Chapter 6: Habitats

A Wildlife Species Endeavor

The purpose of Florida’s State Wildlife Action Plan is to promote the conservation of fish and wildlife species that are imperiled or at risk of becoming imperiled in the future (Chapter 3: SGCN). In order to benefit the most species, the Action Plan has taken a habitat-based approach by addressing the needs of many species through the needs of their associated habitats. Although the Action Plan is organized around habitat categories and much effort has gone into identifying habitat-based conservation actions, it is intended to be a wildlife conservation endeavor. Accomplishment of habitat-based conservation actions is important and will help sustain wildlife populations. However, as Action Plan review and revision progresses, focus must continually be placed back upon the species for which all this work is being done. Conservation of habitat alone is not enough without the fish and wildlife that inhabit and define it.

Florida’s State Wildlife Action Plan Habitats

There is no single accepted statewide comprehensive habitat classification system for Florida. As a result, the Action Plan uses a system modified to classify the breadth of Florida’s habitats from several existing habitat classification systems and available Geographical Information Systems (GIS) landcover data. Forty-five habitat categories are described based on information from the Florida Fish and Wildlife Conservation Commission (FWC), Florida Natural Areas Inventory (FNAI), Water Management District GIS data, and expert opinions. The goal of using this system is to maximize the utility of the Action Plan, while at the same time addressing needs and concerns for habitats across the entire landscape of Florida – terrestrial, freshwater and marine. In this system, Florida’s habitats are consolidated into 22 terrestrial (Figure 6A), 9 freshwater (Figure 6B) and 14 marine (Figure 6C) habitat categories. Two of the marine habitat categories (Beach/Surf Zone and Coastal Tidal River or Stream) also are identified in the terrestrial and freshwater habitat categories, respectively. They are listed in both systems because of their importance to each ecosystem. Refer to FWC 2005 and Appendix E for more information regarding the formation and mapping of the habitat categories.

As with almost any habitat categorization, there are limitations associated with the classification system used for the Action Plan that should be considered in evaluating the following habitat chapters. These limitations include the following components:

- The natural environment of Florida is dynamic and complex, while the developed habitat categories are simplified and broad. Many exceptions to the category boundaries exist. For example, what is classified as a Spring upstream can be called a Calcareous Stream downstream and then a Softwater Stream farther downstream. Also, Sandhill can gradually grade into Mixed Hardwood-Pine Forest or Natural Pineland. The processes and functions of one habitat can feed another, such as
streams that feed into an estuary. Because the classification is divided at a broad, statewide level, these interconnecting aspects of ecology are sometimes obscured.

- The conservation needs of species associated with a particular habitat may not always be met by meeting the conservation needs of that habitat. Florida has chosen to take a habitat-based approach as the most efficient way to address the conservation needs of its large number of Species of Greatest Conservation Need (SGCN). However, while this approach will address many of the important issues facing Florida’s wildlife and maximize the benefit to the largest number of species, it should be recognized that some species will have specific conservation needs unrelated to habitat threats. In addition, the needs of some wide-ranging species will not be met entirely by actions in a single habitat.

- The maps used to represent habitat categories incorporate the most comprehensive GIS data available (FWC 2005). Despite this, the cover of many of the habitats does not accurately reflect their true spatial extent and/or configuration. The habitat maps are intended to be used as a general guide for the distribution of the habitat types in Florida.

All 45 habitat categories identified in the Action Plan are ecologically important; however, 18 habitats have been identified as being under the greatest overall threat (Tables 6A, 6B, 6C). These habitats, listed in alphabetical order, are generally associated with coastal, wetland, upland pine, springs, reef and seagrass areas:

1. Beach/Surf Zone
2. Bivalve Reef
3. Coastal Strand
4. Coastal Tidal River or Stream
5. Coral Reef
6. Dry Prairie
7. Freshwater Marsh and Wet Prairie
8. Inlet
9. Mangrove Swamp
10. Natural Pineland
11. Pine Rockland
12. Salt Marsh
13. Sandhill
14. Scrub
15. Seagrass
16. Softwater Stream
17. Spring and Spring Run
18. Tidal Flat

The relationships among habitat categories and associated threats may be visualized in tabular format. Three tables, one each for terrestrial (Table 6A), freshwater (Table 6B) and marine (Table 6C) habitat categories were created based on 12 Threat and Action Workshop sessions across Florida (FWC 2005). Ranking and evaluation of the habitat threat status is based on The Nature Conservancy’s (TNC) 5-S planning process (FWC 2005, Gordon et al. 2005). The overall threat rank was determined by a process that combined threat ranks across all habitat categories and was not simply a reflection of the highest threat rank within any habitat category (Low 2003). Therefore, several “low” scores could total to a “high” overall score, and different combinations of “low,” “medium,” “high” and “very high” scores could result in different overall threat ranks. Five habitat categories (Agriculture, Artificial Structure, Canal/Ditch, Disturbed/Transitional, Mixed Hardwood-Pine Forest and Urban/Developed) were not addressed through the Threat and Action Workshop process since they are not considered natural habitats.
Florida’s State Wildlife Action Plan
Terrestrial Habitat Categories

Figure 6A. Florida State Wildlife Action Plan Terrestrial Habitat Categories (FWC 2005 and Appendix C).

Chapter 6: Habitats
Table 6A. Overall threat rank across terrestrial habitat categories and collective threat status among terrestrial habitat categories.

<table>
<thead>
<tr>
<th>Threat Category</th>
<th>Threat Rank By Habitat Category</th>
<th>Overall Threat Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Habitat Category Threat Status</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bay Swamp</td>
<td>Beach/Surf Zone</td>
</tr>
<tr>
<td>1</td>
<td>Constriction to housing and urban development</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Constructions to commercial and industrial development</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Incompatible fire</td>
<td>Low</td>
</tr>
<tr>
<td>4</td>
<td>Incompatible recreational activities</td>
<td>Very High</td>
</tr>
<tr>
<td>5</td>
<td>Surface water withdrawal</td>
<td>Medium</td>
</tr>
<tr>
<td>6</td>
<td>Incompatible forestry practices</td>
<td>High</td>
</tr>
<tr>
<td>7</td>
<td>Conversion to agriculture</td>
<td>High</td>
</tr>
<tr>
<td>8</td>
<td>Invasive animals</td>
<td>Low</td>
</tr>
<tr>
<td>9</td>
<td>Snowline hardening</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Sea level rise</td>
<td>High</td>
</tr>
<tr>
<td>11</td>
<td>Constriction to recreation areas</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Groundwater withdrawal</td>
<td>Medium</td>
</tr>
<tr>
<td>13</td>
<td>Light pollution</td>
<td>High</td>
</tr>
<tr>
<td>14</td>
<td>Nutrient loads - agriculture</td>
<td>High</td>
</tr>
<tr>
<td>15</td>
<td>Utility corridors</td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td>Incompatible residential activities</td>
<td>-</td>
</tr>
<tr>
<td>17</td>
<td>Climate variability</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>Management of nature - retail reallocation and dredging</td>
<td>High</td>
</tr>
<tr>
<td>19</td>
<td>Military activities</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>Natural resource</td>
<td>-</td>
</tr>
<tr>
<td>21</td>
<td>Channel modification/ripping</td>
<td>-</td>
</tr>
<tr>
<td>22</td>
<td>Management of nature - stormwater facilities</td>
<td>-</td>
</tr>
<tr>
<td>23</td>
<td>Management of nature - dredge spoil deposition</td>
<td>-</td>
</tr>
<tr>
<td>24</td>
<td>Parasites/pathogens</td>
<td>-</td>
</tr>
<tr>
<td>25</td>
<td>Nutrient loads - urban</td>
<td>-</td>
</tr>
<tr>
<td>26</td>
<td>Management of nature - water control structures</td>
<td>-</td>
</tr>
<tr>
<td>27</td>
<td>Incompatible grazing and nesting</td>
<td>-</td>
</tr>
<tr>
<td>28</td>
<td>New dams</td>
<td>-</td>
</tr>
<tr>
<td>29</td>
<td>Incompatible agricultural practices</td>
<td>-</td>
</tr>
<tr>
<td>30</td>
<td>Incompatible vegetation harvest</td>
<td>-</td>
</tr>
<tr>
<td>31</td>
<td>Chemicals and toxics</td>
<td>-</td>
</tr>
<tr>
<td>32</td>
<td>Solid waste</td>
<td>-</td>
</tr>
<tr>
<td>33</td>
<td>Management of nature - beach raking</td>
<td>-</td>
</tr>
<tr>
<td>34</td>
<td>Incompatible wild animal harvest</td>
<td>-</td>
</tr>
<tr>
<td>35</td>
<td>Humidity and temperature changes</td>
<td>-</td>
</tr>
<tr>
<td>36</td>
<td>Land operations</td>
<td>-</td>
</tr>
<tr>
<td>37</td>
<td>Degraded habitat</td>
<td>-</td>
</tr>
<tr>
<td>38</td>
<td>Altered wind due to buildings</td>
<td>-</td>
</tr>
<tr>
<td>39</td>
<td>Management of nature - renourishment</td>
<td>-</td>
</tr>
<tr>
<td>40</td>
<td>Management of nature - driving for maintenance</td>
<td>-</td>
</tr>
<tr>
<td>41</td>
<td>Commercial/industrial/pronator tissue</td>
<td>-</td>
</tr>
</tbody>
</table>

Chapter 6: Habitats
Florida’s State Wildlife Action Plan
Freshwater Habitat Categories

Figure 6B. Florida State Wildlife Action Plan Freshwater Habitat Categories (FWC 2005 and Appendix C).

Note: Some habitat distributions or locations may be misrepresented on this map due to size, resolution, map overlay difficulties, and insufficient data sources.
Table 6B. Overall threat rank across freshwater habitat categories and collective threat status among freshwater habitat categories.

<table>
<thead>
<tr>
<th>Threat Category</th>
<th>Threat Rank By Habitat Category</th>
<th>Overall Threat Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aquatic Cave</td>
<td>Calcareous Stream</td>
</tr>
<tr>
<td>1 Invasive plants</td>
<td>-</td>
<td>High</td>
</tr>
<tr>
<td>2 Nutrient loads - urban</td>
<td>-</td>
<td>High</td>
</tr>
<tr>
<td>3 Surface water withdrawal</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4 Invasive animals</td>
<td>-</td>
<td>Medium</td>
</tr>
<tr>
<td>5 Nutrient loads - agriculture</td>
<td>-</td>
<td>High</td>
</tr>
<tr>
<td>6 Dam operations</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7 Conversion to housing and urban development</td>
<td>-</td>
<td>Medium</td>
</tr>
<tr>
<td>8 Channel modification/shipping lanes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9 Roads</td>
<td>-</td>
<td>Medium</td>
</tr>
<tr>
<td>10 Chemicals and toxins</td>
<td>-</td>
<td>Medium</td>
</tr>
<tr>
<td>11 Incompatible recreational activities</td>
<td>Medium</td>
<td>-</td>
</tr>
<tr>
<td>12 Conversion to commercial and industrial development</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>13 Management of nature - water control structures</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14 Conversion to agriculture</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15 Incompatible resource extraction: mining/drilling</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>16 Shoreline hardening</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>17 Management of nature - veg clearing/snagging for water conveyance</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>18 Groundwater withdrawal</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>19 Incompatible fire</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>20 Incompatible forestry practices</td>
<td>-</td>
<td>Low</td>
</tr>
<tr>
<td>21 Incompatible agricultural practices</td>
<td>-</td>
<td>Low</td>
</tr>
<tr>
<td>22 Incompatible construction practices</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>23 Conversion to recreation areas</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>24 Management of nature - aquatic plant treatment</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25 Sea level rise</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>26 Incompatible residential activities</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>27 Solid waste</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

Habitat Category Threat Status: Medium High Very High High High High Medium Very High Very High Very High
**Florida’s State Wildlife Action Plan**

**Marine Habitat Categories**

- Artificial Structure
- Coastal Tidal River or Stream**
- Seagrass
- Beach/Surf Zone *
- Hard Bottom
- Coral Reef
- Tidal Flat
- Salt Marsh
- Mangrove Swamp
- Inlet
- Annelid Reef
- Bivalve Reef

*This habitat type is also displayed on the Action Plan Terrestrial map
**This habitat type is also displayed on the Action Plan Freshwater map

Note: Some habitat distributions or locations may be misrepresented on this map due to size, resolution, map overlay difficulties, and insufficient data sources.

Figure 6C. Florida State Wildlife Action Plan Marine Habitat Categories (FWC 2005 and Appendix C).
### Table 6C. Overall threat rank across marine habitat categories and collective threat status among marine habitat categories.

<table>
<thead>
<tr>
<th>Threat Category</th>
<th>Threat Rank By Habitat Category</th>
<th>Overall Threat Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Arid/Rock Reef</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beach/Surf Zone</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bivalve Reef</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coastal Tidal River or Stream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coral Reef</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inlet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mangrove Swamp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hard Bottom</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pelagic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salt Marsh</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seagrass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subtidal Unconsolidated Marine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Estuarine Sediment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tidal Flat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All Habitat Categories</td>
<td></td>
</tr>
<tr>
<td>1. Coastal development</td>
<td>High</td>
<td>Very High</td>
</tr>
<tr>
<td>2. Inadequate stormwater management</td>
<td>Very High</td>
<td>High</td>
</tr>
<tr>
<td>3. Dam operations/incompatible release of water (quantity, timing)</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>4. Incompatible industrial operations</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>5. Channel modifications/shipping lanes</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>6. Climate variability</td>
<td>Very High</td>
<td>Very High</td>
</tr>
<tr>
<td>7. Roads, bridges &amp; causeways</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>8. Management of nature (beach nourishment, impoundments)</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>9. Oil pipeline/groundcover</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>10. Harmful algal blooms</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>11. Invasive plants</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>12. Nutrient load (all sources)</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>13. Disruption of longshore transport of sediments</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>14. Invasive animals</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>15. Surface water withdrawal</td>
<td>Very High</td>
<td>High</td>
</tr>
<tr>
<td>16. Incompatible fishing pressure</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>17. Incompatible recreational activities</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>18. Chemicals &amp; toxics</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>19. Large industrial spills</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>20. Parasites/pathogens</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>21. Boating impacts</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>22. Key predator/prey losses</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>23. Fishing gear impacts</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>24. Groundwater withdrawal</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>25. Wildlife &amp; fisheries management</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>26. Utility corridors</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>27. Nessel impacts</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>28. Solid waste</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>29. Incompatible resource extraction/mining/drilling</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>30. Incompatible aquaculture operations</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>31. Marine pollution</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>32. Silt pollution</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>33. Placement of artificial structures</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>34. Incompatible aquaculture trade</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>35. Inadequate stormwater management</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>36. Thermal pollution</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>37. Military activities</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>


Chapter 6: Habitats
How to Use the Habitat Categories

This section is meant to be a brief guide of how to navigate and utilize the information contained within each of Florida’s 45 habitat categories, which are listed in alphabetical order as follows:

1. Agriculture 23. Industrial/Commercial Pineland
2. Annelid Reef 24. Inlet
3. Aquatic Cave 25. Large Alluvial Stream
4. Artificial Structure 26. Mangrove Swamp
5. Bay Swamp 27. Mixed Hardwood-Pine Forest
6. Beach/Surf Zone 28. Natural Lake
7. Bivalve Reef 29. Natural Pineland
8. Bottomland Hardwood Forest 30. Pelagic
10. Canal/Ditch 32. Reservoir/Managed Lake
11. Coastal Strand 33. Salt Marsh
12. Coastal Tidal River or Stream 34. Sandhill
13. Coral Reef 35. Scrub
15. Disturbed/Transitional 37. Seepage/Steephead Stream
16. Dry Prairie 38. Shrub Swamp
17. Freshwater Marsh and Wet Prairie 39. Softwater Stream
18. Grassland/Improved Pasture 40. Spring and Spring Run
20. Hardwood Hammock Forest 42. Terrestrial Cave
21. Hardwood Swamp/Mixed Wetland Forest 43. Tidal Flat
22. Hydric Hammock 44. Tropical Hardwood Hammock
24. Urban/Developed

Photos

The photos presented are a visual representation of the corresponding habitat category.

Distribution Map

The maps provided are the best available representation of where the habitat category generally occurs within Florida. These maps are a general visual representation and may not always be precisely accurate. In habitats where complete map data are not currently available, such as Hard Bottom and Pelagic, it is noted in the status section (see Status description below).

Status

The overall preliminary assessment of the condition and trend is summarized as a “status” for each habitat category. This rank represents an initial ecological assessment of a habitat from a statewide perspective. Total area, acres in conservation or private ownership, Florida Forever
projects, and ecological significance (area of Strategic Habitat Conservation Areas) that each comprises were derived principally from GIS data sources (Appendix C: GIS Data Tables). Florida Forever project acreages are those that are proposed conservation lands under the Florida Forever program. Strategic Habitat Conservation Areas (SHCA) are important uplands and wetlands that are currently not protected. Acreages of communities and disturbances are approximate, but provide a reasonable estimate.

**Habitat Description**

The description is intended to be a succinct yet comprehensive portrayal of the habitat type. Habitat categories are cross-walked with the widely known ecosystem classification scheme employed by FNAI as presented in the *Guide to the Natural Communities of Florida* (FNAI and Florida Department of Natural Resources 1990). The description and location of the community type presented for each habitat category was developed from a wide range of sources (see References/Literature Cited) and professional knowledge.

**Associated Species**

Within each habitat chapter, there is a list of SGCN associated with the corresponding habitat category. These associations were determined by the best available professional opinion. Species are in phylogenetic order and are separated by taxa group (mammals, birds, amphibians, reptiles, fish and invertebrates). Detailed information about the process of identifying the list of 1036 SGCN can be found in Chapter 3: SGCN.

**Conservation Threats**

For the purposes of the Action Plan, the term ‘source of stress’ is used synonymously with the term ‘threat’. The first set of threats listed for each habitat are statewide threats that are fully addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. Next, there is a short evaluation of the threats specific to the habitat. This discussion is based on the threats that are most important to that particular habitat and the species it contains. Accompanying each assessment are two tables illustrating the results of TNC’s threat analysis for the habitat. Threats were divided into two parts by TNC’s 5-S planning process (FWC 2005, Gorden et al. 2005, and Appendix E):

- **Stress** – the factors that destroy, degrade or impair habitats by impacting variables associated with habitat size, condition or configuration in the landscape

- **Source of stress** – the proximate cause of the stress.

Each stress is assigned a letter and a rank. Stresses are ranked in terms of the potential severity of damage to the habitat and the geographic scope of that damage. Only those stresses that had an overall rank of very high or high were further addressed in the source of stress analysis.

Each source is given a number, a rank, and a list of stresses it causes from the first table. Sources are ranked in terms of the degree to which they contribute to the stress, and the
irreversibility of the stress caused by the source. Overall stress and source of stress rankings are combined to derive a statewide threat rank of the habitat.

Understanding the sources that contribute the greatest proportion of the particular stress will help focus and prioritize action that should be undertaken to abate the threat. Multiple sources generally contribute to a particular stress, and a single source may contribute to several stresses. Therefore, examination and ranking of sources aids in further focusing attention on the most critical conservation actions.

**Conservation Actions**

The conservation actions that were common to the current and multiple other habitats are found in Chapter 7: Multiple Habitat Threats and Conservation Actions. This section includes tables for each threat that is specific to the current habitat. Based on TNC’s 5-S planning process (FWC 2005, Gorden et al. 2005, and Appendix E), the conservation actions for these specific threats are displayed as tables with the rankings of very high (VH), high (H), medium (M), or low (L) for the following categories:

- Feasibility – the ease of implementation
- Benefit – the degree to which the proposed action, if successfully implemented, is likely to achieve the desired outcome(s)
- Cost – total cost of implementing the action based on the time required for the action, but no longer than 10 years
- Overall rank – the average weighted rank combining feasibility and benefits
Agriculture

Status
Current condition: Fair and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 3,101,742 acres (1,255,230 ha) of Agriculture habitat exist. An unknown amount of this habitat is protected in reserves and easements. The majority is other private lands.

Habitat Description

FNAI type: None

This category includes lands which are planted to sugar cane, citrus groves, row crops (e.g., corn, tomatoes, potatoes, cotton, beans), field crops (e.g., hay and grasses), and other agricultural uses (e.g., orchards, nurseries, vineyards, horse and dairy farms, and fallow cropland). In most agricultural areas both the natural substrates and native plant communities have been greatly disturbed as a result of human activities. At the margins of Agriculture habitat, some patches of native vegetation may remain, but those areas often have been invaded to some degree by weedy or exotic species. Pastures and hayfields may provide secondary habitat for some wildlife species adapted to similar natural ecosystems. When managed appropriately, Agriculture habitat can provide food resources for migratory birds and other wildlife. Wildlife movements benefit from row crops and groves that can contribute to a network of continuous habitat.
## Associated Species of Greatest Conservation Need

### Mammals
- **Eptesicus fuscus** (Big Brown Bat)
- **Lasiurus borealis borealis** (Red Bat)
- **Lasiurus intermedius floridanus** (Northern Yellow Bat)
- **Lasiurus seminolus** (Seminole Bat)
- **Tadarida brasiliensis cynocephala** (Brazilian Free-tailed Bat)
- **Geomys pinetis pinetis** (Southeastern Pocket Gopher)
- **Neofiber alleni ssp.** (Round-tailed Muskrat)
- **Sciurus niger niger** (Southeastern Fox Squirrel)
- **Sciurus niger shermani** (Sherman's Fox Squirrel)
- **Mustela frenata olivacea** (Southeastern Weasel)
- **Mustela frenata peninsulae** (Florida Long-tailed Weasel)
- **Puma concolor coryi** (Florida Panther)
- **Spilogale putorius ssp.** (Spotted Skunk)
- **Ursus americanus floridanus** (Florida Black Bear)

### Birds
- **Anas rubripes** (American Black Duck)
- **Anas fulvigula** (Mottled Duck)
- **Mycteria americana** (Wood Stork)
- **Egretta thula** (Snowy Egret)
- **Egrettca caerulea** (Little Blue Heron)
- **Egretta tricolor** (Tricolored Heron)
- **Egretta rufescens** (Reddish Egret)
- **Nycticorax nycticorax** (Black-crowned Night-Heron)
- **Nyctanassa violacea** (Yellow-crowned Night-Heron)
- **Eudocimus albus** (White Ibis)
- **Plegadis falcinellus** (Glossy Ibis)
- **Platalea ajaja** (Roseate Spoonbill)
- **Elanoides forficatus** (Swallow-tailed Kite)
- **Elanus leucurus** (White-tailed Kite)
- **Ictinia mississippiensis** (Mississippi Kite)
- **Haliaeetus leucocephalus** (Bald Eagle)
- **Caracara cheriway audubonii** (Audubon's Crested Caracara)
- **Falco sparverius paulus** (Southeastern American Kestrel)
- **Falco peregrinus** (Peregrine Falcon)
- **Grus canadensis tabida** (Sandhill Crane (Greater))
- **Grus canadensis pratensis** (Florida Sandhill Crane)
- **Grus americana** (Whooping Crane)
- **Pluvialis squatarola** (Black-bellied Plover)
- **Pluvialis dominica** (American Golden-Plover)
- **Recurvirostra americana** (American Avocet)
- **Tringa solitaria** (Solitary Sandpiper)
- **Tringa flavipes** (Lesser Yellowlegs)
- **Bartramia longicauda** (Upland Sandpiper)
- **Numenis americanus** (Long-billed Curlew)
- **Calidris mauri** (Western Sandpiper)
- **Calidris melanotos** (Pectoral Sandpiper)
- **Calidris alpina** (Dunlin)
- **Tryngites subruficollis** (Buff-breasted Sandpiper)
Conservation Threats

While threats to its conservation as well as remedial actions were identified during earlier workshops, the Agriculture habitat category was not addressed in the TNC workshops that generated tables of ranked threats and actions, as seen in most other habitat categories. The decision to not rank threats and actions for this habitat was made (1) to maximize discussion time for higher-priority habitats and (2) because of some disagreement over recognition of this habitat type as important to wildlife conservation. Therefore, threats and actions are presented as simple bulleted lists, arranged in alphabetical order, with no prioritization.
The following stresses threaten this habitat:
- Altered community structure
- Altered fire regime—timing, frequency, intensity, extent
- Altered hydrologic regime—timing, duration, frequency, extent
- Altered landscape pattern or mosaic
- Altered soil structure & chemistry
- Altered species composition/dominance
- Altered successional dynamics
- Altered water and/or soil temperature
- Altered water quality of surface water or aquifer: contaminants
- Altered water quality of surface water or aquifer: nutrients
- Erosion/sedimentation
- Excessive depredation and/or parasitism
- Fragmentation of habitats, communities, ecosystems
- Habitat degradation/disturbance

The sources of stress, or threats, were used to generate conservation actions:

- Chemicals and toxins
- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Incompatible fire
- Incompatible recreational activities
- Invasive animals
- Invasive plants
- Management of nature impoundments
- Nuisance animals
- Nutrient loads
- Parasites/pathogens
- Solid waste

**Conservation Actions**

Actions to abate threats to Agriculture were designed to reduce the impacts of agricultural activities and increase the habitat’s suitability to wildlife. Many threats were statewide (chemicals and toxins, conversion to commercial and industrial development, conversion to housing and urban development, incompatible fire, incompatible recreational activities, invasive animals, invasive plants, and nutrient loads).

The actions to abate threats that were identified for Agriculture are below, though none were prioritized for implementation.

**Land/Water Protection**
- Acquire open space with an emphasis on greenways and network of contiguous habitats
- Conserve wildlife-suitable agricultural lands through conservation easements

**Land/Water/Species Management**
- Restore hydrology by removing ditches, levees, and dams
- Better fire management of rangelands
- Control exotic plants and animals
- Develop and follow Best Management Practices (BMPs)
- Enroll lands in landowner incentive programs
• Reduce amount of pesticide and fertilizer use

**Research, Education and Awareness**

• Increase public/private training and awareness about value of these lands
• Continue to educate landowners about the proper use of BMPs
• Research plans for restoration of this habitat and its hydrology
• Research and educate landowners about management practices for controlling invasive species

**Economic and Other Incentives**

• Provide landowner incentive (public and private) for protection and restoration of habitat

**Capacity Building**

• Form and facilitate partnerships, alliances and networks of organizations willing to research, conserve, and manage this habitat
Status
Current condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), approximately 426 acres (172 ha) of Annelid Reefs are present in Florida.

Habitat Description

**FNAI type:** Worm Reef

Annelid Reefs are formed by aggregations of *Phragmatopoma lapidosa* (also known as *P. caudata* and *P. lapidosa lapidosa*), a tropical marine worm, that create low reefs of sand tubes. These tubes consist of sand grains which are cemented together by protein produced by the worms. *Phragmatopoma* reproduce by releasing gametes into the water column. The free-floating larval stage can last from two to 20 weeks before they settle on or near existing Annelid Reefs that may result in habitat expansion. Waves and currents are important in transporting planktonic food and sand to the worms, thus influencing the health and growth of the reef. These reefs harbor a diverse community of live-bottom flora and fauna. Annelid Reefs provide a nursery for a variety of coastal fish and invertebrate species.

Annelid Reefs extend from Cape Canaveral to Key Biscayne in Florida but extend southward to near Santa Catarina, Brazil. In Florida, they occur in the highest abundances off St. Lucie and Martin counties. They are commonly found in the intertidal and shallow subtidal zone to about 10 m (33 ft) deep.
Associated Species of Greatest Conservation Need

Mammals
- *Trichechus manatus latirostris*  West Indian Manatee

Reptiles
- *Caretta caretta*  Loggerhead Sea Turtle
- *Chelonia mydas*  Green Sea Turtle
- *Eretmochelys imbricata*  Hawksbill Sea Turtle
- *Lepidochelys kempii*  Kemp's Ridley Sea Turtle

Fish
- *Acipenser oxyrinchus desotoi*  Gulf of Mexico Sturgeon
- *Acipenser oxyrinchus oxyrinchus*  Atlantic Sturgeon
- *Alosa aestivalis*  Blueback Herring
- *Alosa alabamae*  Alabama Shad
- *Aetobatus narinari*  Spotted Eagle Ray
- *Alopias superciliosus*  Bigeye Thresher Shark
- *Carcharhinus obscurus*  Dusky Shark
- *Carcharhinus perezi*  Reef Shark
- *Carcharhinus plumbeus*  Sandbar Shark
- *Carcharias taurus*  Sand Tiger Shark
- *Carcharodon carcharias*  White Shark
- *Galeocerdo cuvier*  Tiger Shark
- *Negaprion brevirostris*  Lemon Shark
- *Sphyraena lewini*  Scalloped Hammerhead
- *Sphyra mokarran*  Great Hammerhead
- *Sphyra zygaena*  Smooth Hammerhead
- *Squalus acanthias*  Cape Shark, Piked Dogfish, Spurdog
- *Bairdiella sanctaeluciae*  Striped Croaker
- *Epinephelus drummondhayi*  Speckled Hind
- *Epinephelus itajara*  Goliath Grouper
- *Epinephelus nigritus*  Warsaw Grouper
- *Epinephelus striatus*  Nassau Grouper

Invertebrates
- *Diadema antillarum*  Long-spined Urchin

Conservation Threats

Threats to the Annelid Reef habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Climate variability
- Coastal development
- Dam operations/incompatible release of water (quality, quantity, timing)
- Disruption of longshore transport of sediments
- Fishing gear impacts
- Incompatible industrial operations
- Incompatible recreational activities
• Management of nature (beach nourishment and impoundments)
• Shoreline hardening

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered structure</td>
<td>Very High</td>
</tr>
<tr>
<td>B Altered weather regime/sea level rise</td>
<td>High</td>
</tr>
<tr>
<td>C Habitat destruction</td>
<td>High</td>
</tr>
<tr>
<td>D Habitat disturbance</td>
<td>High</td>
</tr>
<tr>
<td>E Sedimentation</td>
<td>High</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Climate variability</td>
<td>High</td>
<td>A, B</td>
</tr>
<tr>
<td>2 Coastal development</td>
<td>High</td>
<td>A, C</td>
</tr>
<tr>
<td>3 Management of nature (beach nourishment, impoundments)</td>
<td>High</td>
<td>A, C, D, E</td>
</tr>
<tr>
<td>4 Channel modification/shipping lanes</td>
<td>High</td>
<td>A, C, D</td>
</tr>
<tr>
<td>5 Incompatible industrial operations</td>
<td>High</td>
<td>A, D</td>
</tr>
<tr>
<td>6 Utility corridors</td>
<td>Medium</td>
<td>A, C</td>
</tr>
<tr>
<td>7 Disruption of longshore transport of sediments</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>8 Dam operations/incompatible release of water:</td>
<td>Medium</td>
<td>D</td>
</tr>
<tr>
<td>(quality, quantity, timing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Placement of artificial structures</td>
<td>Low</td>
<td>A, C</td>
</tr>
<tr>
<td>10 Fishing gear impacts</td>
<td>Low</td>
<td>C, D</td>
</tr>
<tr>
<td>11 Incompatible recreational activities</td>
<td>Low</td>
<td>D</td>
</tr>
<tr>
<td>12 Shoreline hardening</td>
<td>Low</td>
<td>C</td>
</tr>
<tr>
<td>13 Inadequate stormwater management</td>
<td>Low</td>
<td>D</td>
</tr>
<tr>
<td>14 Boating impacts</td>
<td>Low</td>
<td>C</td>
</tr>
</tbody>
</table>

| Statewide Threat Rank of Habitat                       | High                |

Conservation Actions

Actions to abate the threats to Annelid Reef habitats that were also identified as statewide threats (see list above), are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Many of the threats to Annelid Reefs are the same as for several other marine and estuarine habitats. Consequently, actions to abate these threats will be the same or similar to the actions recommended for abating threats to several other marine and estuarine habitats (e.g., Seagrass, Mangrove Swamp, Coral Reef, and Beach/Surf Zone).
Aquatic Cavves

Status
Current condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 84 Aquatic Caves are included here. This represents only a fraction of all caves that have been identified. Of the mapped aquatic caves, 29% (24) are in existing conservation or managed areas, 5% (4) are within lands covered by Florida Forever projects, 1% (1) are in SHCA-identified lands, and the remaining 65% (55) of Aquatic Caves are within other private lands.

Habitat Description

FNAI type: Aquatic Cave

Aquatic Caves are cavities below the surface of the ground that contain permanent standing water and range from shallow pools to completely inundated caverns. Caves develop in areas of karst topography, as water moves through underlying limestone, dissolving it and creating fissures and caverns. Due to the rise and fall of water levels, many Aquatic Caves have alternately been terrestrial caves. Some Aquatic Caves occur in conjunction with springs. Caves have stable internal environments with temperature, humidity, and water conditions remaining fairly constant. Cave waters are usually clear, and deep water often appears blue. The water may take on a brown stain if decaying plant matter is carried in with rainwater; in some areas the water may have a milky appearance because fine limestone silt is present. The chemical makeup of the water in caves is dependent on the source; most waters in aquatic caves have a high mineral content. Many Aquatic
Cave systems have species that are specifically adapted to and endemic in that system, and are therefore at greater risk from even minute changes in the habitat.

**Associated Species of Greatest Conservation Need**

**Mammals**
- *Myotis austroriparius* Southeastern Myotis
- *Myotis grisescens* Gray Bat
- *Perimyotis subflavus* Tricolored Bat

**Amphibians**
- *Eurycea wallacei* Georgia Blind Salamander

**Fish**
- *Anguilla rostrata* American Eel

**Invertebrates**
- *Villosa amygdala* Florida Rainbow
- *Dasycias franzi* Shaggy Ghostsnail
- *Crangonyx grandimanus* Florida Cave Amphipod
- *Crangonyx hobbsi* Hobbs' Cave Amphipod
- *Strygobromus sp. 25* An Aquatic Cave Amphipod
- *Caecidotea hobbsi* Florida Cave Isopod
- *Caecidotea sp. 7* Rock Springs Cave Isopod
- *Caecidotea sp. 8* Econfina Springs Cave Isopod
- *Remasellus parvus* Swimming Little Florida Cave Isopod
- *Cambarus cryptodytes* Dougherty Plain Cave Crayfish
- *Procambarus acherontis* Orlando Cave Crayfish
- *Procambarus attigua* Silver Glen Springs Cave Crayfish
- *Procambarus delicatus* Big-cheeked Cave Crayfish
- *Procambarus erythrops* Santa Fe Cave Crayfish
- *Procambarus frani* Orange Lake Cave Crayfish
- *Procambarus horsti* Big Blue Spring Cave Crayfish
- *Procambarus leitheuseri* Coastal Lowland Cave Crayfish
- *Procambarus lucifugus* Light-fleeing Cave Crayfish
- *Procambarus milleri* Miami Cave Crayfish
- *Procambarus morrisi* Putnam County Cave Crayfish
- *Procambarus orcinus* Woodville Karst Cave Crayfish
- *Procambarus pallidus* Pallid Cave Crayfish
- *Troglocambarus macalanei* North Florida Spider Cave Crayfish
- *Troglocambarus sp. 1* Orlando Spider Cave Crayfish
- *Palaemonetes cummingi* Squirrel Chimney Cave Shrimp
Conservation Threats

Threats to the Aquatic Cave habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Incompatible recreational activities
- Incompatible resource extraction: mining/drilling

Threats specific to Aquatic Caves also included mining activities causing destruction of critical, irreplaceable habitat. Habitat-specific incompatible recreation includes gating cave entrances and filling in cave openings to prevent trespass from unauthorized recreation. Caves support unique/irreplaceable species and those with very unique adaptations that may be sensitive to small increases in levels of contaminants, shifts in dissolved oxygen, temperature, or food webs.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Habitat destruction or conversion</td>
<td>Medium</td>
</tr>
<tr>
<td>B Habitat degradation/disturbance</td>
<td>Medium</td>
</tr>
<tr>
<td>C Altered species composition/dominance</td>
<td>Medium</td>
</tr>
<tr>
<td>D Altered hydrologic regime</td>
<td>Medium</td>
</tr>
<tr>
<td>E Keystone species missing or lacking in abundance</td>
<td>Medium</td>
</tr>
<tr>
<td>F Erosion/sedimentation</td>
<td>Low</td>
</tr>
<tr>
<td>G Altered water quality or surface water or aquifer: contaminants</td>
<td>Low</td>
</tr>
<tr>
<td>H Altered community structure</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Incompatible recreational activities</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>2 Incompatible resource extraction: mining/drilling</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>3 Solid waste</td>
<td>Low</td>
<td>A</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat | Medium |

Conservation Actions

Actions to abate the threats to Aquatic Caves that were also identified as statewide threats (incompatible recreational activities, incompatible resource extraction: mining/drilling) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for statewide threats were only applicable to Aquatic Cave and a few other habitats (i.e., Calcareous Stream, Cypress Swamp, Freshwater Marsh and Wet Prairie, Natural Lake, Reservoir/Managed Lake, Seepage/Steephead Stream, Softwater Stream,
Spring and Spring Run, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. These actions are intended to prevent harm to cave and other ecosystems influenced by groundwater by developing numeric nutrient criteria specific to cave systems and to prevent physical destruction or degradation of cave habitat from recreational activities (e.g., diving) and facilitate movement of bats and other species through upgrading or retrofitting cave entrances and infrastructure for access.

**Incompatible Recreational Activities**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Discourage hard-gating or filling of cave or sink entrances and provide incentives (e.g., liability limitations where appropriate management procedures have been taken), cost-sharing, or design advice to secure cave entrances with bat-friendly gates.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Upgrade access infrastructure (e.g., boardwalks, planking) to aquatic caves to eliminate sediment disturbance by divers and spelunkers.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

**Incompatible Resource Extraction: Mining/Drilling**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create incentives to avoid loss of, and impacts to, SHCAs and sensitive habitats from mining, particularly wet and dry prairie, scrub, and bat caves.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>
Artificial Structure

Status
Current condition: Unknown.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), over 2,000 artificial reefs and 4,368 miles (7,030 km) of hardened shoreline are known to exist.

Habitat Description

FNAI type: None

This artificial habitat is comprised of two major types of man-made structures in marine and estuarine waters–artificial reefs and hardened shorelines. Both of these structures create “Hard Bottom” habitat but after the initial deployment they typically are not actively managed as a habitat. There are multiple research and monitoring programs focusing on the impacts and benefits of these artificial habitats.

Artificial reefs are created to increase reef fish habitat, enhance recreational fishing and diving opportunities, provide socio-economic benefits to local coastal communities, and facilitate reef fish related research. Florida has one of the most active artificial reef programs among the 14 Gulf and Atlantic states involved in this activity. Thirty-four of 35 Florida coastal counties are or have been involved in artificial reef development, most of which has occurred in the last 20 years. Approximately 30 to 50 artificial reefs are constructed annually off Florida using a combination of federal, state, local, and private funds.

Hardened shorelines differ from artificial reefs in that they are a result of coastal development. Hardened shorelines include rip-rap and other types of coastal armoring as well as breakwaters, piers, and docks. These structures may also provide habitat for some sessile bivalves,
crustaceans, and limited fish communities. In many cases they can negatively impact wildlife such as nesting sea turtles and shore birds, alter natural marine and estuarine shoreline processes, and alter or replace naturally-occurring coastal habitats such as marsh, beach, and dune.

Herein the term “Artificial Structure” includes structures (artificial reefs) specifically designed and placed to enhance natural populations of species associated with hard bottom and/or reef substrates as well as structures (breakwaters, seawalls) designed to moderate or eliminate natural coastal processes such as erosion. As artificial reefs are considered a tool for management (restoration or enhancement) of species associated with hard bottom or reef habitats, future versions of the Action Plan should evaluate the management implications of artificial structures.

