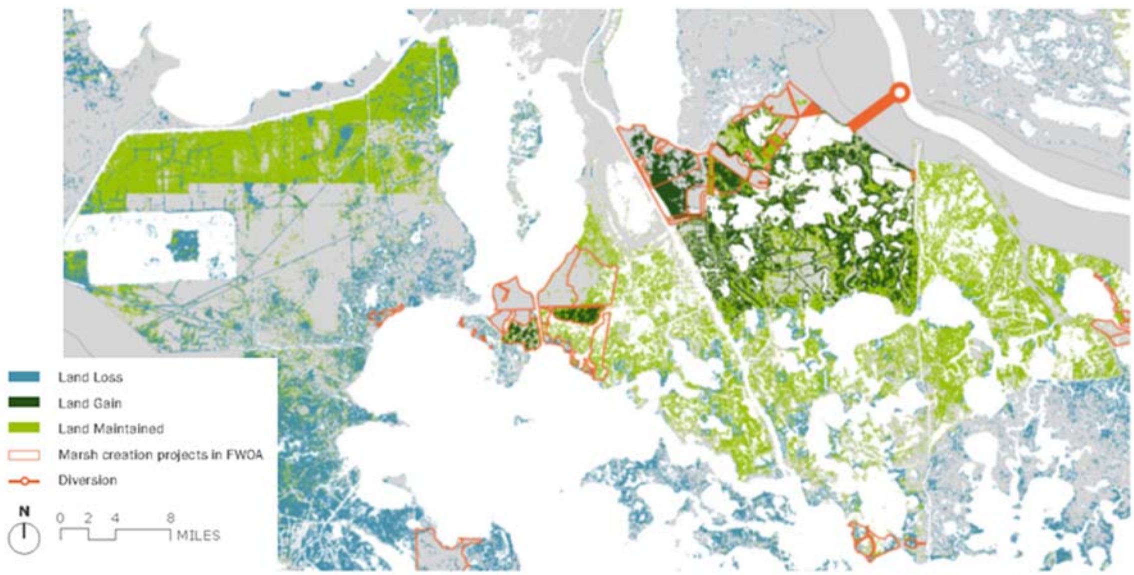

Figure 6. Land change for FWOA-FWOCFP at Year 50 for the lower environmental scenario in parts of LBAne and LBAnw ecoregions.

The effects of the diversion in freshening the mid Barataria Basin is illustrated in Figure 7. Without the diversion in place, salinities are almost 9 ppt greater at Year 50 at this location in FWOCFP compared to FWOA. The diversion does not prevent the increase in salinity associated with subsidence and sea level rise, but it modulates it sufficiently to influence land loss.

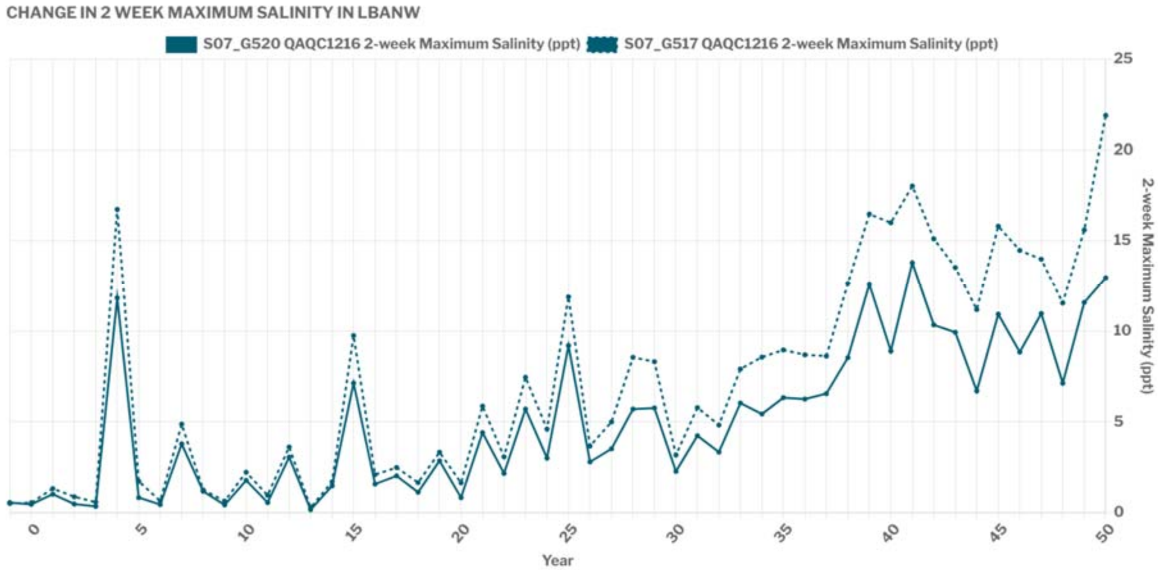

Figure 7. Reduction in maximum 2-week salinity under the lower environmental scenario for FWOA (solid line) vs. FWOCFP (dashed line) for QAQC1216, in the area of land maintained south of the Gulf Intracoastal Water Way shown in Figure 3.

The effect of the projects on vegetation change, mediated through mean annual salinity and water level variability, is shown in Figure 8. FWOA, with the diversions and marsh creation projects in place, shows greater extents of intermediate marsh species (yellow shading) than FWOCFP. Figure 8 shows differences between the two scenarios. Under the lower environmental scenario, the projects initially decrease the area of saline marsh species (red shading) but it increases again in the last decade as sea level rise and subsidence proceed (the increase in salinity over time shown in Figure 7). However, FWOA does not show the gradual increase in the extent of open water in the last decade shown in FWOCFP for the lower environmental scenario. Under the higher environmental scenario, the area of water progressively increases for both FWOCFP and FWOA, but the effect is less for FWOA. FWOA shows little extent of saline marsh species in the last decade under the higher environmental scenario, presumably as higher sea level rise and subsidence rates result in their loss to open water.

