Coastal Wetlands Planning, Protection and Restoration Act

Wetland Value Assessment Methodology

Barrier Headland Community Model

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Environmental Work Group

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WETLAND VALUE ASSESSMENT METHODOLOGY

Barrier Headland Community Model

I. Introduction

The barrier headland model was developed to determine the wetland benefits of headland restoration projects and was developed by an interagency/academic workgroup consisting of individuals with backgrounds in wildlife ecology, fisheries ecology, geomorphology, and plant ecology. The barrier headland model has been developed for determining the suitability of barrier headland habitat along the Louisiana coast in providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species.

The barrier island model was developed to evaluate traditional barrier island habitat along the Louisiana coast; those containing emergent habitat surrounded by open water. However, non-barrier island shorelines (i.e., headlands) also contain barrier island-type habitats such as beach, dune, and supratidal habitats but do not provide the same functions as barrier islands. Application of the barrier island model to those areas was not practical because many of the variables contained within the barrier island model do not apply to headland areas. Therefore, this model was developed to complement the barrier island model.

The barrier headland model should be applied to shoreline areas along the coast which consist of beach, dune, and supratidal habitat and which naturally decrease in elevation to an intertidal marsh. By nature, barrier headlands are contiguous with the mainland marsh and have not yet detached and begun formation of a barrier island. Conversely, the barrier island model is applied to detached headlands which have formed barrier islands and are gulfward of bay or lake systems. This model has been designed to function at a community level and therefore attempts to define an optimal combination of habitat conditions for <u>all</u> fish and wildlife species utilizing barrier headlands.

II. Variable Selection

As with barrier islands, headlands consist of many different habitat components including surf zone, beach, dune, supratidal marsh (i.e., swale), and unvegetated flats or washover areas. A key assumption in model development was that for a barrier headland to provide optimal conditions for fish and wildlife, all of the above habitat components should exist. Unlike the barrier island model which encompasses intertidal and subtidal habitats, this model does not. Those habitat types exist landward of the headland and should be evaluated using the appropriate marsh model.

The variables selected for this model were those variables within the barrier island model which could be applied to barrier headland habitat. The model development group agreed that barrier headlands provide many of the same functions as barrier islands such as nesting and resting sites for birds and other wildlife, storm surge protection of interior marshes, and

proximity to gulf/marine foraging habitat. Furthermore, barrier headlands consist of many of the same habitat components as barrier islands such as surf zone, beach, dune, swale, and woody areas. Therefore, the group agreed that those variables within the barrier island model which address dune and supratidal habitats, vegetative cover, woody vegetation, and beach zone features should be included in the barrier headland model. The final list of variables included in this model are: 1) percent of the subaerial area that is classified as dune habitat; 2) percent of the subaerial area that is classified as supratidal habitat; 3) percent vegetative cover of dune and supratidal habitats; 4) percent vegetative cover by woody species; and 5) beach/surf zone features.

III. Suitability Index Graph Development

Suitability Index graph development was very similar to the process used for other community models developed for CWPPRA. The suitability index graphs from the barrier island community model were modified so that the variable-habitat quality relationships corresponded to barrier headland habitat. The process of SI graph development is one of constant evolution, feedback, and refinement; the form of each SI graph was decided upon through consensus among EnvWG members.

The Suitability Index graphs were developed according to the following assumptions.

Variable V_1 - Percent of the total project area that is classified as dune habitat. Dune habitat is defined as subaerial habitat $\geq$ 5 ft. NAVD88 and encompasses foredune, dune, and reardune. Although dune habitat occurs at elevations below 5 ft. NAVD88, lower-elevation dunes are more ephemeral and more frequently overwashed, which reduces their habitat value. Lower-elevation dunes often consist of vegetation more commonly associated with swale habitat and lack a high percentage of "typical" dune species.

Suitability index graph relationships for this variable were determined by: 1) reviewing profiles and cross-sections of existing barrier islands along the Louisiana coast, 2) field investigations which provided ocular estimates of habitat distribution on the islands, and 3) field knowledge of those involved in development of the model.

Variable V_2 - Percent of the total project area that is classified as supratidal habitat. Supratidal habitat occurs from 2.0 ft. NAVD88 to 4.9 ft. NAVD88. This habitat type primarily encompasses swale and may include low-elevation dune and beach habitat.

Suitability index graph relationships for this variable were determined by: 1) reviewing profiles and cross-sections of existing barrier islands along the Louisiana coast, 2) field investigations which provided ocular estimates of habitat distribution on the islands, and 3) field knowledge of those involved in development of the model.