**Associated Species of Greatest Conservation Need**

**Mammals**
- *Trichechus manatus latirostris*  
  West Indian Manatee

**Birds**
- *Pelecanus occidentalis*  
  Brown Pelican
- *Pandion haliaetus*  
  Osprey
- *Haematopus palliatus*  
  American Oystercatcher
- *Chaetura pelágica*  
  Chimney Swift
- *Progne subis*  
  Purple Martin
- *Hirundo rustica*  
  Barn Swallow

**Reptiles**
- *Caretta caretta*  
  Loggerhead Sea Turtle
- *Eretmochelys imbricata*  
  Hawksbill Sea Turtle
- *Lepidochelys kempii*  
  Kemp's Ridley Sea Turtle

**Fish**
- *Alosa aestivalis*  
  Blueback Herring
- *Alosa alabamae*  
  Alabama Shad
- *Aetobatus narinari*  
  Spotted Eagle Ray
- *Alopias superciliosus*  
  Bigeye Thresher Shark
- *Carcharhinus obscurus*  
  Dusky Shark
- *Carcharhinus perezi*  
  Reef Shark
- *Carcharhinus plumbeus*  
  Sandbar Shark
- *Carcharias taurus*  
  Sand Tiger Shark
- *Carcharodon carcharias*  
  White Shark
- *Galeocerdo cuvier*  
  Tiger Shark
- *Negaprion brevirostris*  
  Lemon Shark
- *Pristis pectinata*  
  Smalltooth Sawfish
- *Pristis pristis*  
  Largetooth Sawfish
- *Sphyra lewini*  
  Scalloped Hammerhead
- *Sphyra mokarran*  
  Great Hammerhead
- *Sphyra zygaena*  
  Smooth Hammerhead
- *Squalus acantthias*  
  Cape Shark, Piked Dogfish, Spurdog
- *Bairdiella sanctaeluciae*  
  Striped Croaker
- *Epinephelus drummondhayi*  
  Speckled Hind
- *Epinephelus itajara*  
  Goliath Grouper
Chapter 6: Habitats - Artificial Structure

**Epinephelus nigritus** Warsaw Grouper
**Epinephelus striatus** Nassau Grouper

**Invertebrates**
- *Crassostrea virginica* Eastern Oyster

**Conservation Threats**

While threats to its conservation as well as remedial actions were identified during Action Plan Science Workshops I and II, the Artificial Structure habitat category was not addressed in TNC workshops that generated tables of ranked threats and actions, as seen in most other habitat categories. The decision to not rank threats and actions for this habitat was made to maximize discussion time for higher-priority habitats and because of some disagreement over recognition of this habitat type as important to wildlife conservation. Therefore, threats and actions are presented as bulleted lists with no prioritization.

The following stresses threaten this habitat:

- Absent to insufficient biological legacies
- Altered community structure
- Altered hydrologic regime—timing, duration, frequency, extent
- Altered species composition/dominance
- Altered successional dynamics
- Altered water and/or soil temperature
- Altered water quality of surface water or aquifer: contaminants
- Altered water quality of surface water or aquifer: nutrients
- Erosion/sedimentation
- Excessive depredation and/or parasitism
- Fragmentation of habitats, communities, ecosystems
- Habitat degradation/disturbance
- Keystone species missing or lacking in abundance
- Missing key communities, functional guilds, or seral stages

The following sources of stress, or threats, were used to generate conservation actions:

- Acoustic pollution
- Chemicals and toxins
- Coastal development
- Disruption of longshore transport of sediments
- Fishing gear impacts
- Harmful algal blooms
- Inadequate stormwater management
- Incompatible fishing pressure
- Incompatible recreational activities
- Incompatible wildlife and fisheries management strategies
- Invasive animals
- Invasive plants
- Management of nature—beach nourishment and impoundments
- Nuisance animals
- Nutrient loads—urban
- Parasites/pathogens
- Roads, bridges, and causeways
- Shoreline hardening
- Solid waste
Conservation Actions

Actions to abate threats to Artificial Structure were largely designed to reduce the impacts of urban activities, and to increase the habitat’s suitability to wildlife. Most of the threats to this habitat (see list above) were also identified for multiple other habitats, and are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. Exceptions are acoustic pollution, nuisance animals, and solid waste.

The actions to abate threats that were identified for Artificial Structure habitat are below, though none were prioritized for implementation.

**Law and Policy**
- Encourage coastal development planning that minimizes the demand for shoreline hardening
- Institute seafloor management planning for wildlife habitat retention
- Support policies that reduce waste and increase ease of recycling (e.g., monofilament collection and recycling, municipal composting, water reuse, and curbside recycling)

**Research, Education and Awareness**
- Continue to investigate effects of artificial reefs on fish population dynamics
- Develop effective erosion control structures that minimize impacts to marine environment
- Target education for homeowners, developers, construction contractors, and policy makers to benefit wildlife in their day-to-day activities
- Involve community volunteers in wildlife conservation efforts and increase their opportunities for involvement
- Educate homeowners about proper pesticide and fertilizer use and disposal

**Economic and Other Incentives**
- Provide awards to municipalities, organizations, and individuals that implement wildlife-friendly design and management practices
- Provide funds and materials for landowners to remove invasive exotics (e.g., commensal rats, Brazilian pepper, etc)
- Support spay or neuter programs for cats and dogs and reduce number of free-ranging pets
Status
Current condition: Unknown.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 201,765 acres (81,651 ha) of Bay Swamp habitat exist, of which 32% (65,570 ac; 26,535 ha) are in existing conservation or managed areas. Another 14% (27,471 ac; 11,117 ha) are Florida Forever projects and 7% (13,486 ac; 5,458 ha) are SHCA-identified lands. The remaining 47% (95,238 ac; 38,541 ha) are other private lands.

Habitat Description

FNAI type: Baygall, Bog

These hardwood swamps contain broadleaf evergreen trees that occur in shallow, stagnant drainages or depressions often found within pine flatwoods, or at the base of sandy ridges where seepage maintains constantly wet soils. Where Bay Swamp occurs in seepage areas it is often associated with or grades into Seepage/Steephead Stream habitat. The soils, which are usually covered by an abundant layer of leaf litter, are mostly acidic peat or muck that remains saturated for long periods but over which little water level fluctuation occurs.

The overstory within bayheads primarily is composed of evergreen hardwood trees, but bay trees, especially sweetbay, red bay, and loblolly bay, dominate the canopy and characterize the community. Depending on the location within the state, other species including pond pine, slash pine, blackgum, cypress, and Atlantic white cedar can occur as scattered individuals. Understory
and ground cover species may include dahoon holly, wax myrtle, fetterbush, greenbriar, royal fern, cinnamon fern, and sphagnum moss.

### Associated Species of Greatest Conservation Need

#### Mammals
- *Corynorhinus rafinesqui*: Rafinesque's Big-eared Bat
- *Lasiurus borealis borealis*: Red Bat
- *Lasiurus seminolus*: Seminole Bat
- *Lontra canadensis lataxina*: River Otter
- *Neovison vison evergladensis*: Everglades Mink
- *Neovison vison ssp.*
- *Puma concolor coryi*: Florida Panther
- *Ursus americanus floridanus*: Florida Black Bear

#### Birds
- *Mycteria americana*: Wood Stork
- *Haliaeetus leucocephalus*: Bald Eagle
- *Buteo brachyurus*: Short-tailed Hawk
- *Falco peregrinus*: Peregrine Falcon
- *Vermivora chrysoptera*: Golden-winged Warbler
- *Vermivora cyanoptera*: Blue-winged Warbler
- *Setophaga ruticilla*: American Redstart
- *Setophaga castanea*: Bay-breasted Warbler
- *Setophaga dominica stoddardi*: Stoddard's Yellow-throated Warbler
- *Setophaga discolor discolor*: Prairie Warbler
- *Euphagus carolinus*: Rusty Blackbird

#### Amphibians
- *Hyla andersonii*: Pine Barrens Treefrog
- *Lithobates virgatipes*: Carpenter Frog
- *Amphiuma pholeter*: One-toed Amphiuma
- *Desmognathus auriculatus*: Southern Dusky Salamander
- *Eurycea chamberlaini*: Chamberlain's Dwarf Salamander
- *Hemidactylium scutatum*: Four-toed Salamander
- *Notophthalmus perstriatus*: Striped Newt
- *Stereochilus marginatus*: Many-lined Salamander

#### Reptiles
- *Alligator mississippiensis*: American Alligator
- *Plestiodon anthracinus pluvialis*: Southern Coal Skink
- *Crotalus horridus*: Timber Rattlesnake
- *Drymarchon couperi*: Eastern Indigo Snake
- *Farancia erytrogramma*: Rainbow Snake
- *Lampropeltis getula*: Eastern Kingsnake
- *Clemmys guttata*: Spotted Turtle
- *Deirochelys reticularia*: Chicken Turtle
- *Terrapene carolina*: Eastern Box Turtle

#### Invertebrates
- *Amblyscirtes aesculapius*: Lace-winged Roadside Skipper
Conservation Threats

Threats to Bay Swamp habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to agriculture
- Conversion to housing and urban development
- Groundwater withdrawal
- Incompatible fire
- Invasive animals
- Invasive plants
- Surface water withdrawal and diversion
- Roads

Threats specific to Bay Swamp included loss and degradation that occurs when this habitat is surrounded by development, eutrophication impacts when water from agricultural or developed landscapes is drained into these swamps, and insufficient fire. These impacts have allowed Bay Swamp to expand into areas that were once herbaceous seepage communities, replacing herbaceous wetlands with closed-canopy forested wetlands.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Altered landscape mosaic or context</td>
</tr>
<tr>
<td>B</td>
<td>Altered species composition/dominance</td>
</tr>
<tr>
<td>C</td>
<td>Fragmentation of habitats, communities, ecosystems</td>
</tr>
<tr>
<td>D</td>
<td>Altered hydrologic regime</td>
</tr>
<tr>
<td>E</td>
<td>Altered soil structure and chemistry</td>
</tr>
<tr>
<td>F</td>
<td>Altered fire regime</td>
</tr>
<tr>
<td>G</td>
<td>Altered community structure</td>
</tr>
<tr>
<td>H</td>
<td>Altered water quality of surface water or aquifer: nutrients</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Invasive plants</td>
<td>High</td>
</tr>
</tbody>
</table>

Chapter 6: Habitats - Bay Swamp
### Conservation Actions

Actions to abate the threats to Bay Swamp habitat that were also identified as statewide threats are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Bay Swamp and other freshwater habitats are below, though none were ranked of high priority for implementation. These actions were designed to reduce the degrading impacts of agriculture and development, and increase fire management of this habitat.

#### Conversion to Agriculture

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create voluntary incentives for maintenance and conversion of lands to agricultural uses that use less water and result in lower nutrient outputs into Florida's waters and wetlands and create market-based incentives to compensate private landowners for the environmental services they provide to the state through management that increases water storage and nutrient reduction.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

#### Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Provide voluntary tax or other incentives, such as density transfers, for environmentally friendly comprehensive development plans for projects that front on rivers, and floodplains that would commit river frontage and riparian habitats to permanent conservation zones.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>
Status
Current condition: Good and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 32,295 acres (13,069 ha) of Beach/Surf Zone habitat exist, of which 46% (14,858 ac; 6,013 ha) are in existing conservation or managed areas. Another 1% (312 ac; 126 ha) are Florida Forever projects and 5% (1,473 ac; 596 ha) are SHCA-identified lands. The remaining 48% (15,652 ac; 6,334 ha) are other private lands.

Habitat Description

FNAI type: Beach Dune

The Beach/Surf Zone is the long, often narrow strip of sand and shells between the tides. Daily flooding by salt water and moderate- to high-energy waves prohibit plant growth except for some inconspicuous algae. Low-energy beaches provide important spawning habitat for horseshoe crabs and feeding habitat for multiple species of shorebirds. Beach dunes are mounds of wind-blown sand that are periodically inundated by seawater during extreme high tides and storms. Vegetation on beach dunes varies regionally in Florida but is restricted to a few highly specialized terrestrial plants.

Florida beaches are important nesting sites for several species of shorebirds and wintering grounds for others. Beaches are also vital nesting sites for many sea turtles and support numerous other mammals and invertebrates. The surf zone is an important nursery and feeding habitat for many species of fish including permit and Florida pompano.
Associated Species of Greatest Conservation Need

**Mammals**
- *Peromyscus polionotus allophrys* - Choctawhatchee Beach Mouse
- *Peromyscus polionotus leucocephalus* - Santa Rosa Beach Mouse
- *Peromyscus polionotus niveiventris* - Southeastern Beach Mouse
- *Peromyscus polionotus peninsularis* - St. Andrew Beach Mouse
- *Peromyscus polionotus phasma* - Anastasia Island Beach Mouse
- *Peromyscus polionotus trissylepsis* - Perdido Key Beach Mouse
- *Procyon lotor auspicatus* - Key Vaca Raccoon
- *Procyon lotor incautus* - Key West Raccoon
- *Procyon lotor inesperatus* - Matecumbe Key Raccoon
- *Trichechus manatus latirostris* - West Indian Manatee
- *Eubalaena glacialis (incl. australis)* - North Atlantic Right Whale

**Birds**
- *Sula dactylatra* - Masked Booby
- *Pelecanus occidentalis* - Brown Pelican
- *Ardea herodias* - Great Blue Heron
- *Ardea alba* - Great Egret
- *Egretta rufescens* - Reddish Egret
- *Pandion haliaetus* - Osprey
- *Falco columbarius* - Merlin
- *Falco peregrinus* - Peregrine Falcon
- *Pluvialis squatarola* - Black-bellied Plover
- *Pluvialis dominica* - American Golden-Plover
- *Charadrius nivosus* - Snowy Plover
- *Charadrius wilsonia* - Wilson's Plover
- *Charadrius melodus* - Piping Plover
- *Haematopus palliatus* - American Oystercatcher
- *Tringa semipalmata semipalmata* - Eastern Willet
- *Tringa semipalmata inornata* - Western Willet
- *Tringa flavipes* - Lesser Yellowlegs
- *Numenius phaeopus* - Whimbrel
- *Numenius americanus* - Long-billed Curlew
- *Limosa fedoa* - Marbled Godwit
- *Arenaria interpres* - Ruddy Turnstone
- *Calidris canutus* - Red Knot
- *Calidris canutus rufa* - Red Knot (rufa)
- *Calidris alba* - Sanderling
- *Calidris pusilla* - Semipalmed Sandpiper
- *Calidris mauri* - Western Sandpiper
- *Calidris alpina* - Dunlin
- *Calidris himantopus* - Stilt Sandpiper
- *Limnodromus griseus* - Short-billed Dowitcher
- *Anous stolidus* - Brown Noddy
- *Onychoprion fuscatus* - Sooty Tern
- *Onychoprion anaethetus* - Bridled Tern
- *Sternula antillarum* - Least Tern
- *Gelochelidon nilotica* - Gull-billed Tern
- *Hydroprogne caspia* - Caspian Tern
- *Sternula dougallii* - Roseate Tern
**Thalasseus maximus**  
Royal Tern

**Thalasseus sandvicensis**  
Sandwich Tern

**Rynchops niger**  
Black Skimmer

**Reptiles**

- **Crocodylus acutus**  
American Crocodile

- **Plestiodon egregius egregius**  
Florida Keys Mole Skink

- **Plestiodon egregius insularis**  
Cedar Key Mole Skink

- **Caretta caretta**  
Loggerhead Sea Turtle

- **Chelonia mydas**  
Green Sea Turtle

- **Dermochelys coriacea**  
Leatherback Sea Turtle

- **Eretmochelys imbricata**  
Hawksbill Sea Turtle

- **Lepidochelys kempi**  
Kemp's Ridley Sea Turtle

- **Malaclemys terrapin**  
Diamond-backed Terrapin

**Fish**

- **Alosa aestivalis**  
Blueback Herring

- **Alosa alabamae**  
Alabama Shad

- **Carcharhinus plumbeus**  
Sandbar Shark

- **Carcharias taurus**  
Sand Tiger Shark

- **Sphyrna lewini**  
Scalloped Hammerhead

- **Sphyrna mokarran**  
Great Hammerhead

- **Sphyrna zygaena**  
Smooth Hammerhead

**Invertebrates**

- **Uca minax**  
Red-jointed Fiddler, Brackish Water Fiddler

- **Uca pugilator**  
Sand Fiddler

- **Uca pugnax**  
Mud Fiddler

- **Cicindela hirticollis**  
Hairy-necked Tiger Beetle

- **Cicindela olivacea**  
Olive Tiger Beetle

- **Branchus floridanus**  
South Florida Beach Darkling Beetle

- **Neothyonidium parvum**  
A Sea Cucumber

**Conservation Threats**

Threats to the Beach/Surf Zone habitat that were also identified for multiple other terrestrial habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Climate variability
- Incompatible recreational activities
- Invasive animals
- Shoreline hardening

Threats to Beach/Surf Zone habitat that were also identified for multiple other marine and estuarine habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Chemicals and toxins
- Climate variability
- Coastal development
- Dam operations
- Disruption of longshore transport of sediments
- Fishing gear impacts
- Harmful algal blooms
- Incompatible fishing pressure
- Incompatible industrial operations
- Incompatible recreational activities
- Incompatible wildlife and fisheries management strategies
- Industrial spills
- Invasive animals
- Invasive plants
- Key predator/herbivore losses
- Management of nature–beach nourishment
- Nutrient loads
- Roads, bridges and causeways
- Shoreline hardening
- Vessel impact

Beach/Surf Zone-specific land-based threats are similar to those for the Coastal Strand habitat. Because of the importance of these habitats for coastal SGCN, such as sea turtles, shorebirds, and beach mice, threats such as light pollution that can inhibit turtle nesting and increase predation for these and other species were highlighted. Dredging of new inlets and deposition of dredged materials for beach nourishment, dune restoration, and other purposes degrade these habitats and can directly impact these species, as can disturbance and predation by nuisance animals. While beach nourishment was primarily viewed as a threat, experts understood the related benefits of habitat restoration, particularly for sea turtles. Activities of residents and their pets living adjacent to Beach/Surf Zone and using the habitat can cause degradation. Military base closure threatens potential conservation protection for Beach/Surf Zone. This habitat also faces numerous water-based threats, such as those caused by changes in natural sediment movement, contamination from industrial spills or urban runoff, and incompatible boating and fishing recreational activities.

The following stresses (and sources of stress below) threaten this habitat in terrestrial habitats:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Very High</td>
</tr>
<tr>
<td>B</td>
<td>High</td>
</tr>
<tr>
<td>C</td>
<td>High</td>
</tr>
<tr>
<td>D</td>
<td>High</td>
</tr>
<tr>
<td>E</td>
<td>Medium</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions. The following sources of stress are threats identified for terrestrial habitats.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very High</td>
<td>A, C, D</td>
</tr>
<tr>
<td>2</td>
<td>High</td>
<td>B, E</td>
</tr>
<tr>
<td>3</td>
<td>High</td>
<td>A, B, D, E</td>
</tr>
<tr>
<td>4</td>
<td>High</td>
<td>A, B, D, E</td>
</tr>
</tbody>
</table>
The following stresses (and sources of stress below) threaten this habitat in marine and estuarine habitats:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion</td>
<td>Very High</td>
</tr>
<tr>
<td>Habitat destruction</td>
<td>Very High</td>
</tr>
<tr>
<td>Altered weather regime/sea level rise</td>
<td>High</td>
</tr>
<tr>
<td>Habitat disturbance</td>
<td>High</td>
</tr>
<tr>
<td>Altered structure</td>
<td>Medium</td>
</tr>
<tr>
<td>Habitat fragmentation</td>
<td>Medium</td>
</tr>
</tbody>
</table>

The following sources of stress are threats identified for marine and estuarine habitats:

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate variability</td>
<td>Very High</td>
<td>F, G, H, K</td>
</tr>
<tr>
<td>Coastal development</td>
<td>Very High</td>
<td>F, G, I, J, K</td>
</tr>
<tr>
<td>Roads, bridges and causeways</td>
<td>Very High</td>
<td>F, G, I, J, K</td>
</tr>
<tr>
<td>Shoreline hardening</td>
<td>High</td>
<td>F, G, I, J, K</td>
</tr>
<tr>
<td>Disruption of longshore transport of sediments</td>
<td>High</td>
<td>F, G, I, J, K</td>
</tr>
<tr>
<td>Management of nature (beach nourishment, impoundments)</td>
<td>High</td>
<td>I, J, K</td>
</tr>
<tr>
<td>Harmful algal blooms</td>
<td>High</td>
<td>I</td>
</tr>
<tr>
<td>Incompatible industrial operations</td>
<td>High</td>
<td>F, G, H, I, J, K</td>
</tr>
<tr>
<td>Invasive plants</td>
<td>High</td>
<td>I, J, K</td>
</tr>
<tr>
<td>Channel modification/shipping lanes</td>
<td>High</td>
<td>F, G, I, J</td>
</tr>
<tr>
<td>Nutrient loads (all sources)</td>
<td>High</td>
<td>I</td>
</tr>
<tr>
<td>Key predator/herbivore losses</td>
<td>High</td>
<td>I</td>
</tr>
<tr>
<td>Dam operations/incompatible release of water</td>
<td>High</td>
<td>F, I</td>
</tr>
<tr>
<td>Industrial spills</td>
<td>Medium</td>
<td>I</td>
</tr>
</tbody>
</table>
### Sources of Stress

<table>
<thead>
<tr>
<th>Source Rank</th>
<th>Related Stresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 Invasive animals</td>
<td>Medium</td>
</tr>
<tr>
<td>16 Light pollution</td>
<td>Medium</td>
</tr>
<tr>
<td>17 Chemicals and toxins</td>
<td>Medium</td>
</tr>
<tr>
<td>18 Incompatible resource extraction: mining/drilling</td>
<td>Medium</td>
</tr>
<tr>
<td>19 Incompatible fishing pressure</td>
<td>Medium</td>
</tr>
<tr>
<td>20 Incompatible recreational activities</td>
<td>Medium</td>
</tr>
<tr>
<td>21 Inadequate stormwater management</td>
<td>Medium</td>
</tr>
<tr>
<td>22 Utility corridors</td>
<td>Medium</td>
</tr>
<tr>
<td>23 Sonic pollution</td>
<td>Medium</td>
</tr>
<tr>
<td>24 Fishing gear impacts</td>
<td>Medium</td>
</tr>
<tr>
<td>25 Vessel impacts</td>
<td>Medium</td>
</tr>
<tr>
<td>26 Solid waste</td>
<td>Medium</td>
</tr>
<tr>
<td>27 Incompatible wildlife and fisheries management strategies</td>
<td>Medium</td>
</tr>
<tr>
<td>28 Incompatible aquaculture operations</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Statewide Threat Rank of Habitat

| Statewide Threat Rank | Very High |

### Conservation Actions

Actions to abate the threats to the Beach/Surf Zone habitat that were also identified as statewide threats (see lists above in Conservation Threats section) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

The actions below address specific threats identified with the Beach/Surf Zone habitat (sometimes in conjunction with a few additional habitats). Actions specific to this habitat were identified in both the terrestrial and marine workshops. These voluntary and incentive-based actions were designed to reduce the need for beach nourishment through reduction of activities that cause sediment movement and protection of shorelines from development and other voluntary and incentive-based actions that might require nourishment. Other actions are identified improvements needed to prevent chemical spills, and changes to and education about fishing and boating activities that will reduce threats to coastal SGCN.

#### TERRESTRIAL-BASED ACTIONS

### Light Pollution

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Ensure through state and local cooperation that coastal lighting ordinances are updated as technology and information improves.</td>
<td>VH</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Overall Rank</td>
<td>Education and Awareness</td>
<td>Feasibility</td>
<td>Benefits</td>
<td>Cost</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td>M</td>
<td>Support cooperative education programs developed and/or implemented by utility companies and local governments for coastal property owners to ensure that light ordinances protecting coastal wildlife are supported (e.g., availability of automatic light shut-off features for beach lights).</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Support and expand the coastal light replacement efforts of the U.S. Fish and Wildlife Service to be implemented statewide where sea turtle nesting and beach mouse habitat exists.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Support sea turtle and beach mouse-friendly lighting in coastal habitats. Fund incentives for retrofitting existing light features.</td>
<td>VH</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Support installation of appropriate light technology for conservation of sea turtles and other coastal species on military lands, Kennedy Space Center, and ports (domestic security facilities).</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

### Nuisance Animals

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Increase funding to implement existing sea turtle management practices and ordinances regarding prevention of egg and hatchling predation. Promote the use of volunteer groups in association with the FWC to provide more capacity for implementation.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Identify important habitat areas for nesting shorebirds (of Greatest Conservation Need), and reduce impacts from people and pets (as appropriate) from these areas through targeted education and signage.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Educate public landowners with responsibilities for coastal zone wildlife conservation about USDA protocols for raccoon management.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Develop public education tools on and encourage removal of unconsumed pet foods from outdoor containers.</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Educate home and business owners on the use of wildlife-proof garbage containers.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage understanding of existing pet restraint rules.</td>
<td>M</td>
<td>E</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Future public lands management plans for coastal managed areas should consider inclusion of control plans for feral animals.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Develop techniques for waste management in areas where SGCN or habitats are subject to high depredation or disturbance rates by exotic and nuisance animals with populations elevated by access to garbage (providing a supplemental food source).</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Assist counties, municipalities, and homeowner associations to develop and implement curbside pick-up of yard and household waste.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
### TERRESTRIAL-AND-MARINE-BASED ACTIONS

#### Management of Nature – Dredging

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Assist in the development of statewide, system-specific dredge material disposal plans that identify long-term disposal sites, specify dredge deposition practices, and minimize or offset impacts to all fish and wildlife resources. Encourage linking the statewide dredge material management plan to port expansion management plans.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Assist in the development of educational programs on natural coastal processes and the ecological benefits and impacts, and economic costs of beach nourishment efforts.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Provide technical expertise on impacts of beach dredging/nourishment projects.</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Assist in the development of criteria for long-term monitoring of dredging and nourishment projects.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Discourage dredging of natural inlets and passes not designated for navigation.</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop one or several coalitions of local groups statewide to identify local restoration projects where dredge material can be used.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Compare the cost of conducting dredge/nourishment projects in perpetuity to spending equal state/federal dollars on acquiring lands subject to erosion (barrier islands) and putting those lands into uses that are not dependent upon dredging.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Fund research on the impacts of beach nourishment on fish and wildlife resources.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

### MARINE-BASED ACTIONS

#### Disruption of Longshore Transport of Sediments

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Provide outreach to the public and to land-use, planning, and regulation agencies so they have a better understanding of barrier island dynamics and natural sediment movement (FEMA-like map). Include cost-benefit information on environmental communities affected.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Assist in the development of educational tools about the ephemeral characteristics of natural inlets and provide technical expertise on the fish and wildlife resources associated with this habitat.</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage restoration of natural sediment transport processes as an alternative to beach nourishment where possible.</td>
<td>L</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Improve implementation of sediment management practices.</td>
<td>L</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>
### Chapter 6: Habitats - Beach/Surf Zone

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Assist in the revision of national flood insurance programs and provide technical expertise on fish and wildlife resources for areas of high sediment transport and unstable shorelines.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Conduct an economic analysis of maintaining structures such as inlets and hardened shorelines that includes benefits and impacts to fish and wildlife resources.</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Conduct regional studies on sediment transport budget and natural sediment processes (not site by site). Collect and map historic information on barrier islands and estuarine sand bars.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

### Management of Nature–Beach Nourishment

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Establish a statewide data clearinghouse or public-private partnership to house all beach nourishment project monitoring results to facilitate the evaluation of cumulative project effects and future project design (i.e., lessons learned). Review the economics of projects including natural resource values pre- and post-project construction. Synthesize the data collected from all projects.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Assist in the development of educational materials about the impacts of coastal development; provide technical expertise on impacts to coastal fish and wildlife resources.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Encourage beach resorts to protect turtle nests through awareness and education programs and by providing support for beach assessment teams (room and board). Provide funding for organizations that provide awareness support.</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Protection</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Acquire coastal lands for habitat protection and management to reduce the need for beach nourishment.</td>
<td>VH</td>
<td>VH</td>
<td>VH</td>
</tr>
<tr>
<td>H</td>
<td>Acquire more land where sea turtles are nesting and are known to nest. Support Florida Forever funding to accommodate a specific coastal zone acquisition component similar to the &quot;Blue Acres&quot; coastal protection program in New Jersey.</td>
<td>H</td>
<td>H</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Investigate and develop, as necessary, sand management technologies to avoid using beach nourishment. Develop statewide BMPs for sand management.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Identify and prioritize beach dune restoration projects where possible and warranted. Be proactive as a means of avoiding the need for beach nourishment where possible. (Potential partner is the USACE.)</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Establish a statewide beach dune restoration protocol for nourishment projects. (Determine if there are existing similar programs. If so, document their requirements and protocols.)</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Review state database to avoid known potential impacts and work with affected parties to develop avoidance, minimization, and mitigation strategies for future nourishment actions.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
### Industrial Spills

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Assist in the revision of emergency response plans in cooperation with the county EOCs, FDEP, DCA, and USCG for coastal waters where water-borne transport of oil and chemicals occur. Encourage bi-annual updates.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Assist in the revision of emergency response plans in cooperation with the county EOCs, FDEP, DCA, USCG and EPA for coastal waters that may be subject to land-based spills of oil and chemicals. Encourage bi-annual updates.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

### Incompatible Fishing Pressure

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Support an independent peer review of current fishery stock assessments of near-shore marine species.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Develop and implement an outreach strategy for subsistence fishers to better understand their impacts on nearshore fish populations.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Protection</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Review effectiveness of current no-take areas.</td>
<td>L</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

### Incompatible Recreational Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Educate boaters, especially new boat operators, about sensitive areas and proper boating techniques, including anchoring, through an outreach program (kiosks, pamphlets, and signage). Develop Boater Guides for areas where they are currently unavailable and distribute at the time of boater registration and at boat rental offices.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>Conduct an outreach program to educate beachgoers and other recreational users about the impact of collecting live shells.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage the use of buffers to sensitive wildlife and habitat areas. Develop multi-use plans that include use of sensitive areas and areas for human use.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>Initiate a statewide underwater coastal cleanup.</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Where information is lacking, conduct study(ies) to assess cumulative impacts of human use of beach habitats. Consider already shifted baselines.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>
Status
Current condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), approximately 13,586 acres (5,498 ha) of oyster reef (a subtype of Bivalve Reef habitat) are accurately mapped. However, spatial data are lacking for most oyster and other Bivalve Reefs, thus minimal distribution is portrayed in this habitat map.

Habitat Description

FNAI type: Mollusk Reef

This habitat is comprised of dense, expansive concentrations of sessile mollusks that attach to hard substrates and each other. Bivalve Reefs occur in both intertidal and subtidal zones to depths of 40 feet (12 m). In Florida the most extensive examples of this habitat, dominated by oysters, are restricted to estuarine environments where salinity concentrations range from 15 to 30 parts per thousand. Events or processes that alter freshwater deliveries to estuaries are detrimental to this habitat. The Bivalve Reef habitat is a diverse ecological community that provides nursery grounds, refugia, and foraging areas to a wide variety of wildlife species.

Associated Species of Greatest Conservation Need

Mammals
- *Procyon lotor auspicatus* Key Vaca Raccoon
- *Procyon lotor incautus* Key West Raccoon
- *Procyon lotor inesperatus* Matecumbe Key Raccoon
Chapter 6: Habitats - Bivalve Reef

- *Trichechus manatus latirostris*  
  West Indian Manatee

**Birds**
- *Haematopus palliatus*  
  American Oystercatcher
- *Tringa semipalmata semipalmata*  
  Eastern Willet
- *Tringa semipalmata inornata*  
  Western Willet
- *Numenius phaeopus*  
  Whimbrel
- *Limosa fedoa*  
  Marbled Godwit
- *Arenaria interpres*  
  Ruddy Turnstone
- *Calidris canutus*  
  Red Knot
- *Calidris canutus rufa*  
  Red Knot (rufa)
- *Calidris mauri*  
  Western Sandpiper
- *Calidris alpina*  
  Dunlin
- *Limnodromus griseus*  
  Short-billed Dowitcher
- *Limnodromus scolopaceus*  
  Long-billed Dowitcher

**Reptiles**
- *Caretta caretta*  
  Loggerhead Sea Turtle
- *Lepidochelys kempii*  
  Kemp’s Ridley Sea Turtle
- *Macrochelys temminckii*  
  Alligator Snapping Turtle
- *Malaclemys terrapin*  
  Diamond-backed Terrapin

**Fish**
- *Acipenser brevirostrum*  
  Shortnose Sturgeon
- *Acipenser oxyrinchus desotoi*  
  Gulf of Mexico Sturgeon
- *Acipenser oxyrinchus oxyrinchus*  
  Atlantic Sturgeon
- *Alosa aestivalis*  
  Blueback Herring
- *Alosa alabamae*  
  Alabama Shad
- *Carcharhinus plumbeus*  
  Sandbar Shark
- *Pristis pectinata*  
  Smalltooth Sawfish
- *Pristis pristis*  
  Largetooth Sawfish
- *Atractosteus spatula*  
  Alligator Gar
- *Epinephelus itajara*  
  Goliath Grouper

**Invertebrates**
- *Crassostrea virginica*  
  Eastern Oyster
- *Fasciolaria lilium*  
  Banded Tulip
- *Lysmata wurdemanni*  
  Peppermint Shrimp

**Conservation Threats**

Threats to the Bivalve Reef habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Coastal development
- Dam operations/incompatible release of water (quality, quantity, timing)
- Harmful algal blooms
- Incompatible fishing pressure
- Incompatible industrial operations
- Incompatible recreational activities
- Incompatible wildlife and fisheries management strategies
- Invasive animals
The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Altered hydrologic regime</td>
<td>Very High</td>
</tr>
<tr>
<td>B  Altered structure</td>
<td>High</td>
</tr>
<tr>
<td>C  Altered water quality—physical, chemical</td>
<td>High</td>
</tr>
<tr>
<td>D  Habitat disturbance</td>
<td>High</td>
</tr>
<tr>
<td>E  Altered species composition</td>
<td>Medium</td>
</tr>
<tr>
<td>F  Altered water quality—nutrients</td>
<td>Medium</td>
</tr>
<tr>
<td>G  Altered water quality—contaminants</td>
<td>Medium</td>
</tr>
<tr>
<td>H  Erosion</td>
<td>Medium</td>
</tr>
<tr>
<td>I  Excessive depredation</td>
<td>Medium</td>
</tr>
<tr>
<td>J  Sedimentation</td>
<td>Medium</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Inadequate stormwater management</td>
<td>Very High</td>
<td>A, B, C, D, F, G</td>
</tr>
<tr>
<td>2  Roads, bridges and causeways</td>
<td>High</td>
<td>A</td>
</tr>
<tr>
<td>3  Coastal development</td>
<td>High</td>
<td>A, J</td>
</tr>
<tr>
<td>4  Dam operations/incompatible release of water (quality, quantity, timing)</td>
<td>High</td>
<td>A, B, C, F, G</td>
</tr>
<tr>
<td>5  Harmful algal blooms</td>
<td>High</td>
<td>D, E, F</td>
</tr>
<tr>
<td>6  Surface water withdrawal</td>
<td>High</td>
<td>A, C</td>
</tr>
<tr>
<td>7  Channel modification/shipping lanes</td>
<td>High</td>
<td>A, J</td>
</tr>
<tr>
<td>8  Invasive animals</td>
<td>High</td>
<td>B, E, I</td>
</tr>
<tr>
<td>9  Nutrient loads (all sources)</td>
<td>High</td>
<td>F</td>
</tr>
<tr>
<td>10 Management of nature (beach nourishment, impoundments)</td>
<td>High</td>
<td>A, B, C</td>
</tr>
<tr>
<td>11 Incompatible recreational activities</td>
<td>Low</td>
<td>D</td>
</tr>
<tr>
<td>12 Incompatible industrial operations</td>
<td>Low</td>
<td>G</td>
</tr>
<tr>
<td>13 Incompatible wildlife and fisheries management strategies</td>
<td>Low</td>
<td>B, E</td>
</tr>
<tr>
<td>14 Incompatible fishing pressure</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>15 Boating impacts</td>
<td>Low</td>
<td>B, D, H</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: Very High
**Conservation Actions**

Nearly all threats to Bivalve Reefs were also identified as statewide threats (see list above). Actions for abatement are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. The sole habitat-specific threat to Bivalve Reefs is boating impacts, which also affects several other marine and estuarine habitats. Consequently, actions to abate this threat will be the same or similar to the actions recommended for the other affected marine and estuarine habitats (e.g., Coastal Tidal River or Stream, Seagrass, Subtidal Unconsolidated Marine/Estuary Sediment, Tidal Flat) and are not repeated here.
Bottomland Hardwood Forest

Status
Current condition: Good and unknown trend. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 84,141 acres (34,051 ha) of Bottomland Hardwood Forest habitat exist, of which 58% (48,778 ac; 19,740 ha) are in conservation or managed areas. Another 5% (4,721 ac; 1,911 ha) are in Florida Forever projects and 25% (20,647 ac; 8,356 ha) are in SHCA-designated lands. The remaining 12% (9,995 ac; 4,045 ha) are other private lands.

Habitat Description

FNAI type: Floodplain Forest, Floodplain Swamp, Freshwater Tidal Swamp

These seasonally flooded wetland forests are composed of a diverse assortment of hydric hardwoods which occur on the rich alluvial soils of silt and clay deposited along the floodplain of several Panhandle rivers including the Apalachicola, Choctawhatchee, and Escambia. These communities are characterized by an overstory that includes water hickory, overcup oak, swamp chestnut oak, river birch, American sycamore, red maple, Florida elm, bald cypress, blue beech, and swamp ash. The understory can range from open and park-like to dense and nearly impenetrable. Understory plants can include bluestem palmetto, hackberry, swamp azalea, pink azalea lanceleaf greenbrier, poison ivy, peppervine, rattanvine, indigo bush, white grass, plume grass, redbtop panicum, caric sedges, silverbells, crossvine, American wisteria, and wood grass. In Bottomland Hardwood Forests, soils and hydroperiods primarily determine the diverse temporary and permanent species composition along with community structure. Additionally, the rich organic material that accumulates on the forest floor is carried off by flooding waters during the wet season,
and therefore provides an essential source of minerals and nutrients for downstream ecosystems such as estuarine systems.

**Associated Species of Greatest Conservation Need**

**Mammals**
- *Corynorhinus rafinesquii* (Rafinesque's Big-eared Bat)
- *Lasiurus borealis borealis* (Red Bat)
- *Lasiurus seminolus* (Seminole Bat)
- *Myotis australoriparius* (Southeastern Myotis)
- *Myotis grisescens* (Gray Bat)
- *Perimyotis subflavus* (Tricolored Bat)
- *Lontra canadensis lataxina* (River Otter)
- *Neovison vison ssp.* (Mink)
- *Ursus americanus floridanus* (Florida Black Bear)

**Birds**
- *Nyctanassa violacea* (Yellow-crowned Night-Heron)
- *Elanoides forficatus* (Swallow-tailed Kite)
- *Ictinia mississippiensis* (Mississippi Kite)
- *Haliaeetus leucocephalus* (Bald Eagle)
- *Buteo platypterus* (Broad-winged Hawk)
- *Scolopax minor* (American Woodcock)
- *Megascope asiaticus* (Eastern Screech-Owl)
- *Picoides villosus* (Hairy Woodpecker)
- *Campephilus principalis* (Ivory-billed Woodpecker)
- *Progne subis* (Purple Martin)
- *Hylocichla mustelina* (Wood Thrush)
- *Vermivora chrysoptera* (Golden-winged Warbler)
- *Vermivora cyanoptera* (Blue-winged Warbler)
- *Geothlypis formosa* (Kentucky Warbler)
- *Setophaga ruticilla* (American Redstart)
- *Setophaga castanea* (Bay-breasted Warbler)
- *Setophaga dominica stoddarti* (Stoddard's Yellow-throated Warbler)
- *Setophaga discolor discolor* (Prairie Warbler)
- *Cardellina canadensis* (Canada Warbler)
- *Euphagus carolinus* (Rusty Blackbird)

**Amphibians**
- *Amphiuma pholeter* (One-toed Amphiuma)
- *Desmognathus auriculatus* (Southern Dusky Salamander)
- *Hemidactylus marmoratus* (Four-toed Salamander)

**Reptiles**
- *Alligator mississippiensis* (American Alligator)
- *Plestiodon anthracinus pluvialis* (Southern Coal Skink)
- *Aglisterodon contortrix contortrix* (Southern Copperhead)
- *Drymarchon couperi* (Eastern Indigo Snake)
- *Farancia eurytherma* (Rainbow Snake)
- *Heterodon platirhinos* (Eastern Hog-nosed Snake)
- *Lampropeltis getula* (Eastern Kingsnake)
Chapter 6: Habitats - Bottomland Hardwood Forest

- **Nerodia cyclopion** Mississippi Green Watersnake
- **Deirochelys reticularia** Chicken Turtle
- **Graptemys barbouri** Barbour's Map Turtle
- **Graptemys ernsti** Escambia Map Turtle
- **Macrochelys temminckii** Alligator Snapping Turtle
- **Pseudemys nelsoni** Florida Red-bellied Cooter (Panhandle Population)
- **Pseudemys suwanniensis** Suwannee Cooter
- **Terrapene carolina** Eastern Box Turtle

**Invertebrates**
- **Amblyscirtes aesculapius** Lace-winged Roadside Skipper
- **Amblyscirtes hegon** Pepper and Salt Skipper
- **Amblyscirtes vialis** Common Roadside-skipper
- **Megathymus cofaqui** Cofaqui Skipper
- **Megathymus yuccae** Yucca Skipper
- **Poanes yehl** Yehl Skipper
- **Callophrys augustinus** Brown Elfin
- **Callophrys henrici** Henry's Elfin
- **Feniseca tarquinius** Harvester
- **Satyrium kingi** King's Hairstreak
- **Satyrium liparops floridensis** Sparkleberry Hairstreak
- **Pyreferra ceromatica** Ceromatic Noctuid Moth
- **Anthanassa texana seminole** Seminole Crescent
- **Chlosyne nycteus** Silvery Checkerspot
- **Enodia portlandia floralae** Florida Pearly Eye

**Conservation Threats**

Threats to Bottomland Hardwood Forest habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Invasive animals
- Invasive plants
- Roads
- Roads

No habitat-specific threats to Bottomland Hardwood Forest were identified.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Altered species composition/dominance</td>
</tr>
<tr>
<td>B</td>
<td>Altered community structure</td>
</tr>
<tr>
<td>C</td>
<td>Missing key communities, functional guilds, or seral stages</td>
</tr>
<tr>
<td>D</td>
<td>Altered hydrologic regime</td>
</tr>
<tr>
<td>E</td>
<td>Fragmentation of habitats, communities, ecosystems</td>
</tr>
</tbody>
</table>
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Roads</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>2 Invasive plants</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>3 Invasive animals</td>
<td>Medium</td>
<td>A</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**

**Medium**

**Conservation Actions**

Actions to abate the threats to Bottomland Hardwood Forest that were also identified as statewide threats (invasive animals, invasive plants, roads) are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Because the experts did not identify any Bottomland Hardwood Forest habitat-specific threats, no specific actions were identified.
Chapter 6: Habitats - Calcareous Stream

Calcareous Stream

Status
Current condition: Good and declining. According to the best available GIS information at this time (Appendix C: GIS Data Tables), there are approximately 2,071 miles (3,332 km) of Calcareous Streams in Florida.