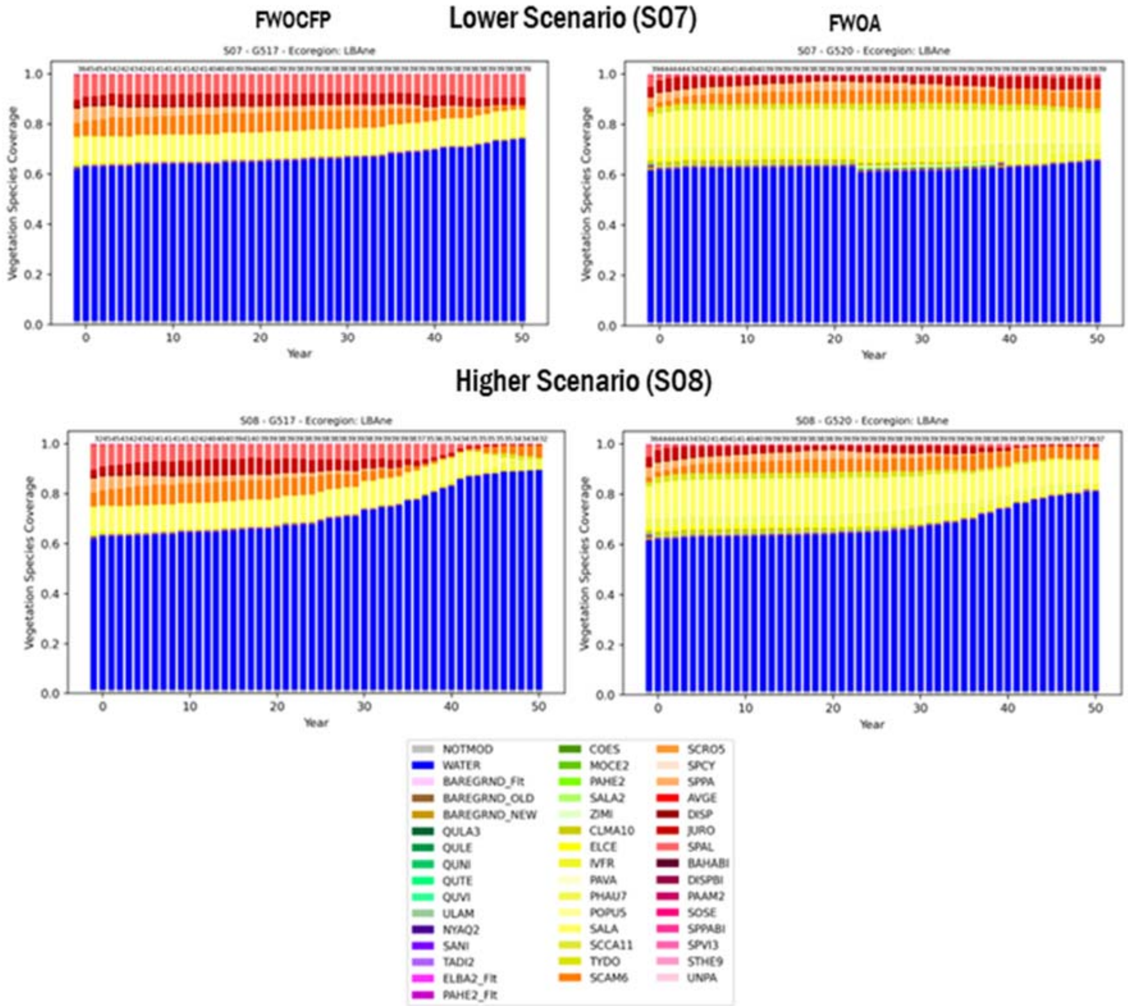

Figure 8. Vegetation change over time for FWOCFP and FWOA for both environmental scenarios in LBAne.

The net effect of the projects on land loss in LBAne and LBAnw is shown in Figure 9 and Figure 10, respectively. Under the lower environmental scenario at Year 50, LBAne has over 21 sq mi more land in FWOA compared to FWOA, and for the higher environmental scenario the difference is over 28 sq mi. The FWOA increase in land area under the lower environmental scenario in Year 22 is associated with sediment deposition in open water reaching an elevation where vegetation can establish signaling the transition from water to land.

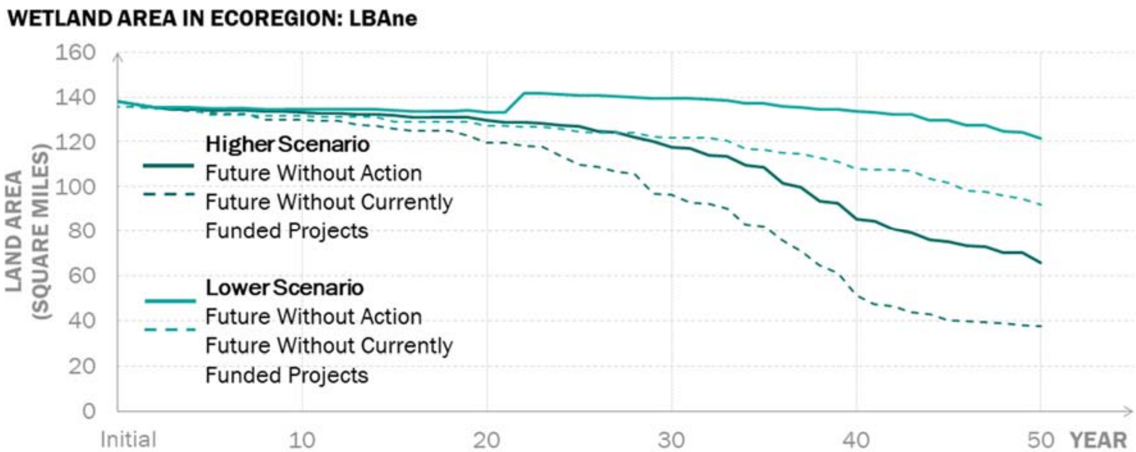

Figure 9. Land area over time for FWOCFP and FWOA in the LBAne ecoregion for the lower and higher environmental scenarios.