Variable V_3 - Percent vegetative cover of dune and supratidal habitats. Common dune species include beach tea (*Croton punctatus*), bitter panicum (*Panicum amarum*), morningglory (*Ipomoea sp.*), marshhay cordgrass (*Spartina patens*), and *Heterotheca*

subaxillaris. Common foredune/high beach species include sea rocket (*Cakile fusiformis*), sea purslane (*Sesuvium portulacastrum*), and seaside heliotrope (*Heliotropium curassavicum*).

Common supratidal species include goldenrod (*Solidago sempervirens*), marshhay cordgrass (*Spartina patens*), saltgrass (*Distichlis spicata*), deerpea (*Vigna luteola*), eastern baccharis (*Baccharis halimifolia*), marshelder (*Iva frutescens*), sea ox-eye (*Borrichia frutescens*), glasswort (*Salicornia bigelovii, S. virginica*), saltwort (*Batis maritima*), black mangrove (*Avicennia germinans*), beach pea (*Strophostyles helvola*), seashore paspalum (*Paspalum vaginatum*), *Heterotheca subaxillaris*, *Fimbristylis castanea*, *Suaeda linearis*, smooth cordgrass (*Spartina alterniflora*), *Sabatia stellaris* and seaside gerardia (*Agalinis maritima*).

Suitability index graph relationships for this variable were determined by: 1) reviewing vegetative cover transects of existing barrier islands along the Louisiana coast, 2) field investigations which provided ocular estimates of vegetative cover, and 3) field knowledge of those involved in development of the model.

Variable V_4 - Percent vegetative cover by woody species. This variable is intended to capture the habitat value of areas vegetated by woody species. Common woody species include black mangrove (*Avicennia germinans*), eastern baccharis (*Baccharis halimifolia*), wax myrtle (*Myrica cerifera*), and marshelder (*Iva frutescens*). This variable is defined as the percent of the subaerial vegetated area consisting of at least two woody species. The suitability index is divided by two for islands with only one woody species.

The suitability index graph for this variable was primarily based on the best professional judgment and personal field knowledge of those involved in model development. It was agreed that cover by woody species should be a small percentage (10% to 20%) of the vegetative cover on an island.

Variable V_5 - Beach/surf zone features. This variable is intended to capture the habitat value of the beach/surf zone. The suitability index graph for this variable is based on the assumption that a natural beach/surf zone slope or profile provides optimal habitat conditions for fish and wildlife. Man-made features such as breakwaters, containment dikes, and shoreline protection provide sub-optimal conditions. The suitability index value for each beach zone feature was based on the best professional judgment and field knowledge of those involved in model development.

IV. Habitat Suitability Index Formula

As with the barrier island model, the EnvWG agreed that the primary habitat variables (i.e., those pertaining to dune and supratidal habitats) were the most important variables in characterizing the habitat quality of a barrier island. Therefore, those variables were given greater influence (i.e., 64% of the model weight) in the model than the remaining variables.

Within the HSI formula, variable influence is only determined by the weight (i.e., multiplier) assigned to each variable.

V. Benefit Assessment

One HSI formula is used for the barrier headland model to calculate net benefits in the project area. Calculation of HUs, AAHUs, and net AAHUs follow the procedure described in the Wetland Value Assessment Methodology Introduction.

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Barrier Headland Community Model

Dune Habitat
Variable V_1 Percent of the total project area that is classified as dune habitat.

Supratidal Habitat
Variable V_2 Percent of the total project area that is classified as supratidal habitat.

Vegetative Cover
Variable V_3 Percent vegetative cover of dune and supratidal habitats.

Woody Species
Variable V_4 Percent vegetative cover by woody species.