Habitat Description

FNAI type: Spring-run Stream

The Calcareous Stream habitat occurs only in the north and central regions of the state and is comprised of 26 streams originating in or flowing through the Ocala Uplift region of north central Florida and the eastern panhandle, and the Dougherty Plain (Dougherty Karst) region in the central panhandle. Springs and spring runs form low-order tributaries to most of the Calcareous Streams. As a result, Calcareous Streams share many characteristics with the Spring and Spring Run habitat.

This habitat typically has a high pH, high carbonate level, and sand bottom with some limestone exposed. Most Calcareous Streams are clear and cool, although in areas where they flow through pinelands or scrub the streams will become stained by the tannins in the vegetation. Some Calcareous Streams are associated with sinks, where all or sections of the stream flow underground before resurfacing to flow overland. Surface and groundwater recharge is bidirectional; water in the river recharges the aquifer during flood conditions and the water in the aquifer recharges the river during drought conditions. Submerged plants are frequently dense, and can include tape grass, wild rice, and giant cutgrass. Calcareous Streams provide habitat to a variety of species including many snails, water snakes, and fish, and is critical to certain species of anadromous fish, such as Gulf Sturgeon. Examples of streams in this category include the Suwannee River (downstream of the Big Shoals), Santa Fe River (downstream of the Big Rise), Ichetucknee, lower Withlacoochee (north) and Alapaha Rivers, Chipola River, Econfina Creek, Ocklawaha River, Hillsborough River and the
lower, nontidal portions of most of the rivers draining into the Big Bend region on Florida’s Gulf coast from the St. Marks River to the Waccasassa River.

**Associated Species of Greatest Conservation Need**

**Mammals**
- *Corynorhinus rafinesquii* — Rafinesque's Big-eared Bat
- *Eptesicus fuscus* — Big Brown Bat
- *Lasiurus borealis borealis* — Red Bat
- *Lasiurus cinereus cinereus* — Hoary Bat
- *Lasiurus intermedius floridanus* — Northern Yellow Bat
- *Lasiurus seminolus* — Seminole Bat
- *Myotis austroriparius* — Southeastern Myotis
- *Myotis grisescens* — Gray Bat
- *Perimyotis subflavus* — Tricolored Bat
- *Lontra canadensis lataxina* — River Otter
- *Trichechus manatus latirostris* — West Indian Manatee

**Birds**
- *Egretta caerulea* — Little Blue Heron
- *Elanoides forficatus* — Swallow-tailed Kite
- *Haliaeetus leucocephalus* — Bald Eagle
- *Aramus guarauna* — Limpkin
- *Parkesia motacilla* — Louisiana Waterthrush

**Amphibians**
- *Amphiuma pholeter* — One-toed Amphiuma
- *Desmognathus auriculatus* — Southern Dusky Salamander

**Reptiles**
- *Alligator mississippiensis* — American Alligator
- *Farancia erytrogramma* — Rainbow Snake
- *Apalone spinifera aspera* — Gulf Coast Spiny Softshell
- *Clemmys guttata* — Spotted Turtle
- *Graptemys barbouri* — Barbour's Map Turtle
- *Macrochelys temminckii* — Alligator Snapping Turtle
- *Pseudemys nelsoni* — Florida Red-bellied Cooter (Panhandle Population)
- *Pseudemys suwanniensis* — Suwannee Cooter

**Fish**
- *Acipenser brevirostrum* — Shortnose Sturgeon
- *Acipenser oxyrinchus desotoi* — Gulf of Mexico Sturgeon
- *Anguilla rostrata* — American Eel
- *Alosa aestivalis* — Blueback Herring
- *Alosa alabamae* — Alabama Shad
- *Moxostoma n. sp. cf. poecilurum* — Grayfin Redhorse
- *Pteronotropis welaka* — Bluenose Shiner
- *Fundulus blairae* — Lowland Topminnow
- *Atractosteus spatula* — Alligator Gar
- *Agonostomus monticola* — Mountain Mullet
- *Enneacanthus chaetodon* — Black Banded Sunfish
Chapter 6: Habitats - Calcareous Stream

- *Etheostoma olmstedi*  
  Tessellated Darter
- *Etheostoma parvipinne*  
  Goldstripe Darter
- *Micropterus notius*  
  Suwannee Bass
- *Ameiurus brunneus*  
  Snail Bullhead
- *Ameiurus serracanthus*  
  Spotted Bullhead

**Invertebrates**
- *Alasmidonta triangulata*  
  Southern Elktoe
- *Alasmidonta wrightiana*  
  Ochlockonee Arcmussel
- *Amblema neislerii*  
  Fat Three-ridge Mussel
- *Elliptio chipolaensis*  
  Chipola Slabshell
- *Elliptio purpurella*  
  Inflated Spike
- *Elliptioideus sloatanus*  
  Purple Bankclimber
- *Fusconaia burkei*  
  Tapered Pigtoe
- *Lampsilis floridensis*  
  Yellow Sandshell
- *Medionidus acutissimus*  
  Alabama Moccasinshell
- *Quadrula infucata*  
  Sculptured Pigtoe
- *Quadrula kleiniana*  
  Suwannee Pigtoe
- *Villosa villosa*  
  Downy Rainbow
- *Elimia clench*  
  Clench's Goniobasis
- *Elimia dickinsoni*  
  Stately Elimia
- *Macrobrachium acanthurus*  
  Cinnamon River Shrimp
- *Macrobrachium carcinus*  
  Big Claw River Shrimp
- *Macrobrachium ohione*  
  Ohio River Shrimp
- *Acentrella parvula*  
  A Mayfly
- *Procloeon rubropictum*  
  A Mayfly
- *Procloeon rufostrigatum*  
  A Mayfly
- *Baetisca gibbera*  
  A Mayfly
- *Baetisca obesa*  
  A Mayfly
- *Allocapnia starki*  
  Slender Winter Stonefly
- *Helopisus subvarians*  
  A Stonefly
- *Isogenoides varians*  
  Rock Island Springfly
- *Hydropsyche alabama*  
  A Caddisfly
- *Hydroptila bernerii*  
  Berner’s Microcaddisfly
- *Setodes chipolanus*  
  Chipola River Caddisfly
- *Setodes guttatus*  
  A Caddisfly

**Conservation Threats**

Threats to Calcareous Stream habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Chemicals and toxins
- Conversion to housing and urban development
- Incompatible forestry practices
- Incompatible resource extraction: mining/drilling
- Invasive animals
- Invasive plants
- Nutrient loads–agriculture
- Nutrient loads–urban
- Road
The Calcareous Stream-specific threats identified focused on water quality issues caused primarily by nutrient inputs and on invasive plant species. Nutrients from stormwater runoff, agricultural fertilizers, and septic systems result in eutrophication of this habitat, potentially altering species composition and other important ecosystem functions and processes. Methods to control invasive aquatic plants are more successful in still water than in flowing water systems, also leading to changes in species composition and other stresses.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Altered species composition/dominance</td>
<td>High</td>
</tr>
<tr>
<td>B  Altered water quality of surface water or aquifer: nutrients</td>
<td>High</td>
</tr>
<tr>
<td>C  Erosion/sedimentation</td>
<td>High</td>
</tr>
<tr>
<td>D  Altered water quality of surface water or aquifer: contaminants</td>
<td>Medium</td>
</tr>
<tr>
<td>E  Altered landscape mosaic or context</td>
<td>Medium</td>
</tr>
<tr>
<td>F  Altered hydrologic regime</td>
<td>Medium</td>
</tr>
<tr>
<td>G  Fragmentation of habitats, communities, ecosystems</td>
<td>Low</td>
</tr>
<tr>
<td>H  Habitat destruction or conversion</td>
<td>Low</td>
</tr>
<tr>
<td>I  Altered water salinity, pH, conductivity, or other physical water quality characteristics of surface water or aquifer</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Nutrient loads–urban</td>
<td>High</td>
<td>A, B</td>
</tr>
<tr>
<td>2 Invasive plants</td>
<td>High</td>
<td>A</td>
</tr>
<tr>
<td>3 Nutrient loads–agriculture</td>
<td>High</td>
<td>A, B</td>
</tr>
<tr>
<td>4 Invasive animals</td>
<td>Medium</td>
<td>A, C</td>
</tr>
<tr>
<td>5 Conversion to housing and urban development</td>
<td>Medium</td>
<td>B, C, E</td>
</tr>
<tr>
<td>6 Chemicals and toxins</td>
<td>Medium</td>
<td>D</td>
</tr>
<tr>
<td>7 Roads</td>
<td>Medium</td>
<td>C</td>
</tr>
<tr>
<td>8 Incompatible forestry practices</td>
<td>Low</td>
<td>A, C</td>
</tr>
<tr>
<td>9 Incompatible agricultural practices</td>
<td>Low</td>
<td>B, C</td>
</tr>
<tr>
<td>10 Incompatible resource extraction: mining/drilling</td>
<td>Low</td>
<td>C</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: **High**

**Conservation Actions**

Actions to abate the threats to Calcareous Stream that were also identified as statewide threats (nutrient loads–urban, invasive plants, nutrient loads–agriculture, invasive animals, conversion to housing and urban development, chemicals and toxins, roads, incompatible forestry...
practices, incompatible resource extraction: mining/drilling) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat were only applicable to Calcareous Stream and a few other habitats (i.e., Aquatic Cave, Cypress Swamp, Freshwater Marsh and Wet Prairie, Natural Lake, Reservoir/Managed Lake, Seepage/Steephead Stream, Softwater Stream, Spring and Spring Run, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. These actions were designed to prevent harm to stream ecosystems influenced by groundwater inflows by placing limits on the total permissible nutrient loads and to develop improved methods for applying herbicides in flowing water systems.

### Nutrient Loads – Urban

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Develop numeric nutrient criteria to monitor effects on groundwater ecosystems as well as biota where groundwater discharges to springs and other surface waters.</td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

### Invasive Plants

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Research methods for control of aquatic invasive species in flowing waters where current control methods for those species are only effective in non-flowing waters.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Nutrient Loads – Agriculture

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Develop numeric nutrient criteria to monitor effects on groundwater ecosystems as well as biota where groundwater discharges to springs and other surface waters.</td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

### Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage tax or other incentives, such as density transfers, for environmentally friendly comprehensive development plans for projects that front on rivers and floodplains.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage development of and use of a buffer zone between new development and river or floodplain edges, of a minimum distance (e.g., the 550 ft zone specified for the Wekiva River, FWS recommendations).</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
### Chemicals and Toxins

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>For situations where they do not yet exist, develop management techniques and standards for private landowners that minimize runoff of chemicals and toxins into wetlands and aquatic systems.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Conduct research defining appropriate sediment-quality standards for the various aquatic and marine systems for development and implementation of state sediment-quality standards. Fund research defining the cause-and-effect relationship between sediment contamination (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>Conduct research defining standards for persistent organic contaminants for the various aquatic and marine systems for development and implementation of state water-quality standards. Fund research defining the cause-and-effect relationship between contamination from organics (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

### Roads

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work with the USFWS to improve coordination of the Technical Advisory Committee for the Stream Crossing Technical Center (SCTC).</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Provide training to road maintenance personnel on methods for minimizing sediment movement to water bodies.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Support operation of the SCTC to promote recovery and conservation of aquatic ecosystems from interactions between unpaved road-stream crossings that result in sediment movement into streams.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Based on a stream crossing inventory and prioritization, develop funding opportunities for road stabilization projects in Florida counties.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>
Canal/Ditch

Status
Current condition: Good and stable.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), approximately 27,594 miles (44,408 km) of Canal/Ditch are present in Florida.

Habitat Description

FNAI type: None

Canals are linear waterways, typically with steep sides, that frequently connect upstream wetlands or water sources with downstream habitats; they are typified by minimal or emergent vegetation. Ditches are shallow and roadside swales primarily serve as water catchments which support abundant wetland contiguous flora and fauna.

Canal/Ditch habitat in Florida serves many purposes including drainage, flood control, irrigation, navigation, and recreation. These waterways provide alternative habitat that would not otherwise be available. Species, such as the Panama City crayfish, have adapted to surviving in roadside ditches that may not always be recognized as a viable resource.

Associated Species of Greatest Conservation Need

Mammals
- Blarina shermani Sherman's Short-tailed Shrew
- Corynorhinus rafinesquii Rafinesque's Big-eared Bat
- Eptesicus fuscus Big Brown Bat
- Eumops floridanus Florida Bonneted Bat
- Lasiurus borealis borealis Red Bat
<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lasiurus cinereus cinereus</td>
<td>Hoary Bat</td>
</tr>
<tr>
<td>Lasiurus intermedius floridanus</td>
<td>Northern Yellow Bat</td>
</tr>
<tr>
<td>Lasiurus seminolus</td>
<td>Seminole Bat</td>
</tr>
<tr>
<td>Myotis australis</td>
<td>Southeastern Myotis</td>
</tr>
<tr>
<td>Myotis griseus</td>
<td>Gray Bat</td>
</tr>
<tr>
<td>Perimyotis subflavus</td>
<td>Tricolored Bat</td>
</tr>
<tr>
<td>Tadarida brasiliensis cynocephala</td>
<td>Brazilian Free-tailed Bat</td>
</tr>
<tr>
<td>Lontra canadensis tatusina</td>
<td>River Otter</td>
</tr>
<tr>
<td>Trichechus manatus latirostris</td>
<td>West Indian Manatee</td>
</tr>
</tbody>
</table>

**Birds**

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anas fulvigula</td>
<td>Mottled Duck</td>
</tr>
<tr>
<td>Mycteria americana</td>
<td>Wood Stork</td>
</tr>
<tr>
<td>Botaurus lentiginosus</td>
<td>American Bittern</td>
</tr>
<tr>
<td>Ardea herodias</td>
<td>Great Blue Heron</td>
</tr>
<tr>
<td>Ardea herodias occidentalis</td>
<td>Great White Heron</td>
</tr>
<tr>
<td>Ardea alba</td>
<td>Great Egret</td>
</tr>
<tr>
<td>Egretta thula</td>
<td>Snowy Egret</td>
</tr>
<tr>
<td>Egretta caerulea</td>
<td>Little Blue Heron</td>
</tr>
<tr>
<td>Egretta tricolor</td>
<td>Tricolored Heron</td>
</tr>
<tr>
<td>Butorides virescens</td>
<td>Green Heron</td>
</tr>
<tr>
<td>Nycticorax nycticorax</td>
<td>Black-crowned Night-Heron</td>
</tr>
<tr>
<td>Nyctanassa violacea</td>
<td>Yellow-crowned Night-Heron</td>
</tr>
<tr>
<td>Eudocimus albus</td>
<td>White Ibis</td>
</tr>
<tr>
<td>Platalea ajaja</td>
<td>Roseate Spoonbill</td>
</tr>
<tr>
<td>Pandion haliaetus</td>
<td>Osprey</td>
</tr>
<tr>
<td>Rostrhamus sociabilis</td>
<td>Snail Kite</td>
</tr>
<tr>
<td>Haliaeetus leucocephalus</td>
<td>Bald Eagle</td>
</tr>
<tr>
<td>Porphyrio martinica</td>
<td>Purple Gallinule</td>
</tr>
<tr>
<td>Aramus guarauna</td>
<td>Limpkin</td>
</tr>
<tr>
<td>Tringa solitaria</td>
<td>Solitary Sandpiper</td>
</tr>
<tr>
<td>Tringa flavipes</td>
<td>Lesser Yellowlegs</td>
</tr>
<tr>
<td>Numenius phaeopus</td>
<td>Whimbrel</td>
</tr>
<tr>
<td>Sterna artrallarum</td>
<td>Least Tern</td>
</tr>
<tr>
<td>Chlidonias niger</td>
<td>Black Tern</td>
</tr>
<tr>
<td>Setophaga petechia gundlachi</td>
<td>Cuban Yellow Warbler</td>
</tr>
<tr>
<td>Euphagus cyanocephalus</td>
<td>Brewer's Blackbird</td>
</tr>
</tbody>
</table>

**Amphibians**

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithobates capito</td>
<td>Gopher Frog</td>
</tr>
<tr>
<td>Pseudacris ornata</td>
<td>Ornate Chorus Frog</td>
</tr>
<tr>
<td>Pseudobranchus striatus lustricolus</td>
<td>Gulf Hammock Dwarf Siren</td>
</tr>
<tr>
<td>Pseudobranchus striatus striatus</td>
<td>Broad-striped Dwarf Siren</td>
</tr>
</tbody>
</table>

**Reptiles**

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alligator mississippiensis</td>
<td>American Alligator</td>
</tr>
<tr>
<td>Crocodylus acutus</td>
<td>American Crocodile</td>
</tr>
<tr>
<td>Plestiodon anthracinus pluvialis</td>
<td>Southern Coal Skink</td>
</tr>
<tr>
<td>Lampropeltis getula</td>
<td>Eastern Kingsnake</td>
</tr>
<tr>
<td>Nerodia clarkii taniata</td>
<td>Atlantic Saltmarsh Watersnake</td>
</tr>
<tr>
<td>Nerodia cyclopion</td>
<td>Mississippi Green Watersnake</td>
</tr>
<tr>
<td>Seminatrix pygaea cyclas</td>
<td>Southern Florida Swampsnake</td>
</tr>
</tbody>
</table>
**Conservation Threats**

Canal/Ditch presently serves as surrogate habitat for a few aquatic SGCN in lieu of native historic habitat that has now largely been eliminated. Examples include the suite of “tropical peripheral” fishes (including opossum pipefish and several rare gobiid species) that now inhabit and spawn in coastal canals in the Indian River Lagoon and lower east coast of Florida in lieu of historical natural freshwater streams. Similarly, a number of marine species such as tarpon, ladyfish, and many others utilize canals in south and central Florida during some stages of their life cycles. In north Florida, the Panama City crayfish (a burrowing species once found in seasonally wet pine flatwoods in a small area of Bay County) now almost exclusively relies on shallow roadside swales and ditches because natural flatwoods in this area have been converted to developed land uses.

Although this situation clearly points to the need for conservation actions that involve restoring historic habitat for these species, in many cases where such habitat has been eliminated, this may not be feasible. Consequently, despite the fact that canals and ditches rank as a source of
stress for many habitats and species, maintaining existing sub-optimal habitat for these species in canals and ditches and taking action to reduce stress levels in these environments is critical.

From the perspective of SGCN that utilize canals and ditches as a primary habitat or a critical habitat for certain life stages, the following stresses and sources of stress are most important to consider:

- **Habitat destruction/conversion**–Loss of existing ditch or swale habitat to curb and gutter or underground storm-sewer-type drainage systems associated with more intensive urban or suburban development (applies only in north region), or loss of “riparian” cover along canals/ditches as a result of canal maintenance practices (applies to central and south regions)

  *Sources*: Conversion to housing and development (north region), intensification of surface water diversion/drainage associated with more intensive development (north region), incompatible canal maintenance practices (e.g., removing all canal bank vegetation through herbicide applications, etc.) (all regions)

- **Altered landscape mosaic**–Destruction or conversion of wet flatwoods adjacent to roadside ditches (north region)

  *Source*: Conversion to housing and development (north region)

- **Altered water quality**–Nutrients

  *Sources*: Nutrient loads–agriculture (all regions), nutrient loads–urban storm water (all regions)

- **Altered water quality**–Contaminants

  *Sources*: Chemicals/toxins–oil/grease and heavy metals from roads (north region), incompatible agricultural practices–pesticides in runoff or drainage water (all regions), incompatible residential practices–pesticides in runoff (all regions), mosquito control (north region)

- **Altered hydrologic regime**–Large pulses of flood water or storm runoff that disrupts life cycle requirements or alters or removes physical habitat

  *Sources*: Management of dams/control structures (central/south regions), incompatible agricultural practices–management of runoff (all regions), incompatible residential practices–management of runoff (all regions)

**Conservation Actions**

Actions to abate threats to Canal/Ditch habitat were not addressed directly in the actions workshops due to the experts’ impression that it is not a natural habitat and more often acts as a
threat to other habitats. However, one action was suggested in conjunction with the threat of invasive species that applies to this habitat. In addition, several desired outcomes were identified in the threat workshops that may guide actions developed to better manage this habitat for the needs of SGCN:

- Removal of or application of herbicide to native freshwater marsh vegetation should not be done in conjunction with canal maintenance in areas with known populations of SGCN.
- Water releases should be managed to maintain adequate water velocities and dissolved oxygen needed to support fish and other aquatic life.

### Invasive Animals

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Promote canal designs that limit opportunities for movement and establishment of exotic aquatic species.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>
Coastal Strand

Status
Current condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 14,855 acres (6,012 ha) of Coastal Strand habitat exist, of which 76% (11,317 ac; 4,580 ha) are in conservation or managed areas. Another 1% (90 ac; 36 ha) are in Florida Forever projects and 3% (471 ac; 191 ha) are in SHCA-designated lands. The remaining 20% (2,977 ac; 1,205 ha) are other private lands.

Habitat Description

FNAI types: Beach Dune, Coastal Berm, Coastal Grassland, Coastal Rock Barren, Coastal Strand

This habitat encompasses dunes and more landward areas typically described as coastal strand, as well as areas that may be described as upper beach and coastal rock formations. Coastal Strand is the vegetated zone that typically occurs between open beach and maritime hammock habitats. Coastal Strand occurs on deep, well-drained, sandy soils that are largely wind-deposited and washed or sorted by wave action to some extent. This habitat generally occurs in long, narrow bands along high-energy shorelines, parallel to the open waters of the Atlantic Ocean, Gulf of Mexico, and some coastal bays or sounds in both north and south Florida. Vegetation in this habitat is strongly affected by wind, wave action, and salt spray and consists of low-growing vines, grasses, and other herbaceous plants and salt-tolerant shrub species that, in some areas, may form dense thickets. Pioneer or early successional herbaceous vegetation characterizes foredune and upper beach areas with a gradual change to woody shrub species on the more protected and stabilized areas farther landward. Typical plant species of Coastal Strand include beach morning glory,
railroad vine, sea oats, saw palmetto, Spanish bayonet, yaupon holly, wax myrtle, and sea grape; in southern Florida, cocoplum, nickerbean, and other more tropical species are present.

## Associated Species of Greatest Conservation Need

### Mammals
- **Tadarida brasiliensis cynocephala** Brazilian Free-tailed Bat
- **Peromyscus polionotus allophrys** Choctawhatchee Beach Mouse
- **Peromyscus polionotus leucocephalus** Santa Rosa Beach Mouse
- **Peromyscus polionotus niveiventris** Southeastern Beach Mouse
- **Peromyscus polionotus peninsularis** St. Andrew Beach Mouse
- **Peromyscus polionotus phasma** Anastasia Island Beach Mouse
- **Peromyscus polionotus trissylepis** Perdido Key Beach Mouse
- **Podomys floridanus** Florida Mouse
- **Spilogale putorius ssp.** Spotted Skunk
- **Ursus americanus floridanus** Florida Black Bear

### Birds
- **Falco columbarius** Merlin
- **Falco peregrinus** Peregrine Falcon
- **Anous stolidus** Brown Noddy
- **Onychoprion fuscatus** Sooty Tern
- **Onychoprion anaethetus** Bridled Tern
- **Columbina passerina** Common Ground-Dove
- **Aphelocoma coerulescens** Florida Scrub-Jay
- **Catharus bicknelli** Bicknell's Thrush
- **Vermivora chrysoptera** Golden-winged Warbler
- **Vermivora cyanoptera** Blue-winged Warbler
- **Setophaga ruticilla** American Redstart
- **Setophaga kirtlandii** Kirtland's Warbler
- **Setophaga castanea** Bay-breasted Warbler
- **Setophaga dominica stoddardi** Stoddard's Yellow-throated Warbler
- **Setophaga discolor discolor** Prairie Warbler
- **Cardellina canadensis** Canada Warbler
- **Passerina ciris** Painted Bunting

### Reptiles
- **Anolis carolinensis seminolus** Southern Green Anole
- **Pllestiodon egregius egregius** Florida Keys Mole Skink
- **Sceloporus woodi** Florida Scrub Lizard
- **Crotalus adamanteus** Eastern Diamond-backed Rattlesnake
- **Drymarchon couperi** Eastern Indigo Snake
- **Heterodon platirhinos** Eastern Hog-nosed Snake
- **Heterodon simus** Southern Hog-nosed Snake
- **Lampropeltis getula** Eastern Kingsnake
- **Pituophis melanoleucus mugitus** Florida Pinesnake
- **Tantilla relicta** Florida Crowned Snake
- **Caretta caretta** Loggerhead Sea Turtle
- **Chelonia mydas** Green Sea Turtle
- **Dermochelys coriacea** Leatherback Sea Turtle
- **Eretmochelys imbricata** Hawksbill Sea Turtle
- *Gopherus polyphemus*  
  Gopher Tortoise

- *Lepidochelys kempii*  
  Kemp's Ridley Sea Turtle

- *Malaclemys terrapin*  
  Diamond-backed Terrapin

- *Terrapene carolina*  
  Eastern Box Turtle

**Invertebrates**

- *Arctosa sanctaerosae*  
  Santa Rosa Wolf Spider

- *Coenobita clypeatus*  
  Land Hermit Crab

- *Cardisoma guanhumi*  
  Great Land Crab (Blue Land Crab)

- *Stizocera floridana*  
  Florida Privet Long-horned Beetle

- *Anomala flavipennsis okaloosensis*  
  Panhandle Dune Anomala Scarab Beetle

- *Geopsammodes hydropicus*  
  Atlantic Dune Tiny Sand-loving Scarab

- *Geopsammodes subpedalis*  
  Underfoot Tiny Sand-loving Scarab

- *Gronocarus autumnalis*  
  Lobed Spiny Burrowing Beetle

- *Gronocarus inornatus*  
  Lobeless Spiny Burrowing Beetle

- *Polyphylla woodruffi*  
  Woodruff's Polyphyllan Scarab Beetle

- *Hesperapis oraria*  
  Barrier Island Hesperapis Bee

- *Megathymus cofaqui*  
  Cofaqui Skipper

- *Megathymus yuccae*  
  Yucca Skipper

- *Cyclargus thomasi bethunebakeri*  
  Miami Blue

- *Strymon martialis*  
  Martial Scrub-hairstreak

- *Anthanassa frisia*  
  Cuban Crescent

- *Aphrissa statira*  
  Statira

**Conservation Threats**

Threats to Coastal Strand habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Climate variability
- Conversion to housing and urban development
- Conversion to recreation areas
- Incompatible fire
- Incompatible recreational activities
- Invasive animals
- Invasive plants
- Roads
- Shoreline hardening

Threats specific to Coastal Strand are similar to those for the *Beach/Surf Zone* habitat. Because of the importance of these habitats for coastal SGCN, such as sea turtles, shorebirds, and beach mice, habitat-specific threats such as light pollution, that can inhibit turtle nesting and increase predation for these and other species, were highlighted. Deposition of dredged materials for beach nourishment, dune restoration, and other purposes degrade these habitats and can directly impact these species, as can disturbance and predation by nuisance animals. Activities of residents and their pets living adjacent to or utilizing Coastal Strand to access beach habitats can cause degradation. Military base closures threaten potential loss of protection of Coastal Strand. Unlike the adjacent seaward habitat, conversion of Coastal Strand to golf courses remains a significant source of habitat loss.

Chapter 6: Habitats - Coastal Strand
The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Erosion/sedimentation</td>
<td>Very High</td>
</tr>
<tr>
<td>B Fragmentation of habitats, communities, ecosystems</td>
<td>High</td>
</tr>
<tr>
<td>C Altered soil structure and chemistry</td>
<td>High</td>
</tr>
<tr>
<td>D Habitat degradation/disturbance</td>
<td>High</td>
</tr>
<tr>
<td>E Altered species composition/dominance</td>
<td>High</td>
</tr>
<tr>
<td>F Excessive depredation and/or parasitism</td>
<td>Medium</td>
</tr>
<tr>
<td>G Insufficient size/extent of characteristic communities or ecosystems</td>
<td>Medium</td>
</tr>
<tr>
<td>H Habitat destruction or conversion</td>
<td>Medium</td>
</tr>
<tr>
<td>I Altered fire regime</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of the stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Shoreline hardening</td>
<td>Very High</td>
<td>A, B, C, G</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>Very High</td>
<td>A, B, C, G</td>
</tr>
<tr>
<td>3 Sea level rise</td>
<td>High</td>
<td>A, B, C, G</td>
</tr>
<tr>
<td>4 Conversion to recreation areas</td>
<td>High</td>
<td>A, B, C, G</td>
</tr>
<tr>
<td>5 Incompatible recreational activities</td>
<td>High</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>6 Roads</td>
<td>High</td>
<td>A, B, C, G</td>
</tr>
<tr>
<td>7 Light pollution</td>
<td>High</td>
<td>D, E, F</td>
</tr>
<tr>
<td>8 Climate variability</td>
<td>High</td>
<td>A, B, G</td>
</tr>
<tr>
<td>9 Incompatible residential activities</td>
<td>High</td>
<td>D, E</td>
</tr>
<tr>
<td>10 Invasive plants</td>
<td>Medium</td>
<td>A, D, E</td>
</tr>
<tr>
<td>11 Invasive animals</td>
<td>Medium</td>
<td>D, E</td>
</tr>
<tr>
<td>12 Nuisance animals</td>
<td>Medium</td>
<td>F</td>
</tr>
<tr>
<td>13 Management of nature–inlet relocation and dredging</td>
<td>Medium</td>
<td>A, B, C</td>
</tr>
<tr>
<td>14 Channel modification/shipping lanes</td>
<td>Medium</td>
<td>A, B</td>
</tr>
<tr>
<td>15 Military activities</td>
<td>Medium</td>
<td>A, B, G</td>
</tr>
<tr>
<td>16 Degraded habitat</td>
<td>Low</td>
<td>F</td>
</tr>
<tr>
<td>17 Management of nature–nourishment</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>18 Key predator/herbivore/pollinator losses</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>19 Chemicals and toxins</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>20 Nutrient loads–urban</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>21 Altered wind due to buildings</td>
<td>Low</td>
<td>E</td>
</tr>
</tbody>
</table>
Chapter 6: Habitats - Coastal Strand

Conservation Actions

Actions to abate the threats to Coastal Strand that were also identified as statewide threats (see list above in Conservation Threats section) may be found in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Coastal Strand are below. These actions were designed to reduce the impacts of light, dredged material, and humans and nuisance animals on coastal SGCN, reduce habitat loss to golf courses, and assure that the management and closure of military bases be implemented to retain critical habitat for Florida’s SGCN.

Conversion to Recreation Areas

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage incentives in county and regional planning for maintaining large tracts of native habitat in the development of recreational facilities.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

Light Pollution

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Ensure through state and local cooperation that coastal lighting ordinances are updated as technology and information improves.</td>
<td>VH</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Support cooperative education programs developed and/or implemented by utility companies and local governments for coastal property owners to ensure that light ordinances protecting coastal wildlife are followed (e.g., availability of automatic light shut-off features for beach lights).</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Support and expand the coastal light replacement efforts of the U.S. Fish and Wildlife Service to be implemented statewide where sea turtle nesting and beach mice habitat exists.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Support incentives for retrofitting existing light features.</td>
<td>VH</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Source</th>
<th>Rank</th>
<th>Source</th>
<th>Rank</th>
<th>Source</th>
<th>Rank</th>
<th>Source</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Incompatible fire</td>
<td>Low</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Incompatible Residential Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Expand the scale of the Florida Yards and Neighborhoods program from certifying individual landowners to whole neighborhoods; certification should be renewed biennially and any time property ownership changes.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Provide incentives (through local governments) for covenants, codes and restrictions in residential areas that address issues of pesticide use, pet control, feeding of wildlife, household or yard waste disposal, landscape plants, irrigation use, prescribed fire tolerance, and light-use in coastal areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Identify and promote effective reward models for homeowners, maintenance companies, and municipalities for reducing impacts on neighboring conservation areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Provide incentives (through local governments) (e.g., fast track, density breaks) for developers that produce on-site, site-specific educational materials and standards that are maintained by homeowner associations.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Develop and fund continuing education courses for the landscape maintenance industry that includes appropriate use of chemicals, irrigation, plants, and disposal of yard waste.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Provide information to homeowners about the nearest access points and areas for off-road vehicle use and the impacts of creating new access routes on coastal habitats.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage understanding of and compliance with leash laws in coastal strand and beach zones through increased patrols and information dissemination during nesting season. Utilize volunteers and others to help.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

### Nuisance Animals

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Identify important habitat areas for nesting and loafing shorebirds (of Greatest Conservation Need), and encourage people and their pets to avoid them (as appropriate) through targeted education, signage, and patrols.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Educate public landowners with responsibilities for coastal zone wildlife conservation about USDA protocols for raccoon management.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Increase funding to implement existing sea turtle management practices regarding prevention of egg and hatchling predation. Promote the use of volunteer groups in association with the FWC to provide more capacity for implementation.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Integrate feral animal management into public land management.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Develop and implement techniques for waste management in areas where SGCN or habitats are subject to high depredation or disturbance rates due to exotic or nuisance populations attracted or sustained by garbage.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Overall Rank</td>
<td>Policy</td>
<td>Feasibility</td>
<td>Benefits</td>
<td>Cost</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td>M</td>
<td>Assist counties, municipalities, and homeowners associations to develop and implement curbside pick-up of yard and household waste.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Promote increased awareness and understanding of potential impacts of outdoor pet feeding on wildlife, and encourage homeowners to feed pets indoors.</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Through cost-sharing and other incentive programs with local governments, ensure that home and business owners have wildlife-proof garbage containers.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>Work with Homeowner Associations to amend their bylaws to address outdoor feeding of feral cats and raccoons.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

**Management of Nature–Dredging**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Develop statewide, system-specific dredge material disposal plans that identify long-term disposal sites, specify dredge deposition practices, and minimize or offset impacts to all coastal wildlife. Tie the overall statewide dredge material management plan to port expansion management plan (recommended in Incompatible Industrial Operations).</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop educational programs about the importance of natural coastal processes and the economic cost of continually battling the natural movement of sand—direct these programs toward both the public and their elected officials.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop one or several coalitions of local groups statewide to identify local restoration projects where dredge material can be used.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop and promote incentive programs to encourage avoidance of areas where development is dependent upon beach dredging/nourishment.</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Promote long-term monitoring of impacts for dredging and nourishment projects.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Compare the cost of conducting dredge/nourishment projects in perpetuity to spending equal state/federal dollars on acquiring lands subject to erosion (barrier islands) and putting those lands into uses that are not dependent upon dredging.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Fund research on the impacts of beach nourishment on wildlife. For example, how invertebrate and benthic communities are impacted by nourishment projects and the cumulative impacts of repeated nourishment.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Establish a database of locations and timing of dredge/nourishment projects so that effects of repeated nourishment may be identified.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

**Military Activities**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Establish a permanent consultative group of multi-agency wildlife and habitat professionals that work with US DOD on development of any statewide plans for base expansion, increased usage, and growth or closure needs to enhance positive or minimize any negative impacts on wildlife and conservation lands.</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>Overall Rank</td>
<td>Land/Water Protection</td>
<td>Feasibility</td>
<td>Benefits</td>
<td>Cost</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------</td>
<td>-------------</td>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td>VH</td>
<td>Work to develop partnerships to encourage conservation of significant habitats on lands encompassed by federal/state base closures.</td>
<td>H</td>
<td>VH</td>
<td>VH</td>
</tr>
<tr>
<td>H</td>
<td>Work with the USDOD to develop management and mitigation alternatives for any loss or degradation of Coastal Strand habitat from military activities on barrier islands.</td>
<td>VH</td>
<td>M</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create a cooperative program to ensure consistent implementation of management plans on federal lands with sufficient capacity for conservation management of wildlife and habitats on military lands in Florida (e.g., prescribed fire, invasive species control, monitoring). Agreements should include that USDOD provides sufficient access to critical habitats for management and monitoring purposes (e.g., identify a procedure for routine access to restricted areas for these purposes). (State agencies, NGO conservation organizations, and USDOD)</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work to develop partnerships to encourage implementation of comprehensive management and mitigation plans that protect high-quality habitats and natural resources.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
Coastal Tidal River or Stream

Status
Current condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), the combined total length of all of Florida’s Coastal Tidal River or Stream is approximately 6,088 miles (9,798 km).

Habitat Description

FNAI type: None

Coastal Tidal River or Stream habitat includes the freshwater or brackish portions of a river or stream adjacent to an estuary or marine habitat in which the effects of tides cause the rise and fall of water levels. The effect of the tides at the upper limits of influence may lag several hours behind tides on the coast. The amount of water movement is controlled by the height of the tides, tidal range, downstream freshwater flow rates, rainfall, and wind. Saltwater wedges are formed in many of these systems, enabling numerous species a mechanism to move up or down river. Water flow is bidirectional in coastal tidal rivers and streams; as the tide rises, water flows toward the head of the river and, as the tide retreats, the water flows toward the coastal outlet. This habitat bridges the freshwater and marine realms, with aquatic communities ranging from tidal freshwater to tidal brackish; salinities can vary from freshwater to approximately that of seawater. This variation, along with temperature and water clarity, determines the flora and fauna of the Coastal Tidal River or Stream. Typical plants may include cord grass or submerged aquatic vegetation such as seagrasses and algae.

The Coastal Tidal River or Stream drains to the Gulf of Mexico or the Atlantic Ocean on Florida’s entire coast and comprises the dominant stream habitat in the south Florida region. The longest or most extensive area of this habitat occurs in the lower St. Johns River. Other coastal bay systems such as Choctawhatchee Bay, Pensacola Bay, Tampa Bay, and Charlotte Harbor are also
included in this habitat. Numerous small tidal creeks and coastal rivers are also included, especially in the Big Bend region of Florida’s Gulf coast along with the lower portions of other large rivers including the Suwannee and Escambia.