Similarly to LBAne, the difference in land area between FWOCFP and FWOA in LBAnw increases over time (Figure 10). Here, though, this is a result of the project maintaining land that would otherwise be lost, rather than the direct effect of sediment in open water from a diversion or due to marsh creation.

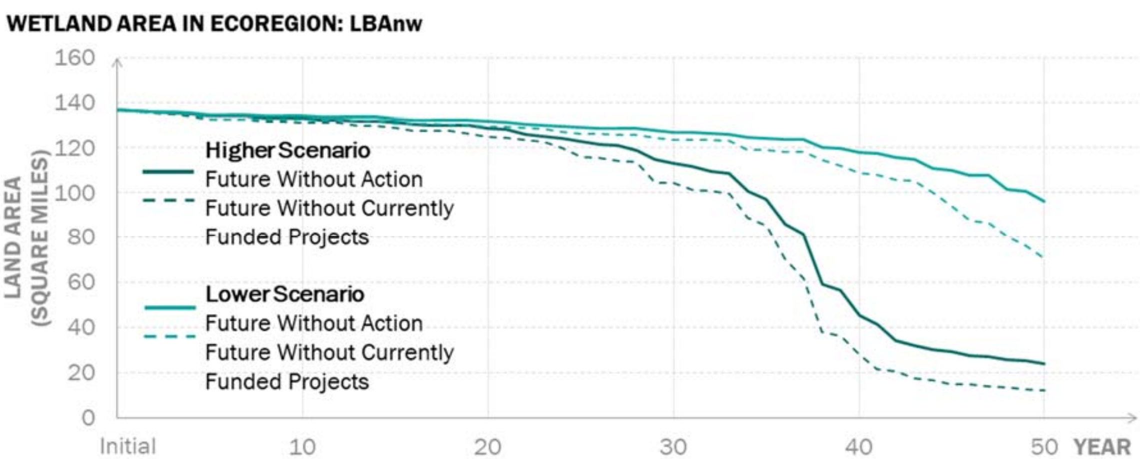

Figure 10. Land area over time for FWOCFP and FWOA in the LBAnw ecoregion for the lower and higher environmental scenarios.

The effect of the Mid-Breton Sediment Diversion in the Breton Basin is less obvious in the Upper Breton ecoregion (UBR). This basin already has substantial freshwater inputs from the Mississippi River via a series of crevasses[1] below the Bohemia Spillway, e.g., Mardi Gras Pass, splays at Fort St.

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1 In 2019 a new and particularly large crevase, Neptune Pass, formed near Ostrica. This new crevasse formed *after* the ICM was developed and validated for use in the 2023 Master Plan and is therefore

Philip. The effect on vegetation is much less than the mid basin diversion into Barataria. Figure 11 shows extensive intermediate marsh (yellow shading) for the lower environmental scenario in both FWOCFP and FWOA and little difference in the extent of open water. As in Barataria, there is a slight decrease in saline marsh species (red shading). The Mid-Breton Diversion is the only restoration project included in FWOA for this area. Under the higher environmental scenario, there is little change in land-water between FWOCFP and FWOA, but greater intermediate species compared to brackish species (orange shading), indicating some freshening associated with diversion when sea level rise and subsidence are higher.