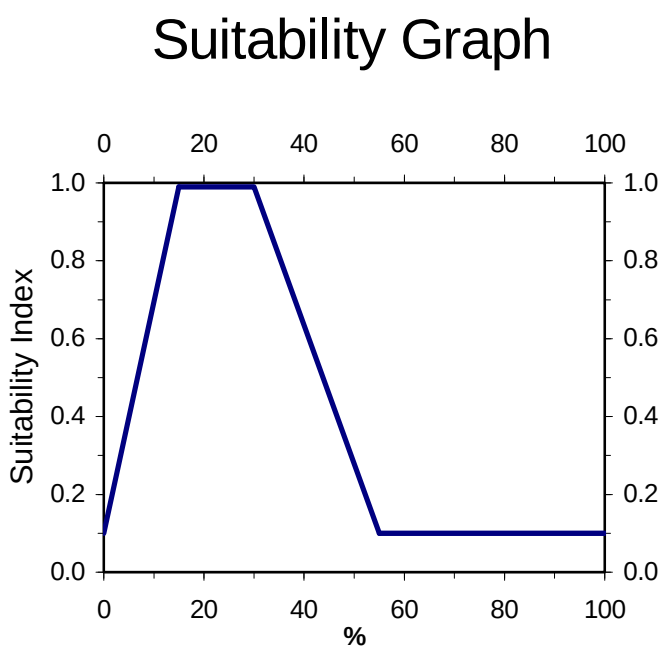
Beach Zone Habitat
Variable V_5 Beach/surf zone features.

HSI Calculation:

$$HSI = 0.23(V_1) + 0.23(V_2) + 0.18(V_3) + 0.18(V_4) + 0.18(V_5)$$

BARRIER HEADLAND

Variable V_1 Percent of the total project area that is classified as dune habitat.

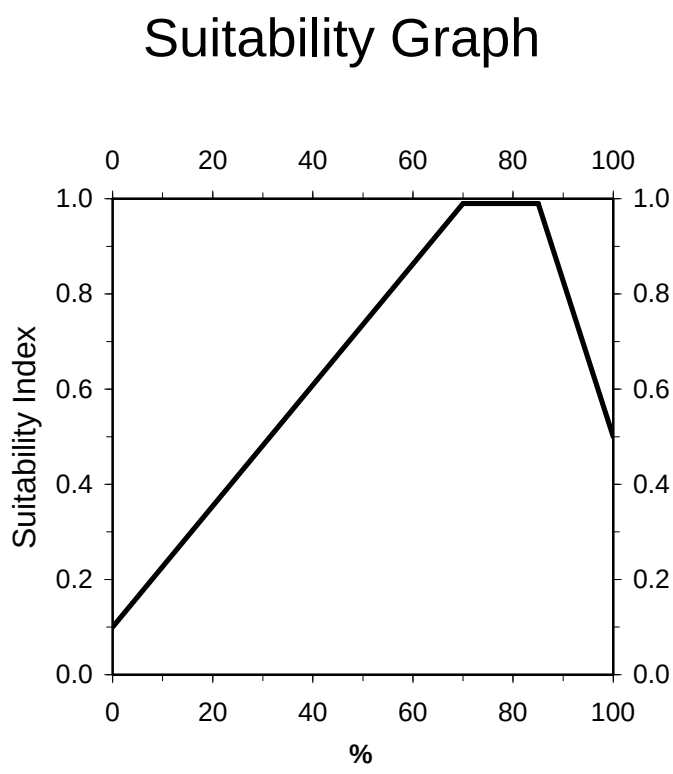


Line Formulas

If % < 15, then SI = (0.06*%) + 0.1
If 15 ≤ % ≤ 30, then SI = 1.0
If 30 < % ≤ 55, then SI = (-0.036*%) + 2.08
If % > 55, then SI = 0.1

BARRIER HEADLAND

Variable V_2 Percent of the total project area that is classified as supratidal habitat.

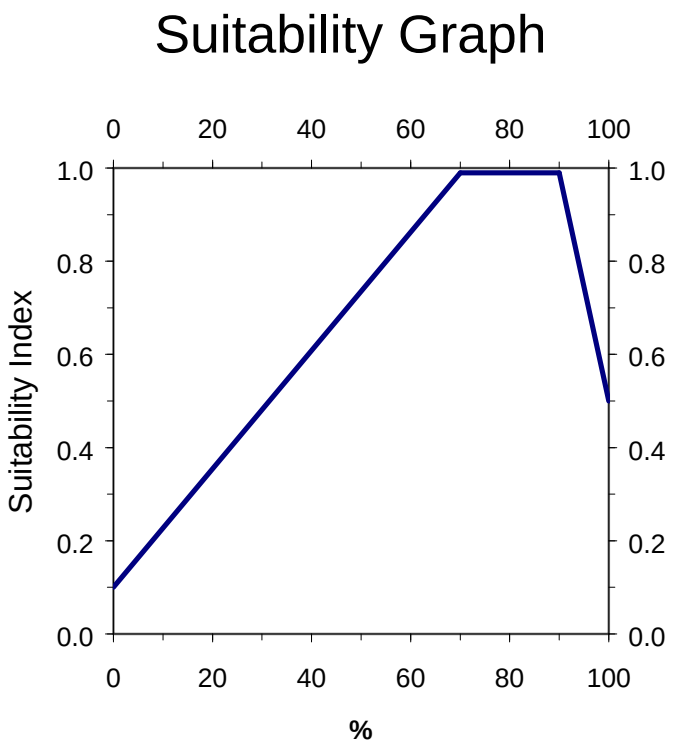


Line Formulas

If % < 70, then SI = (0.013*%) + 0.1
If 70 ≤ % ≤ 85, then SI = 1.0
If % > 85, then SI = (-0.0333*%) + 3.83