**Associated Species of Greatest Conservation Need**

**Mammals**
- Corynorhinus rafinesquii  
  Rafinesque's Big-eared Bat
- Eptesicus fuscus  
  Big Brown Bat
- Eumops floridanus  
  Florida Bonneted Bat
- Lasiurus borealis borealis  
  Red Bat
- Lasiurus seminolus  
  Seminole Bat
- Myotis austroriparius  
  Southeastern Myotis
- Perimyotis subflavus  
  Tricolored Bat
- Tadarida brasiliensis cynocephala  
  Brazilian Free-tailed Bat
- Lontra canadensis lataxina  
  River Otter
- Trichechus manatus latirostris  
  West Indian Manatee
- Eubalaena glacialis (incl. australis)  
  North Atlantic Right Whale

**Birds**
- Anas rubripes  
  American Black Duck
- Anas fulvigula  
  Mottled Duck
- Aythya marila  
  Greater Scaup
- Aythya affinis  
  Lesser Scaup
- Gavia immer  
  Common Loon
- Podiceps auritus  
  Horned Grebe
- Mycteria americana  
  Wood Stork
- Pelecanus occidentalis  
  Brown Pelican
- Ardea herodias  
  Great Blue Heron
- Ardea herodias occidentalis  
  Great White Heron
- Ardea alba  
  Great Egret
- Egretta thula  
  Snowy Egret
- Egretta caerulea  
  Little Blue Heron
- Egretta rufescens  
  Reddish Egret
- Butorides virescens  
  Green Heron
- Nycticorax nycticorax  
  Black-crowned Night-Heron
- Nyctanassa violacea  
  Yellow-crowned Night-Heron
- Platalea ajaja  
  Roseate Spoonbill
- Pandion haliaetus  
  Osprey
- Haliaeetus leucocephalus  
  Bald Eagle
- Pluvialis squatarola  
  Black-bellied Plover
- Pluvialis dominica  
  American Golden-Plover
- Haematopus palliatus  
  American Oystercatcher
- Tringa semipalmata semipalmata  
  Eastern Willet
- Tringa semipalmata inornata  
  Western Willet
- Tringa flavipes  
  Lesser Yellowlegs
- Numenius americanus  
  Long-billed Curlew
- Limosa fedoa  
  Marbled Godwit
- Arenaria interpres  
  Ruddy Turnstone
- Calidris alpina  
  Dunlin
- Calidris himantopus  
  Stilt Sandpiper
- *Limnodromus griseus* Short-billed Dowitcher
- *Limnodromus scolopaceus* Long-billed Dowitcher
- *Phalaropus tricolor* Wilson’s Phalarope
- *Sternula antillarum* Least Tern
- *Gelochelidon nilotica* Gull-billed Tern
- *Hydroprogne caspia* Caspian Tern
- *Chlidonias niger* Black Tern
- *Thalasseus maximus* Royal Tern
- *Thalasseus sandvicensis* Sandwich Tern
- *Cistothorus platensis* Sedge Wren

### Reptiles
- *Alligator mississippiensis* American Alligator
- *Crocodileus acutus* American Crocodile
- *Nerodia clarkii clarkii* Gulf Saltmarsh Watersnake
- *Nerodia clarkii compressicauda* Mangrove Saltmarsh Watersnake
- *Nerodia clarkii taeniata* Atlantic Saltmarsh Watersnake
- *Seminatrix pygaea cyclas* Southern Florida Swampsnake
- *Caretta caretta* Loggerhead Sea Turtle
- *Clemmys guttata* Spotted Turtle
- *Macrochelys temminckii* Alligator Snapping Turtle
- *Malaclemys terrapin* Diamond-backed Terrapin
- *Pseudemys nelsoni* Florida Red-bellied Cooter (Panhandle Population)
- *Pseudemys suwanniensis* Suwanee Cooter

### Fish
- *Acipenser brevirostrum* Shortnose Sturgeon
- *Acipenser oxyrinchus desotoi* Gulf of Mexico Sturgeon
- *Acipenser oxyrinchus oxyrinchus* Atlantic Sturgeon
- *Anguilla rostrata* American Eel
- *Alosa aestivalis* Blueback Herring
- *Alosa alabamae* Alabama Shad
- *Notropis harperi* Redeye Chub
- *Fundulus jenkinsi* Saltmarsh Topminnow
- *Carcharhinus plumbeus* Sandbar Shark
- *Carcharodon carcharias* White Shark
- *Galeocerdo cuvier* Tiger Shark
- *Pristis pectinata* Smalltooth Sawfish
- *Pristis pristis* Largetooth Sawfish
- *Sphyraena lewini* Scalloped Hammerhead
- *Sphyraena mokarran* Great Hammerhead
- *Sphyraena zygaena* Smooth Hammerhead
- *Squalus acanthias* Cape Shark, Piked Dogfish, Spurdog
- *Atractosteus spatula* Alligator Gar
- *Agoxostomus monticola* Mountain Mullet
- *Awaous banana* River Goby
- *Ctenogobius pseudofasciatus* Slashcheek Goby
- *Epinephelus itajara* Goliath Grouper
- *Microphus brachyurus* Opossum Pipefish
- *Syngnathus fuscus* Northern Pipefish
Invertebrates

- *Crassostrea virginica*  
  Eastern Oyster
- *Uca minax*  
  Red-jointed Fiddler, Brackish Water Fiddler
- *Uca pugilator*  
  Sand Fiddler
- *Uca pugnax*  
  Mud Fiddler
- *Macrobrachium acanthurus*  
  Cinnamon River Shrimp
- *Macrobrachium carcinus*  
  Big Claw River Shrimp
- *Macrobrachium ohione*  
  Ohio River Shrimp
- *Cicindela hirticollis*  
  Hairy-necked Tiger Beetle
- *Cicindela wapleri*  
  White-sand Tiger Beetle
- *Nectopsyche tavara*  
  Tavares White Miller Caddisfly
- *Oecetis porteri*  
  Porter's Long-horn Caddisfly
- *Triaenodes furcellus*  
  Little-fork Triaenode Caddisfly
- *Poanes viator zizaniae*  
  Broad-winged Skipper

Conservation Threats

Threats to the Coastal Tidal River or Stream habitat that were also identified for multiple other freshwater and wetland habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Chemicals and toxins
- Climate variability
- Conversion to commercial/industrial development
- Conversion to housing and urban development
- Invasive animals
- Invasive plants
- Nutrient loads–agriculture
- Nutrient loads–urban
- Roads
- Industrial spills
- Invasive animals
- Invasive plants
- Management of nature (beach nourishment and impoundments)
- Nutrient loads (urban)
- Roads, bridges and causeways
- Shoreline hardening
- Surface water and groundwater withdrawal
- Vessel impacts

Additional threats specific to this habitat include the operation of dams or water control structures, especially in south and central Florida, dredging and channel modification, loss of
submarine springs, and shoreline hardening. The impacts of recreational activities from boating, especially impacts to manatees and seagrass communities in coastal rivers, and discarded fishing gear that threatens wildlife were specifically identified for this habitat.

The following stresses (and sources of stress below) threaten this habitat in freshwater habitats:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered species composition/dominance</td>
<td>High</td>
</tr>
<tr>
<td>B Altered hydrologic regime</td>
<td>High</td>
</tr>
<tr>
<td>C Altered landscape mosaic or context</td>
<td>High</td>
</tr>
<tr>
<td>D Habitat destruction or conversion</td>
<td>Medium</td>
</tr>
<tr>
<td>E Altered water quality of surface water or aquifer: nutrients</td>
<td>Medium</td>
</tr>
<tr>
<td>F Altered water quality of surface water or aquifer: contaminants</td>
<td>Medium</td>
</tr>
<tr>
<td>G Altered water salinity, pH, conductivity or other physical water quality characteristics of surface water of aquifer</td>
<td>Medium</td>
</tr>
<tr>
<td>H Fragmentation of habitats, communities, ecosystems</td>
<td>Medium</td>
</tr>
<tr>
<td>I Altered community structure</td>
<td>Medium</td>
</tr>
<tr>
<td>J Erosion/sedimentation</td>
<td>Medium</td>
</tr>
<tr>
<td>K Habitat degradation/disturbance</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions. The following sources of stress are threats identified for freshwater habitats:

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Surface water withdrawal</td>
<td>High</td>
<td>A, B, C, G, I</td>
</tr>
<tr>
<td>2 Channel modification/shipping lanes</td>
<td>High</td>
<td>A, B, D, G, I</td>
</tr>
<tr>
<td>3 Dam operations</td>
<td>High</td>
<td>A, B, G, H, I</td>
</tr>
<tr>
<td>4 Conversion to housing and urban development</td>
<td>High</td>
<td>B, C, D</td>
</tr>
<tr>
<td>5 Shoreline hardening</td>
<td>High</td>
<td>A, D, H, I</td>
</tr>
<tr>
<td>6 Management of nature–veg clearing/snagging for water conveyance</td>
<td>Medium</td>
<td>A, B, H, I</td>
</tr>
<tr>
<td>7 Roads</td>
<td>Medium</td>
<td>D</td>
</tr>
<tr>
<td>8 Chemicals and toxins</td>
<td>Medium</td>
<td>A, F</td>
</tr>
<tr>
<td>9 Conversion to commercial and industrial development</td>
<td>Medium</td>
<td>D</td>
</tr>
<tr>
<td>10 Nutrient loads–agriculture</td>
<td>Medium</td>
<td>A, E</td>
</tr>
<tr>
<td>11 Nutrient loads–urban</td>
<td>Medium</td>
<td>A, E</td>
</tr>
<tr>
<td>12 Invasive plants</td>
<td>Medium</td>
<td>A, I</td>
</tr>
<tr>
<td>13 Sea level rise</td>
<td>Low</td>
<td>B</td>
</tr>
</tbody>
</table>

Chapter 6: Habitats - Coastal Tidal River or Stream
Chapter 6: Habitats - Coastal Tidal River or Stream

The following stresses (and sources of stress below) threaten this habitat in marine and estuarine habitats:

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Invasive animals</td>
<td>Low</td>
<td>A</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: Very High

The sources of stress, or threats, were used to generate conservation actions. The following sources of stress are threats identified for marine and estuarine habitats:

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Coastal development</td>
<td>Very High</td>
<td>L,M,P,T,U</td>
</tr>
<tr>
<td>2 Dam operations/incompatible release of water: (quality, quantity, timing)</td>
<td>Very High</td>
<td>L,M,N,O,Q,S,W</td>
</tr>
<tr>
<td>3 Channel modification/shipping lanes</td>
<td>Very High</td>
<td>L,O,P,Q,U,W</td>
</tr>
<tr>
<td>4 Inadequate stormwater management</td>
<td>Very High</td>
<td>L,M,N,O,Q,S,U</td>
</tr>
<tr>
<td>5 Shoreline hardening</td>
<td>Very High</td>
<td>L,P</td>
</tr>
<tr>
<td>6 Management of nature (beach nourishment, impoundments)</td>
<td>High</td>
<td>L,M,,O,Q,T</td>
</tr>
<tr>
<td>7 Chemicals and toxins</td>
<td>High</td>
<td>N,V</td>
</tr>
<tr>
<td>8 Industrial spills</td>
<td>High</td>
<td>N,Q,V</td>
</tr>
<tr>
<td>9 Incompatible industrial operations</td>
<td>High</td>
<td>L,M,N,T</td>
</tr>
<tr>
<td>10 Surface water withdrawal</td>
<td>High</td>
<td>L,M,O</td>
</tr>
<tr>
<td>11 Invasive animals</td>
<td>High</td>
<td>M,Q</td>
</tr>
</tbody>
</table>
### Sources of Stress

<table>
<thead>
<tr>
<th></th>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Invasive plants</td>
<td>High</td>
<td>M,U</td>
</tr>
<tr>
<td>13</td>
<td>Incompatible resource extraction: mining/drilling</td>
<td>High</td>
<td>O</td>
</tr>
<tr>
<td>14</td>
<td>Climate variability</td>
<td>High</td>
<td>R</td>
</tr>
<tr>
<td>15</td>
<td>Nutrient loads (all sources)</td>
<td>High</td>
<td>S</td>
</tr>
<tr>
<td>16</td>
<td>Utility corridors</td>
<td>Medium</td>
<td>L,P</td>
</tr>
<tr>
<td>17</td>
<td>Vessel impacts</td>
<td>Medium</td>
<td>P,Q</td>
</tr>
<tr>
<td>18</td>
<td>Boating impacts</td>
<td>Medium</td>
<td>P,Q</td>
</tr>
<tr>
<td>19</td>
<td>Incompatible recreational activities</td>
<td>Medium</td>
<td>M,Q</td>
</tr>
<tr>
<td>20</td>
<td>Groundwater withdrawal</td>
<td>Medium</td>
<td>L,M,O</td>
</tr>
<tr>
<td>21</td>
<td>Incompatible fishing pressure</td>
<td>Medium</td>
<td>M,T</td>
</tr>
<tr>
<td>22</td>
<td>Solid waste</td>
<td>Medium</td>
<td>Q</td>
</tr>
<tr>
<td>23</td>
<td>Roads, bridges and causeways</td>
<td>Medium</td>
<td>L,P,U</td>
</tr>
<tr>
<td>24</td>
<td>Acoustic pollution</td>
<td>Medium</td>
<td>Q</td>
</tr>
<tr>
<td>25</td>
<td>Thermal pollution</td>
<td>Medium</td>
<td>O</td>
</tr>
<tr>
<td>26</td>
<td>Fishing gear impacts</td>
<td>Medium</td>
<td>Q</td>
</tr>
</tbody>
</table>

### Statewide Threat Rank of Habitat

**Very High**

### Conservation Actions

Actions to abate the threats to Coastal Tidal River or Stream habitats that were also identified as statewide threats (see lists above in Conservation Threats section) are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Actions for this habitat were developed in both the terrestrial/freshwater and marine workshops.

Several of the actions developed for a statewide threat were only applicable to Coastal Tidal River or Stream and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Cypress Swamp, Freshwater Marsh and Wet Prairie, Natural Lake, Reservoir/Managed Lake, Seepage/Steephead Stream, Softwater Stream, Spring and Spring Run, and Terrestrial Cave) and are listed below. Additional actions were developed to address threats specific to this habitat. These actions are intended to prevent harm to aquatic ecosystems by managing the magnitude, duration, and frequency of fresh water inflows to coastal habitats and remediating the damage through targeted restoration projects, reducing sediment and nutrient loading through the development of advanced best management practices for urban activities, increasing the compatibility of urban development with conservation of coastal stream and associated riparian wetland and estuarine habitat, increasing scientific knowledge on the threats to submarine springs in coastal rivers, and improving enforcement for existing fishing and boating regulations.
### TERRESTRIAL/FRESHWATER-BASED ACTIONS

#### Dam Operations

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Encourage interstate coordination of Action Plan actions to ensure protection of all fish and wildlife resources when water management operations are altered.</td>
<td>M</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Coordinate multi-agency review of USACE activities, including biological aspects (fish spawn guidelines, protection of fish and wildlife resources) of water control plans for interstate water projects, fish spawn guidelines, re-establishing natural seasonal fluctuation of flows.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work cooperatively with other agencies to restore appropriate salinity regimes to coastal habitats</td>
<td>H</td>
<td>M</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Determine the appropriate hydrological flows and levels for water reservations on the Apalachicola, Yellow, Ochlockonee and other interstate rivers using Ecologically Sustainable Water Management (ESWM) approach.</td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Evaluate cumulative impacts of small rural impoundments on fish and wildlife.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Evaluate feasibility of incentive programs to remove small rural impoundments.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

### Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage tax or other incentives, such as density transfers, for environmentally friendly comprehensive development plans for projects that front on rivers and floodplains.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage establishment of and assist in development of criteria to create buffer zones between new development and river or floodplain edges.</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Roads

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage multi-agency participation in the Technical Advisory Committee for the Stream Crossing Technical Center (SCTC).</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Provide training to road maintenance personnel on methods for minimizing sediment movement to water bodies.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Support the implementation of the SCTC to promote recovery and conservation of aquatic ecosystems from impacts of unpaved road-stream crossings.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Based on a stream crossing inventory and prioritization, develop funding opportunities for road stabilization projects in Florida counties.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>
### Chemicals and Toxins

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop management techniques and standards for private landowners that minimize runoff of chemicals and toxins into wetlands and aquatic systems.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Conduct research defining appropriate sediment quality standards for the various aquatic and marine systems for development and implementation of state sediment quality standards. Fund research defining the cause-and-effect relationship between sediment contamination (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>Conduct research defining standards for persistent organic contaminants for the various aquatic and marine systems for development and implementation of state water quality standards. Fund research defining the cause-and-effect relationship between contamination from organics (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

### Invasive Plants

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Research methods for control of aquatic invasive species in flowing waters.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### MARINE-BASED ACTIONS

#### Industrial Spills

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Assist in the revision of emergency response plans in cooperation with the county EOCs, FDEP, DCA, and USCG for coastal waters where water-borne transport of oil and chemicals occur. Encourage bi-annual updates.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Assist in the revision of emergency response plans in cooperation with the county EOCs, FDEP, DCA, USCG and EPA for coastal waters that may be subject to land-based spills of oil and chemicals. Encourage bi-annual updates.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

### Surface/Groundwater withdrawal

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Characterize and support restoration of appropriate flow regimes in estuarine systems and coastal tidal streams.</td>
<td>M</td>
<td>M</td>
<td>VH</td>
</tr>
</tbody>
</table>

### Incompatible Recreational Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Improve understanding of and voluntary compliance with watercraft speed limits/zones, and work with all affected parties to explore options for reassessing speed zones.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Improve understanding of, signage for, and voluntary compliance with manatee protection zones.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
### Fishing Gear Impacts

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Continue to support and expand coastal clean-up. Expand into underwater habitats and statewide (include lead sinkers).</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
Coral Reef

Status
Current condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), approximately 1,400,000 acres (566,560 ha) of Coral Reef are present in Florida.

Habitat Description

FNAI type: Coral Reef

A Coral Reef is an epibenthic community; a concentrated topographic complex of massive corals and other sessile organisms (algae, bryozoans) that build calcium carbonate (limestone) skeletons. The structural complexity provides habitat for a highly diverse flora and fauna that live all or portions of their lives on Coral Reefs.

Two major Coral Reef types are recognized: patch reefs and offshore bank reefs. Bank Reefs are further defined by zones (e.g., reef flat, spur and groove). The types of Coral Reefs found off the coast of Florida include the shallow-wave resistant reefs in the region from Dry Tortugas to Martin County; deeper (30-130 ft; 10-40 m) reefs in the same region; the Oculina Banks seaward of Palm Beach to Vero Beach. Deep water (165-265 ft; 50-80 m) structures such as Pulley Ridge and the Florida Middle Grounds occur along the west Florida shelf break in federal waters.

Associated Species of Greatest Conservation Need

Mammals
- *Trichechus manatus latirostris*  West Indian Manatee
Birds
- *Fregata magnificens* Magnificent Frigatebird
- *Onychoprion anaethetus* Bridled Tern
- *Stern dougallii* Roseate Tern

Reptiles
- *Caretta caretta* Loggerhead Sea Turtle
- *Chelonia mydas* Green Sea Turtle
- *Eretmochelys imbricata* Hawksbill Sea Turtle

Fish
- *Aetobatus narinari* Spotted Eagle Ray
- *Alopias superciliosus* Bigeye Thresher Shark
- *Carcharhinus falciformis* Silky Shark
- *Carcharhinus obscurus* Dusky Shark
- *Carcharhinus perezi* Reef Shark
- *Carcharias taurus* Sand Tiger Shark
- *Carcharodon carcharias* White Shark
- *Cetorhinus maximus* Basking Shark
- *Manta birostris* Giant Manta Ray
- *Negaprion brevirostris* Lemon Shark
- *Pristis pectinata* Smalltooth Sawfish
- *Sphyrna lewini* Scalloped Hammerhead
- *Sphyrna mokarran* Great Hammerhead
- *Sphyrna zygaena* Smooth Hammerhead
- *Squalus acanthias* Cape Shark, Piked Dogfish, Spurdog
- *Bairdiella sanctae-luciae* Striped Croaker
- *Epinephelus drummondhayi* Speckled Hind
- *Epinephelus itajara* Goliath Grouper
- *Epinephelus striatus* Nassau Grouper
- *Lutjanus mahogoni* Mahogany Snapper
- *Starksia starcki* Key Blenny

Invertebrates
- *Gorgonia flabellum* Venus Sea Fan
- *Gorgonia ventrala* Purple Sea Fan
- *Bartholomea annulata* Ringed (Curlique Or Corkscrew) Anemone
- *Condyactis gigantea* Giant Caribbean Anemone
- *Epicystis crucifer* Beaded (Rock) Anemone
- *Stichodactyla helianthus* Sun (Carpet) Anemone
- *Acropora cervicornis* Staghorn Coral
- *Acropora palmata* Elkhorn Coral
- *Acropora prolifera* Fused Staghorn Coral
- *Agaricia agaricites* Lettuce Coral
- *Agaricia fragilis* Fragile Saucer Coral
- *Agaricia lamarcki* Lamanck's Sheet Coral
- *Agaricia tenuifolia* Thin Leaf Lettuce Coral
- *Leptoseris cucullata* Sunray Lettuce Coral
- *Eusmilia fastigiata* Flower Coral
- *Colophyllia natans* Large Grooved Brain Coral
- *Diploria clivosa* Knobby Brain Coral
- *Diploria labyrinthiformis* Grooved Brain Coral
- Diploria strigosa  
  Symmetrical Brain Coral

- Manicina areolata  
  Rose Coral

- Montastraea annularis  
  Boulder Star Coral

- Montastraea cavernosa  
  Great Star Coral

- Montastraea faveolata  
  Mountainous Star Coral

- Montastraea franksi  
  Boulder Star Coral

- Solenastrea bournoni  
  Smooth Star Coral

- Solenastrea hyades  
  Knobby Star Coral

- Dendrogyra cylindrus  
  Pillar Coral

- Dichocoenia stokesii  
  Elliptical Star Coral, Pineapple Coral

- Meandrina meandrites  
  Butterprint Brain Coral, Maze Coral

- Isophyllastraea rigida  
  Rough Star Coral

- Isophyllia sinuosa  
  Sinuous Cactus Coral

- Mussa angulosa  
  Large Flower Coral

- Mycetophyllia aliciae  
  Knobby Cactus Coral

- Mycetophyllia danaana  
  Low-ridge Cactus Coral

- Mycetophyllia ferox  
  Rough Cactus Coral

- Mycetophyllia lamarckiana  
  Ridged Cactus Coral

- Scolymia cubensis  
  Artichoke Coral

- Scolymia lacera  
  Atlantic Mushroom Coral

- Oculina robusta  
  Robust Ivory Tree Coral

- Oculina varicosa  
  Large Ivory Coral

- Madracis decactis  
  Ten-rayed Star Coral

- Madracis formosa  
  Eight-rayed Star Coral

- Madracis mirabilis  
  Yellow Pencil Coral

- Madracis pharensis  
  Encrusting Star Coral

- Porites branneri  
  Blue Crust Coral

- Porites porites  
  Finger Coral

- Phyllangia americana  
  Hidden Cup Coral

- Siderastrea siderea  
  Massive Starlet Coral

- Discosoma calgreni  
  Forked-tentacle Corallimorpharian

- Discosoma neglecta  
  Umbrella Mushroom, Umbrella Corallimorph

- Discosoma sanctithomae  
  Warty False Coral

- Ricordea florida  
  Florida False Coral

- Plumaphyes pennacea  
  Feather Black Coral

- Tanacetipathes barbadensis  
  Bottle Brush Black Coral

- Tanacetipathes tanacetum  
  Bottle Brush Black Coral

- Tanacetipathes thamnea  
  Black Coral

- Distichopora violacea  
  Violet Lace Coral

- Stylaster filogranus  
  Frilly Lace Coral

- Millepora alcicornis  
  Encrusting Fire Coral

- Millepora complanata  
  Bladed Fire Coral

- Pseudobiceros splendidus  
  Red-rim Flatworm, Splendid Flatworm

- Calliostoma javanicum  
  Chocolate-lined Topsnail

- Lithopoma americanum  
  American Starsnail

- Cassis flammee  
  Flame Helmet

- Cassis madagascariensis  
  Emperor or Queen Helmet

- Cassis tuberosa  
  King Helmet

- Cypraea cervus  
  Atlantic Deer Cowrie

- Cypraea zebra  
  Measled Cowrie

- Cyphoma mcgintyi  
  Spotted Cyphoma

- Chondropoma dentatum  
  Crenulate Horn

- Charonia tritonis variegata  
  Atlantic Trumpet Triton
• Cymatium femorale  Angular Triton
• Strombus gallus  Roostertail Conch
• Strombus gigas  Queen Conch
• Fasciolaria lilium  Banded Tulip
• Chromodoris kempfi  Purple-crowned Sea Goddess
• Glossodoris sedna  Red-tipped Sea Goddess
• Favorinus auritulus  Long-eared Nudibranch
• Cyancler cristallina  Harlequin Glass-slug
• Elysia clarki  Lettuce Sea Slug
• Elysia crispata  Lettuce Slug
• Elysia picta  Painted Elysia
• Octopus burryi  Brownstripe Octopus
• Octopus joubini  Atlantic Pygmy Octopus
• Enoplometopus antillensis  Flaming Reef Lobster
• Lysmata wurdemanni  Peppermint Shrimp
• Mithrax aculeatus (pilosus)  Hairy Clinging Crab
• Luidia senegalensis  Nine-armed Sea Star
• Poraniella echinulata  Red Miniature Sea Star
• Copidaster lymani  Mottled Red Sea Star
• Oreaster reticulatus  Cushion Star, Bahama Star
• Asterina folium  Common Blunt Armed Sea Star
• Echinaster echinophorus  Thorny Sea Star
• Asteropora annulata  Basket Star
• Astropyga magnifica  Magnificent Urchin
• Diadema antillarum  Long-spined Urchin
• Lytechinus williamsi  Jewel Urchin
• Clypeaster chesheri  A Sea Biscuit
• Clypeaster luetkeni  A Sea Biscuit
• Clypeaster rosaceus  West Indian Sea Biscuit
• Clypeaster subdepressus  Sea Biscuit
• Duasmodactyla seguroensis  A Sea Cucumber
• Ocnus suspicatus  A Sea Cucumber
• Havelockia inermis  A Sea Cucumber
• Neothyonidium parvum  A Sea Cucumber
• Euthyonidiella destichada  A Sea Cucumber
• Euthyonidiella trita  A Sea Cucumber
• Actinopyga agassizii  Five-toothed Sea Cucumber, West Indian Sea Cucumber
• Holothuria mexicana  Donkey Dung Sea Cucumber
• Holothuria occidentalis  A Sea Cucumber
• Holothuria parvula  A Sea Cucumber
• Holothuria rowei  A Sea Cucumber

Conservation Threats

The threat to Coral Reef habitats caused by Key predator/herbivore loss reflects the loss of Diadema antillarum sea urchins that has resulted in an overabundance of algae and threatens the health of the entire community. Other threats include over-fishing of the snapper/grouper complex, and intensive fishing of the spiny lobster and stone crab. Nutrient loading impacts species composition and community structure, and potentially interacts with parasites and pathogens to degrade the community further. Damage from groundings of boats and ships, and anchors of all size vessels have direct and cumulative impact on Coral Reefs.
Threats to the Coral Reef habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Chemicals and toxins
- Climate variability
- Coastal development
- Dam operations/incompatible release of water (quality, quantity, timing)
- Disruption of longshore transport of sediments
- Fishing gear impacts
- Harmful algal blooms
- Incompatible fishing pressure
- Incompatible industrial operations
- Incompatible recreational activities
- Incompatible resource extraction: mining/drilling
- Industrial spills
- Invasive plants
- Key predator/herbivore loss
- Management of nature (beach nourishment and impoundments)
- Nutrient loads (urban)
- Roads, bridges and causeways
- Shoreline hardening
- Vessel impacts

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Altered structure</td>
<td>Very High</td>
</tr>
<tr>
<td>B  Altered species composition</td>
<td>Very High</td>
</tr>
<tr>
<td>C  Missing key communities or functional guilds/trophic shift</td>
<td>Very High</td>
</tr>
<tr>
<td>D  Keystone species missing or lacking in abundance</td>
<td>Very High</td>
</tr>
<tr>
<td>E  Habitat destruction</td>
<td>Very High</td>
</tr>
<tr>
<td>F  Altered weather regime/sea level rise</td>
<td>High</td>
</tr>
<tr>
<td>G  Altered water quality, physical, chemistry</td>
<td>High</td>
</tr>
<tr>
<td>H  Altered primary productivity</td>
<td>High</td>
</tr>
<tr>
<td>I  Altered water quality–contaminants</td>
<td>Medium</td>
</tr>
<tr>
<td>J  Altered water quality–nutrients</td>
<td>Medium</td>
</tr>
<tr>
<td>K  Habitat disturbance</td>
<td>Medium</td>
</tr>
<tr>
<td>L  Sedimentation</td>
<td>Medium</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Climate variability</td>
<td>Very High</td>
<td>A, B, C, D, E, F, G, H, I, J, K</td>
</tr>
<tr>
<td>2 Inadequate stormwater management</td>
<td>Very High</td>
<td>A, B, C, D, E, G, H, I, J, K</td>
</tr>
<tr>
<td>3 Coastal development</td>
<td>Very High</td>
<td>A, E, G</td>
</tr>
<tr>
<td>4 Nutrient loads (all sources)</td>
<td>Very High</td>
<td>A, B, C, D, G, H, J, K</td>
</tr>
</tbody>
</table>
## Sources of Stress

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Parasites/pathogens</td>
<td>Very High</td>
<td>A, B, C, D, E, H, K</td>
</tr>
<tr>
<td>6 Incompatible fishing pressure</td>
<td>Very High</td>
<td>A, B, C, D, E, H, K</td>
</tr>
<tr>
<td>7 Fishing gear impacts</td>
<td>High</td>
<td>A, B, C, D, E, K</td>
</tr>
<tr>
<td>8 Invasive plants</td>
<td>High</td>
<td>A, B, C, D, E, K</td>
</tr>
<tr>
<td>9 Key predator/herbivore losses</td>
<td>High</td>
<td>A, B, D, K</td>
</tr>
<tr>
<td>10 Dam operations/incompatible release of water (quality,</td>
<td>High</td>
<td>B, E, G, H</td>
</tr>
<tr>
<td>quantity, timing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Channel modification/shipping lanes</td>
<td>High</td>
<td>A, E, G</td>
</tr>
<tr>
<td>13 Vessel impacts</td>
<td>High</td>
<td>A, B, C, D, E, I, K</td>
</tr>
<tr>
<td>14 Boating impacts</td>
<td>High</td>
<td>A, B, C, D, E, G, I, K</td>
</tr>
<tr>
<td>16 Incompatible aquarium trade</td>
<td>High</td>
<td>B, C, D, K</td>
</tr>
<tr>
<td>17 Chemicals and toxins</td>
<td>High</td>
<td>B, C, D, I, K</td>
</tr>
<tr>
<td>18 Incompatible resource extraction: mining/drilling</td>
<td>High</td>
<td>G</td>
</tr>
<tr>
<td>19 Shoreline hardening</td>
<td>High</td>
<td>E, G</td>
</tr>
<tr>
<td>20 Harmful algal blooms</td>
<td>High</td>
<td>G, H</td>
</tr>
<tr>
<td>21 Utility corridors</td>
<td>Medium</td>
<td>A, B, D, E, K</td>
</tr>
<tr>
<td>22 Incompatible recreational activities</td>
<td>Medium</td>
<td>A, B, E, I, K</td>
</tr>
<tr>
<td>23 Incompatible industrial operations</td>
<td>Medium</td>
<td>A, B, C, D, I, K</td>
</tr>
<tr>
<td>24 Disruption of longshore transport of sediments</td>
<td>Medium</td>
<td>G</td>
</tr>
<tr>
<td>25 Industrial spills</td>
<td>Medium</td>
<td>A, B, C, E, H, I, K</td>
</tr>
<tr>
<td>26 Placement of artificial structures</td>
<td>Medium</td>
<td>A, B, C, D, E, G, K</td>
</tr>
<tr>
<td>27 Military activities</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>28 Solid waste</td>
<td>Medium</td>
<td>A, E</td>
</tr>
</tbody>
</table>

### Statewide Threat Rank of Habitat

| Statewide Threat Rank of Habitat | Very High |

## Conservation Actions

Actions to abate the threats to Coral Reef that were also identified as statewide threats (see list above) are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Outcomes identified for this habitat address restoration of *Diadema* populations, reducing pollution inputs, and
ensuring that ship anchorages are not sited over sensitive areas, and reducing the probability that vessels run aground.

Highest ranked actions identified for abating this source of stress focused on:

- Expanding the recommendations made by the Land Based Sources of Pollution Focus Team of the Southeast Florida Coral Reef Initiative statewide to include all estuarine and nearshore areas of the State
- Funding research and communication on parasites, pathogens, and biotoxins
- Establishing a funding source for remediation of damages from vessel impacts
- Development of a vessel anchoring management plan and use of mooring buoys

Additional actions included:

- Improving management of water control structures to restore freshwater flows to nearshore systems
- Developing additional methods using new technologies to keep vessels away from sensitive areas
- Supporting restoration of damaged areas and replacement of species lost

### Dam Operations

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage improvement of management of water control structures to protect and enhance downstream environmental conditions.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

### Climate Variability

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Continue and support research to better understand how coral reefs and other marine/estuarine habitats react to climate variability issues.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Nutrient Loads

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Support Southeast Florida Coral Reef Initiative (SEFCRI).</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

### Parasites/Pathogens

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Develop regional biotoxin working groups, such as the one in the IRL, to address fish and wildlife disease events.</td>
<td>VH</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Improve capabilities/sophistication for inspection, recognition, and treatment of aquatic organism diseases and parasites.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
### Key Predator/Herbivore Loss

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Fund research on bacterial/viral signature of healthy versus diseased specimens of selected species (i.e., urchins and corals).</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

### Vessel Impacts

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management:</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Support a marine/estuarine restoration trust fund.</td>
<td>M</td>
<td>VH</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Develop a passive warning system for vessels to alert operators of sensitive or danger zones (shallows, reefs).</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Encourage avoidance of anchorage and moorage in sensitive areas.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Identify appropriate areas for anchorage and moorings. Develop educational tools on low-impact mooring techniques.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Support a nursery(ies) for replacement stock of corals, seagrasses, etc.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>
Cypress Swamp

Habitat Description

FNAI type: Strand Swamp, Dome Swamp

These regularly inundated wetlands form a forested border along large rivers, creeks, and lakes, or occur in depressions as circular domes or linear strands. These communities are strongly dominated by either bald cypress or pond cypress, with very low numbers of scattered black gum, red maple, and sweetbay. Understory and ground cover are usually sparse due to frequent flooding but sometimes include such species as buttonbush, lizard's-tail, and various ferns.