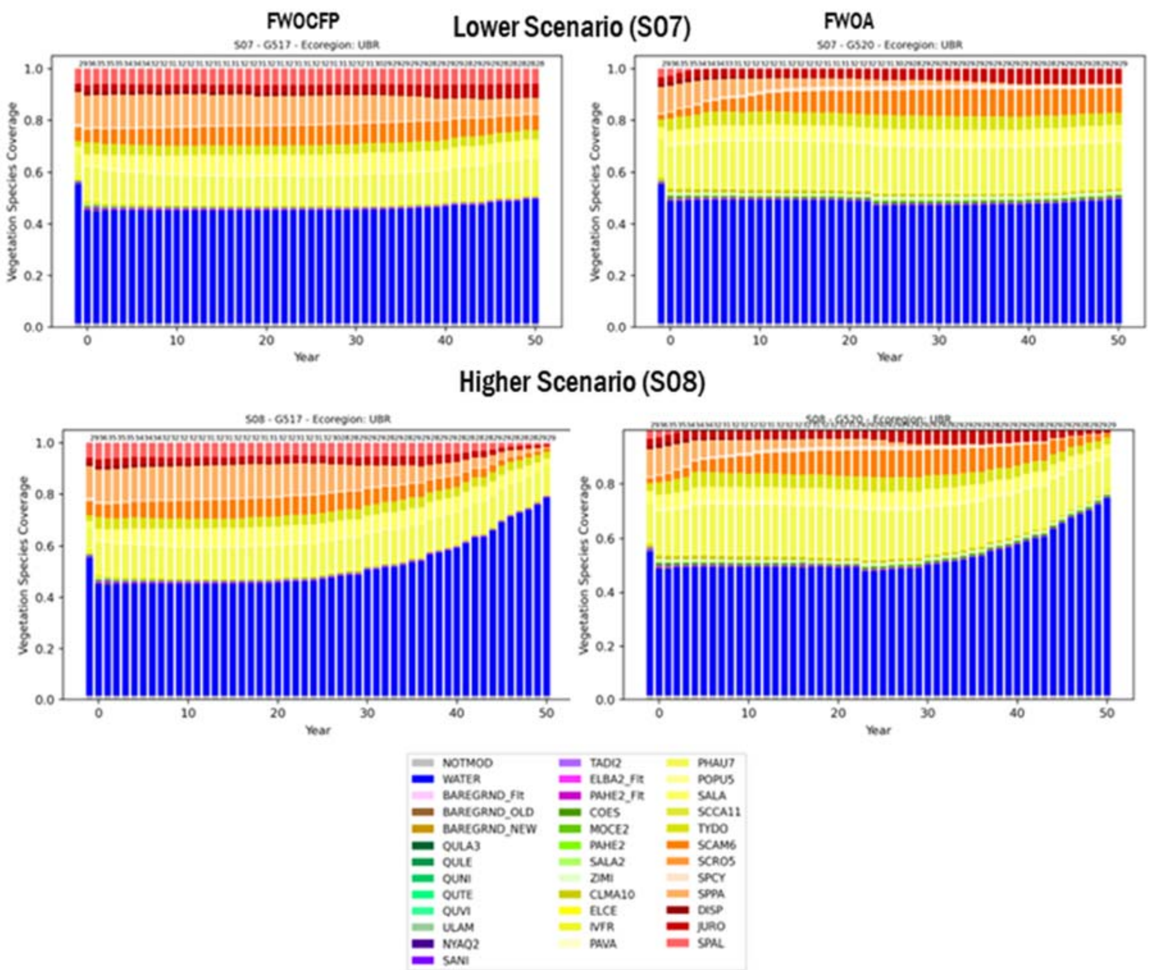

Figure 11. Vegetation change over time for FWOCFP and FWOA for both environmental scenarios in UBR.

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not represented in the 2023 version of the ICM. Neptune Pass will be represented in updated versions of the ICM used for future Master Plans, starting with the 2029 plan.

The River Reintroduction to Maurepas Swamp project also provides freshwater to the Maurepas ecoregion (MRP) which is already fresh, and seaward ecoregions, e.g., Lake Pontchartrain (LPO) and Lake Borgne (LBO). Figure 12 shows vegetation change over time for FWOCFP and FWOA is similar for each scenario. It is difficult to assess the effect of this diversion project on land area change in seaward ecoregions as they also include marsh creation projects that contribute to land area.

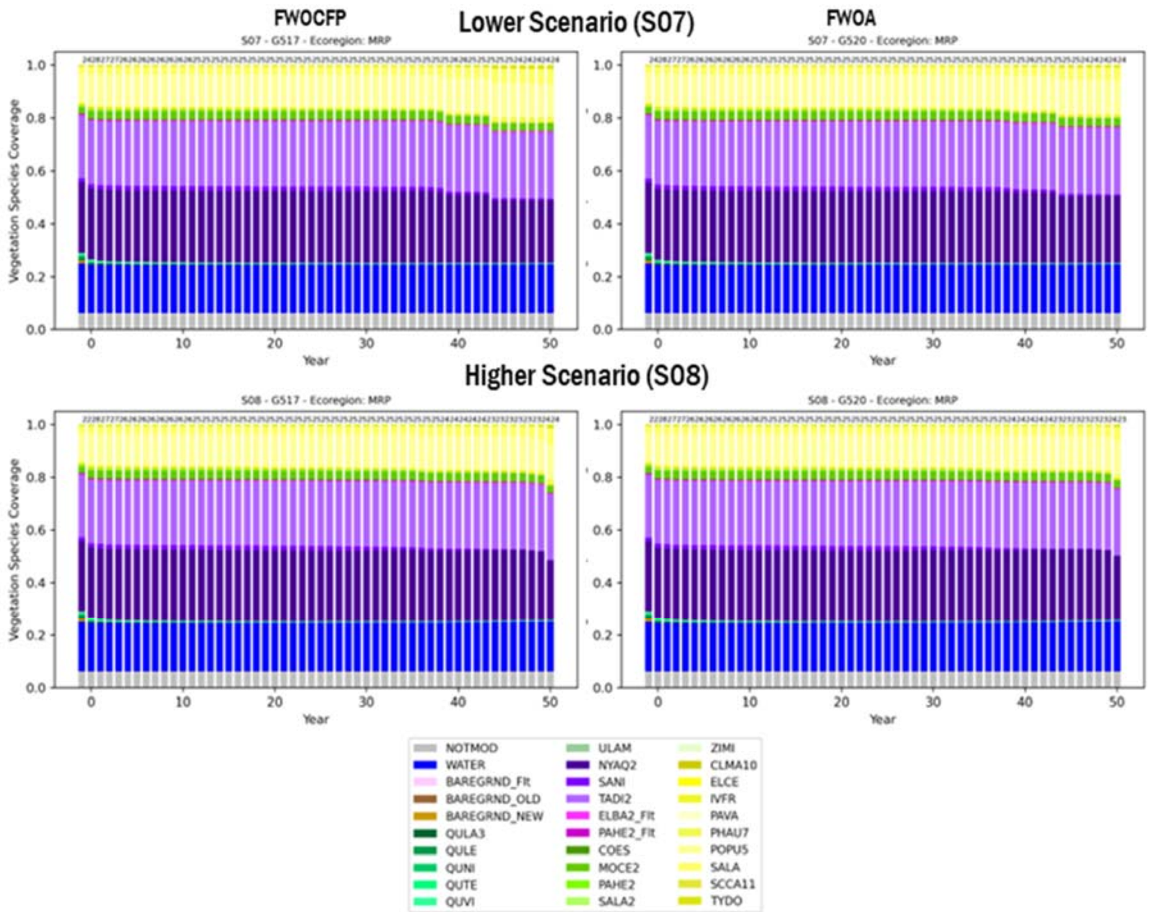

Figure 12. Vegetation change over time for FWOCFP and FWOA for both environmental scenarios in the MRP ecoregion.