BARRIER HEADLAND

Variable V_3 Percent vegetative cover of dune and supratidal habitats.

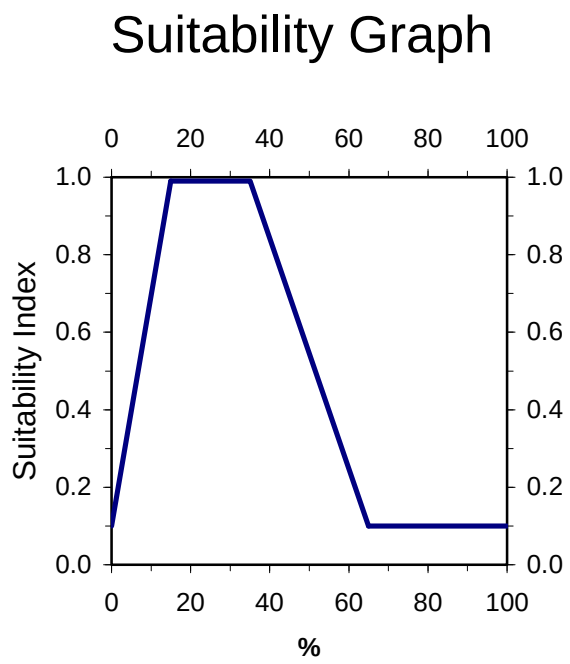


Line Formulas

If % < 70, then SI = (0.013*%) + 0.1
If 70 ≤ % ≤ 90, then SI = 1.0
If % > 90, then SI = (-0.05*%) + 5.5

BARRIER HEADLAND

Variable V_4 Percent vegetative cover by woody species.

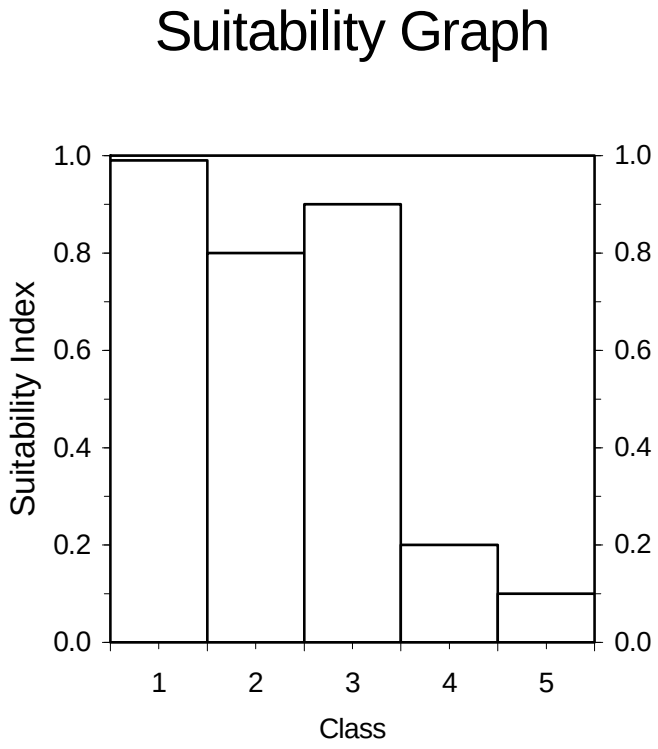


Line Formulas

If % < 15, then SI = (0.06*%) + 0.1
If 15 ≤ % ≤ 35, then SI = 1.0
If 35 < % ≤ 65, then SI = (-0.03*%) + 2.05
If % > 65, then SI = 0.1

BARRIER HEADLAND

Variable V_5 Beach/surf zone features.



Class 1 = Natural Beach/Unconfined Disposal
Class 2 = Confined Disposal
Class 3 = Breakwaters
Class 4 = Rock on Beach
Class 5 = Seawall/No emergent habitat