Associated Species of Greatest Conservation Need

Mammals
- *Corynorhinus rafinesquii*  
  Rafinesque's Big-eared Bat
- *Eumops floridanus*  
  Florida Bonneted Bat

Status
Current Condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 1,586,941 acres (642,212 ha) of Cypress Swamp habitat exist, of which 44% (689,955 ac; 279,215 ha) are in existing conservation or managed areas. Another 11% (173,971 ac; 70,404 ha) are in Florida Forever projects and 10% (163,702 ac; 66,248 ha) are in SHCA-designated lands. The remaining 35% (559,313 ac; 226,346 ha) are other private lands.
<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lasiurus borealis borealis</td>
<td>Red Bat</td>
</tr>
<tr>
<td>Lasiurus intermedius floridanus</td>
<td>Northern Yellow Bat</td>
</tr>
<tr>
<td>Lasiurus seminolus</td>
<td>Seminole Bat</td>
</tr>
<tr>
<td>Myotis austroriparius</td>
<td>Southeastern Myotis</td>
</tr>
<tr>
<td>Perimyotis subflavus</td>
<td>Tricolored Bat</td>
</tr>
<tr>
<td>Lontra canadensis lataxina</td>
<td>River Otter</td>
</tr>
<tr>
<td>Neovison vison evergladensis</td>
<td>Everglades Mink</td>
</tr>
<tr>
<td>Neovison vison halilimnetes</td>
<td>Gulf Salt Marsh Mink</td>
</tr>
<tr>
<td>Puma concolor coryi</td>
<td>Florida Panther</td>
</tr>
<tr>
<td>Ursus americanus floridanus</td>
<td>Florida Black Bear</td>
</tr>
<tr>
<td>Trichechus manatus latirostris</td>
<td>West Indian Manatee</td>
</tr>
</tbody>
</table>

**Birds**

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mycteria americana</td>
<td>Wood Stork</td>
</tr>
<tr>
<td>Ardea herodias</td>
<td>Great Blue Heron</td>
</tr>
<tr>
<td>Ardea alba</td>
<td>Great Egret</td>
</tr>
<tr>
<td>Egretta thula</td>
<td>Snowy Egret</td>
</tr>
<tr>
<td>Egretta caerulea</td>
<td>Little Blue Heron</td>
</tr>
<tr>
<td>Butorides virescens</td>
<td>Green Heron</td>
</tr>
<tr>
<td>Nycticorax nycticorax</td>
<td>Black-crowned Night-Heron</td>
</tr>
<tr>
<td>Nyctanassa violacea</td>
<td>Yellow-crowned Night-Heron</td>
</tr>
<tr>
<td>Eudocimus albus</td>
<td>White Ibis</td>
</tr>
<tr>
<td>Plegadis falcinellus</td>
<td>Glossy Ibis</td>
</tr>
<tr>
<td>Elanoides forficatus</td>
<td>Swallow-tailed Kite</td>
</tr>
<tr>
<td>Haliaeetus leucocephalus</td>
<td>Bald Eagle</td>
</tr>
<tr>
<td>Buteo brachyrurus</td>
<td>Short-tailed Hawk</td>
</tr>
<tr>
<td>Aramus guarauna</td>
<td>Limpkin</td>
</tr>
<tr>
<td>Campephilus principalis</td>
<td>Ivory-billed Woodpecker</td>
</tr>
<tr>
<td>Vermivora chrysoptera</td>
<td>Golden-winged Warbler</td>
</tr>
<tr>
<td>Vermivora cyanoptera</td>
<td>Blue-winged Warbler</td>
</tr>
<tr>
<td>Protonotaria citrea</td>
<td>Prothonotary Warbler</td>
</tr>
<tr>
<td>Setophaga ruticilla</td>
<td>American Redstart</td>
</tr>
<tr>
<td>Setophaga dominica stoddardi</td>
<td>Stoddard's Yellow-throated Warbler</td>
</tr>
<tr>
<td>Setophaga discolor discolor</td>
<td>Prairie Warbler</td>
</tr>
<tr>
<td>Cardellina canadensis</td>
<td>Canada Warbler</td>
</tr>
<tr>
<td>Euphasagus carolinus</td>
<td>Rusty Blackbird</td>
</tr>
</tbody>
</table>

**Amphibians**

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithobates capito</td>
<td>Gopher Frog</td>
</tr>
<tr>
<td>Lithobates virgatipes</td>
<td>Carpenter Frog</td>
</tr>
<tr>
<td>Pseudacris ornata</td>
<td>Ornate Chorus Frog</td>
</tr>
<tr>
<td>Ambystoma bishopi</td>
<td>Reticulated Flatwoods Salamander</td>
</tr>
<tr>
<td>Ambystoma cingulatum</td>
<td>Frosted Flatwoods Salamander</td>
</tr>
<tr>
<td>Ambystoma tigrinum</td>
<td>Eastern Tiger Salamander</td>
</tr>
<tr>
<td>Amphiuma pholetter</td>
<td>One-toed Amphiuma</td>
</tr>
<tr>
<td>Desmognathus auriculatus</td>
<td>Southern Dusky Salamander</td>
</tr>
<tr>
<td>Eurycea chamberlaini</td>
<td>Chamberlain's Dwarf Salamander</td>
</tr>
<tr>
<td>Hemidactylum scutatum</td>
<td>Four-toed Salamander</td>
</tr>
<tr>
<td>Notopthalmus perstriatus</td>
<td>Striped Newt</td>
</tr>
<tr>
<td>Pseudobranchus striatus lustricolus</td>
<td>Gulf Hammock Dwarf Siren</td>
</tr>
<tr>
<td>Pseudobranchus striatus striatus</td>
<td>Broad-striped Dwarf Siren</td>
</tr>
<tr>
<td>Stereochilus marginatus</td>
<td>Many-lined Salamander</td>
</tr>
</tbody>
</table>
Reptiles

- **Alligator mississippiensis**
  - American Alligator
- **Anolis carolinensis seminolus**
  - Southern Green Anole
- **Plestiodon anthracinus pluvialis**
  - Southern Coal Skink
- **Crotalus horridus**
  - Timber Rattlesnake
- **Drymarchon couperi**
  - Eastern Indigo Snake
- **Farancia erytrogramma**
  - Rainbow Snake
- **Heterodon platirhinos**
  - Eastern Hog-nosed Snake
- **Lampropeltis getula**
  - Eastern Kingsnake
- **Nerodia cyclopion**
  - Mississippi Green Watersnake
- **Seminatrix pygaea cyclas**
  - Southern Florida Swampsnake
- **Clemmys guttata**
  - Spotted Turtle
- **Deirochelys reticularia**
  - Chicken Turtle
- **Terrapene carolina**
  - Eastern Box Turtle

Fish

- **Hybognathus hayi**
  - Cypress Minnow
- **Notropis melanostomus**
  - Blackmouth Shiner
- **Pteronotropis welaka**
  - Bluenose Shiner
- **Umbra pygmaea**
  - Eastern Mudminnow
- **Atractosteus spatula**
  - Alligator Gar
- **Acantharchus pomotis**
  - Mud Sunfish
- **Enneacanthus chaetodon**
  - Black Banded Sunfish
- **Etheostoma proeliare**
  - Cypress Darter

Invertebrates

- **Cambarellus blacki**
  - Cypress Crayfish
- **Cambarellus schmitti**
  - A Crayfish
- **Procambarus apalachicolae**
  - A Crayfish
- **Procambarus latipleurum**
  - A Crayfish
- **Chrysobasis lucifer**
  - Tail-light Damselfly
- **Lestes tenuatus**
  - Blue-striped Spreadwing
- **Euphyes berryi**
  - Berry's Skipper
- **Euphyes dion**
  - Dion Skipper
- **Hesperia attalus slossonae**
  - Seminole Skipper
- **Callophrys henrici**
  - Henry's Elfin
- **Callophrys hesseli**
  - Hessel's Hairstreak
- **Zale percula**
  - Okefenokee Zale Moth
- **Anthanassa texana seminole**
  - Seminole Crescent
- **Enodia portlandia floralae**
  - Florida Pearly Eye

Conservation Threats

Threats to the Cypress Swamp habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to agriculture
- Conversion to housing and urban development
- Groundwater withdrawal
- Incompatible fire
- Incompatible forestry practices

Chapter 6: Habitats - Cypress Swamp
• Incompatible resource extraction—mining/drilling
• Invasive animals
• Invasive plants
• Nutrient loads—agriculture

• Nutrient loads—urban
• Roads
• Surface water withdrawal and diversion

Widespread ditching and diking of this habitat and hydrologic fragmentation due to construction of roads through and adjacent to this habitat are large sources of altered hydrologic regime. Groundwater withdrawal for municipal and agricultural purposes has impacted cypress wetlands in localized areas throughout Florida, but this threat is most severe in portions of central Florida. Incompatible forestry practices threaten this habitat due to physical and hydrological disturbance and the slow regeneration time of cypress trees. Currently, most cypress harvest is of young, small-diameter trees for landscape mulch. Nearly all cypress wetlands in unprotected lands have suffered from altered landscape context as the surrounding uplands and wet prairies have been converted to other land uses, primarily agriculture and urban/suburban development. In many parts of Florida, cypress wetlands are particularly vulnerable to and have been seriously impacted by a variety of invasive plants. Many cypress wetlands in both agricultural and urban settings receive nutrient-laden discharges from stormwater management systems, often leading to drastic changes in understory plant community composition and associated faunal changes. Additional threats specific to this habitat include the numerous water control structures affecting Cypress Swamps, particularly smaller dome swamps, statewide.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Altered hydrologic regime</td>
</tr>
<tr>
<td>B</td>
<td>Altered landscape mosaic or context</td>
</tr>
<tr>
<td>C</td>
<td>Altered soil structure and chemistry</td>
</tr>
<tr>
<td>D</td>
<td>Altered community structure</td>
</tr>
<tr>
<td>E</td>
<td>Altered species composition/dominance</td>
</tr>
<tr>
<td>F</td>
<td>Habitat destruction or conversion</td>
</tr>
<tr>
<td>G</td>
<td>Altered water quality of surface water or aquifer: nutrients</td>
</tr>
<tr>
<td>H</td>
<td>Missing key communities, functional guilds, or seral stages</td>
</tr>
<tr>
<td>I</td>
<td>Altered fire regime</td>
</tr>
<tr>
<td>J</td>
<td>Fragmentation of habitats, communities, ecosystems</td>
</tr>
<tr>
<td>K</td>
<td>Altered water and/or soil temperature</td>
</tr>
<tr>
<td>L</td>
<td>Habitat degradation/disturbance</td>
</tr>
</tbody>
</table>
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Incompatible forestry practices</td>
<td>High</td>
<td>A, B, C, D, E, F, H</td>
</tr>
<tr>
<td>2 Surface water withdrawal</td>
<td>High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>3 Nutrient loads–agriculture</td>
<td>High</td>
<td>E, G</td>
</tr>
<tr>
<td>4 Invasive plants</td>
<td>High</td>
<td>D, E</td>
</tr>
<tr>
<td>5 Conversion to housing and urban development</td>
<td>High</td>
<td>A, B</td>
</tr>
<tr>
<td>6 Invasive animals</td>
<td>Medium</td>
<td>C, D, E</td>
</tr>
<tr>
<td>7 Groundwater withdrawal</td>
<td>Medium</td>
<td>A, C, E</td>
</tr>
<tr>
<td>8 Roads</td>
<td>Medium</td>
<td>A, B, E</td>
</tr>
<tr>
<td>9 Conversion to agriculture</td>
<td>Medium</td>
<td>A, B</td>
</tr>
<tr>
<td>10 Incompatible vegetation harvest</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>11 Nutrient loads–urban</td>
<td>Low</td>
<td>E, G</td>
</tr>
<tr>
<td>12 Incompatible fire</td>
<td>Low</td>
<td>B, E</td>
</tr>
<tr>
<td>13 Incompatible resource extraction: mining/drilling</td>
<td>Low</td>
<td>A, F</td>
</tr>
<tr>
<td>14 Incompatible grazing and ranching</td>
<td>Low</td>
<td>D, E, G</td>
</tr>
<tr>
<td>15 Incompatible agricultural practices</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>16 Management of nature–water control structures</td>
<td>Low</td>
<td>A, B</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: High

Conservation Actions

Actions to abate the threats to Cypress Swamp that were also identified as statewide threats (incompatible forestry practices, surface water withdrawal and diversion, nutrient loads–agriculture, invasive plants, conversion to housing and urban development, invasive animals, groundwater withdrawal, roads, conversion to agriculture, nutrient loads–urban, incompatible fire, and incompatible resource extraction–mining/drilling) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat that were only applicable to Cypress Swamp and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Freshwater Marsh and Wet Prairie, Natural Lake, Reservoir/Managed Lake, Seepage/Steephead Stream, Softwater Stream, Spring and Spring Run, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. Additional actions were developed to address threats specific to this habitat. These actions are intended to increase the spatial extent of Cypress Swamps in the landscape and improve the functionality of existing cypress wetlands through both regional and small-scale hydrologic restoration projects.
### Incompatible Forestry Practices

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage labeling on cypress mulch alternatives that promotes their ecological value to consumers.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Through garden clubs, landscapers, and other avenues, promote acceptable alternatives to cypress mulch and make them readily available.</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Investigate various sources of possible funding for cypress regeneration studies</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Recognizing that species move between wetland and upland regeneration studies, assess the effectiveness of current BMP’s regarding bedding near isolated wetlands.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

### Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage tax or other incentives, such as density transfers, for environmentally friendly comprehensive development plans for projects that front on rivers and floodplains.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

### Conversion to Agriculture

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create incentives for maintenance and conversion of lands to agricultural uses that use less water and result in lower nutrient outputs into Florida's waters and wetlands, and create market-based incentives to compensate private landowners for the environmental services they provide to the state through management that increases water storage and nutrient reduction.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

### Management of Nature – Water Control Structures

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Review existing Farm Bill programs and explore options for enhancing economic benefits to landowners that improve or remove water control structures.</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Develop an awareness program for Drainage Districts created by Chapter 298 of the Florida Administrative Code (&quot;298 Districts&quot;) to educate them about opportunities to improve fish and wildlife habitat conditions through operational and/or structural changes in their drainage systems.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Create a grant program (or utilize existing Farm Bill and other federal programs) to replace or retrofit existing stop log or manually controlled structures with V-notch weirs in agricultural drainage systems. Give priority to those control structures that are identified as acting as barriers to wildlife movement or sheet flow.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>Form an interagency task force to streamline the permitting process for wetland restoration projects that restore hydrology.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

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Chapter 6: Habitats - Cypress Swamp
Disturbed/Transitional

Status
Current condition: Unknown.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), approximately 2,807,185 acres (1,136,027 ha) of Disturbed/Transitional habitat exist. However, this is a very dynamic cover class. Areas are rapidly added to and lost from this category, due to both natural processes (e.g., succession, wildfire) and human enterprise (e.g., agriculture).

Habitat Description

FNAI type: None

This habitat category includes two principal types of Disturbed/Transitional habitat. The first type is comprised of a variety of situations where a natural upland community type has recently experienced an extensive disturbance resulting in the loss of nearly all of the vegetative cover (e.g., clear-cutting, land clearing, or severe fire) and is recovering through natural successional processes. This includes areas that range from bare soil to recently denuded areas where vegetative growth has resulted in a dense, mixed cover of herbaceous vegetation, shrubs, and vines. Species composition may approximate that of the pre-existing stand. These areas could be characterized as early-successional habitats.

The second type of Disturbed/Transitional habitat is comprised of upland or wetland site dominated by non-native invasive plants, most commonly trees. These invasives may have been planted, or may have escaped cultivation and invaded native plant communities. These exotics include Melaleuca, Australian pine, Brazilian pepper, and Eucalyptus.
## Associated Species of Greatest Conservation Need

### Mammals
- **Blarina shermani** — Sherman's Short-tailed Shrew
- **Sorex longirostris eionis** — Homosassa Shrew
- **Corynorhinus rafinesquii** — Rafinesque's Big-eared Bat
- **Eptesicus fuscus** — Big Brown Bat
- **Eumops floridanus** — Florida Bonneted Bat
- **Lasiurus borealis borealis** — Red Bat
- **Lasiurus cinereus cinereus** — Hoary Bat
- **Lasiurus intermedius floridanus** — Northern Yellow Bat
- **Lasiurus seminolus** — Seminole Bat
- **Myotis auroriparius** — Southeastern Myotis
- **Myotis grisescens** — Gray Bat
- **Perimyotis subflavus** — Tricolored Bat
- **Tadarida brasiliensis cynocephala** — Brazilian Free-tailed Bat
- **Sylvilagus palustris hefneri** — Lower Keys Marsh Rabbit
- **Geomys pinetis pinetis** — Southeastern Pocket Gopher
- **Neofiber alleni** — Round-tailed Muskrat
- **Neotoma floridana smalli** — Key Largo Woodrat
- **Oryzomyx palastris natator** — Silver Rice Rat
- **Oryzomyx palastris planirostris** — Pine Island Marsh Rice Rat
- **Oryzomyx palastris sanibeli** — Sanibel Island Marsh Rice Rat
- **Peromyscus gossypinus allapaticola** — Key Largo Cotton Mouse
- **Peromyscus polionotus allophrys** — Choctawhatchee Beach Mouse
- **Peromyscus polionotus leucocephalus** — Santa Rosa Beach Mouse
- **Peromyscus polionotus niveiventris** — Southeastern Beach Mouse
- **Peromyscus polionotus trissylepsis** — Perdido Key Beach Mouse
- **Podomys floridanus** — Florida Mouse
- **Sciurus niger avicennia** — Big Cypress Fox Squirrel
- **Sciurus niger niger** — Southeastern Fox Squirrel
- **Sciurus niger shermani** — Sherman's Fox Squirrel
- **Sigmodon hispidus exsputus** — Lower Keys Cotton Rat
- **Sigmodon hispidus insulicola** — Insular Cotton Rat
- **Tamias striatus** — Eastern Chipmunk
- **Mustela frenata olivacea** — Southeastern Weasel
- **Mustela frenata peninsulariae** — Florida Long-tailed Weasel
- **Procyon lotor auspicatus** — Key Vaca Raccoon
- **Procyon lotor incautus** — Key West Raccoon
- **Procyon lotor inesperatus** — Matecumbe Key Raccoon
- **Puma concolor coryi** — Florida Panther
- **Spilogale putorius ssp.** — Spotted Skunk
- **Ursus americanus floridanus** — Florida Black Bear
- **Odocoileus virginianus clavium** — Key Deer

### Birds
- **Colinus virginianus** — Northern Bobwhite
- **Mycteria americana** — Wood Stork
- **Elanoides forficatus** — Swallow-tailed Kite
- **Elanus leucurus** — White-tailed Kite
<table>
<thead>
<tr>
<th>Species Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ictinia mississippiensis</td>
<td>Mississippi Kite</td>
</tr>
<tr>
<td>Buteo platypterus</td>
<td>Broad-winged Hawk</td>
</tr>
<tr>
<td>Buteo brachyurus</td>
<td>Short-tailed Hawk</td>
</tr>
<tr>
<td>Caracara cheriway audubonii</td>
<td>Audubon's Crested Caracara</td>
</tr>
<tr>
<td>Falco sparverius paulus</td>
<td>Southeastern American Kestrel</td>
</tr>
<tr>
<td>Falco columbarius</td>
<td>Merlin</td>
</tr>
<tr>
<td>Falco peregrinus</td>
<td>Peregrine Falcon</td>
</tr>
<tr>
<td>Grus canadensis pratensis</td>
<td>Florida Sandhill Crane</td>
</tr>
<tr>
<td>Grus americana</td>
<td>Whooping Crane</td>
</tr>
<tr>
<td>Charadrius nivosus</td>
<td>Snowy Plover</td>
</tr>
<tr>
<td>Charadrius wilsonia</td>
<td>Wilson's Plover</td>
</tr>
<tr>
<td>Charadrius melodus</td>
<td>Piping Plover</td>
</tr>
<tr>
<td>Tringa solitaria</td>
<td>Solitary Sandpiper</td>
</tr>
<tr>
<td>Tryngites subruficollis</td>
<td>Buff-breasted Sandpiper</td>
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<td>Sterna antillarum</td>
<td>Least Tern</td>
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<td>Columba passerina</td>
<td>Common Ground-Dove</td>
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<tr>
<td>Crotophaga ani</td>
<td>Smooth-billed Ani</td>
</tr>
<tr>
<td>Megascops asio</td>
<td>Eastern Screech-Owl</td>
</tr>
<tr>
<td>Athene cunicularia</td>
<td>Burrowing Owl</td>
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<tr>
<td>Chordeiles minor</td>
<td>Common Nighthawk</td>
</tr>
<tr>
<td>Chordeiles gundlachii</td>
<td>Antillean Nighthawk</td>
</tr>
<tr>
<td>Caprimulgus carolinensis</td>
<td>Chuck-will's-widow</td>
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<tr>
<td>Caprimulgus vociferus</td>
<td>Eastern Whip-poor-will</td>
</tr>
<tr>
<td>Tyrannus dominicensis</td>
<td>Gray Kingbird</td>
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<tr>
<td>Lanius ludovicianus</td>
<td>Loggerhead Shrike</td>
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<tr>
<td>Vireo altilogus</td>
<td>Black-whiskered Vireo</td>
</tr>
<tr>
<td>Aphelocoma coerulescens</td>
<td>Florida Scrub-Jay</td>
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<tr>
<td>Catharus bicknelli</td>
<td>Bicknell's Thrush</td>
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<tr>
<td>Helmitheros vermivorum</td>
<td>Worm-eating Warbler</td>
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<tr>
<td>Parkesia motacilla</td>
<td>Louisiana Waterthrush</td>
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<tr>
<td>Vermivora chrysoptera</td>
<td>Golden-winged Warbler</td>
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<tr>
<td>Vermivora cyanoptera</td>
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<td>Protonotaria citrea</td>
<td>Prothonotary Warbler</td>
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<td>Limnothlypis swainsonii</td>
<td>Swainson's Warbler</td>
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<tr>
<td>Geothlypis formosa</td>
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<td>American Redstart</td>
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<tr>
<td>Setophaga cerulea</td>
<td>Cerulean Warbler</td>
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<tr>
<td>Setophaga castanea</td>
<td>Bay-breasted Warbler</td>
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<td>Setophaga petechia gundlachi</td>
<td>Cuban Yellow Warbler</td>
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<td>Setophaga dominica stoddardi</td>
<td>Stoddard's Yellow-throated Warbler</td>
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<td>Setophaga discolor discolor</td>
<td>Prairie Warbler</td>
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<tr>
<td>Setophaga discolor paludicola</td>
<td>Florida Prairie Warbler</td>
</tr>
<tr>
<td>Cardellina canadensis</td>
<td>Canada Warbler</td>
</tr>
<tr>
<td>Peucaea aestivalis</td>
<td>Bachman's Sparrow</td>
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<tr>
<td>Ammodramus savannarum pratensis</td>
<td>Grasshopper Sparrow</td>
</tr>
<tr>
<td>Ammodramus savannarum floridanus</td>
<td>Florida Grasshopper Sparrow</td>
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<tr>
<td>Ammodramus henslowii</td>
<td>Henslow's Sparrow</td>
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<td>Ammodramus maritimus fisheri</td>
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<td>Ammodramus maritimus macgillivraii</td>
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<td>Ammodramus maritimus mirabilis</td>
<td>Cape Sable Seaside Sparrow</td>
</tr>
<tr>
<td>Ammodramus maritimus peninsulae</td>
<td>Scott's Seaside Sparrow</td>
</tr>
<tr>
<td>Ammodramus maritimus junicolus</td>
<td>Wakulla Seaside Sparrow</td>
</tr>
</tbody>
</table>
- **Passerina ciris** Painted Bunting
- **Euphagus cyanocephalus** Brewer's Blackbird

### Reptiles

- **Anolis carolinensis seminolus** Southern Green Anole
- **Plestiodon egregius egregius** Florida Keys Mole Skink
- **Plestiodon egregius insularis** Cedar Key Mole Skink
- **Plestiodon egregius lividus** Blue-tailed Mole Skink
- **Plestiodon egregius onocrepis** Peninsula Mole Skink
- **Plestiodon reynoldsi** Florida Sand Skink
- **Rhineura floridana** Florida Worm Lizard
- **Sceloporus woodi** Florida Scrub Lizard
- **Sphaerodactylus notatus notatus** Florida Reef Gecko
- **Aglisterodon contortrix contortrix** Southern Copperhead
- **Cemophora cocchina coccinea** Florida Scarlet Snake
- **Crotalus adamanteus** Eastern Diamond-backed Rattlesnake
- **Crotalus horridus** Timber Rattlesnake
- **Diadophis punctatus acricus** Key Ring-necked Snake
- **Drymarchon couperi** Eastern Indigo Snake
- **Heterodon platirhinos** Eastern Hog-nosed Snake
- **Heterodon simus** Southern Hog-nosed Snake
- **Lampropeltis calligaster** Yellow-bellied Kingsnake
- **Lampropeltis extenuata** Short-tailed Snake
- **Lampropeltis getula** Eastern Kingsnake
- **Pantherophis guttatus** Red Cornsnake (Lower Keys population)
- **Pituophis melanoleucus mugitus** Florida Pine Snake
- **Sororia victa** Florida Brown Snake (Keys Population)
- **Tantilla oolitica** Rim Rock Crowned Snake
- **Tantilla relictia** Florida Crowned Snake
- **Thamnophis sauritus sackenii** Peninsula Ribbonsnake (Lower Keys Population)
- **Virginia valeriae valeriae** Eastern Smooth Earth Snake (Highlands Co.)
- **Terrapene carolina** Eastern Box Turtle

### Invertebrates

- **Amblyscirtes vialis** Common Roadside-skipper
- **Atrytonopsis loammi** Loammi Skipper
- **Ephyriades brunnea floridensis** Florida Duskywing
- **Hesperia attalus slossonae** Seminole Skipper
- **Megathytmus cofaqui** Cofiqui Skipper
- **Megathytmus yuccae** Yucca Skipper
- **Nastra neamathla** Neamathla Skipper
- **Poanes yehl** Yehl Skipper
- **Polites baracoa** Baracoa Skipper
- **Polites origenes** Crossline Skipper
- **Staphylyus hayhurstii** Scalloped Sooty Wing
- **Callophrys irus** Frosted Elfin
- **Cupido comynas** Eastern Tailed Blue
- **Ministrymon azia** Gray Ministreak
- **Satyrium kingi** King's Hairstreak
- **Satyrium liparops floridensis** Sparkleberry Hairstreak
- **Satyrium titus** Coral Hairstreak
- **Anthanassa frisia** Cuban Crescent
Conservation Threats

While threats to its conservation as well as remedial actions were identified during Action Plan Science Workshops I and II, the Disturbed/Transitional habitat category was not addressed in TNC workshops that generated tables of ranked threats and actions, as seen in most other habitat categories. The decision to not rank threats and actions for this habitat was made (1) to maximize discussion time for higher-priority habitats and (2) because of some disagreement over recognition of this habitat type as important to wildlife conservation. Therefore, threats and actions are presented as simple bulleted lists, arranged in alphabetical order, with no prioritization.

The following stresses threaten this habitat:

- Absent or insufficient biological legacies
- Altered community structure
- Altered fire regime—timing, frequency, intensity, extent
- Altered hydrologic regime—timing, duration, frequency, extent
- Altered landscape pattern or mosaic
- Altered soil structure and chemistry
- Altered species composition/dominance
- Altered successional dynamics
- Altered water and/or soil temperature
- Altered water quality of surface water or aquifer: contaminants
- Altered water quality of surface water or aquifer: nutrients
- Erosion/sedimentation
- Excessive depredation and/or parasitism
- Fragmentation of habitats, communities, ecosystems
- Habitat degradation/disturbance
- Insufficient size/extent of disturbance
- Insufficient size/extent of characteristic communities/ecosystems
- Keystone species missing or lacking in abundance
- Missing key communities, functional guilds, or seral stages

The following sources of stress, or threats, were used to generate conservation actions.

- Chemicals and toxins
- Conversion to agriculture
- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Conversion to recreation areas
- Incompatible fire
- Incompatible forestry practices
- Incompatible recreational activities
- Incompatible resource extraction—mining
- Incompatible wildlife and fisheries management strategies
- Invasive animals
- Invasive plants
Conservation Actions

Actions to abate threats to Disturbed/Transitional were designed to reduce the impacts of on-site and adjacent management activities, and to increase the habitat’s suitability to wildlife. Most of the threats to this habitat (see list above) were also identified for multiple other habitats, and are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. Exceptions are Conversion to commercial and industrial development, lack of knowledge/appreciation of early-successional habitat, and nuisance animals.

The actions to abate threats that were identified for Disturbed/Transitional habitat are below, though none were prioritized for implementation.

**Land/Water/Species Management**
- Convert invasives-dominated sites into early-successional habitat, and maintain

**Law and Policy**
- Develop a plan to fund long-term post-reclamation management programs—include control of invasive flora and fauna
- Promote the use of mitigation banking

**Research, Education and Awareness**
- Increase development of biocontrol options for invasive plants to reduce need for herbicides
- Increase public and private training on the conservation value of these lands (e.g., via extension education)
- Target education for landowners and policy makers to benefit wildlife in their day-to-day activities
- Encourage wildlife-friendly land management (e.g., maintaining early-successional habitat, etc.)

**Economic and Other Incentives**
- Provide incentives to improve land for wildlife
- Provide economic incentives for “green” developments (e.g., give density breaks for developments that cluster housing)
- Provide awards to municipalities, organizations, and individuals that implement wildlife-friendly design and management practices
- Provide funds and materials for landowners to remove invasive exotics
Dry Prairie

Status
Current Condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 1,215,099 acres (491,733 ha) of Dry Prairie habitat exist, of which 29% (353,768 ac; 143,165 ha) are in existing conservation or managed areas. Another 13% (163,613 ac; 66,212 ha) are in Florida Forever projects and 11% (131,803 ac; 53,339 ha) are in SHCA-designated lands. The remaining 47% (565,915 ac; 229,018 ha) are other private lands.

Habitat Description

FNAI type: Dry Prairie

Dry Prairies are large native grass- and shrub-lands occurring on very flat terrain interspersed with scattered cypress domes and strands, bayheads, isolated freshwater marshes, and hardwood hammocks. This community is characterized by many species of grasses, sedges, herbs, and shrubs, including saw palmetto, fetterbush, staggerbush, tar flower, gallberry, blueberry, wiregrass, carpet grasses, and various bluestems. The largest areas of these treeless plains historically occurred just north of Lake Okeechobee. In central and south Florida, palmetto prairies, which consist of former pine flatwoods where the overstory trees have been thinned or removed, are also included in this category. These sites contain highly scattered pines that cover less than 10 to 15 % of an area.
Associated Species of Greatest Conservation Need

Mammals
- *Eumops floridanus*  
  Florida Bonneted Bat
- *Tadarida brasiliensis cyenocephala*  
  Brazilian Free-tailed Bat
- *Puma concolor coryi*  
  Florida Panther
- *Spilogale putorius ssp.*  
  Spotted Skunk

Birds
- *Anas fulvigula*  
  Mottled Duck
- *Colinus virginianus*  
  Northern Bobwhite
- *Elanus leucurus*  
  White-tailed Kite
- *Caracara cheriway audubonii*  
  Audubon's Crested Caracara
- *Falco sparverius paulus*  
  Southeastern American Kestrel
- *Grus canadensis tabida*  
  Sandhill Crane (Greater)
- *Grus canadensis pratensis*  
  Florida Sandhill Crane
- *Grus americana*  
  Whooping Crane
- *Pluvialis dominica*  
  American Golden-Plover
- *Bartramia longicauda*  
  Upland Sandpiper
- *Columbina passerina*  
  Common Ground-Dove
- *Crotophaga ani*  
  Smooth-billed Ani
- *Athene cunicularia*  
  Burrowing Owl
- *Asio flammeus*  
  Short-eared Owl
- *Chordeiles minor*  
  Common Nighthawk
- *Caprimulgus carolinensis*  
  Chuck-will's-widow
- *Riparia riparia*  
  Bank Swallow
- *Setophaga discolor discolor*  
  Prairie Warbler
- *Peucaea aestiva*  
  Bachman's Sparrow
- *Ammodramus savannarum pratensis*  
  Grasshopper Sparrow
- *Ammodramus savannarum floridanus*  
  Florida Grasshopper Sparrow
- *Ammodramus henslowii*  
  Henslow's Sparrow
- *Ammodramus leconteii*  
  Le Conte's Sparrow

Amphibians
- *Lithobates capito*  
  Gopher Frog
- *Pseudacris ornata*  
  Ornate Chorus Frog

Reptiles
- *Anolis carolinensis seminolus*  
  Southern Green Anole
- *Cemophora coccinea coccinea*  
  Florida Scarletsnake
- *Crotalus adamanteus*  
  Eastern Diamond-backed Rattlesnake
- *Drymarchon couperi*  
  Eastern Indigo Snake
- *Heterodon platirhinos*  
  Eastern Hog-nosed Snake
- *Heterodon simus*  
  Southern Hog-nosed Snake
- *Lampropeltis calligaster*  
  Yellow-bellied Kingsnake
- *Lampropeltis getula*  
  Eastern Kingsnake
- *Pituophis melanoleucus mugitus*  
  Florida Pinesnake
- *Seminatrix pygaea cyclas*  
  Southern Florida Swampsnake
- *Gopherus polyphemus*  
  Gopher Tortoise
- *Terrapene carolina*  
  Eastern Box Turtle
Invertebrates

- Amblyscirtes alternata  
  Dusky Roadside-skipper
- Atrytone arogos arogos  
  Arogos Skipper
- Atrytonopsis loammi  
  Loammi Skipper
- Ephyriades brunnea floridensis  
  Florida Duskywing
- Euphyes berryi  
  Berry's Skipper
- Hesperia attalus slossonae  
  Seminole Skipper
- Hesperia meskei straton  
  Eastern Meske's Skipper
- Polites origenes  
  Crossline Skipper
- Idia gopheri  
  Gopher Tortoise Noctuid Moth

Conservation Threats

Threats to Dry Prairie habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to agriculture
- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Incompatible fire
- Incompatible forestry practices
- Incompatible resource extraction: mining/drilling
- Invasive plants
- Roads
- Surface water withdrawal

Threats specific to Dry Prairie included incompatible forestry practices because this habitat supports grassland bird SGCN that are not tolerant of adjacent dense pine stands. Habitat-specific threats from mining include both habitat loss and inadequate mitigation for habitat alteration that results in small, fragmented areas rather than more contiguous areas of this habitat. Military base closure threatens potential conservation protection for Dry Prairie.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Fragmentation of habitats, communities, ecosystems</td>
<td>High</td>
</tr>
<tr>
<td>B Habitat destruction or conversion</td>
<td>High</td>
</tr>
<tr>
<td>C Altered hydrologic regime</td>
<td>High</td>
</tr>
<tr>
<td>D Altered fire regime</td>
<td>High</td>
</tr>
<tr>
<td>E Insufficient size/extent of characteristic communities or ecosystems</td>
<td>High</td>
</tr>
<tr>
<td>F Altered landscape mosaic or context</td>
<td>High</td>
</tr>
<tr>
<td>G Altered community structure</td>
<td>Medium</td>
</tr>
<tr>
<td>H Altered species composition/dominance</td>
<td>Medium</td>
</tr>
<tr>
<td>I Habitat degradation/disturbance</td>
<td>Low</td>
</tr>
</tbody>
</table>
The sources of the stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Roads</td>
<td>Very High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>Very High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>3 Conversion to commercial and industrial development</td>
<td>High</td>
<td>A, B, E</td>
</tr>
<tr>
<td>4 Conversion to agriculture</td>
<td>Medium</td>
<td>A, B, C, E, F</td>
</tr>
<tr>
<td>5 Surface water withdrawal</td>
<td>Medium</td>
<td>A, C, D, F</td>
</tr>
<tr>
<td>6 Incompatible fire</td>
<td>Medium</td>
<td>D, F</td>
</tr>
<tr>
<td>7 Incompatible grazing and ranching</td>
<td>Low</td>
<td>D, F</td>
</tr>
<tr>
<td>8 Military activities</td>
<td>Low</td>
<td>A, B, E</td>
</tr>
<tr>
<td>9 Invasive plants</td>
<td>Low</td>
<td>A, B, E</td>
</tr>
<tr>
<td>10 Incompatible agricultural practices</td>
<td>Low</td>
<td>A, B, F</td>
</tr>
<tr>
<td>11 Incompatible forestry practices</td>
<td>Low</td>
<td>A, E</td>
</tr>
<tr>
<td>12 Incompatible resource extraction: mining/drilling</td>
<td>Low</td>
<td>A, B, E</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: Very High

Conservation Actions

Actions to abate the threats to Dry Prairie that were also identified as statewide threats (roads, conversion to housing and urban development, conversion to commercial and industrial development, conversion to agriculture, surface water withdrawal, incompatible fire, invasive plants, incompatible forestry practices (also see actions below), Incompatible resource extraction: mining/drilling (also see actions below) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Dry Prairie are listed below. These actions were designed to reduce the impacts of adjacent forest management, mining and mine mitigation, and potential management or loss on Avon Park Air Force Range.

Military Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Establish a permanent consultative group of multi-agency environmental professionals that work with USDOD on development of any statewide plans for base expansion, increased usage, and growth or closure needs to enhance positive, or minimize any negative, impacts on wildlife and conservation lands.</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Protection</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Work to develop partnerships to encourage conservation of significant habitats on lands encompassed by federal/state base closures.</td>
<td>H</td>
<td>VH</td>
<td>VH</td>
</tr>
</tbody>
</table>
### Land/Water/Species Management

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Support a collaborative effort among the USFWS, Avon Park Air Force Range (APAFR), Archbold Biological Station, and the FWC to develop and implement a mitigation and management plan to accommodate military needs and maintain habitat and species viability at APAFR.</td>
<td>VH</td>
<td>M</td>
<td>VH</td>
</tr>
<tr>
<td>M</td>
<td>Create a cooperative program to ensure consistent implementation of management plans on federal lands with sufficient capacity for conservation management of wildlife and habitats on military lands in Florida (e.g., prescribed fire, invasive species control, monitoring). Agreement should include that USDOD provides sufficient access to critical habitats for management and monitoring purposes (e.g., identify a procedure for routine access to restricted areas for these purposes). (State agencies, NGO conservation organizations, and USDOD)</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

### Planning and Standards

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Create incentives (e.g., mitigation credits, permit streamlining) to encourage preservation of large contiguous patches of Dry Prairie and other sensitive upland habitats.</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Create incentives to avoid loss of, and impacts to, SHCAs and sensitive habitats from mining, particularly wet and dry prairie, scrub, and bat caves.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

### Incompatible Forestry Practices

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Ensure that bird viability is the priority in management decisions on public lands where silvicultural management is in conflict with maintaining viable populations of imperiled grassland and scrub birds.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

### Incompatible Resource Extraction: Mining
Freshwater Marsh and Wet Prairie

**Habitat Description**

**FNAI type:** Basin Marsh, Coastal Interdunal Swale, Depression Marsh, Marl Prairie, Wet Prairie, Floodplain Marsh, Sough, Swale

These wetland communities are dominated by a wide assortment of herbaceous plant species growing on sand, clay, marl, and organic soils in areas of variable water depths and inundation regimes. Generally, Freshwater Marsh habitat occurs in deeper, more strongly inundated situations and is characterized by tall emergents and floating-leaved species. Freshwater Marshes occur within flatwoods depressions, along broad, shallow lake and river shorelines, and scattered in open areas within hardwood, Dry Prairie, and Cypress Swamps. Portions of freshwater lakes, rivers, and canals that are dominated by floating-leaved plants such as lotus, spatterdock, duck weed, and water hyacinths are included in this category. Freshwater Marshes are common features of many river deltas, such as the Escambia, Apalachicola and Choctawhatchee, where these rivers discharge into estuaries. Wet Prairies commonly occur in shallow, periodically inundated areas and are usually

**Status**

Current condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 2,941,170 acres (1,190,249 ha) of Freshwater Marsh and Wet Prairie habitat exist, of which 67% (1,959,950 ac; 793,164 ha) are in existing conservation or managed areas. Another 5% (145,462 ac; 58,866 ha) are in Florida Forever projects and 7% (200,677 ac; 81,211 ha) are in SHCA-designated lands. The remaining 21% (635,081 ac; 257,008 ha) are other private lands.

Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.
dominated by aquatic grasses, sedges, and their associates. Wet Prairies occur as scattered, shallow depressions within Dry Prairie and flatwoods habitat and on marl prairie areas in south Florida. Also included in this category are areas in southwest Florida with scattered dwarf cypress having less than 20% canopy coverage, and a dense ground cover of freshwater marsh plants. Various combinations of pickerel weed, sawgrass, maidencane, arrowhead, fire flag, cattail, spike rush, bulrush, white water lily, water shield, and various sedges dominate Freshwater Marshes and Wet Prairies. Many subcategories of this habitat, such as sawgrass marsh or maidencane prairie, have been described and named based on their dominant plant species.