The diversion of Mississippi River flows through these three diversions in FWOA reduces the flow reaching the Bird's Foot Delta (BFD) ecoregion. However, there is little difference in the species distribution (not shown), and differences in BFD land area between FWOCFP and FWOA are 1.2 sq mi for the lower environmental scenario and less than 0.1 sq mi for the higher environmental scenario.

3.2 EFFECTS OF MARSH CREATION

One of the largest marsh creation projects included in FWOA is the Lake Borgne Marsh Creation - Increment 1 project on the southeast shore of Lake Borgne. This is the only FWOA project located in the Lake Borgne ecoregion (LBO). Figure 13 shows consistently higher land area in LBO for FWOA compared to FWOCFP for both environmental scenarios. For the higher environmental scenario, Figure 14 shows the local effect of the Lake Borgne Marsh Creation project in ICM-Hydro compartment 58 (note that the project footprint extends into compartments 55 and 59). Land area is stable in both FWOCFP and FWOA until Year 27 and declines thereafter but at a higher rate in FWOCFP. Figure 13 shows the decline beginning about Year 25, perhaps indicating that at the ecoregion scale under the high scenario subsidence and sea level rise are starting to contribute to inundation loss.

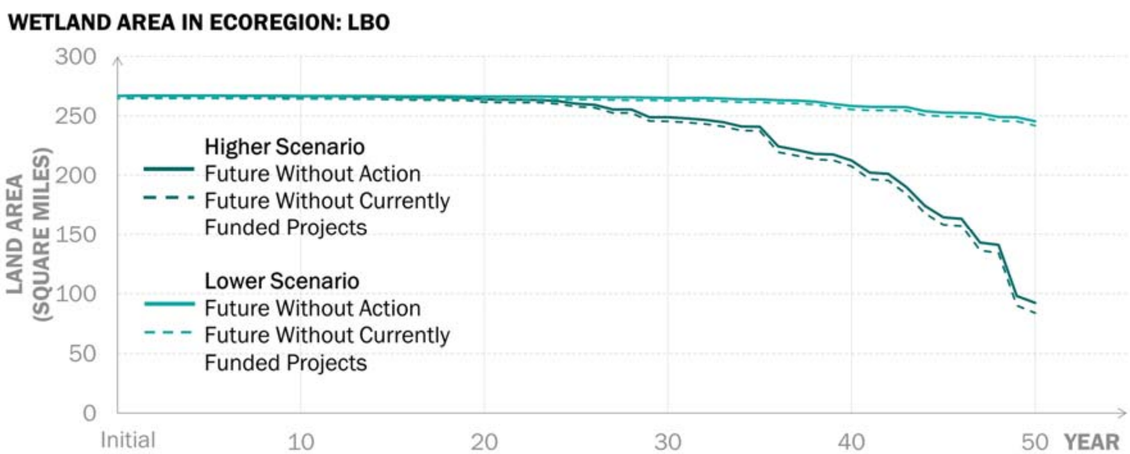

Figure 13. Land area over time for FWOCFP and FWOA in the LBO ecoregion for the lower and higher environmental scenarios.

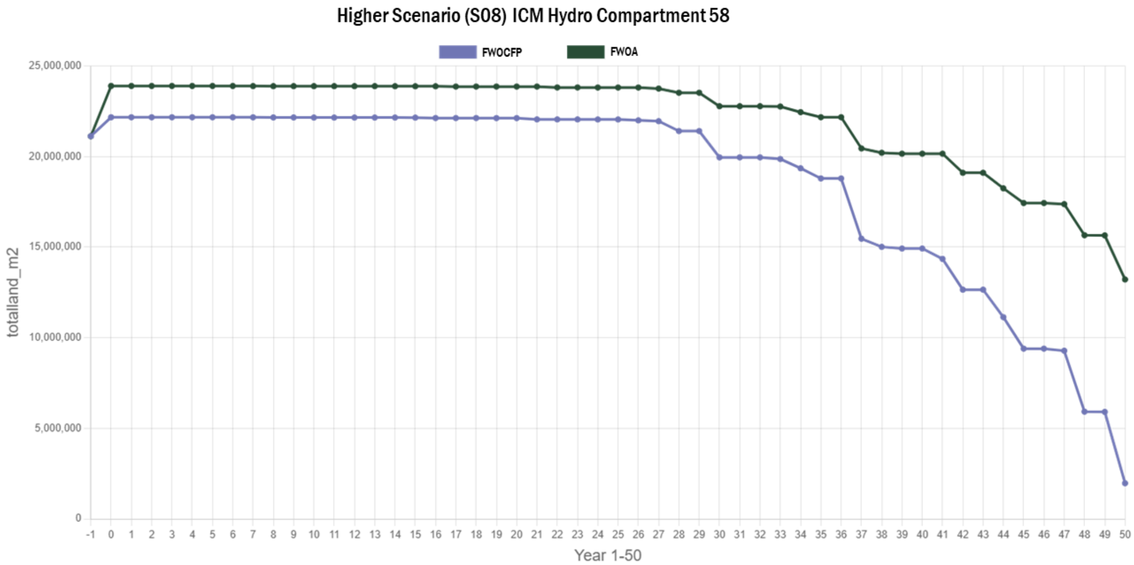

Figure 14. Land area over time for FWOCFP and FWOA in compartment 58 for the higher environmental scenario.