**Associated Species of Greatest Conservation Need**

**Mammals**
- *Eumops floridanus* Florida Bonneted Bat
- *Lasiurus borealis borealis* Red Bat
- *Lasiurus intermedius floridanus* Northern Yellow Bat
- *Lasiurus seminolus* Seminole Bat
- *Myotis australis floridanus* Eastern Myotis
- *Tadarida brasiliensis cynocephala* Brazilian Free-tailed Bat
- *Neofiber aleni ssp.* Round-tailed Muskrat
- *Oryzomys palustris natator* Silver Rice Rat
- *Oryzomys palustris planirostris* Pine Island Marsh Rice Rat
- *Oryzomys palustris sanibeli* Sanibel Island Marsh Rice Rat
- *Lontra canadensis lataxina* River Otter
- *Neovison vison evergladensis* Everglades Mink
- *Neovison vison halimmetes* Gulf Salt Marsh Mink
- *Neovison vison lutensis* Atlantic Salt Marsh Mink
- *Neovison vison ssp.* Mink
- *Puma concolor coryi* Florida Panther
- *Ursus americanus floridanus* Florida Black Bear
- *Trichechus manatus latirostris* West Indian Manatee

**Birds**
- *Anas rubripes* American Black Duck
- *Anas fulvigula* Mottled Duck
- *Mycteria americana* Wood Stork
- *Botaurus lentiginosus* American Bittern
- *Ixobrychus exilis* Least Bittern
- *Ardea herodias* Great Blue Heron
- *Ardea herodias occidentalis* Great White Heron
- *Ardea alba* Great Egret
- *Egretta thula* Snowy Egret
- *Egretta caerulea* Little Blue Heron
- *Egretta tricolor* Tricolored Heron
- *Egretta rufescens* Reddish Egret
- *Butorides virescens* Green Heron
- *Nycticorax nycticorax* Black-crowned Night-Heron
- *Nyctanassa violacea* Yellow-crowned Night-Heron
- *Eudocimus albus* White Ibis
- *Plegadis falcinellus* Glossy Ibis
- *Platalea ajaja* Roseate Spoonbill
• *Elanoides forficatus*  Swallow-tailed Kite
• *Elanus leucurus*  White-tailed Kite
• *Rostrhamus sociabilis*  Snail Kite
• *Ictinia mississippiensis*  Mississippi Kite
• *Haliaeetus leucocephalus*  Bald Eagle
• *Caracara cheriway audubonii*  Audubon's Crested Caracara
• *Coturnicops noveboracensis*  Yellow Rail
• *Laterallus jamaicensis*  Black Rail
• *Rallus elegans*  King Rail
• *Porphyrio martinica*  Purple Gallinule
• *Aramus guarauna*  Limpkin
• *Grus canadensis tabida*  Sandhill Crane (Greater)
• *Grus canadensis pratensis*  Florida Sandhill Crane
• *Grus americana*  Whooping Crane
• *Recurvirostra americana*  American Avocet
• *Tringa solitaria*  Solitary Sandpiper
• *Tringa flavipes*  Lesser Yellowlegs
• *Numenius americanus*  Long-billed Curlew
• *Calidris fuscicollis*  White-rumped Sandpiper
• *Calidris melanotos*  Pectoral Sandpiper
• *Calidris alpina*  Dunlin
• *Calidris himantopus*  Stilt Sandpiper
• *Tryngites subruficollis*  Buff-breasted Sandpiper
• *Limnodromus scolopaceus*  Long-billed Dowitcher
• *Chlidonias niger*  Black Tern
• *Crotophaga ani*  Smooth-billed Ani
• *Asio flammeus*  Short-eared Owl
• *Chordeiles minor*  Common Nighthawk
• *Progne subis*  Purple Martin
• *Riparia riparia*  Bank Swallow
• *Cistothorus platensis*  Sedge Wren
• *Setophaga discolor discolor*  Prairie Warbler
• *Cardellina canadensis*  Canada Warbler
• *Ammodramus leconteii*  Le Conte's Sparrow
• *Ammodramus maritimus mirabilis*  Cape Sable Seaside Sparrow
• *Euphagus carolinus*  Rusty Blackbird
• *Euphagus cyanocephalus*  Brewer's Blackbird

**Amphibians**
• *Lithobates capito*  Gopher Frog
• *Lithobates virgatipes*  Carpenter Frog
• *Pseudacris ornata*  Ornate Chorus Frog
• *Ambystoma bishopi*  Reticulated Flatwoods Salamander
• *Ambystoma cingulatum*  Frosted Flatwoods Salamander
• *Ambystoma tigrinum*  Eastern Tiger Salamander
• *Notophthalmus perstriatus*  Striped Newt

**Reptiles**
• *Alligator mississippiensis*  American Alligator
• *Anolis carolinensis seminolus*  Southern Green Anole
• *Drymarchon couperi*  Eastern Indigo Snake
• *Heterodon platirhinos*  Eastern Hog-nosed Snake
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- *Lampropeltis getula*  
  Eastern Kingsnake
- *Seminatrix pygaea cyclas*  
  Southern Florida Swampsnake
- *Storeria dekayi limnetes*  
  Marsh Brownsnake
- *Storeria victa*  
  Florida Brownsnake (Keys Population)
- *Thamnophis sauritus sackenii*  
  Peninsula Ribbonsnake (Lower Keys Population)
- *Clemmys guttata*  
  Spotted Turtle
- *Deirochelys reticularia*  
  Chicken Turtle
- *Kinosternon baurii*  
  Striped Mud Turtle (Lower Keys Population)
- *Pseudemys nelsoni*  
  Florida Red-bellied Cooter (Panhandle Population)
- *Terrapene carolina*  
  Eastern Box Turtle

**Fish**

- *Anguilla rostrata*  
  American Eel
- *Pteronotropis welaka*  
  Bluenose Shiner
- *Umbrapygmaea*  
  Eastern Mudminnow
- *Enneacanthus chaetodon*  
  Black Banded Sunfish
- *Etheostoma proeliare*  
  Cypress Darter

**Invertebrates**

- *Procambarus econfinae*  
  Panama City Crayfish
- *Gymnoscirtetes morsei*  
  Morse's Wingless Grasshopper
- *Desmopachria cenchramis*  
  Fig Seed Diving Beetle
- *Photuris brunnipennis floridana*  
  Everglades Brownwing Firefly
- *Orthotrichia curta*  
  Short Orthotrichian Microcaddisfly
- *Oecetis parva*  
  Little Oecetis Longhorned Caddisfly
- *Triaenodes dendyi*  
  A Caddisfly
- *Triaenodes florida*  
  Floridian Triaenode Caddisfly
- *Cernotina truncona*  
  Florida Cernotinan Caddisfly
- *Amblyscirtes reversa*  
  Reversed Roadside-skipper
- *Atrytonopsis loammi*  
  Loammi Skipper
- *Euphies berryi*  
  Berry's Skipper
- *Euphies dion*  
  Dion Skipper
- *Poanes viator zizaniae*  
  Broad-winged Skipper
- *Polites origenes*  
  Crossline Skipper
- *Staphylus hayhurstii*  
  Scalloped Sooty Wing
- *Merycomyia brunnea*  
  Brown Merycomyian Tabanid Fly

**Conservation Threats**

Threats to the Freshwater Marsh and Wet Prairie habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to agriculture
- Conversion to housing and urban development
- Groundwater withdrawal
- Incompatible fire
- Incompatible forestry practices
- Incompatible recreational activities
- Incompatible resource extraction—mining/drilling
- Invasive animals
- Invasive plants
- Nutrient loads—agriculture
- Nutrient loads–urban
- Roads
- Surface water withdrawal and diversion

As one of the most ubiquitous and widespread wetland types in Florida, the Freshwater Marsh and Wet Prairie habitat is subject to a wide array of threats, many of them highly ranked. Widespread ditching, diking, and hydrologic fragmentation caused by roads in or adjacent to this habitat are important sources of altered hydrologic regime. Groundwater withdrawal for municipal and agricultural purposes has impacted depressional marsh wetlands in localized areas throughout Florida, but this threat is most severe in portions of central Florida. Nearly all marsh and wet prairie systems in unprotected lands have suffered from direct habitat conversion and altered landscape context as the surrounding uplands and much of the wet prairie habitat have been converted to other land uses, primarily agriculture and urban/suburban development. Small wetlands are undervalued and frequently altered even though they are the only sites in which certain Florida species either live or reproduce. In south and central Florida, marsh and wet prairie wetlands are particularly vulnerable to and have been seriously impacted by a variety of invasive plants. Many marsh and wet prairie wetlands in both agricultural and urban settings receive nutrients from discharges from stormwater management systems which may lead to substantial changes in plant community composition and associated faunal changes. The experts noted that very little of the marsh and wet prairie habitat statewide is receiving adequate fire as a result of perceived difficulties in burning these habitats and lack of knowledge of the role of fire in herbaceous wetland ecosystems. Additional threats specific to this habitat include the numerous water control structures affecting marsh and wet prairie habitat, particularly in the Everglades region and in smaller isolated wetlands, statewide.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>High</td>
</tr>
<tr>
<td>B</td>
<td>High</td>
</tr>
<tr>
<td>C</td>
<td>High</td>
</tr>
<tr>
<td>D</td>
<td>High</td>
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<tr>
<td>E</td>
<td>High</td>
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<tr>
<td>F</td>
<td>High</td>
</tr>
<tr>
<td>G</td>
<td>Medium</td>
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<tr>
<td>H</td>
<td>Medium</td>
</tr>
<tr>
<td>I</td>
<td>Medium</td>
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<tr>
<td>J</td>
<td>Medium</td>
</tr>
<tr>
<td>K</td>
<td>Medium</td>
</tr>
<tr>
<td>L</td>
<td>Medium</td>
</tr>
<tr>
<td>M</td>
<td>Low</td>
</tr>
<tr>
<td>N</td>
<td>Low</td>
</tr>
</tbody>
</table>

Chapter 6: Habitats - Freshwater Marsh and Wet Prairie
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Conversion to agriculture</td>
<td>Very High</td>
<td>A, B, D, G, J, K</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>Very High</td>
<td>A, B, C, D, G, J, K</td>
</tr>
<tr>
<td>3 Surface water withdrawal</td>
<td>High</td>
<td>A, B, C, D, E, F, H, J, K, L</td>
</tr>
<tr>
<td>4 Incompatible fire</td>
<td>High</td>
<td>B, C, D, F, G, H, K, L</td>
</tr>
<tr>
<td>5 Nutrient loads--agriculture</td>
<td>High</td>
<td>E, F, H</td>
</tr>
<tr>
<td>6 Incompatible resource extraction: mining/drilling</td>
<td>High</td>
<td>A, B, D, E, G, K</td>
</tr>
<tr>
<td>7 Roads</td>
<td>High</td>
<td>A, B, C, D, F, G</td>
</tr>
<tr>
<td>8 Invasive plants</td>
<td>High</td>
<td>B, C, D, F, H, K</td>
</tr>
<tr>
<td>9 Incompatible recreational activities</td>
<td>Medium</td>
<td>C, H, I</td>
</tr>
<tr>
<td>10 Invasive animals</td>
<td>Medium</td>
<td>F, H</td>
</tr>
<tr>
<td>11 Management of nature–water control structures</td>
<td>Medium</td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>12 Nutrient loads–urban</td>
<td>Medium</td>
<td>E, F, H</td>
</tr>
<tr>
<td>13 Groundwater withdrawal</td>
<td>Medium</td>
<td>A, D, F</td>
</tr>
<tr>
<td>14 Incompatible forestry practices</td>
<td>Low</td>
<td>A, B, G</td>
</tr>
<tr>
<td>15 Incompatible grazing and ranching</td>
<td>Low</td>
<td>C, E, F</td>
</tr>
<tr>
<td>16 Channel modification/shipping lanes</td>
<td>Low</td>
<td>G</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: Very High

Conservation Actions

Actions to abate the threats to Freshwater Marsh and Wet Prairie that were also identified as statewide threats (see list above in Conservation Threats section) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat were only applicable to Freshwater Marsh and Wet Prairie and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Cypress Swamp, Natural Lake, Reservoir/Managed Lake, Seepage/Steephead Stream, Softwater Stream, Spring and Spring Run, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. Additional actions were developed to address threats specific to this habitat. These actions are intended to support the ecological restoration efforts under way in the Everglades region, specifically, and more generally to increase the spatial extent of herbaceous wetlands in the landscape, improve the functionality of existing herbaceous wetlands through both regional and small-scale hydrologic restoration projects, raise awareness of the need for fire in herbaceous wetland systems, prevent harm to wetland ecosystems caused by discharge to and nutrient loading of marshes and wet prairies, and decrease the amount of wetland acreage converted to other land uses by making development more compatible with wetland habitat conservation.
### Conversion to Agriculture

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create voluntary incentives for maintenance and conversion of lands to agricultural uses that use less water and result in lower nutrient outputs into Florida's waters and wetlands, and create market-based incentives to compensate private landowners for the environmental services they provide to the state through management that increases water storage and nutrient reduction.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

### Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Provide tax reductions or other voluntary incentives, such as density transfers, for environmentally friendly comprehensive development plans for projects that front on rivers and floodplains.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

### Surface Water Withdrawal

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Continue funding projects that address ecological restoration, including Comprehensive Everglades Restoration Plan, Minimum Flows and Levels, water reservations, and other conservation programs</td>
<td>VH</td>
<td>VH</td>
<td>VH</td>
</tr>
</tbody>
</table>

### Incompatible Fire

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Develop and disseminate a focused education program for ranchers and plantation owners on the value of growing season burns and burning in wetlands. Review and improve existing agency outreach materials to address these issues.</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

### Incompatible Resource Extraction – Mining/Drilling

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create incentives to avoid loss of, and impacts to, SHCAs and sensitive habitats from mining, particularly wet and dry prairie, scrub, and bat caves.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

### Management of Nature – Water Control Structures

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Review existing Farm Bill programs and explore options for enhancing economic benefits to landowners that improve or remove water control structures.</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop an awareness program for Drainage Districts created by Chapter 298 of the Florida Administrative Code (“298 Districts”) to educate them about opportunities to improve fish and wildlife habitat conditions through operational and/or structural changes in their drainage systems.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>Overall Rank</td>
<td>Land/Water/Species Management</td>
<td>Feasibility</td>
<td>Benefits</td>
<td>Cost</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td>H</td>
<td>Implement projects in the <a href="https://www.evergladesrestoration.org/">Comprehensive Everglades Restoration Plan</a></td>
<td>H</td>
<td>H</td>
<td>VH</td>
</tr>
<tr>
<td>L</td>
<td>Create a grant program (or utilize existing Farm Bill and other federal programs) to replace or retrofit existing stop log or manually controlled structures with V-notch weirs in agricultural drainage systems. Give priority to those control structures identified as acting as barriers to wildlife movement or sheet flow.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>Overall Rank</td>
<td>Policy</td>
<td>Feasibility</td>
<td>Benefits</td>
<td>Cost</td>
</tr>
<tr>
<td>H</td>
<td>Form an interagency task force to streamline the permitting process for wetland restoration projects that restore hydrology.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Overall Rank</td>
<td>Research</td>
<td>Feasibility</td>
<td>Benefits</td>
<td>Cost</td>
</tr>
<tr>
<td>M</td>
<td>Fund research to identify the habitat needs, movements, and impacts of wetland restoration on SGCN. Inventory water control structures, and identify the extent to which particular existing water control structures negatively affect species ecology.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Recognizing that species move between wetland and upland habitats, assess the effectiveness of current BMP’s regarding bedding near isolated wetlands.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>
Chapter 6: Habitats - Grassland/Improved Pasture

Status
Current condition: Good and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 2,931,999 acres (1,186,538 ha) of Grassland/Improved Pasture habitat exist, of which 6% (186,662 ac; 75,539 ha) are in existing conservation or managed areas. Another 7% (193,063 ac; 78,130 ha) are in Florida Forever projects, and 9% (262,558 ac; 106,253 ha) are in SHCA-designated lands. The remaining 78% (2,289,716 ac; 926,615 ha) are other private lands.

Habitat Description

FNAI type: None

This is an upland community where the predominant vegetative cover is very low-growing grasses and forbs, most commonly in monocultures of non-invasive, non-native species. Improved Pastures have typically been cleared, tilled, reseeded with specific grass types, and periodically improved with brush control and fertilizer application.

Associated Species of Greatest Conservation Need

Mammals
- *Lasiurus borealis borealis* Red Bat
- *Lasiurus intermedius floridanus* Northern Yellow Bat
- *Lasiurus seminolus* Seminole Bat

Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.
- *Tadarida brasiliensis cynocephala* Brazilian Free-tailed Bat
- *Geomys pinetis pinetis* Southeastern Pocket Gopher
- *Sciurus niger avicennia* Big Cypress Fox Squirrel
- *Sciurus niger niger* Southeastern Fox Squirrel
- *Sciurus niger shermani* Sherman's Fox Squirrel
- *Puma concolor shermani* Florida Panther
- *Spilogale putorius* Spotted Skunk

### Birds
- *Anas fulvigula* Mottled Duck
- *Colinus virginianus* Northern Bobwhite
- *Mycteria americana* Wood Stork
- *Plegadis falcinellus* Glossy Ibis
- *Elanoides forficatus* Swallow-tailed Kite
- *Elanus leucurus* White-tailed Kite
- *Ictinia mississippiensis* Mississippi Kite
- *Caracara cheriway auduboni* Audubon's Crested Caracara
- *Falco sparverius paulus* Southeastern American Kestrel
- *Falco columbarius* Merlin
- *Falco peregrinus* Peregrine Falcon
- *Grus canadensis tabida* Sandhill Crane (Greater)
- *Grus canadensis pratensis* Florida Sandhill Crane
- *Grus americana* Whooping Crane
- *Calidris melanotos* Pectoral Sandpiper
- *Tryngites subruficollis* Buff-breasted Sandpiper
- *Scolopax minor* American Woodcock
- *Columbina passerina* Common Ground-Dove
- *Crotophaga ani* Smooth-billed Ani
- *Athene cunicularia* Burrowing Owl
- *Asio flammeus* Short-eared Owl
- *Chordeiles minor* Common Nighthawk
- *Caprimulgus carolinensis* Chuck-will's-widow
- *Lanius ludovicianus* Loggerhead Shrike
- *Aphelocoma coerulescens* Florida Scrub-Jay
- *Riparia riparia* Bank Swallow
- *Cistothorus platensis* Sedge Wren
- *Peucaea aestivalis* Bachman's Sparrow
- *Ammodramus savannarum pratensis* Grasshopper Sparrow
- *Ammodramus savannarum floridanus* Florida Grasshopper Sparrow
- *Ammodramus henslowii* Henslow's Sparrow
- *Ammodramus leconteii* Le Conte's Sparrow
- *Passerina ciris* Painted Bunting
- *Euphagus carolinus* Rusty Blackbird
- *Euphagus cyanocephalus* Brewer's Blackbird

### Amphibians
- *Lithobates capito* Gopher Frog
- *Pseudacris ornata* Ornate Chorus Frog
- *Ambystoma tigrinum* Eastern Tiger Salamander

### Reptiles
- *Cemophora coccinea coccinea* Florida Scarlets Snake
- *Crotalus adamanteus*  
  Eastern Diamond-backed Rattlesnake
- *Drymarchon couperi*  
  Eastern Indigo Snake
- *Heterodon platirhinos*  
  Eastern Hog-nosed Snake
- *Heterodon simus*  
  Southern Hog-nosed Snake
- *Lampropeltis calligaster*  
  Eastern Kingsnake
- *Lampropeltis getula*  
  Yellow-bellied Kingsnake
- *Pituophis melanoleucus mugitus*  
  Florida Pinesnake
- *Tantilla oolitica*  
  Rim Rock Crowned Snake
- *Tantilla relicta*  
  Florida Crowned Snake
- *Gopherus polyphemus*  
  Gopher Tortoise
- *Terrapene carolina*  
  Eastern Box Turtle

**Invertebrates**

- *Procambarus rogersi rogersi*  
  A Crayfish
- *Nastra neamathla*  
  Neamathla Skipper
- *Polites origenes*  
  Crossline Skipper
- *Cupido comyntas*  
  Eastern Tailed Blue
- *Idia gopheri*  
  Gopher Tortoise Noctuid Moth
- *Junonia genoveva*  
  Tropical Buckeye

**Conservation Threats**

Threats to Grassland/Improved Pasture habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to more intensive agriculture
- Conversion to housing and urban development
- Conversion to recreation areas
- Roads
No habitat-specific threats to Grassland/Improved Pasture were identified.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Fragmentation of habitats, communities, ecosystems</td>
<td>High</td>
</tr>
<tr>
<td>B Habitat destruction or conversion</td>
<td>High</td>
</tr>
<tr>
<td>C Altered species composition/dominance</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Roads</td>
<td>High</td>
<td>A, B</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>High</td>
<td>A, B</td>
</tr>
<tr>
<td>3 Conversion to agriculture</td>
<td>Medium</td>
<td>A, B</td>
</tr>
<tr>
<td>4 Conversion to recreation areas</td>
<td>Low</td>
<td>A, B</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**

**High**

**Conservation Actions**

Actions to abate the threats to Grassland/Improved Pasture that were also identified as statewide threats (conversion to agriculture, conversion to housing and urban development, conversion to recreation areas, and roads) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Because the experts did not identify any Grassland/Improved Pasture habitat-specific threats, no specific actions were identified. However, during the threats workshops, the participants identified several desired outcomes for this habitat that could form the basis for specific actions:

- While pasture is not a native landscape, pastures can provide significant wildlife habitat; therefore, conversion of pastures to more intense land uses should be discouraged, particularly in areas with karst geology. As much of this area is in private lands, incentives and/or cooperative agreements should be developed to identify and to retain or improve the functional values that these lands provide to wildlife.

- Conversion of natural and semi-natural habitats to improved pasture should be discouraged through incentive programs and easements.

- The value of this habitat could be enhanced for species that use pasture but are not doing well overall. For example, kestrel nest boxes could be placed on rights-of-way, and animal burrows could be located and avoided by heavy equipment operators.
• More conservation land could be acquired (e.g., in Citrus County or adjacent to Withlacoochee State Forest) to protect habitat for burrowing owls, kestrels, and red-cockaded woodpecker.

• A network of contiguous habitats could be conserved, through voluntary restoration or preservation of patches of native vegetation at intervals across the range of this habitat.
Hard Bottom

Status
Current condition: Poor and declining.
Due to the lack of sufficient map data for this habitat category (see Appendix C: GIS Data Tables), no acreage estimates are currently available.

Habitat Description

FNAI type: Consolidated Substrate, Octocoral Bed, Sponge Bed

Hard Bottom is characterized as mixed communities of algae, sponges, octocorals and stony corals. This habitat occurs in subtidal, intertidal, and supratidal zones throughout Florida's coastal waters. Hard Bottom is composed of attendant epibenthic biota on a rocky substrate composed of coquina, limestone, or relic coral, molluscan, and annelid reefs. Coquina is a limestone composed of broken shell debris. Limestone rock (many different strata) occurs as high- or low-relief outcrops of calcium carbonate. Relic reefs are the skeletal remains of once-living reefs such as the Vermetid Reef built by worm-like gastropod mollusks, *Petaloconchus*. These reefs are only known to be found in shallow waters seaward of the outer islands in the Ten Thousand Islands area of southwest Florida.

Hard Bottom biological communities are structured by depth and latitude and inhabited by sessile, planktonic, epifaunal, and pelagic plants and animals; infaunal organisms are present in interstitial soft bottom substrate. In the region south of Stuart on the east coast and Bay Port on the west coast, subtidal hard bottom communities are characteristically inhabited by soft corals (octocorals) and sponges. Octocoral Beds have dense concentrations of sea fans, sea plumes, and sea feathers. Mobile species found in octocoral beds include flamingo tongue shell, purple shrimp, and basket starfish. Sponge beds include the branching, vase, tube, Florida loggerhead, and
sheepswool sponges. Other mobile fauna found in both the octocoral beds and the sponge beds include amphipods, isopods, burrowing shrimp, crabs, sand dollars, and many species of fish. Although the coral species found in Hard Bottom habitat are not reef-building, they do contribute to the three-dimensional nature of the areas by increasing the surface area for sessile organisms and by providing important refuges for a variety of fish and invertebrates.

**Associated Species of Greatest Conservation Need**

### Mammals
- *Trichechus manatus latirostris* West Indian Manatee
- *Eubalaena glacialis* (incl. *australis*) North Atlantic Right Whale

### Birds
- *Aythya affinis* Lesser Scaup
- *Gavia immer* Common Loon
- *Podiceps auritus* Horned Grebe

### Reptiles
- *Caretta caretta* Loggerhead Sea Turtle
- *Chelonia mydas* Green Sea Turtle
- *Eretmochelys imbricata* Hawksbill Sea Turtle
- *Lepidochelys kempi* Kemp's Ridley Sea Turtle
- *Malaclemys terrapin* Diamond-backed Terrapin

### Fish
- *Acipenser oxyrinchus desotoi* Gulf of Mexico Sturgeon
- *Acipenser oxyrinchus oxyrinchus* Atlantic Sturgeon
- *Alosa aestivalis* Blueback Herring
- *Alosa alabamae* Alabama Shad
- *Aetobatus narinari* Spotted Eagle Ray
- *Alopias superciliosus* Bigeye Thresher Shark
- *Carcharhinus falciformis* Silky Shark
- *Carcharhinus obscurus* Dusky Shark
- *Carcharhinus perezi* Reef Shark
- *Carcharhinus plumbeus* Sandbar Shark
- *Carcharias taurus* Sand Tiger Shark
- *Carcharodon carcharias* White Shark
- *Cetorhinus maximus* Basking Shark
- *Manta birostris* Giant Manta Ray
- *Negaprion brevirostris* Lemon Shark
- *Sphyra lewini* Scalloped Hammerhead
- *Sphyra mokarran* Great Hammerhead
- *Sphyra zygaena* Smooth Hammerhead
- *Squalus acanthias* Cape Shark, Piked Dogfish, Spurdog
- *Atractosteus spatula* Alligator Gar
- *Epinephelus drummondi* Speckled Hind
- *Epinephelus itajara* Goliath Grouper
- *Epinephelus nigritus* Warsaw Grouper
- *Epinephelus niveatus* Snowy Grouper
- *Epinephelus striatus* Nassau Grouper
- *Lutjanus mahogoni* Mahogany Snapper
<table>
<thead>
<tr>
<th>Invertebrates</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gorgonia flabellum</strong></td>
<td>Venus Sea Fan</td>
</tr>
<tr>
<td><strong>Gorgonia ventilina</strong></td>
<td>Purple Sea Fan</td>
</tr>
<tr>
<td><strong>Bartholomea annulata</strong></td>
<td>Ringed (Curlique Or Corkscrew) Anemone</td>
</tr>
<tr>
<td><strong>Condylactis gigantea</strong></td>
<td>Giant Caribbean Anemone</td>
</tr>
<tr>
<td><strong>Epicystis crucifer</strong></td>
<td>Beaded (Rock) Anemone</td>
</tr>
<tr>
<td><strong>Stichodactyla helianthus</strong></td>
<td>Sun (Carpet) Anemone</td>
</tr>
<tr>
<td><strong>Acropora cervicornis</strong></td>
<td>Staghorn Coral</td>
</tr>
<tr>
<td><strong>Acropora palmata</strong></td>
<td>Elkhorn Coral</td>
</tr>
<tr>
<td><strong>Acropora prolifera</strong></td>
<td>Fused Staghorn Coral</td>
</tr>
<tr>
<td><strong>Agaricia agaricites</strong></td>
<td>Lettuce Coral</td>
</tr>
<tr>
<td><strong>Eusmilia fastigiata</strong></td>
<td>Flower Coral</td>
</tr>
<tr>
<td><strong>Diploria clivosa</strong></td>
<td>Knobby Brain Coral</td>
</tr>
<tr>
<td><strong>Diploria labyrinthiformis</strong></td>
<td>Grooved Brain Coral</td>
</tr>
<tr>
<td><strong>Diploria stringosa</strong></td>
<td>Symmetrical Brain Coral</td>
</tr>
<tr>
<td><strong>Manicina areolata</strong></td>
<td>Rose Coral</td>
</tr>
<tr>
<td><strong>Montastraea annularis</strong></td>
<td>Boulder Star Coral</td>
</tr>
<tr>
<td><strong>Solenastrea hyades</strong></td>
<td>Knobby Star Coral</td>
</tr>
<tr>
<td><strong>Dendrogyra cylindrus</strong></td>
<td>Pillar Coral</td>
</tr>
<tr>
<td><strong>Dichocoenia stokesii</strong></td>
<td>Elliptical Star Coral, Pineapple Coral</td>
</tr>
<tr>
<td><strong>Isophyllastrea rigida</strong></td>
<td>Rough Star Coral</td>
</tr>
<tr>
<td><strong>Isophyllia sinuosa</strong></td>
<td>Sinuous Cactus Coral</td>
</tr>
<tr>
<td><strong>Oculina robusta</strong></td>
<td>Robust Ivory Tree Coral</td>
</tr>
<tr>
<td><strong>Oculina varicosa</strong></td>
<td>Large Ivory Coral</td>
</tr>
<tr>
<td><strong>Porites porites</strong></td>
<td>Finger Coral</td>
</tr>
<tr>
<td><strong>Phyllangia americana</strong></td>
<td>Hidden Cup Coral</td>
</tr>
<tr>
<td><strong>Siderastrea siderea</strong></td>
<td>Massive Starlet Coral</td>
</tr>
<tr>
<td><strong>Discosoma calgreni</strong></td>
<td>Forked-tentacle Corallimorpharian</td>
</tr>
<tr>
<td><strong>Discosoma neglecta</strong></td>
<td>Umbrella Mushroom, Umbrella Corallimorph</td>
</tr>
<tr>
<td><strong>Discosoma sanctithomae</strong></td>
<td>Warty False Coral</td>
</tr>
<tr>
<td><strong>Ricordea florida</strong></td>
<td>Florida False Coral</td>
</tr>
<tr>
<td><strong>Plumapathes pennacea</strong></td>
<td>Feather Black Coral</td>
</tr>
<tr>
<td><strong>Tanacetipathes barbadensis</strong></td>
<td>Bottle Brush Black Coral</td>
</tr>
<tr>
<td><strong>Tanacetipathes tanacetum</strong></td>
<td>Bottle Brush Black Coral</td>
</tr>
<tr>
<td><strong>Tanacetipathes thamnea</strong></td>
<td>Black Coral</td>
</tr>
<tr>
<td><strong>Millepora alcicornis</strong></td>
<td>Encrusting Fire Coral</td>
</tr>
<tr>
<td><strong>Pseudobicerus splendidus</strong></td>
<td>Red-rim Flatworm, Splendid Flatworm</td>
</tr>
<tr>
<td><strong>Caottostoma javanicum</strong></td>
<td>Chocolate-lined Topsnail</td>
</tr>
<tr>
<td><strong>Lithopoma americanum</strong></td>
<td>American Starsnail</td>
</tr>
<tr>
<td><strong>Cassis flammea</strong></td>
<td>Flame Helmet</td>
</tr>
<tr>
<td><strong>Cassis madagascariensis</strong></td>
<td>Emperor or Queen Helmet</td>
</tr>
<tr>
<td><strong>Cassis tuberosa</strong></td>
<td>King Helmet</td>
</tr>
<tr>
<td><strong>Cyprea cervus</strong></td>
<td>Atlantic Deer Cowrie</td>
</tr>
<tr>
<td><strong>Cyprea zebra</strong></td>
<td>Measled Cowrie</td>
</tr>
<tr>
<td><strong>Cyphoma mcgintyi</strong></td>
<td>Spotted Cyphoma</td>
</tr>
<tr>
<td><strong>Strombus gallus</strong></td>
<td>Roostertail Conch</td>
</tr>
<tr>
<td><strong>Strombus gigas</strong></td>
<td>Queen Conch</td>
</tr>
<tr>
<td><strong>Dolabrifera dolabrifera</strong></td>
<td>Warty Seacat</td>
</tr>
<tr>
<td><strong>Glossodoris sedna</strong></td>
<td>Red-tipped Sea Goddess</td>
</tr>
<tr>
<td><strong>Elysia picta</strong></td>
<td>Painted Elysia</td>
</tr>
<tr>
<td><strong>Octopus joubini</strong></td>
<td>Atlantic Pygmy Octopus</td>
</tr>
</tbody>
</table>
Conservation Threats

Threats to Hard Bottom habitats are caused by changes in sediment accretion and removal from beach nourishment activities, damage from ship and boat groundings, cumulative impacts of anchors of all size vessels, and alteration of species composition and trophic interactions caused by parasites and pathogens.

Threats to Hard Bottom habitats that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Chemicals and toxins
- Climate variability
- Dam operations/incompatible release of water (quality, quantity, timing)
- Disruption of longshore transport of sediments
- Fishing gear impacts
- Harmful algal blooms
- Incompatible fishing pressure
- Incompatible industrial operations
- Incompatible wildlife and fisheries management strategies
- Invasive animals
- Invasive plants
- Key predator/herbivore loss
- Management of nature (beach nourishment and impoundments)
- Roads, bridges and causeways
- Shoreline hardening
- Vessel impacts

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered species composition</td>
<td>High</td>
</tr>
<tr>
<td>B Altered structure</td>
<td>High</td>
</tr>
<tr>
<td>C Altered water quality–physical, chemistry</td>
<td>High</td>
</tr>
<tr>
<td>D Altered weather regime/sea level rise</td>
<td>High</td>
</tr>
</tbody>
</table>
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Parasites/pathogens</td>
<td>High</td>
<td>A, B, E, G, H</td>
</tr>
<tr>
<td>2. Disruption of longshore transport of sediments</td>
<td>High</td>
<td>E, F, I</td>
</tr>
<tr>
<td>3. Channel modification/shipping lanes</td>
<td>High</td>
<td>E, F, I</td>
</tr>
<tr>
<td>4. Incompatible industrial operations</td>
<td>Medium</td>
<td>C, E</td>
</tr>
<tr>
<td>5. Incompatible fishing pressure</td>
<td>Medium</td>
<td>A, E</td>
</tr>
<tr>
<td>6. Dam operations/incompatible release of water: (quality, quantity, timing)</td>
<td>Medium</td>
<td>A, C, F</td>
</tr>
<tr>
<td>7. Climate variability</td>
<td>Medium</td>
<td>D</td>
</tr>
<tr>
<td>8. Inadequate stormwater management</td>
<td>Medium</td>
<td>A, C, G</td>
</tr>
<tr>
<td>9. Key predator/herbivore losses</td>
<td>Medium</td>
<td>A, F</td>
</tr>
<tr>
<td>10. Harmful algal blooms</td>
<td>Medium</td>
<td>A, F, G</td>
</tr>
<tr>
<td>11. Invasive plants</td>
<td>Medium</td>
<td>A, H</td>
</tr>
<tr>
<td>12. Management of nature (beach nourishment, impoundments)</td>
<td>Medium</td>
<td>A, C, E, F, I</td>
</tr>
<tr>
<td>13. Fishing gear impacts</td>
<td>Medium</td>
<td>B, E, F</td>
</tr>
<tr>
<td>14. Incompatible wildlife and fisheries management strategies</td>
<td>Medium</td>
<td>A, G</td>
</tr>
<tr>
<td>15. Placement of artificial structures</td>
<td>Medium</td>
<td>A, B, E, H</td>
</tr>
<tr>
<td>16. Shoreline hardening</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>17. Vessel impacts</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>18. Chemicals and toxins</td>
<td>Medium</td>
<td>F</td>
</tr>
<tr>
<td>19. Invasive animals</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>20. Solid waste</td>
<td>Medium</td>
<td>E, F</td>
</tr>
<tr>
<td>21. Utility corridors</td>
<td>Low</td>
<td>B, E</td>
</tr>
<tr>
<td>22. Roads, bridges and causeways</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>23. Boating impacts</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>24. Incompatible aquarium trade</td>
<td>Low</td>
<td>A</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**  
High
Conservation Actions

Actions to abate the threats to Hard Bottom that were also identified as statewide threats (see list above) are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Outcomes identified for this habitat address better understanding of the effects of beach nourishment and ensuring that ship anchorages are not sited over sensitive areas to reduce the probability that vessels run aground.

Highest ranked actions identified for abating this source of stress focus on:

- Establishing a funding source for remediation of damages from vessel impacts
- Development of a vessel anchoring management plan
- Improving the detection of pathogens, parasites, and biotoxins in marine organisms and the ability to rehabilitate impacted animals

Additional actions included:

- Evaluating whether parasites are indicators of estuarine and marine health
- Developing methods for keeping vessels away from sensitive areas
- Supporting restoration of damaged areas and replacement of species lost

The following actions, organized by action type, were identified to abate this threat:

### Beach Nourishment/Impoundments

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Review and revise criteria for statewide monitoring protocols to assess beach and offshore habitat impacts related to beach nourishment projects similar to BACI (Before-after-control-impacts: the analytical framework and adaptive management tool).</td>
<td>VH</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

### Parasites/Pathogens

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Improve capabilities for/sophistication of inspection, recognition and treatment of aquatic organism diseases and parasites.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>H</td>
<td>Continue and support response teams/hotlines associated with disease outbreak, trauma, strandings, and mortality events for fish and wildlife species.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Expand the number and capabilities of rehabilitation facilities for diseased and injured wildlife.</td>
<td>H</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Conduct additional research on aquatic wildlife parasites and diseases, and the impacts of biotoxins on fish and wildlife resources.</td>
<td>VH</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>Synthesize and consolidate understanding, and identify gaps in understanding, of marine flora/fauna diseases, pathogens, and biotoxin impacts on fish and wildlife resources.</td>
<td>VH</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>M</td>
<td>Research and examine use of parasites as indicators of estuarine and marine health.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
### Vessel Impacts

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management:</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Explore establish a marine/estuarine restoration fund.</td>
<td>M</td>
<td>VH</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Develop a passive warning system for vessels to alert operators of sensitive or danger zones (shallows, reefs).</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Encourage avoidance of anchorage and moorage in sensitive areas.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Identify appropriate areas for anchorage and moorings. Develop educational tools on low-impact mooring techniques.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.

**Hardwood Hammock Forest**

**Status**
Current condition: Unknown. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 979,826 acres (396,522 ha) of Hardwood Hammock Forest habitat exist, of which 16% (159,557 ac; 64,570 ha) are in existing conservation or managed areas. Another 4% (36,874 ac; 14,922 ha) are in Florida Forever projects and 6% (62,053 ac; 25,112 ha) are SHCA-designated lands. The remaining 74% (721,342 ac; 291,917 ha) are other private lands.

**Habitat Description**

**FNAI type:** Xeric Hammock, Maritime Hammock, Slope Forest, Prairie Hammock, Upland Hardwood Forest

This class includes the major upland hardwood associations that occur statewide on fairly rich sandy soils. Variations in species composition and the local or spatial distributions of these communities are due in part to differences in soil moisture regimes, soil type, and geographic location within the state. Mesic and xeric variations are included within this association.

The mesic hammock community represents the climax vegetation type within many areas of northern and central Florida. Characteristic species in the extreme north include American beech, southern magnolia, Shumard oak, white oak, mockernut hickory, pignut hickory, sourgum, basswood, white ash, mulberry, and spruce pine. Mesic hammocks of the peninsula are less diverse due to the absence of hardwood species that are adapted to more northerly climates, and are
characterized by laurel oak, hop hornbeam, blue beech, sweetgum, cabbage palm, American holly, and southern magnolia.

Xeric hammocks occur on deep, well-drained, sandy soils where fire has been absent for long periods of time. These open, dry hammocks contain live oak, sand-live oak, bluejack oak, blackjack oak, southern red oak, sand-post oak, and pignut hickory.

Also included in this category are cabbage palm-live oak hammocks. This class is characterized by cabbage palms and live oaks occurring in small clumps within prairie communities. These hammocks typically have an open understory which may include such species as wax myrtle, water oak, and saw palmetto. Cabbage palm-live oak hammocks are also often found bordering large lakes and rivers, and are distributed throughout the prairie region of south central Florida and extend northward in the St. Johns River basin. Cabbage palms often form a fringe around hardwood “islands” located within improved pastures.

### Associated Species of Greatest Conservation Need

**Mammals**
- *Sorex longirostris eionis*  
  Homosassa Shrew
- *Corynorhinus rafinesquii*  
  Rafinesque's Big-eared Bat
- *Lasiusus borealis borealis*  
  Red Bat
- *Lasiusus intermedius floridanus*  
  Northern Yellow Bat
- *Lasiusus seminolus*  
  Seminole Bat
- *Myotis austroiriparius*  
  Southeastern Myotis
- *Microtus pinetorum ssp.*  
  Pine Vole
- *Tamias striatus*  
  Eastern Chipmunk
- *Mustela frenata olivacea*  
  Southeastern Weasel
- *Mustela frenata peninsulatae*  
  Florida Long-tailed Weasel
- *Puma concolor coryi*  
  Florida Panther
- *Spilogale putorius ssp.*  
  Spotted Skunk
- *Ursus americanus floridanus*  
  Florida Black Bear

**Birds**
- *Colinus virginianus*  
  Northern Bobwhite
- *Elanoides forficatus*  
  Swallow-tailed Kite
- *Ictinia mississippiensis*  
  Mississippi Kite
- *Buteo platypterus*  
  Broad-winged Hawk
- *Buteo brachyurus*  
  Short-tailed Hawk
- *Caracara cheriway audubonii*  
  Audubon's Crested Caracara
- *Scolopax minor*  
  American Woodcock
- *Columbina passerina*  
  Common Ground-Dove
- *Megasosps asio*  
  Eastern Screech-Owl
- *Melanerpes erythrocephalus*  
  Red-headed Woodpecker
- *Picoides villosus*  
  Hairy Woodpecker
- *Colaptes auratus*  
  Northern Flicker
- *Tyrannus dominicensis*  
  Gray Kingbird
- *Vireo altiloquus*  
  Black-whiskered Vireo
- *Sitta carolinensis*  
  White-breasted Nuthatch
- *Hylocichla mustelina*  
  Wood Thrush
- *Helmitheros vermivorum*  
  Worm-eating Warbler
- Parkesia motacilla
- Vermivora chrysoptera
- Vermivora cyanoptera
- Protonotaria citrea
- Limnothlypis swainsonii
- Geothlypis formosa
- Setophaga ruticilla
- Setophaga kirtlandii
- Setophaga cerulea
- Setophaga castanea
- Setophaga petechia gundlachi
- Setophaga dominica stoddardi
- Setophaga discolor discolor
- Setophaga discolor paludicola
- Cardellina canadensis
- Passerina ciris
- Louisiana Waterthrush
- Golden-winged Warbler
- Blue-winged Warbler
- Prothonotary Warbler
- Swainson's Warbler
- Kentucky Warbler
- American Redstart
- Kirtland's Warbler
- Cerulean Warbler
- Bay-breasted Warbler
- Cuban Yellow Warbler
- Stoddard's Yellow-throated Warbler
- Prairie Warbler
- Florida Prairie Warbler
- Canada Warbler
- Painted Bunting

**Amphibians**

- Lithobates capito
- Lithobates okaloosae
- Pseudacris ornata
- Ambystoma tigrinum
- Desmognathus apalachicolae
- Desmognathus auriculatus
- Desmognathus cf. conanti
- Desmognathus monticola
- Hemidactylium scutatum
- Notophthalmus perstriatus
- Gopher Frog
- Florida Bog Frog
- Ornate Chorus Frog
- Eastern Tiger Salamander
- Apalachicola Dusky Salamander
- Southern Dusky Salamander
- Eglin Ravine Spotted Dusky Salamander
- Seal Salamander
- Four-toed Salamander
- Striped Newt

**Reptiles**

- Alligator mississippiensis
- Anolis carolinensis seminolus
- Plestiodon anthracinus pluvialis
- Plestiodon egregius lividus
- Plestiodon egregius onocrepis
- Rhineura floridana
- Sceloporus woodi
- Agkistrodon contortrix contortrix
- Cemophora coccinea coccinea
- Crotalus adamanteus
- Crotalus horridus
- Drymarchon couperi
- Heterodon platirhinus
- Heterodon simus
- Lampropeltis calligator
- Lampropeltis extenuata
- Lampropeltis getula
- Pituophis melanoleucus mugitus
- Tantilla coronata
- Tantilla relicta
- Virginia valeriae valeriae
- Gopherus polyphemus
- American Alligator
- Southern Green Anole
- Southern Coal Skink
- Blue-tailed Mole Skink
- Peninsula Mole Skink
- Florida Wormlizard
- Florida Scrub Lizard
- Southern Copperhead
- Florida Scarletsnake
- Eastern Diamond-backed Rattlesnake
- Timber Rattlesnake
- Eastern Indigo Snake
- Eastern Hog-nosed Snake
- Southern Hog-nosed Snake
- Yellow-bellied Kingsnake
- Short-tailed Snake
- Eastern Kingsnake
- Florida Pinesnake
- Southeastern Crowned Snake
- Florida Crowned Snake
- Eastern Smooth Earthsnake (Highlands Co.)
- Gopher Tortoise
• **Terrapene carolina** Eastern Box Turtle

**Invertebrates**

• *Sphodros rufipes* Red-legged Purse-web Spider
• *Cyclocosmia torreya* Torreya Trap-door Spider
• *Myrmeckiaphila torreya* A Trapdoor Spider
• *Chinattus parvalus* Little Mountain Jumping Spider
• *Tettigidea empedonepia* Torreya Pygmy Grasshopper
• *Cicindela sexguttata* Six-spotted Tiger Beetle
• *Mycotrupes gaigei* North Peninsular Mycotrupes Beetle
• *Ataenius brevicollis* An Ataenius Beetle
• *Phanaeus triangularis* Floodplain Phanaeus Scarab Beetle
• *Phyllophaga clemens* Clemens' June Beetle
• *Achalarus lyriades* Hoary Edge
• *Autochton cellus* Golden-banded Skipper
• *Megathyms cocaqui* Cofaqui Skipper
• *Megathyms yuccae* Yucca Skipper
• *Staphylus hayhurstii* Scalloped Sooty Wing
• *Callophrys henrici* Henry's Elfin
• *Chlosyne nycteis* Silvery Checkerspot
• *Proserpinus gaurae* Proud Sphinx
• *Merope tuber* Earwig Scorpionfly

**Conservation Threats**

Threats to Hardwood Hammock Forest habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to agriculture
- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Conversion to recreation areas
- Groundwater withdrawal
- Incompatible fire
- Incompatible resource extraction: mining/drilling
- Invasive animals
- Invasive plants
- Roads
- Surface water withdrawal

Threats specific to Hardwood Hammock Forest were limited to incompatible residential activities that include movement of fertilizer, herbicide, and invasive species from landscape maintenance, activities of people, their pets, and nuisance species, and disposal of yard and household waste.
The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Habitat destruction or conversion</td>
<td>High</td>
</tr>
<tr>
<td>B  Altered species composition/dominance</td>
<td>Medium</td>
</tr>
<tr>
<td>C  Altered hydrologic regime</td>
<td>Medium</td>
</tr>
<tr>
<td>D  Altered community structure</td>
<td>Medium</td>
</tr>
<tr>
<td>E  Fragmentation of habitats, communities, ecosystems</td>
<td>Medium</td>
</tr>
<tr>
<td>F  Erosion/sedimentation</td>
<td>Low</td>
</tr>
<tr>
<td>G  Altered landscape mosaic or context</td>
<td>Low</td>
</tr>
<tr>
<td>H  Altered fire regime</td>
<td>Low</td>
</tr>
<tr>
<td>I  Habitat degradation/disturbance</td>
<td>Low</td>
</tr>
<tr>
<td>J  Excessive depredation and/or parasitism</td>
<td>Low</td>
</tr>
<tr>
<td>K  Missing key communities, functional guilds, or seral stages</td>
<td>Low</td>
</tr>
<tr>
<td>L  Insufficient size/extent of characteristic communities</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Conversion to commercial and industrial development</td>
<td>High</td>
<td>A, C</td>
</tr>
<tr>
<td>2  Conversion to housing and urban development</td>
<td>High</td>
<td>A, C</td>
</tr>
<tr>
<td>3  Roads</td>
<td>High</td>
<td>A, C</td>
</tr>
<tr>
<td>4  Surface water withdrawal</td>
<td>Medium</td>
<td>B</td>
</tr>
<tr>
<td>5  Incompatible resource extraction: mining/drilling</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>6  Invasive plants</td>
<td>Medium</td>
<td>B</td>
</tr>
<tr>
<td>7  Incompatible agricultural practices</td>
<td>Low</td>
<td>C</td>
</tr>
<tr>
<td>8  Conversion to recreation areas</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>9  Incompatible residential activities</td>
<td>Low</td>
<td>A, B</td>
</tr>
<tr>
<td>10 Incompatible fire</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>11 Invasive animals</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>12 Conversion to agriculture</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>13 Groundwater withdrawal</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>14 Humidity and temperature changes</td>
<td>Low</td>
<td>B</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: High
Conservation Actions

Actions to abate the threats to Hardwood Hammock Forest that were also identified as statewide threats (see list above in Conservation Threats section) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Hardwood Hammock Forest are below, though none were ranked of high priority for implementation. These actions were designed to reduce the impacts from activities of residents adjacent to this habitat.

Incompatible Residential Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Expand the scale of the Florida Yards and Neighborhoods program from certifying individual landowners to whole neighborhoods; certification should be renewed biennially and any time property ownership changes.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Provide incentives (through local governments) for covenants, codes, and restrictions in residential areas that address issues of pesticide use, pet control, feeding of wildlife, household or yard waste disposal, landscape plants, irrigation use, prescribed fire tolerance, and light-use in coastal areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Identify and promote effective reward models for homeowners, maintenance companies, and municipalities for reducing impacts on neighboring conservation areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Provide incentives (through local governments) (e.g., fast track, density breaks) for developers that produce on-site, site-specific educational materials and standards that are maintained by homeowner associations.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Promote and fund continuing education courses for landscape maintenance industry that include appropriate use of chemicals, irrigation, plants, and disposal of yard waste.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
Chapter 6: Habitats - Hardwood Swamp/Mixed Wetland Forest

Habitat Description

**FNAI type:** Bottomland Forest, Basin Swamp

These wooded wetland communities are composed of either pure stands of hardwoods, or occur as a mixture of hardwoods and cypress where hardwoods achieve dominance. This association of wetland-adapted trees occurs throughout the state on organic soils and forms the forested floodplains of non-alluvial rivers, creeks, and broad lake basins. Tree species include a mixed overstory containing black gum, water tupelo, bald cypress, dahoon holly, red maple, swamp ash, cabbage palm, and sweetbay. Also included in this category are mixed wetland forest communities in which neither hardwoods nor conifers achieve dominance. The mix can include hardwoods with pine or cypress and can represent a mixed hydric site or a transition between hardwoods and conifers on hydric/mesic sites. Hardwood Swamp/Mixed Wetland Forests occur on low-lying flatlands or scattered low spots in basins and depressions that will only flood in extreme conditions. The canopy is usually dense and closed, keeping air movement and light penetration...
relatively low and, thus, keeping the humidity high. Due to these damp conditions, this habitat infrequently burns.

## Associated Species of Greatest Conservation Need

### Mammals

- **Blarina shermani** - Sherman's Short-tailed Shrew
- **Sorex longirostris eionis** - Homosassa Shrew
- **Corynorhinus rafinesquii** - Rafinesque's Big-eared Bat
- **Lasiurus borealis borealis** - Red Bat
- **Lasiurus intermedius floridanus** - Northern Yellow Bat
- **Lasiurus seminolus** - Seminole Bat
- **Myotis austropiparius** - Southeastern Myotis
- **Myotis griseescens** - Gray Bat
- **Microtus pinetorum ssp.** - Pine Vole
- **Lontra canadensis lataxina** - River Otter
- **Neovison vison evergladensis** - Everglades Mink
- **Neovison vison halilimnetes** - Gulf Salt Marsh Mink
- **Neovison vison lutensis** - Atlantic Salt Marsh Mink
- **Neovison vison ssp.** - Mink
- **Puma concolor coryi** - Florida Panther
- **Ursus americanus floridanus** - Florida Black Bear

### Birds

- **Mycteria americana** - Wood Stork
- **Egretta thula** - Snowy Egret
- **Egretta caerulea** - Little Blue Heron
- **Nycticorax nycticorax** - Black-crowned Night-Heron
- **Nyctanassa violacea** - Yellow-crowned Night-Heron
- **Eulagoites forficatus** - Swallow-tailed Kite
- **Ictinia mississippiensis** - Mississippi Kite
- **Haliaeetus leucocephalus** - Bald Eagle
- **Buteo platypterus** - Broad-winged Hawk
- **Buteo brachyurus** - Short-tailed Hawk
- **Aramus guarauna** - Limpkin
- **Megaoscops asio** - Eastern Screech-Owl
- **Picoides villosus** - Hairy Woodpecker
- **Campephilus principalis** - Ivory-billed Woodpecker
- **Progne subis** - Purple Martin
- **Vermivora chrysoptera** - Golden-winged Warbler
- **Vermivora cyanoptera** - Blue-winged Warbler
- **Protonotaria citrea** - Prothonotary Warbler
- **Limnolophus swainsonii** - Swainson's Warbler
- **Setophaga ruticilla** - American Redstart
- **Setophaga castanea** - Bay-breasted Warbler
- **Setophaga dominica stoddardi** - Stoddard's Yellow-throated Warbler
- **Setophaga discolor discolor** - Prairie Warbler
- **Cardellina canadensis** - Canada Warbler
- **Euphagus carolinus** - Rusty Blackbird
### Amphibians
- **Lithobates okaloosae** Florida Bog Frog
- **Lithobates virgatipes** Carpenter Frog
- **Amphiuma pholeter** One-toed Amphiuma
- **Desmognathus auriculatus** Southern Dusky Salamander
- **Eurycea chamberlaini** Chamberlain's Dwarf Salamander
- **Hemidactylium scutatum** Four-toed Salamander
- **Pseudobranchus striatus lustralis** Gulf Hammock Dwarf Siren
- **Pseudobranchus striatus striatus** Broad-striped Dwarf Siren
- **Amphiuma pholeter** One-toed Amphiuma
- **Desmognathus auriculatus** Southern Dusky Salamander
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- **Hemidactylium scutatum** Four-toed Salamander
- **Pseudobranchus striatus lustralis** Gulf Hammock Dwarf Siren
- **Pseudobranchus striatus striatus** Broad-striped Dwarf Siren

### Reptiles
- **Alligator mississippiensis** American Alligator
- **Anolis carolinensis seminolus** Southern Green Anole
- **Plestiodon anthracinus pluvialis** Southern Coal Skink
- **Crotalus horridus** Timber Rattlesnake
- **Drymarchon couperi** Eastern Indigo Snake
- **Farancia erytrogramma** Rainbow Snake
- **Heterodon platirhinos** Eastern Hog-nosed Snake
- **Lampropeltis getula** Eastern Kingsnake
- **Seminatrix pygaea cyclas** Southern Florida Swampsnake
- **Clemmys guttata** Spotted Turtle
- **Deirochelys reticularia** Chicken Turtle
- **Terrapene carolina** Eastern Box Turtle

### Fish
- **Anguilla rostrata** American Eel
- **Pteronotropis welaka** Bluenose Shiner
- **Umbra pygmaea** Eastern Mudminnow
- **Acantharchus pomotis** Mud Sunfish

### Invertebrates
- **Cicindela blanda** Sandbar Tiger Beetle
- **Cicindela hirticollis** Hairy-necked Tiger Beetle
- **Cicindela wapleri** White-sand Tiger Beetle
- **Amblyscirtes aesculapius** Lace-winged Roadside Skipper
- **Amblyscirtes hegon** Pepper and Salt Skipper
- **Autochton cellus** Golden-banded Skipper
- **Megathyrsus cofaqui** Cofaqui Skipper
- **Megathyrsus yuccae** Yucca Skipper
- **Poanes viator zizaniae** Broad-winged Skipper
- **Poanes yehl** Yehl Skipper
- **Staphylus hayhurstii** Scalloped Sooty Wing
- **Callophrys augustinus** Brown Elfin
- **Callophrys henrici** Henry's Elfin
- **Feniseca tarquinia** Harvester
- **Satyrium kingi** King's Hairstreak
- **Satyrium liparops floridensis** Sparkleberry Hairstreak
- **Pyreterra ceromatica** Ceromatic Noctuid Moth
- **Anthanassa texana seminole** Seminole Crescent
- **Chlosyne nycteis** Silvery Checkerspot
- **Enodia portlandia floridanae** Florida Pearly Eye
Conservation Threats

Threats to Hardwood Swamp/Mixed Wetland Forest habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to agriculture
- Conversion to housing and urban development
- Groundwater withdrawal
- Incompatible fire
- Incompatible forestry practices
- Incompatible recreational activities
- Invasive animals
- Invasive plants
- Roads
- Surface water withdrawal and diversion
- Invasive animals
- Invasive plants
- Roads
- Surface water withdrawal and diversion

Threats specific to Hardwood Swamp/Mixed Wetland Forest include changes to the fire and hydrological regimes that have resulted in loss of marsh or seepage wetlands embedded within this forested wetland habitat. Water control structures from weirs to dams and surface drainage from agricultural and developed areas into these wetlands have exacerbated water level and quality changes.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered hydrologic regime</td>
<td>High</td>
</tr>
<tr>
<td>B Altered community structure</td>
<td>High</td>
</tr>
<tr>
<td>C Altered species composition/dominance</td>
<td>High</td>
</tr>
<tr>
<td>D Altered landscape mosaic or context</td>
<td>Medium</td>
</tr>
<tr>
<td>E Habitat destruction or conversion</td>
<td>Medium</td>
</tr>
<tr>
<td>F Fragmentation of habitats, communities, ecosystems</td>
<td>Medium</td>
</tr>
<tr>
<td>G Missing key communities, functional guilds, or seral stages</td>
<td>Medium</td>
</tr>
<tr>
<td>H Altered fire regime</td>
<td>Medium</td>
</tr>
<tr>
<td>I Altered water quality of surface water or aquifer: nutrients</td>
<td>Low</td>
</tr>
<tr>
<td>J Habitat degradation/disturbance</td>
<td>Low</td>
</tr>
<tr>
<td>K Erosion/sedimentation</td>
<td>Low</td>
</tr>
<tr>
<td>L Altered soil structure and chemistry</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Surface water withdrawal</td>
<td>High</td>
<td>A, C, D, F, H</td>
</tr>
<tr>
<td>2 Invasive plants</td>
<td>High</td>
<td>B, C, H</td>
</tr>
<tr>
<td>3 Incompatible forestry practices</td>
<td>High</td>
<td>B, C, G</td>
</tr>
</tbody>
</table>
### Sources of Stress

<table>
<thead>
<tr>
<th>Rank</th>
<th>Source</th>
<th>Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Invasive animals</td>
<td>Medium</td>
<td>B, C</td>
</tr>
<tr>
<td>5</td>
<td>Roads</td>
<td>Medium</td>
<td>A, D, E, F, H</td>
</tr>
<tr>
<td>6</td>
<td>Incompatible fire</td>
<td>Medium</td>
<td>C, H</td>
</tr>
<tr>
<td>7</td>
<td>Conversion to agriculture</td>
<td>Medium</td>
<td>D, E</td>
</tr>
<tr>
<td>8</td>
<td>Conversion to housing and urban development</td>
<td>Medium</td>
<td>D, E</td>
</tr>
<tr>
<td>9</td>
<td>New dams</td>
<td>Medium</td>
<td>B, C, G</td>
</tr>
<tr>
<td>10</td>
<td>Incompatible vegetation harvest</td>
<td>Low</td>
<td>B, C</td>
</tr>
<tr>
<td>11</td>
<td>Groundwater withdrawal</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>12</td>
<td>Dam operations</td>
<td>Low</td>
<td>B, C</td>
</tr>
<tr>
<td>13</td>
<td>Management of nature–water control structures</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>14</td>
<td>Incompatible recreational activities</td>
<td>Low</td>
<td>C, E</td>
</tr>
<tr>
<td>15</td>
<td>Incompatible grazing and ranching</td>
<td>Low</td>
<td>C</td>
</tr>
<tr>
<td>16</td>
<td>Incompatible animal harvest</td>
<td>Low</td>
<td>C</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**: High

### Conservation Actions

Actions to abate the threats to Hardwood Swamp/Mixed Wetland Forest that were also identified as statewide threats (surface water withdrawal and diversion, invasive plants, incompatible forestry practices (also see actions below), invasive animals, roads, incompatible fire, conversion to agriculture (also see actions below), conversion to housing and urban development (also see actions below), groundwater withdrawal, incompatible recreational activities) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Hardwood Swamp/Mixed Wetland Forest are below. These actions were designed to restore more natural fire and hydrological regimes, the latter through alteration of both local surface water drainage and retrofitting and restoring existing water control structures.

### Conversion to Agriculture

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage incentives for maintenance and conversion of lands to agricultural uses that use less water and result in lower nutrient outputs into Florida's waters and wetlands, and create market-based incentives to compensate private landowners for the environmental services they provide to the state through management that increases water storage and nutrient reduction.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>
## Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage tax or other incentives, such as density transfers, for environmentally friendly comprehensive development plans for projects that front on rivers and floodplains.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

## Dam Operations

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Coordinate interstate Action Plan actions to ensure that all fish and wildlife resources in all states are protected when changing dam operations in shared basins. (USFWS)</td>
<td>M</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Coordinate multiagency review of USACE activities, including biological aspects (fish spawn guidelines, protection of fish and wildlife resources) of water control plans for interstate water projects, fish spawn guidelines, re-establishing natural seasonal fluctuation of flows.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

## Land/Water/Species Management

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work with all affected parties to reassess the value in implementing the U.S. Forest Service (USFS) plan to remove Rodman Dam and restore impacted aquatic and wetland habitat.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

## Research

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Determine the appropriate hydrological flows and levels for water reservations on the Apalachicola, Yellow, Ochlockonee, and other interstate rivers using the ESWM (Ecologically Sustainable Water Management) approach.</td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

## Management of Nature – Water Control Structures

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Explore options for enhancing economic benefits to landowners that improve or remove water control structures.</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

## Policy

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Form an interagency task force to streamline the permitting process for wetland restoration projects on private lands and public lands that involve removing small, local water control structures.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

## Research

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Fund research to identify the habitat needs and movement requirements of native SGCN aquatic species, inventory water control structures, and identify the extent to which particular existing water control structures negatively affect species ecology.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
Hydric Hammock

Status
Current condition: Good and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 35,341 acres (14,302 ha) of Hydric Hammock habitat exist, of which 75% (26,409 ac; 10,687 ha) are in existing conservation or managed areas. Another 9% (3,271 ac; 1,324 ha) are in Florida Forever projects, and 2% (691 ac; 280 ha) are in SHCA-designated lands. The remaining 14% (4,970 ac; 2,011 ha) are other private lands.

Habitat Description

FNAI type: Hydric Hammock

Hydric Hammock occurs on soils that are poorly drained or have high water tables. This association is a still-water wetland, flooded less frequently and for shorter periods of time than mixed hardwood and cypress swamps. Outcrops of limestone are common in the Gulf coastal area. Typical plant species include laurel oak, live oak, cabbage palm, southern red cedar, and sweetgum. Canopy closure is typically 75 to 90%. The sub-canopy layer and ground layer vegetation is highly variable between sites. Wax myrtle is the most frequent shrub in Hydric Hammock. Other shrubs include yaupon, dahoon, and swamp dogwood. Ground cover may be absent or consist of a dense growth of ferns, sedges, grasses, and greenbriars. Sites are usually between mesic hammocks or pine flatwoods and river swamp, wet prairie, or marsh. Hydric Hammock is found in a narrow band along parts of the Gulf coast and along the St. Johns River where it often extends to the edge of coastal salt marshes.
Associated Species of Greatest Conservation Need

Mammals
- Corynorhinus rafinesquii
- Lasiurus borealis
- Lasiurus intermedium floridanus
- Lasiurus seminolus
- Myotis austroriparius
- Perimyotis subflavus
- Lontra canadensis laxata
- Neovison vison halimnetes
- Ursus americanus floridanus

Birds
- Colinus virginianus
- Elanoides forficatus
- Buteo brachyurus
- Caracara cheriway audubonii
- Megascops asio
- Vermivora chrysoptera
- Vernivora cyanoptera
- Linnothlypis swainsonii
- Setophaga ruticilla
- Setophaga castanea
- Setophaga dominica stoddardi
- Setophaga discolor discolor
- Cardellina canadensis ciris

Amphibians
- Amphiuma pholeter
- Desmognathus auriculatus
- Pseudobranchus striatus lustricolus

Reptiles
- Alligator mississippiensis
- Anolis carolinensis seminolus
- Crotalus adamanteus
- Crotalus horridus
- Drymarchon couperi
- Farancia erytrogramma
- Heterodon platirhinos
- Lampropeltis getula
- Clemmys guttata
- Terrapene carolina

Invertebrates
- Amblyscirtes aesculapius
- Euphyes dukesi calhouni
- Anthanassa texana seminole
- Enodia portlandia floralae
- Satyrodes appalachia

Chapter 6: Habitats - Hydric Hammock
Conservation Threats

Threats to Hydric Hammock habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Climate variability
- Invasive plants

Habitat-specific threats to Hydric Hammock were identified because of potential military use of a new area along the Big Bend coastline that includes significant occurrences of this habitat.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered species composition/dominance</td>
<td>High</td>
</tr>
<tr>
<td>B Habitat destruction or conversion</td>
<td>High</td>
</tr>
<tr>
<td>C Altered hydrologic regime</td>
<td>Medium</td>
</tr>
<tr>
<td>D Altered community structure</td>
<td>Medium</td>
</tr>
<tr>
<td>E Erosion/sedimentation</td>
<td>Medium</td>
</tr>
<tr>
<td>F Altered water quality of surface water or aquifer: nutrients</td>
<td>Medium</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sea level rise</td>
<td>High</td>
<td>A, B</td>
</tr>
<tr>
<td>2 Invasive plants</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>3 Military activities</td>
<td>Low</td>
<td>A, B</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: Medium

Conservation Actions

Actions to abate the threats to Hydric Hammock that were also identified as statewide threats (climate variability, invasive plants) are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions were developed to ensure that any expansion of military activity into this habitat would be sensitive to and appropriately mitigate for impacts to the habitat and SGCN it supports.
### Military Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Establish a permanent consultative group of multi-agency wildlife and habitat professionals that work with USDOD on development of any statewide plans for base expansion, increased usage, and growth or closure needs to enhance positive, or minimize any negative, impacts on wildlife and conservation lands.</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Protection</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Encourage voluntary mitigation for any loss or degradation of Hydric Hammock habitat from military activities through acquisition of habitat protecting the same species that would be impacted.</td>
<td>VH</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>
Chapter 6: Habitats - Industrial/Commercial Pineland

**Industrial/Commercial Pineland**

Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.

**Habitat Description**

**FNAI type:** None

This category includes industrial and commercial pine plantations that are almost exclusively artificially produced through silvicultural practices. Due to a climate conducive to rapid growth, Florida is part of one of the most productive timber-producing regions in the world; Florida’s timberlands are a major contributor to the state’s economy and provide critical water recharge areas within Florida. Industrial/Commercial Pineland habitat is characterized by high density, even-aged, single-species stands, planted in rows at regular intervals, across large areas. This habitat includes sites predominantly planted to slash pine, although longleaf pine and loblolly pine tracts also occur. Also included in this category are sand pine plantations, which often are planted on sites with poorer soils; many of these areas occur on intensively prepared sites. Ground cover and shrub vegetation on Industrial/Commercial Pineland sites vary with the growth stage of the pine trees and management techniques used at the site. On early or recently planted sites,

**Status**

Current condition: Good and declining. According to the best available GIS information at this time (Appendix C: GIS Data Tables), 3,363,024 acres (1,360,968 ha) of Industrial/Commercial Pineland are in Florida. Of that total, 19% (634,848 acres; 256,914 ha) are in existing conservation or managed areas, 11% (358,029 acres; 144,889 ha) are on private lands encompassed by Florida Forever projects, 6% (196,264 acres; 79,425 ha) are within SCHA-identified lands, and the remaining 65% (2,173,883 acres; 879,739 ha) are within other private lands.
ground cover and shrub vegetation may be excessively dense, and may include species such as palmetto, gallberry, and wax myrtle. As the trees become taller and canopy cover becomes complete, ground cover and shrub vegetation becomes sparse. As Industrial/Commercial Pineland sites approach maturity other vegetation may disappear and the ground cover may consist of a thick layer of pine needles and other litter. Industrial/Commercial Pineland may provide habitat for a variety of species depending upon the growth stage of the forest and the management practices employed on-site. Species such as the Florida panther and the black bear may use this habitat as a corridor between primary habitats.

**Associated Species of Greatest Conservation Need**

<table>
<thead>
<tr>
<th>Mammals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Sorex longirostris eionis</em></td>
<td>Homosassa Shrew</td>
</tr>
<tr>
<td><em>Lasiurus borealis borealis</em></td>
<td>Red Bat</td>
</tr>
<tr>
<td><em>Lasiurus cinereus cinereus</em></td>
<td>Hoary Bat</td>
</tr>
<tr>
<td><em>Lasiurus intermedius floridanus</em></td>
<td>Northern Yellow Bat</td>
</tr>
<tr>
<td><em>Lasiurus seminolus</em></td>
<td>Seminole Bat</td>
</tr>
<tr>
<td><em>Myotis griseescens</em></td>
<td>Gray Bat</td>
</tr>
<tr>
<td><em>Microtus pinetorum ssp.</em></td>
<td>Pine Vole</td>
</tr>
<tr>
<td><em>Sorex niger niger</em></td>
<td>Southeastern Fox Squirrel</td>
</tr>
<tr>
<td><em>Sciurus niger shermani</em></td>
<td>Sherman's Fox Squirrel</td>
</tr>
<tr>
<td><em>Mustela frenata olivacea</em></td>
<td>Southeastern Weasel</td>
</tr>
<tr>
<td><em>Mustela frenata peninsulae</em></td>
<td>Florida Long-tailed Weasel</td>
</tr>
<tr>
<td><em>Puma concolor coryi</em></td>
<td>Florida Panther</td>
</tr>
<tr>
<td><em>Spilogale putorius ssp.</em></td>
<td>Spotted Skunk</td>
</tr>
<tr>
<td><em>Ursus americanus floridanus</em></td>
<td>Florida Black Bear</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Birds</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Mycteria americana</em></td>
<td>Wood Stork</td>
</tr>
<tr>
<td><em>Elanoides forficatus</em></td>
<td>Swallow-tailed Kite</td>
</tr>
<tr>
<td><em>Haliaeetus leucocephalus</em></td>
<td>Bald Eagle</td>
</tr>
<tr>
<td><em>Falco sparverius paulus</em></td>
<td>Southeastern American Kestrel</td>
</tr>
<tr>
<td><em>Falco peregrinus</em></td>
<td>Peregrine Falcon</td>
</tr>
<tr>
<td><em>Columbina passerina</em></td>
<td>Common Ground-Dove</td>
</tr>
<tr>
<td><em>Megascops asio</em></td>
<td>Eastern Screech-Owl</td>
</tr>
<tr>
<td><em>Chordeiles minor</em></td>
<td>Common Nighthawk</td>
</tr>
<tr>
<td><em>Caprimulgus carolinensis</em></td>
<td>Chuck-will’s-widow</td>
</tr>
<tr>
<td><em>Caprimulgus vociferus</em></td>
<td>Eastern Whip-poor-will</td>
</tr>
<tr>
<td><em>Melanerpes erythrocephalus</em></td>
<td>Red-headed Woodpecker</td>
</tr>
<tr>
<td><em>Picoides villosus</em></td>
<td>Hairy Woodpecker</td>
</tr>
<tr>
<td><em>Colaptes auratus</em></td>
<td>Northern Flicker</td>
</tr>
<tr>
<td><em>Vermivora chrysoptera</em></td>
<td>Golden-winged Warbler</td>
</tr>
<tr>
<td><em>Vermivora cyanoptera</em></td>
<td>Blue-winged Warbler</td>
</tr>
<tr>
<td><em>Limnothlypis swainsonii</em></td>
<td>Swainson’s Warbler</td>
</tr>
<tr>
<td><em>Setophaga ruticilla</em></td>
<td>American Restart</td>
</tr>
<tr>
<td><em>Setophaga castanea</em></td>
<td>Bay-breasted Warbler</td>
</tr>
<tr>
<td><em>Setophaga discolor discolor</em></td>
<td>Prairie Warbler</td>
</tr>
<tr>
<td><em>Pseucaea aestivalis</em></td>
<td>Bachman's Sparrow</td>
</tr>
<tr>
<td><em>Euphagus cyanocephalus</em></td>
<td>Brewer's Blackbird</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Invertebrates</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Callophrys niphon</em></td>
<td>Eastern Pine Elfin</td>
</tr>
</tbody>
</table>

Chapter 6: Habitats - Industrial/Commercial Pineland
Conservation Threats

Threats to Industrial/Commercial Pineland habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Incompatible forestry practices
- Roads

Although intensively managing pine stands alters the native habitat conditions and reduces habitat quality for some SGCN, other species sometimes benefit from these conditions. Threats specific to Commercial/Industrial Pineland apply to loss of habitat quality for SGCN requiring a less altered pineland environment. Such losses in habitat quality vary by species and may result from inappropriate application of BMPs or other management actions that are not compatible with habitat needs for the species. These management actions may include bedding and other site preparation, dense stocking of single-age monocultures, short rotation lengths, overuse of herbicide instead of fire or other alternatives for vegetation management, major hydrological alterations, and insufficient invasive control efforts.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Habitat degradation/disturbance</td>
<td>High</td>
</tr>
<tr>
<td>B Habitat destruction or conversion</td>
<td>High</td>
</tr>
<tr>
<td>C Low genetic diversity in pines</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of the stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Incompatible forestry practices</td>
<td>High</td>
<td>A</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>High</td>
<td>B</td>
</tr>
<tr>
<td>3 Conversion to commercial and industrial development</td>
<td>High</td>
<td>B</td>
</tr>
<tr>
<td>4 Roads</td>
<td>Medium</td>
<td>B</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: High
Conservation Actions

Actions to abate the threats to Industrial/Commercial Pineland that were also identified as statewide threats (incompatible forestry practices [see habitat specific actions below], conversion to housing and urban development, conversion to commercial and industrial development, roads) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Industrial/Commercial Pineland are below. These actions were designed to increase management consistency with habitat for wildlife SGCN and control of Japanese climbing fern where pine straw is harvested, but none were ranked as of high priority for implementation.

**Incompatible Forestry Practices**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Provide incentives for increasing rotation length, reducing tree densities, and improving native ground cover on industrial and non-industrial private forest (NIPF) ownerships. Use incentive programs to compensate forest managers and owners for any profit lost due to use of longer rotations.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Promote and encourage full and comprehensive utilization of the Sustainable Forestry Initiative (SFI).</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Research on alternatives to bedding for silvicultural production.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Research on productivity loss if bedding is not implemented (to identify whether subsidies might be necessary to reimburse for productivity loss)</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>
Inlet

Status
Current condition: Unknown.
Due to the lack of sufficient map data for this habitat category, no acreage estimates are currently available.

Habitat Description

FNAI type: None

Inlets are natural or man-made cuts in the shoreline that link coastal and inland water bodies. This habitat is defined as the subtidal area within a two-kilometer radius of the central part (i.e., throat) of the Inlet. These features tend to be hot spots of biodiversity and are critical in the recruitment of many fish and invertebrate species. Inlets provide habitat for the settling larvae from coastal areas and provide an emigration conduit for outgoing juveniles. They also are essential spawning habitat for several marine fishes.

Associated Species of Greatest Conservation Need

Mammals
- *Trichechus manatus latirostris*  
  West Indian Manatee
- *Eubalaena glacialis* (incl. australis)  
  North Atlantic Right Whale

Birds
- *Anas rubripes*  
  American Black Duck
- *Aythya marila*  
  Greater Scaup
- *Gavia stellata*  
  Red-throated Loon
• Gavia immer
  Common Loon
• Podiceps auritus
  Horned Grebe
• Sula dactylatra
  Masked Booby
• Pelecanus occidentalis
  Brown Pelican
• Ardea herodias
  Great Blue Heron
• Ardea alba
  Great Egret
• Egretta caerulea
  Little Blue Heron
• Egretta rufescens
  Reddish Egret
• Buto rides virescens
  Green Heron
• Nycticorax nycticorax
  Black-crowned Night-Heron
• Platalea ajaja
  Roseate Spoonbill
• Pandion haliaetus
  Osprey
• Haliaeetus leucocephalus
  Bald Eagle
• Pluvialis squatarola
  Black-bellied Plover
• Pluvialis dominica
  American Golden-Plover
• Charadrius nivosus
  Snowy Plover
• Charadrius wilsonia
  Wilson's Plover
• Charadrius melodus
  Piping Plover
• Haematopus palliatus
  American Oystercatcher
• Recurvirostra americana
  American Avocet
• Tringa semipalmata semipalmata
  Eastern Willet
• Tringa semipalmata inornata
  Western Willet
• Tringa flavipes
  Lesser Yellowlegs
• Numenius americanus
  Long-billed Curlew
• Limosa fedoa
  Marbled Godwit
• Arenaria interpres
  Ruddy Turnstone
• Calidris alba
  Sanderling
• Calidris alpina
  Dunlin
• Calidris himantopus
  Stilt Sandpiper
• Limnodromus griseus
  Short-billed Dowitcher
• Limnodromus scolopaceus
  Long-billed Dowitcher
• Phalaropus tricolor
  Wilson's Phalarope
• Sternuma antillarum
  Least Tern
• Gelochelidon nilotica
  Gull-billed Tern
• Hydroprogne caspia
  Caspian Tern
• Chlidonias niger
  Black Tern
• Sterna dougallii
  Roseate Tern
• Thalasseus maximus
  Royal Tern
• Thalasseus sandvicensis
  Sandwich Tern
• Rynchops niger
  Black Skimmer

Reptiles
• Crocodylus acutus
  American Crocodile
• Nerodia clarkii clarkii
  Gulf Saltmarsh Watersnake
• Nerodia clarkii compressicauda
  Mangrove Saltmarsh Watersnake
• Nerodia clarkii taeniata
  Atlantic Saltmarsh Watersnake
• Caretta caretta
  Loggerhead Sea Turtle
• Chelonia mydas
  Green Sea Turtle
• Eretmochelys imbricata
  Hawksbill Sea Turtle
• Lepidochelys kempii
  Kemp's Ridley Sea Turtle
• Malaclemys terrapin
  Diamond-backed Terrapin
Fish

- *Acipenser oxyrinchus desotoi*  Gulf of Mexico Sturgeon
- *Acipenser oxyrinchus oxyrinchus*  Atlantic Sturgeon
- *Anguilla rostrata*  American Eel
- *Alosa aestivalis*  Blueback Herring
- *Alosa alabamae*  Alabama Shad
- *Aetobatus narinari*  Spotted Eagle Ray
- *Alopias superciliosus*  Bigeye Thresher Shark
- *Carcharhinus obscurus*  Dusky Shark
- *Carcharhinus plumbeus*  Sandbar Shark
- *Carcarias taurus*  Sand Tiger Shark
- *Carcharodon carcharias*  White Shark
- *Galeocerdo cuvier*  Tiger Shark
- *Negaprion brevirostris*  Lemon Shark
- *Pristis pectinata*  Smalltooth Sawfish
- *Pristis pristis*  Largetooth Sawfish
- *Sphyrna lewini*  Scalloped Hammerhead
- *Sphyrna mokarran*  Great Hammerhead
- *Sphyrna zygaena*  Smooth Hammerhead
- *Squalus acanthias*  Cape Shark, Piked Dogfish, Spurdog
- *Atractosteus spatula*  Alligator Gar
- *Agonostomus monticola*  Mountain Mullet
- *Ctenogobius pseudofasciatus*  Slashcheek Goby
- *Epinephelus itajara*  Goliath Grouper

Invertebrates

- *Crassostrea virginica*  Eastern Oyster
- *Cassis tuberosa*  King Helmet
- *Elysia clarki*  Lettuce Sea Slug
- *Elysia picta*  Painted Elysia
- *Cardisoma guanhumi*  Great Land Crab (Blue Land Crab)
- *Aratus pisonii*  Mangrove Crab
- *Lysmata wurdemanni*  Peppermint Shrimp
- *Luidia senegalensis*  Nine-armed Sea Star
- *Oreaster reticulatus*  Cushion Star, Bahama Star
- *Diadema antillarum*  Long-spined Urchin

Conservation Threats

Threats to the Inlet habitats that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Coastal development
- Dam operations/incompatible release of water (quality, quantity, timing)
- Disruption of longshore transport of sediments
- Fishing gear impacts
- Harmful algal blooms
- Incompatible fishing pressure
- Incompatible industrial operations
- Incompatible recreational activities
- Industrial spills
- Invasive animals
- Invasive plants
- Management of nature (beach nourishment and impoundments)
- Nutrient loads (urban)
- Roads, bridges and causeways
- Surface water and groundwater withdrawal
- Vessel impacts

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Habitat disturbance</td>
</tr>
<tr>
<td>B</td>
<td>Altered species composition</td>
</tr>
<tr>
<td>C</td>
<td>Altered structure</td>
</tr>
<tr>
<td>D</td>
<td>Altered water quality–physical, chemistry</td>
</tr>
<tr>
<td>E</td>
<td>Erosion</td>
</tr>
<tr>
<td>F</td>
<td>Habitat destruction</td>
</tr>
<tr>
<td>G</td>
<td>Altered hydrologic regime</td>
</tr>
<tr>
<td>H</td>
<td>Keystone species missing or lacking in abundance</td>
</tr>
<tr>
<td>I</td>
<td>Sedimentation</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Channel modification/shipping lanes</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Shoreline hardening</td>
<td>High</td>
</tr>
<tr>
<td>3</td>
<td>Dam operations/incompatible release of water: (quality, quantity, timing)</td>
<td>High</td>
</tr>
<tr>
<td>4</td>
<td>Disruption of longshore transport of sediments</td>
<td>High</td>
</tr>
<tr>
<td>5</td>
<td>Coastal development</td>
<td>High</td>
</tr>
<tr>
<td>6</td>
<td>Management of nature (beach nourishment, impoundments)</td>
<td>High</td>
</tr>
<tr>
<td>7</td>
<td>Boating impacts</td>
<td>High</td>
</tr>
<tr>
<td>8</td>
<td>Incompatible recreational activities</td>
<td>High</td>
</tr>
<tr>
<td>9</td>
<td>Light pollution</td>
<td>High</td>
</tr>
<tr>
<td>10</td>
<td>Industrial spills</td>
<td>Medium</td>
</tr>
<tr>
<td>11</td>
<td>Harmful algal blooms</td>
<td>Medium</td>
</tr>
<tr>
<td>12</td>
<td>Road, bridges and causeways</td>
<td>Medium</td>
</tr>
<tr>
<td>13</td>
<td>Inadequate stormwater management</td>
<td>Medium</td>
</tr>
<tr>
<td>14</td>
<td>Incompatible industrial operations</td>
<td>Medium</td>
</tr>
<tr>
<td>15</td>
<td>Invasive plants</td>
<td>Medium</td>
</tr>
<tr>
<td>16</td>
<td>Incompatible fishing pressure</td>
<td>Medium</td>
</tr>
<tr>
<td>17</td>
<td>Acoustic pollution</td>
<td>Medium</td>
</tr>
</tbody>
</table>
## Sources of Stress

<table>
<thead>
<tr>
<th>Rank</th>
<th>Source</th>
<th>Habitat Source Rank</th>
<th>Related Stresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Vessel impacts</td>
<td>Medium</td>
<td>A, F</td>
</tr>
<tr>
<td>19</td>
<td>Utility corridors</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>20</td>
<td>Fishing gear impacts</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>21</td>
<td>Military activities</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>22</td>
<td>Invasive animals</td>
<td>Medium</td>
<td>A, B</td>
</tr>
<tr>
<td>23</td>
<td>Surface water withdrawal</td>
<td>Medium</td>
<td>D</td>
</tr>
</tbody>
</table>

### Statewide Threat Rank of Habitat

<table>
<thead>
<tr>
<th>Rank</th>
<th>Source</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Conservation Actions

Actions to abate the threats to Inlet that were also identified as statewide threats (see list above) are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Many of the threats to the Inlet habitat category are the same as for several other marine and estuarine habitats. Consequently, actions to abate these threats will be the same or similar to the actions recommended for abating threats to several other marine and estuarine habitats (e.g., Beach/Surf Zone, Coastal Strand, Coral Reef, Hard Bottom, Mangrove Swamp, Seagrass, Coastal Tidal River or Stream).
Large Alluvial Stream

Status
Current condition: Good and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 1,019 miles (1,640 km) of Large Alluvial Stream habitat exist.