However, the difference between FWOCFP and FWOA increases in the last two decades of the simulation. Prior to Year 25 the difference in land area was approximately 0.67 sq mi but by Year 50 has increased to 4.34 sq mi. The earlier benefit reflects the project converting open water to land through the placement of dredged material. Marsh creation projects also increase the elevation of existing wetlands within the project footprint. Without the project, these would be lost to open water, but the increase in elevation allows them to remain as land longer. Thus, once land loss within the area becomes a factor in FWOCFP at around Year 25 (Figure 13), the effect of the project on maintaining land area becomes apparent. While the Lake Borgne Marsh Creation project is the only one in FWOA within the LBO ecoregion, the River Reintroduction to Maurepas Swamp project is introducing freshwater into the basin landward. Figure 15 confirms that FWOA produces a slight decrease in salinity in compartment 58 in the later decades of the simulation, which can also influence the timing of land loss through changes to vegetation and organic matter accretion.

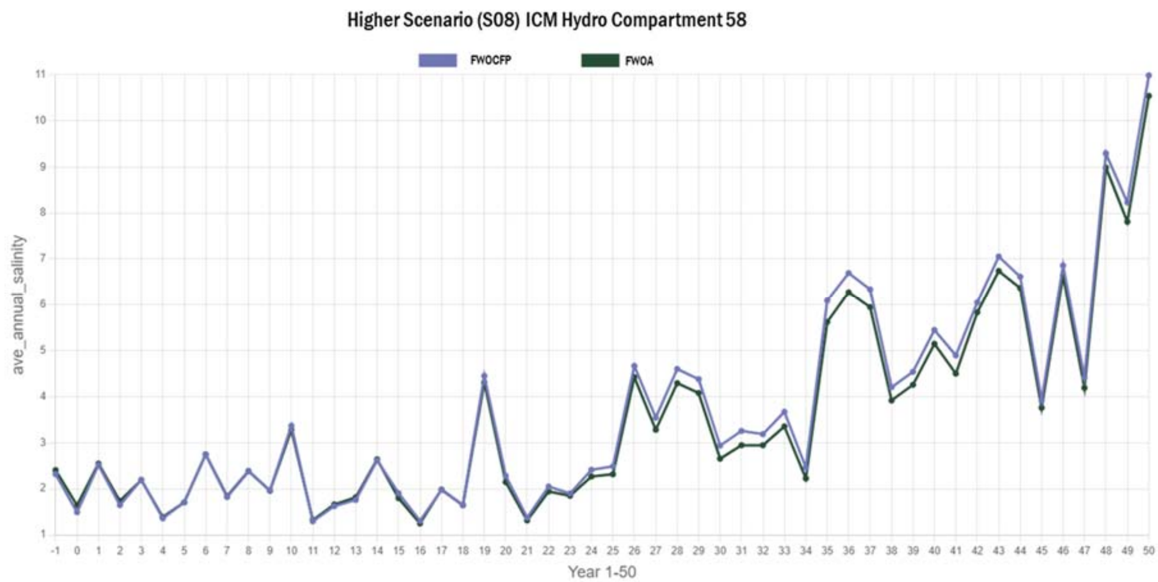

Figure 15. Mean annual salinity over time for FWOCFP and FWOA in compartment 58 for the higher environmental scenario.

The Eastern Terrebonne ecoregion (ETB) is not directly influenced by any of the FWOA diversions and includes the Terrebonne Basin Ridge and Marsh Creation - Bayou Terrebonne Increment and West Fourchon Marsh Creation and Nourishment. Figure 16 shows a slight increase in land area in this ecoregion for FWOA compared to FWOCFP. However, the lines converge in Year 49 for the lower environmental scenario and in Year 34 for the higher environmental scenario. This is the result of the marsh creation projects being lost to inundation. White et al. (2023a) note that under the higher environmental scenario Terrebonne Basin Ridge and Marsh Creation - Bayou Terrebonne Increment turns to open water in Year 30/31, and results indicate loss of West Fourchon Marsh Creation and Nourishment a few years later.

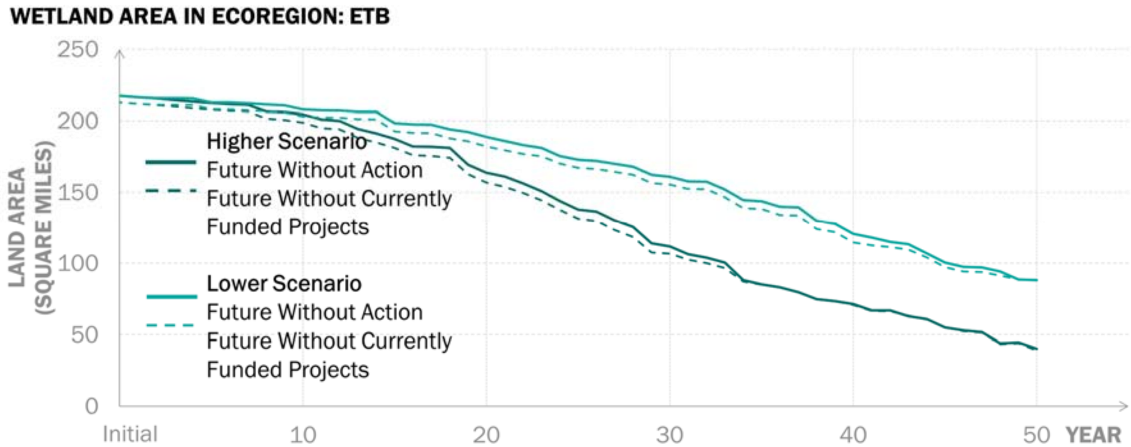

Figure 16. Land area over time for FWOCFP and FWOA in the ETB ecoregion for the lower and higher environmental scenarios.

The Penchant ecoregion (PEN) includes the Bayou Decade Ridge Restoration and Marsh Creation project and the Lost Lake Marsh Creation and Hydrologic Restoration project. The hydrologic restoration component includes the replacement of fixed crest weirs with variable crested structures to improve distribution of freshwater and sediment from the Atchafalaya/Fourleague Bay system. Figure 17 shows land change over time for FWOCFP and FWOA for this ecoregion. Under the higher environmental scenario, the land footprint of both of these projects is lost to open water in the fourth decade of the simulation. This is seen in Figure 17 as a convergence of the lines for the higher environmental scenario. However, FWOA continues to support more land in PEN in the last decade of the simulation after the project footprints have been lost. This may be associated with the hydrologic restoration aspects of the project, but it could also be associated with changes in projects and land water configurations to the south in the Western Terrebonne ecoregion (WTB). White et al. (2023b) note that hydrologic conditions in PEN can be influenced by ridges and projects to the south.

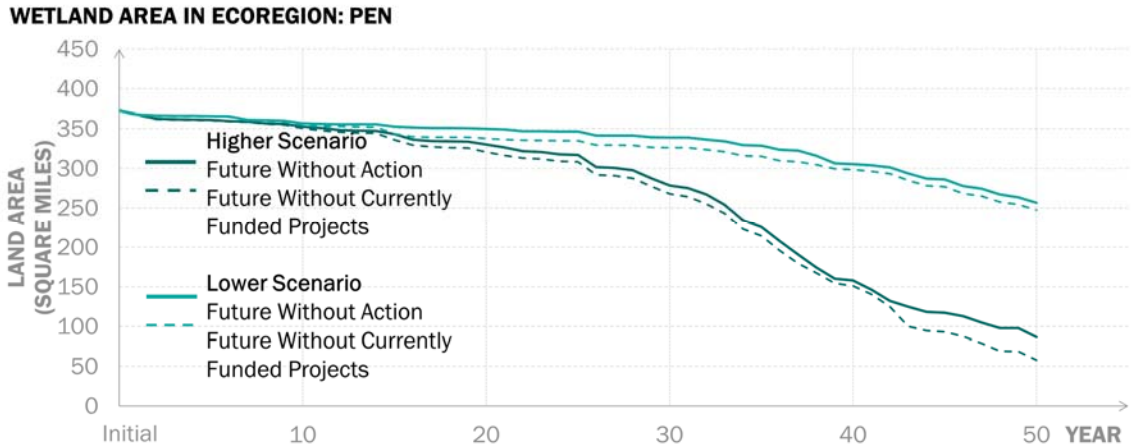

Figure 17. Land area over time for FWOCFP and FWOA in the PEN ecoregion for the lower and higher environmental scenarios.

The Cameron Meadows Marsh Creation and Terracing project is located in the Sabine ecoregion (SAB). Figure 18 shows very little change in land area at the ecoregion scale for the lower environmental scenario with some increase in FWOA over FWOCFP in later decades for the higher environmental scenario.

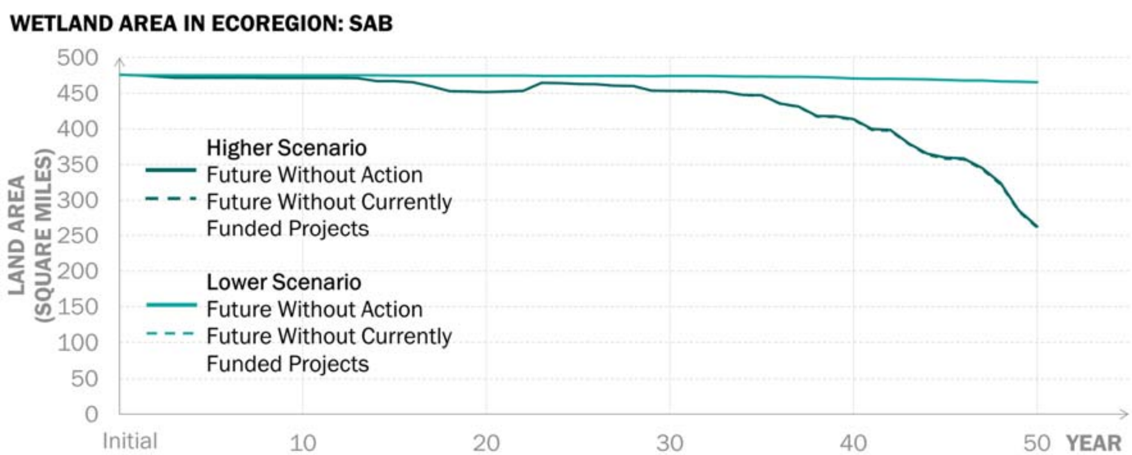

Figure 18. Land area over time for FWOCFP and FWOA in the SAB ecoregion for the lower and higher environmental scenarios.

The project is located in ICM-Hydro compartment 1131. **Error! Reference source not found.** shows the change in land area over time for the higher environmental scenario. The pattern is similar to that shown in Figure 14 for the Lake Borgne Marsh Creation project. There are no changes to hydrology for FWOA in this basin and so increasing effects of the FWOA project over time, compared to FWOCFP, from 0.45 sq mi at Year 20 to over 8.5 sq. mi, indicating some influence of the project on land loss within the compartment outside of the project area.

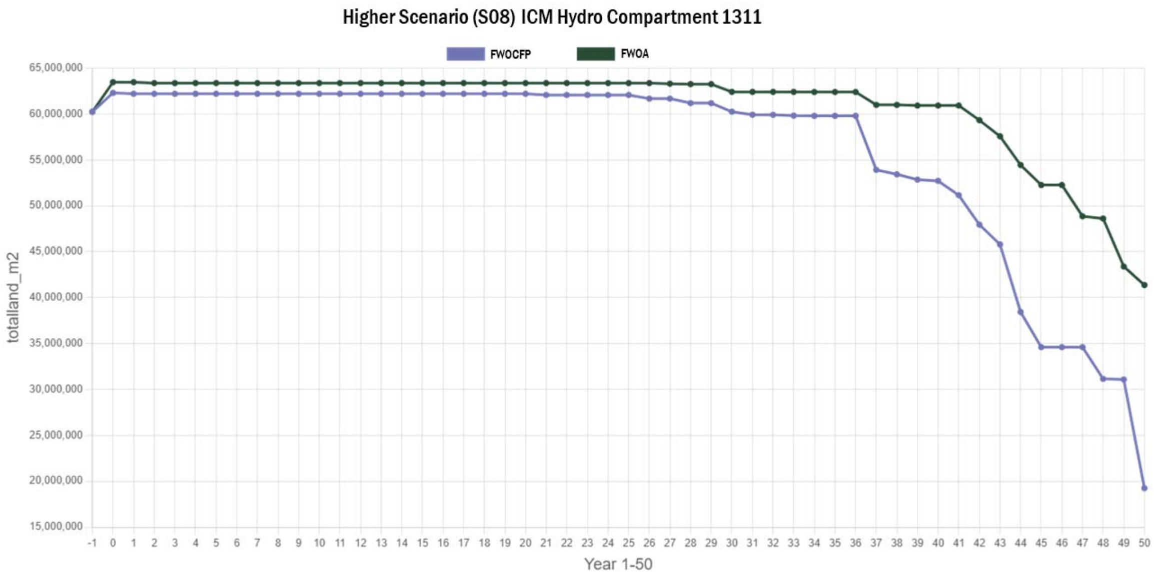

Figure 19. Land area over time for FWOCFP and FWOA in compartment 1311 for the higher environmental scenario.

4.0 DISCUSSION

The estimated cost of the restoration projects included in FWOA is just over $4.3 billion. This results in an additional 74 sq mi of land by Year 50 for the lower environmental scenario and an additional 122 sq mi by Year 50 for the higher environmental scenario. In comparison, the 2023 Coastal Master Plan includes projects with an estimated total cost of $22.4 billion, and the additional land at Year 50 is 314 sq mi for the lower environmental scenario and 233 sq mi for the higher environmental scenario. Note that the cost estimates for the 2023 Coastal Master Plan projects are based on different assumptions from the projects included in FWOA, many of which are based on more detailed local information developed during engineering and design. Also, the 2023 Coastal Master Plan projects were selected on the basis of their ability to contribute to land area coast wide, while many of the FWOA projects were developed under programs such as the Coastal Wetlands Planning Protection and Restoration Act which takes into account additional factors and more regional context.

The increase in land area performance by the FWOA projects at Year 50 for the higher environmental scenario compared to the lower reflects the nature of the projects included and the regional context within which they are implemented. Table 2 shows the biggest differences between FWOCFP and FWOA are in the LBAne and LBAnw ecoregions – those most directly benefitted by the Mid-Barataria Sediment Diversion. As discussed previously, the diversion of freshwater and sediment into the Barataria Basin has a greater effect than into the Breton Basin as there are fewer existing connections to the Mississippi River on its west side. Table 2 also shows that the Mid Barataria (MBA) and Upper Breton (UBR) ecoregions both have relatively high amounts of additional land at Year 50, especially under the higher environmental scenario. Other ecoregions show less change, and some have minor negative effects, although most of these are small in magnitude. Loss of land associated with some projects may be due to changes in hydrology as open water areas are infilled that result in slightly higher inundation in adjacent areas, triggering land loss.

These results support the enduring benefit of the river diversion projects that continue to yield benefits in the face of sea level rise and subsidence by keeping areas fresh and more able to withstand relative sea level rise through elevated rates of organic accretion. However, it is important to note that the results shown here are dependent on the operational rules applied in simulating diversion releases into the estuarine basins.

This analysis has demonstrated the potential benefits of the ongoing activities of the Louisiana coastal program in implementing projects already ‘on the books.’ The projects selection process for the 2023 Coastal Master Plan assumed these benefits were already ‘on the landscape’ and ensured that any interactions between the FWOA and selected projects would be complementary. The FWOA projects also presented challenges. For example, multiple freshwater and sediment diversions into the swamps of the Western Pontchartrain and Upper Barataria basins were modeled for inclusion in the plan. These projects showed complex interactions with the FWOA diversions that need to be better understood. Such interactions are expected to be explored through the Upper Basin Diversion Program included in the 2023 Coastal Master Plan.

Table 2. Additional land area at Year 50 (sq mi) for each ecoregion for the lower and higher environmental scenarios.

Ecoregion	Lower Environmental Scenario	Higher Environmental Scenario
ATD	0.92	1.12
BFD	1.20	-0.08
CAL	-0.47	0.22
CHR	-0.15	-0.02
CHS	-0.04	0.00
ETB	0.02	1.21
LBAne	29.70	28.25
LBAnw	25.99	11.89
LBAse	1.19	0.51
LBAsw	0.99	0.16
LBO	3.82	8.47
LBR	0.20	0.28

Ecoregion	Lower Environmental Scenario	Higher Environmental Scenario
LPO	1.88	4.72
MBA	-0.28	19.06
MEL	-0.66	0.17
MRP	0.02	0.17
PEN	9.09	29.01
SAB	0.47	2.01
TVB	-0.18	0.64
UBA	-0.54	-1.46
UBR	1.29	15.48
UVR	0.00	-0.02
VRT	-0.15	-0.20
WTE	-0.22	0.12

5.0 REFERENCES

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