Habitat Description

FNAI type: Alluvial Stream, River Floodplain Lake, Swamp Lake

Alluvial streams originate in high uplands that are composed of sand and silt based clays, thereby giving these streams a natural high turbidity. These streams only occur in the north region of Florida and are characterized as having meandering channels with a mix of sand bottom, sand and gravel, and areas of bedrock or shoals. Large Alluvial Streams have flow rates and sediment loads that range from low to high (flood) stages, consequently causing water depth and other water quality parameters to fluctuate substantially with seasonal rainfall patterns. Flood stages which overflow the banks and inundate the adjacent floodplain and Bottomland Hardwood Forest communities usually occur one or two times each year during winter or early spring. Due to the high natural turbidity of these streams there is minimal vegetation which is mostly confined to channel edges or backwaters. Typical plants include spatterdock, duckweed, American lotus, and water hyssop. Examples of this stream category include the Escambia, Choctawhatchee, and Apalachicola rivers.

Associated Species of Greatest Conservation Need

Mammals
- Corynorhinus rafinesquii
  Rafinesque's Big-eared Bat
- Eptesicus fuscus
  Big Brown Bat

Chapter 6: Habitats - Large Alluvial Stream
- *Lasiurus borealis borealis*  Red Bat
- *Lasiurus cinereus cinereus*  Hoary Bat
- *Lasiurus intermedius floridanus*  Northern Yellow Bat
- *Lasiurus seminolus*  Seminole Bat
- *Myotis australirostris*  Southeastern Myotis
- *Myotis grisescens*  Gray Bat
- *Perimyotis subflavus*  Tricolored Bat
- *Lontra canadensis lataxina*  River Otter
- *Trichechus manatus latirostris*  West Indian Manatee

**Birds**
- *Mycteria Americana*  Wood Stork
- *Ixobrychus exilis*  Least Bittern
- *Ardea herodias*  Great Blue Heron
- *Ardea alba*  Great Egret
- *Egretta thula*  Snowy Egret
- *Egretta caerulea*  Little Blue Heron
- *Egretta tricolor*  Tricolored Heron
- *Butorides virescens*  Green Heron
- *Nycticorax nycticorax*  Black-crowned Night-Heron
- *Nyctanassa violacea*  Yellow-crowned Night-Heron
- *Plegadis falcinellus*  Glossy Ibis
- *Pandion haliaetus*  Osprey
- *Elanoides forficatus*  Swallow-tailed Kite
- *Haliaeetus leucocephalus*  Bald Eagle
- *Aramus guarauna*  Limpkin
- *Grus canadensis pratensis*  Florida Sandhill Crane
- *Recurvirostra americana*  American Avocet
- *Tringa solitaria*  Solitary Sandpiper
- *Tringa flavipes*  Lesser Yellowlegs
- *Tryngites subruficollis*  Buff-breasted Sandpiper
- *Protonotaria citrea*  Prothonotary Warbler

**Amphibians**
- *Amphiuma pholeter*  One-toed Amphiuma
- *Desmognathus auriculatus*  Southern Dusky Salamander

**Reptiles**
- *Alligator mississippiensis*  American Alligator
- *Farancia erytrogramma*  Rainbow Snake
- *Apalone matica calvata*  Gulf Coast Smooth Softshell
- *Apalone spinifera aspera*  Gulf Coast Spiny Softshell
- *Graptemys barbouri*  Barbour's Map Turtle
- *Graptemys ernsti*  Escambia Map Turtle
- *Macrochelys temminckii*  Alligator Snapping Turtle
- *Pseudemys nelsoni*  Florida Red-bellied Cooter (Panhandle Population)
- *Pseudemys suwanniensis*  Suwannee Cooter

**Fish**
- *Acipenser oxyrinchus desotoi*  Gulf of Mexico Sturgeon
- *Anguilla rostrata*  American Eel
- *Alosa aestivalis*  Blueback Herring

Chapter 6: Habitats - Large Alluvial Stream
Chapter 6: Habitats - Large Alluvial Stream

- *Alosa alabamae* - Alabama Shad
- *Cyprinella callitaenia* - Bluestripe Shiner
- *Hybognathus hayi* - Cypress Minnow
- *Luxilus chrysocephalus* - Striped Shiner
- *Lynthurus atrapiculus* - Blacktip Shiner
- *Moxostoma n. sp. cf. aestivalis* - Florida Chub/Speckled Chub
- *Moxostoma n. sp. cf. poecilurum* - Grayfin Redhorse
- *Moxostoma carinatum* - River Redhorse
- *Noemis leptcephalus* - Bluehead Chub
- *Notropis baileyi* - Rough Shiner
- *Notropis harperi* - Redeye Chub
- *Notropis melanostomus* - Blackmouth Shiner
- *Fundulus blairae* - Lowland Topminnow
- *Pristis pectinata* - Smalltooth Sawfish
- *Pristis pristis* - Large-tooth Sawfish
- *Umbray pygmaea* - Eastern Mudminnow
- *Atractosteus spatula* - Alligator Gar
- *Agonostomus monticoloma* - Mountain Mullet
- *Acantharchus pomotis* - Mud Sunfish
- *Crystallaria asprella* - Crystal Darter
- *Enneacanthus chaetodon* - Black Banded Sunfish
- *Ethostoma histrio* - Harlequin Darter
- *Ethostoma olmstedi* - Tessellated Darter
- *Ethostoma parvipinne* - Goldstripe Darter
- *Ethostoma proeliare* - Cypress Darter
- *Micropterus cataractae* - Shoal Bass
- *Percina australopercula* - Southern Logperch
- *Percina vigil* - Saddleback Darter
- *Ameiurus brunneus* - Snail Bullhead
- *Ameiurus serracanthus* - Spotted Bullhead

**Invertebrates**

- *Alasmidonta triangulata* - Southern Elktoe
- *Alasmidonta wrightiana* - Ochlockonee Arcmussel
- *Amblema neislerii* - Fat Three-ridge Mussel
- *Anodonta heardi* - Apalachicola Floater
- *Anodonta suborbiculata* - Flat Floater
- *Anodontoides radiatus* - Rayed Creekshell
- *Elliptio arctica* - Delicate Spike
- *Elliptio chipolaensis* - Chipola Slabshell
- *Elliptio mcmichaeli* - Fluted Elephant-ear
- *Elliptio purpurella* - Inflated Spike
- *Elliptioideus sloatanus* - Purple Bankclimber
- *Fusconaia burkei* - Tapered Pigtoe
- *Fusconaia escambia* - Narrow Pigtoe
- *Fusconaia rotulata* - Round Ebonyshell
- *Glebula rotundata* - Round Pearlshell
- *Hamiota australis* - Southern Sandshell
- *Lampsilis floridensis* - Yellow Sandshell
- *Lampsilis ornata* - Southern Pocketbook
- *Medionidus acutissimus* - Alabama Moccasinshell
- *Medionidus penicillatus* - Gulf Moccasinshell
Conservation Threats

Threats to the Large Alluvial Stream habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Chemicals and toxins
- Groundwater withdrawal
- Incompatible forestry practices
- Incompatible recreational activities
- Invasive animals
- Surface water withdrawal and diversion
Existing dams and associated water withdrawal pose a serious source of stress to the alluvial stream habitat on the Apalachicola River and a potential future threat on several additional rivers. Dams and other activities, including incompatible forestry practices and channel modification, can appreciably alter sediment dynamics in this habitat. Additional threats specific to this habitat include dam operations and management of nature (i.e., water control structures/dams and levees, especially on the large interstate rivers of the Florida panhandle, as well as channel modification for the Apalachicola River specifically).

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered species composition/dominance</td>
<td>Medium</td>
</tr>
<tr>
<td>B Altered community structure</td>
<td>Medium</td>
</tr>
<tr>
<td>C Habitat destruction or conversion</td>
<td>Medium</td>
</tr>
<tr>
<td>D Fragmentation of habitats, communities, ecosystems</td>
<td>Medium</td>
</tr>
<tr>
<td>E Altered hydrologic regime</td>
<td>Medium</td>
</tr>
<tr>
<td>F Erosion/sedimentation</td>
<td>Medium</td>
</tr>
<tr>
<td>G Altered water quality of surface water or aquifer: nutrients</td>
<td>Low</td>
</tr>
<tr>
<td>H Altered water quality of surface water or aquifer: contaminants</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dam operations</td>
<td>High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>2 Management of nature–water control structures</td>
<td>High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>3 Channel modification/shipping lanes</td>
<td>High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>4 Invasive animals</td>
<td>Medium</td>
<td>A, B, C, F</td>
</tr>
<tr>
<td>5 Surface water withdrawal</td>
<td>Medium</td>
<td>D, E</td>
</tr>
<tr>
<td>6 Groundwater withdrawal</td>
<td>Low</td>
<td>E</td>
</tr>
<tr>
<td>7 Incompatible forestry practices</td>
<td>Low</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>8 Chemicals and toxins</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>9 Incompatible recreational activities</td>
<td>Low</td>
<td>A, B, C, F</td>
</tr>
</tbody>
</table>

| Statewide Threat Rank of Habitat            | High                |

**Conservation Actions**

Actions to abate the threats to Large Alluvial Stream that were also identified as statewide threats (invasive animals, surface water withdrawal and diversion, groundwater withdrawal, incompatible forestry practices, chemicals and toxins, incompatible recreational activities) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.
Several of the actions developed for a statewide threat were only applicable to Large Alluvial Stream and a few other habitats, and are listed below. Additional actions were developed to address threats specific to this habitat. These actions were intended to reduce the impacts of dams and dam operations on movement and survival of aquatic species by retrofitting and restoring existing structures or by setting limits on the magnitude, duration, and frequency of downstream water releases required to support aquatic habitat.

**Dam operations**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Coordinate interstate Action Plan actions to ensure that all fish and wildlife resources in all states are protected when changing dam operations in shared basins. (USFWS)</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Coordinate multiagency review of USACE activities, including biological aspects (fish spawn guidelines, protection of fish and wildlife resources) of water control plans for interstate water projects, fish spawn guidelines, re-establishing natural seasonal fluctuation of flows.</td>
<td>L</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

**Land/Water/Species Management**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Raise the intake water from the Ochlockonee Dam to increase downstream dissolved oxygen content to natural levels.</td>
<td>VH</td>
<td>M</td>
</tr>
</tbody>
</table>

**Research**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Determine the appropriate hydrological flows and levels for water reservations on the Apalachicola, Yellow, Ochlockonee, and other interstate rivers using the ESWM (Ecologically Sustainable Water Management) approach.</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Complete research on anadromous fish passage implementation and effectiveness on the Apalachicola River. Expand research to Lake Talquin Dam.</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Evaluate cumulative impacts of small rural impoundments on fish and wildlife.</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Evaluate feasibility of incentive programs to remove small rural impoundments.</td>
<td>H</td>
<td>L</td>
</tr>
</tbody>
</table>

**Management of nature – water control structures**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Explore funding sources for fish and aquatic wildlife passage research and improvements to existing dams and other water control structures to facilitate movement of migratory species (e.g., Apalachicola Woodruff Dam work).</td>
<td>H</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Fund research to identify the habitat needs and movement requirements of native SGCN aquatic species, inventory water control structures, and identify the extent to which particular existing water control structures negatively affect species ecology.</td>
<td>VH</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Fund research to investigate the cumulative impacts of small farm ponds on low-order streams in north Florida to determine the effectiveness of existing regulations and recommend changes to the regulatory/permitting process aimed at reducing cumulative impacts.</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>
### Chemicals and toxins

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage voluntary incentives for private landowners to minimize runoff of chemicals and toxins into wetlands and aquatic systems.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
Mangrove Swamp

Status
Current condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 588,434 acres (238,131 ha) of Mangrove Swamp habitat exist, of which 88% (515,783 ac; 208,730 ha) are in existing conservation or managed areas. Another 2% (10,376 ac; 4,199 ha) are in Florida Forever projects and 3% (16,997 ac; 6,878 ha) are in SHCA-designated lands. The remaining 7% (45,278 ac; 18,323 ha) are other private lands.

Habitat Description

FNAI type: Tidal Swamp

Mangroves form dense, brackish-water swamps along low-energy shorelines and in protected, tidally influenced bays of southern Florida. This community type is composed of freeze-sensitive tree species and, with some limited exceptions, mangroves which are distributed south of Cedar Key on the Gulf coast and south of St. Augustine on the Atlantic coast. These swamp communities are usually composed of red mangrove, black mangrove, and white mangrove. Depending on slopes and amounts of disturbance, mangrove swamps may progress in zones of single species from seaward (red mangrove) to landward (white mangrove) areas. Buttonwoods usually occur in areas above high tide. Often vines, such as rubber vines and morning-glory, clamber over mangroves, especially at swamp edges.
Associated Species of Greatest Conservation Need

**Mammals**
- *Eumops floridanus* Florida Bonneted Bat
- *Tadarida brasiliensis cynocephala* Brazilian Free-tailed Bat
- *Sylvilagus palustris hefneri* Lower Keys Marsh Rabbit
- *Oryzomys palustris natator* Silver Rice Rat
- *Oryzomys palustris planirostris* Pine Island Marsh Rice Rat
- *Oryzomys palustris sanibeli* Sanibel Island Marsh Rice Rat
- *Lontra canadensis lataxina* River Otter
- *Neovison vison evergladensis* Everglades Mink
- *Procyon lotor auspicatus* Key Vaca Raccoon
- *Procyon lotor incautus* Key West Raccoon
- *Procyon lotor inesperatus* Matecumbe Key Raccoon
- *Ursus americanus floridanus* Florida Black Bear
- *Trichechus manatus latirostris* West Indian Manatee
- *Odocoileus virginianus clavium* Key Deer

**Birds**
- *Anas fulvigula* Mottled Duck
- *Mycteria americana* Wood Stork
- *Fregata magnificens* Magnificent Frigatebird
- *Pelecanus occidentalis* Brown Pelican
- *Ixobrychus exilis* Least Bittern
- *Ardea herodias* Great Blue Heron
- *Ardea herodias occidentalis* Great White Heron
- *Ardea alba* Great Egret
- *Egretta thula* Snowy Egret
- *Egretta caerulea* Little Blue Heron
- *Egretta tricolor* Tricolored Heron
- *Egretta rufescens* Reddish Egret
- *Butorides virescens* Green Heron
- *Nycticorax nycticorax* Black-crowned Night-Heron
- *Nyctanassa violacea* Yellow-crowned Night-Heron
- *Eudocimus albus* White Ibis
- *Plegadis falcinellus* Glossy Ibis
- *Platalea ajaja* Roseate Spoonbill
- *Elanoides forficatus* Swallow-tailed Kite
- *Haliaeetus leucocephalus* Bald Eagle
- *Falco peregrinus* Peregrine Falcon
- *Rallus longirostris insularum* Mangrove Clapper Rail
- *Rallus longirostris scotti* Florida Clapper Rail
- *Haematopus palliatus* American Oystercatcher
- *Recurvirostra americana* American Avocet
- *Tringa semipalmata semipalmata* Eastern Willet
- *Tringa flavipes* Lesser Yellowlegs
- *Anous stolidus* Brown Noddy
- *Hydroprogne caspia* Caspian Tern
- *Patagioenas leucocephala* White-crowned Pigeon
- *Coccyzus minor* Mangrove Cuckoo
- *Tyrannus dominicensis* Gray Kingbird
- *Vireo altiloquus* Black-whiskered Vireo
### Chapter 6: Habitats - Mangrove Swamp

<table>
<thead>
<tr>
<th>Birds</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vermivora chrysoptera</td>
<td>Golden-winged Warbler</td>
</tr>
<tr>
<td>Vermivora cyanoptera</td>
<td>Blue-winged Warbler</td>
</tr>
<tr>
<td>Setophaga ruticilla</td>
<td>American Redstart</td>
</tr>
<tr>
<td>Setophaga castanea</td>
<td>Bay-breasted Warbler</td>
</tr>
<tr>
<td>Setophaga petechia gundlachi</td>
<td>Cuban Yellow Warbler</td>
</tr>
<tr>
<td>Setophaga discolor discolor</td>
<td>Prairie Warbler</td>
</tr>
<tr>
<td>Setophaga discolor paludicola</td>
<td>Florida Prairie Warbler</td>
</tr>
<tr>
<td>Cardellina canadensis</td>
<td>Canada Warbler</td>
</tr>
</tbody>
</table>

### Reptiles

<table>
<thead>
<tr>
<th>Reptile</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alligator mississippiensis</td>
<td>American Alligator</td>
</tr>
<tr>
<td>Crocodylus acutus</td>
<td>American Crocodile</td>
</tr>
<tr>
<td>Drymarchon couperi</td>
<td>Eastern Indigo Snake</td>
</tr>
<tr>
<td>Nerodia clarkii clarkei</td>
<td>Gulf Saltmarsh Watersnake</td>
</tr>
<tr>
<td>Nerodia clarkii compressicauda</td>
<td>Mangrove Saltmarsh Watersnake</td>
</tr>
<tr>
<td>Nerodia clarkii taeniata</td>
<td>Atlantic Saltmarsh Watersnake</td>
</tr>
<tr>
<td>Pantherophis guttatus</td>
<td>Red Cornsake (Lower Keys population)</td>
</tr>
<tr>
<td>Thamnophus sauritus sackenii</td>
<td>Peninsula Ribbonsnake (Lower Keys Population)</td>
</tr>
<tr>
<td>Caretta caretta</td>
<td>Loggerhead Sea Turtle</td>
</tr>
<tr>
<td>Deirochelys reticularia</td>
<td>Chicken Turtle</td>
</tr>
<tr>
<td>Eretmochelys imbricata</td>
<td>Hawksbill Sea Turtle</td>
</tr>
<tr>
<td>Lepidochelys kempi</td>
<td>Kemp's Ridley Sea Turtle</td>
</tr>
<tr>
<td>Malaclemys terrapin</td>
<td>Diamond-backed Terrapin</td>
</tr>
</tbody>
</table>

### Fish

<table>
<thead>
<tr>
<th>Fish</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Menidia conchorum</td>
<td>Key Silverside</td>
</tr>
<tr>
<td>Gambusia rhizophorae</td>
<td>Mangrove Gambusia</td>
</tr>
<tr>
<td>Rivulus marmoratus</td>
<td>Mangrove Rivulus</td>
</tr>
<tr>
<td>Negaprion brevirostris</td>
<td>Lemon Shark</td>
</tr>
<tr>
<td>Squalus acanthias</td>
<td>Cape Shark, Piked Dogfish, Spurdog</td>
</tr>
<tr>
<td>Lutjanus mahogoni</td>
<td>Mahogany Snapper</td>
</tr>
</tbody>
</table>

### Invertebrates

<table>
<thead>
<tr>
<th>Invertebrate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agaricia agaricites</td>
<td>Lettuce Coral</td>
</tr>
<tr>
<td>Diploria clivosa</td>
<td>Knobby Brain Coral</td>
</tr>
<tr>
<td>Elysia clarki</td>
<td>Lettuce Sea Slug</td>
</tr>
<tr>
<td>Thermocyclops parvus</td>
<td>A Copepod</td>
</tr>
<tr>
<td>Aratus pisonii</td>
<td>Mangrove Crab</td>
</tr>
<tr>
<td>Goniopsis cruentata</td>
<td>Mangrove Crab</td>
</tr>
<tr>
<td>Heterachthes sablensis</td>
<td>Mangrove Long-horned Beetle</td>
</tr>
<tr>
<td>Photuris brunnipennis floridana</td>
<td>Everglades Brownwing Firefly</td>
</tr>
<tr>
<td>Aphrissa statira</td>
<td>Statira</td>
</tr>
<tr>
<td>Kricogonia lyside</td>
<td>Lyside Sulphur</td>
</tr>
<tr>
<td>Oreaster reticulatus</td>
<td>Cushion Star, Bahama Star</td>
</tr>
<tr>
<td>Echinaster echinophorus</td>
<td>Thorny Sea Star</td>
</tr>
<tr>
<td>Holothuria mexicana</td>
<td>Donkey Dung Sea Cucumber</td>
</tr>
</tbody>
</table>
Chapter 6: Habitats - Mangrove Swamp

Conservation Threats

Habitat-specific threats to Mangrove Swamp include reduction in freshwater flows from dam operations, lack of tidal fluctuation caused by mosquito impoundments, loss of mangroves from inappropriate pruning by coastal property owners, and coastal development.

Threats to Mangrove Swamp habitats that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Chemicals and toxins
- Climate variability
- Coastal development
- Dam operations/incompatible release of water (quality, quantity, timing)
- Fishing gear impacts
- Harmful algal blooms
- Incompatible fishing pressure
- Incompatible industrial operations
- Incompatible recreational activities
- Incompatible wildlife and fisheries management strategies
- Industrial Spills
- Invasive animals
- Invasive plants
- Management of nature (beach nourishment and impoundments)
- Nutrient loads–urban
- Roads, bridges and causeways
- Shoreline hardening
- Surface water and groundwater withdrawal
- Vessel impacts

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered hydrologic regime</td>
<td>Very High</td>
</tr>
<tr>
<td>B Habitat destruction</td>
<td>Very High</td>
</tr>
<tr>
<td>C Altered structure</td>
<td>High</td>
</tr>
<tr>
<td>D Altered water quality–contaminants</td>
<td>High</td>
</tr>
<tr>
<td>E Altered weather regime/sea level rise</td>
<td>High</td>
</tr>
<tr>
<td>F Altered species composition</td>
<td>High</td>
</tr>
<tr>
<td>G Habitat disturbance</td>
<td>High</td>
</tr>
<tr>
<td>H Habitat fragmentation</td>
<td>High</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Coastal development</td>
<td>Very High</td>
<td>A, B, C, D, G, H</td>
</tr>
<tr>
<td>2 Roads, bridges and causeways</td>
<td>High</td>
<td>A, B, D, F, G, H</td>
</tr>
<tr>
<td>3 Harmful algal blooms</td>
<td>High</td>
<td>B, F, G</td>
</tr>
<tr>
<td>4 Incompatible industrial operations</td>
<td>High</td>
<td>B, D, F, G, H</td>
</tr>
<tr>
<td>5 Invasive plants</td>
<td>High</td>
<td>B, C, F, G</td>
</tr>
</tbody>
</table>
### Sources of Stress

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Shoreline hardening</td>
<td>High</td>
<td>A, B, F, G, H</td>
</tr>
<tr>
<td>7 Invasive animals</td>
<td>High</td>
<td>B, F, G</td>
</tr>
<tr>
<td>8 Dam operations/incompatible release of water (quality, quantity, timing)</td>
<td>High</td>
<td>A, B, D, F, G</td>
</tr>
<tr>
<td>9 Incompatible wildlife and fisheries management strategies</td>
<td>High</td>
<td>B,C</td>
</tr>
<tr>
<td>10 Climate variability</td>
<td>High</td>
<td>A, B, E, H</td>
</tr>
<tr>
<td>11 Parasites/pathogens</td>
<td>High</td>
<td>B, F, G</td>
</tr>
<tr>
<td>12 Channel modification/shipping lanes</td>
<td>High</td>
<td>A, B, F, G, H</td>
</tr>
<tr>
<td>13 Incompatible aquaculture operations</td>
<td>High</td>
<td>B, H</td>
</tr>
<tr>
<td>14 Chemicals and toxins</td>
<td>High</td>
<td>B, D, F, G</td>
</tr>
<tr>
<td>15 Nutrient loads (all sources)</td>
<td>High</td>
<td>D, F, G</td>
</tr>
<tr>
<td>16 Acoustic pollution</td>
<td>High</td>
<td>B</td>
</tr>
<tr>
<td>17 Inadequate stormwater management</td>
<td>Medium</td>
<td>A, B, D, F, G</td>
</tr>
<tr>
<td>18 Industrial spills</td>
<td>Medium</td>
<td>B, D, F, G</td>
</tr>
<tr>
<td>19 Boating impacts</td>
<td>Medium</td>
<td>B, C, F, G, H</td>
</tr>
<tr>
<td>20 Incompatible fishing pressure</td>
<td>Medium</td>
<td>F, G, H</td>
</tr>
<tr>
<td>21 Solid waste</td>
<td>Medium</td>
<td>B, C, G</td>
</tr>
<tr>
<td>22 Management of nature (beach nourishment, impoundments)</td>
<td>Medium</td>
<td>A, B, F, G</td>
</tr>
<tr>
<td>23 Fishing gear impacts</td>
<td>Medium</td>
<td>B, C, G</td>
</tr>
<tr>
<td>24 Surface water withdrawal</td>
<td>Medium</td>
<td>A, F, G</td>
</tr>
<tr>
<td>25 Utility corridors</td>
<td>Medium</td>
<td>B, C, G</td>
</tr>
<tr>
<td>26 Groundwater withdrawal</td>
<td>Medium</td>
<td>A, F, G</td>
</tr>
<tr>
<td>27 Incompatible recreational activities</td>
<td>Medium</td>
<td>B, D, F, G</td>
</tr>
<tr>
<td>28 Thermal pollution</td>
<td>Medium</td>
<td>F, G</td>
</tr>
<tr>
<td>29 Placement of artificial structures</td>
<td>Medium</td>
<td>B, C</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**  
Very High

### Conservation Actions

Actions to abate the threats to Mangrove Swamp that were also identified as statewide marine and estuarine threats (see list above) are in Chapter 7: Multiple Habitat Threats and Conservation Actions. However, experts identified outcomes to reduce damaging mangrove trimming, restore appropriate freshwater flows, and reconnect existing salt marsh/mangrove...
impoundments to tide and manage to maximize resource values while maintaining adequate levels of mosquito control.

Highest ranked actions identified for abating this source of stress focus on:
- Improving the detection of pathogens, parasites, and biotoxins in marine organisms and the ability to rehabilitate impacted animals

Additional actions included:
- Providing training on appropriate mangrove trimming to landscape maintenance and wetlands professionals
- Evaluating whether parasites are indicators of estuarine and marine health.

The following actions, organized by action type were identified to abate this threat:

### Climate Change

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Using GIS, identify modifications to mangroves and marshes, use restoration techniques to reverse modifications, and include consideration of sea level rise in restoration goal.</td>
<td>L</td>
<td>M</td>
<td>VH</td>
</tr>
</tbody>
</table>

### Coastal Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Issue continuing education credits for proper mangrove trimming. This could be for professional wetland scientists, certified ecologists, landscape architects, arborists, landscape professionals. Improve knowledge of mangroves through certification program. Link with herbicide application CEU's to ensure increased participation.</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

### Parasites/Pathogens

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Improve capabilities for sophistication of inspection, recognition, and treatment of aquatic organism diseases and parasites.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>H</td>
<td>Continue and support response teams/hotlines associated with disease outbreak, trauma, strandings, and mortality events for fish and wildlife species.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Expand the number and capabilities of rehabilitation facilities for diseased marine mammals and reptiles.</td>
<td>H</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

### Research

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Conduct additional research for aquatic wildlife parasites and diseases. and the impacts of biotoxins on fish and wildlife resources.</td>
<td>VH</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>Synthesize and consolidate understanding, and identification of gaps in understanding, of marine flora/fauna diseases, pathogens, biotoxins, including slime mold on seagrasses and oyster disease.</td>
<td>VH</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>M</td>
<td>Research and examine use of parasites as indicators of estuarine and marine health.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
Mixed Hardwood-Pine Forest

Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.

Status
Current condition: Good and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 879,766 acres (356,029 ha) of Mixed Hardwood-Pine Forest habitat exist, of which 16% (141,495 ac; 57,261 ha) are in conservation or managed areas. Another 3% (30,783 ac; 12,457 ha) are in Florida Forever projects and 6% (49,009 ac; 19,833 ha) are in SHCA-designated lands. The remaining 75% (658,479 ac; 266,477 ha) are other private lands.

Habitat Description

FNAI type: Upland Mixed Forest

This community is the southern extension of the Piedmont southern mixed hardwoods, and occurs mainly on the rolling hills of sandy clay soils of the northern Panhandle. Younger stands may be predominantly pines, whereas a complex of various hardwoods become co-dominants as the system matures over time through plant succession. The overstory consists of shortleaf and loblolly pine, American beech, mockernut hickory, southern red oak, water oak, American holly, and dogwood.

Also included in this category are other upland forests that occur statewide and contain a mixture of conifers and hardwoods as the co-dominant overstory component. These communities contain well developed associations of longleaf pine, slash pine, and loblolly pine in mixed company with live oak, laurel oak, and water oak, together with other hardwood species characteristic of the Hardwood Hammock Forest community type. In this habitat, the ground is usually covered with a thick layer of leaf mulch which helps in the retention of moisture. Adding to
the mesic condition is a thick canopy with low air flow and light penetration. Due to this damp environment, Mixed Hardwood-Pine Forests seldom burn.

**Associated Species of Greatest Conservation Need**

### Mammals
- *Blarina shermani* Sherman's Short-tailed Shrew
- *Sorex longirostris eionis* Homosassa Shrew
- *Corynorhinus rafinesquii* Rafinesque's Big-eared Bat
- *Eptesicus fuscus* Big Brown Bat
- *Lasiurus borealis borealis* Red Bat
- *Lasiurus cinereus cinereus* Hoary Bat
- *Lasiurus intermedius floridanus* Northern Yellow Bat
- *Lasiurus seminolus* Seminole Bat
- *Myotis auripilus* Southeastern Myotis
- *Myotis griseascens* Gray Bat
- *Perimyotis subflavus* Tricolored Bat
- *Microtus pinetorum ssp.* Pine Vole
- *Sciurus niger niger* Southeastern Fox Squirrel
- *Sciurus niger shermani* Sherman's Fox Squirrel
- *Tamias striatus* Eastern Chipmunk
- *Mustela frenata olivacea* Southeastern Weasel
- *Mustela frenata peninsulare* Florida Long-tailed Weasel
- *Puma concolor coryi* Florida Panther
- *Ursus americanus floridanus* Florida Black Bear

### Birds
- *Colinus virginianus* Northern Bobwhite
- *Ictinia mississippiensis* Mississippi Kite
- *Haliaeetus leucocephalus* Bald Eagle
- *Buteo platypterus* Broad-winged Hawk
- *Scolopax minor* American Woodcock
- *Megascops asio* Eastern Screech-Owl
- *Chordeiles minor* Common Nighthawk
- *Progne subis* Purple Martin
- *Hylocichla mustelina* Wood Thrush
- *Helmitheros vermivorum* Worm-eating Warbler
- *Parkesia motacilla* Louisiana Waterthrush
- *Vermivora chrysoptera* Golden-winged Warbler
- *Vermivora cyanoptera* Blue-winged Warbler
- *Pipilo erythrophthalmus* Hairy Woodpecker
- *Caprimulgus vociferus* Eastern Whip-poor-will
- *Sethophaga setifer* Red-headed Woodpecker
- *Geothlypis formosa* Kentucky Warbler
- *Pipilo erythrophthalmus* Red-headed Woodpecker
- *Pipilo erythrophthalmus* Florida Long-tailed Weasel
- *Pipilo erythrophthalmus* Stoddard's Yellow-throated Warbler
- *Sethophaga setifer* Prairie Warbler
- *Cardellina canadensis* Canada Warbler
### Amphibians
- *Lithobates capito*  
  Gopher Frog
- *Pseudacris ornata*  
  Ornate Chorus Frog
- *Ambystoma tigrinum*  
  Eastern Tiger Salamander
- *Desmognathus apalachicolae*  
  Apalachicola Dusky Salamander
- *Desmognathus auriculatus*  
  Southern Dusky Salamander
- *Desmognathus cf. conanti*  
  Eglin Ravine Spotted Dusky Salamander
- *Desmognathus monticola*  
  Seal Salamander
- *Eurycea chamberlaini*  
  Chamberlain's Dwarf Salamander
- *Hemidactylium scutatum*  
  Four-toed Salamander

### Reptiles
- *Anolis carolinensis seminolus*  
  Southern Green Anole
- *Agkistrodon contortrix contortrix*  
  Southern Copperhead
- *Cemophora coccinea coccinea*  
  Florida Scarletsnake
- *Crotalus adamanteus*  
  Eastern Diamond-backed Rattlesnake
- *Crotalus horridus*  
  Timber Rattlesnake
- *Drymarchon couperi*  
  Eastern Indigo Snake
- *Heterodon platirhinos*  
  Eastern Hog-nosed Snake
- *Heterodon simus*  
  Southern Hog-nosed Snake
- *Lampropeltis extenuata*  
  Short-tailed Snake
- *Lampropeltis getula*  
  Eastern Kingsnake
- *Pituophis melanoleucus mugitus*  
  Florida Pinesnake
- *Tantilla coronata*  
  Southeastern Crowned Snake
- *Tantilla relicta*  
  Florida Crowned Snake
- *Terrapene carolina*  
  Eastern Box Turtle

### Invertebrates
- *Macrobrachium acanthurus*  
  Cinnamon River Shrimp
- *Macrobrachium carcinus*  
  Big Claw River Shrimp
- *Macrobrachium ohione*  
  Ohio River Shrimp
- *Achalarus lyciades*  
  Hoary Edge
- *Autochton cellus*  
  Golden-banded Skipper
- *Erynnis baptisiae*  
  Wild Indigo Duskywing
- *Nastra neamathla*  
  Neamathla Skipper
- *Callophrys henrici*  
  Henry's Elfin
- *Callophrys niphon*  
  Eastern Pine Elfin
- *Cupido comyntas*  
  Eastern Tailed Blue
- *Satyrium titus*  
  Coral Hairstreak
- *Catocala grisatra*  
  Grisattra Underwing
- *Idia gopheri*  
  Gopher Tortoise Noctuid Moth
- *Proserpinus gaurae*  
  Proud Sphinx

### Conservation Threats

Because of serious problems interpreting this habitat in the workshops, no threats could be identified and hence no conservation actions were developed. As identified in TNC’s Final Report (Gordon et al. 2005), it is recommended that the mapping for this habitat be revisited and/or the habitat itself re-classified. In all three of the regional threats workshops, experts concurred that Mixed Hardwood-Pine Forest is not a habitat unto itself. When experts examined the distribution of
this cover type, they suggested that it represents either areas of degraded pinelands into which hardwoods have invaded and require fire or other restoration to reduce the hardwoods, or floodplain forest and other hardwood-dominated systems into which pines have invaded, perhaps because of altered hydrology. The experts suggested that each pixel of this habitat type be reclassified the same as the adjacent pixel of a hardwood or pineland site, and the assumption was made that they adequately covered the stresses and sources for these areas when they assessed the other cover types. It is recommended that the threats and conservation actions for the habitats identified as more accurately depicting this cover type should be extrapolated to this “habitat” or that this habitat be eliminated as a separate category and/or subsumed into other habitats.

While threats to its conservation as well as remedial actions were identified during earlier workshops, the Mixed Hardwood-Pine Forest habitat category was not addressed in TNC workshops that generated tables of ranked threats and actions, as seen in most other habitat categories. The decision to not rank threats and actions for this habitat was made (1) to maximize discussion time for higher-priority habitats and (2) because of some disagreement over recognition of this habitat type as important to wildlife conservation. Therefore, threats and actions are presented as simple bulleted lists, arranged in alphabetical order, with no prioritization.

The following stresses threaten this habitat:

- Altered community structure
- Altered landscape mosaic or context
- Altered fire regime
- Altered species composition/dominance
- Fragmentation of habitats, communities, ecosystems
- Habitat degradation/disturbance
- Habitat destruction or conversion
- Insufficient size/extent of characteristic communities or ecosystems
- Missing key communities, functional guilds, or seral stages

The sources of stress, or threats, were used to generate conservation actions.

- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Conversion to recreation areas
- Incompatible fire
- Incompatible forestry practices
- Incompatible recreational activities
- Incompatible wildlife and fisheries management
- Invasive animals
- Invasive plants
- Roads
Conservation Actions

Actions to abate threats to Hardwood-Pine Forest were designed to increase the awareness and appreciation of this habitat by professionals and the public. Many actions point to the need for more information and definition of this habitat. All threats were also identified as statewide (see sources of stress above) and are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Specific actions to abate threats that were identified for Mixed Hardwood-Pine Forest habitat are below, though none were prioritized for implementation.

**Land/Water Protection**
- Support and encourage land protection that utilize easements

**Land/Water/Species Management**
- Encourage use of the “master logger program” and expand to smaller timber companies
- Develop a plan to fund management programs long term after reclamation—include invasive flora and fauna

**Law and Policy**
- Minimize connectivity impacts to wildlife through supporting effective land-use planning

**Research, Education and Awareness**
- Better define and map the current condition, and develop management practices to achieve the future condition of this habitat
- Research plans for restoration of this habitat and its hydrology
- Research management practices for controlling invasive species
- Educate landowners about management practices for controlling invasive species
- Increase public/private training and awareness about value of these lands
- Continue to educate landowners about the proper use of BMPs

**Economic and Other Incentives**
- Provide landowner incentive (public and private) for protection and restoration of habitat

**Capacity Building**
- Form and facilitate partnerships, alliances, and networks of organizations willing to research, conserve and manage this habitat
Status
Current condition: Good and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 1,510,216 acres (611,163 ha) of Natural Lake habitat exist.

Habitat Description

FNAI type: Clastic Upland Lake, Sandhill Lake, Sinkhole Lake

Florida has approximately 7,800 Natural Lakes with a surface area of one acre (0.4 ha) or more. Very few of these lakes were formed by riverine processes. However, the great majority were formed or enlarged by dissolution of the underlying limestone by acidic surface waters. Slumping of the overburden resulted in a surface depression. Most Natural Lakes in Florida retain an intimate connection with groundwater, and lack a natural surface outflow. They may be connected to aquatic caves by underground fissures or bedding planes, and thus provide additional habitat for animal species found in those subterranean habitats, or they may have bottom substrates of silt or sand. Most of these lakes have highly variable water levels. Despite their origin, many Florida lakes are not alkaline, and are vulnerable to acidification. They also commonly are nutrient-deficient, thus are vulnerable to nutrient inputs.

Florida’s lakes are usually less than 45 feet (14 m) deep, with sand, silt, or organic bottom substrates. Depending on the water chemistry, vegetation in the lakes can vary from nonexistent, to a fringe of emergent plants at the shoreline, to a complete covering of floating plants. Indeed, introduced aquatic weeds are a major threat to this habitat. Some Florida lakes have held water continuously for 8,000 years, and two exceed 30,000 years in age.
This habitat category is comprised exclusively of standing water bodies of natural origin, some of which have been altered by the construction of water control structures. Natural Lakes are essentially permanent, although many of them dry completely during droughts.

**Associated Species of Greatest Conservation Need**

**Mammals**
- *Corynorhinus rafinesquii*  
  Rafinesque's Big-eared Bat
- *Eptesicus fuscus*  
  Big Brown Bat
- *Eumops floridanus*  
  Florida Bonneted Bat
- *Lasiurus borealis borealis*  
  Red Bat
- *Lasiurus cinereus cinereus*  
  Hoary Bat
- *Lasiurus intermedius floridanus*  
  Northern Yellow Bat
- *Lasiurus seminolus*  
  Seminole Bat
- *Myotis austroriparius*  
  Southeastern Myotis
- *Myotis grisescens*  
  Gray Bat
- *Perimyotis subflavus*  
  Tricolored Bat
- *Lontra canadensis lataxina*  
  River Otter
- *Trichechus manatus latirostris*  
  West Indian Manatee

**Birds**
- *Anas rubripes*  
  American Black Duck
- *Anas fulvigula*  
  Mottled Duck
- *Aythya marila*  
  Greater Scaup
- *Gavia immer*  
  Common Loon
- *Mycteria americana*  
  Wood Stork
- *Pelecanus occidentalis*  
  Brown Pelican
- *Botaurus lentiginosus*  
  American Bittern
- *Ixobrychus exilis*  
  Least Bittern
- *Ardea herodias*  
  Great Egret
- *Ardea alba*  
  Great Blue Heron
- *Egretta thula*  
  Snowy Egret
- *Egretta caerulea*  
  Little Blue Heron
- *Egretta tricolor*  
  Tricolored Heron
- *Egretta rufescens*  
  Reddish Egret
- *Butorides virescens*  
  Green Heron
- *Nycticorax nycticorax*  
  Black-crowned Night-Heron
- *Nyctanassa violacea*  
  Yellow-crowned Night-Heron
- *Eudocimus albus*  
  White Ibis
- *Plegadis falcinellus*  
  Glossy Ibis
- *Platalea ajaja*  
  Roseate Spoonbill
- *Pandion haliaetus*  
  Osprey
- *Rostrhamus sociabilis*  
  Snail Kite
- *Haliaeetus leucocephalus*  
  Bald Eagle
- *Falco peregrinus*  
  Peregrine Falcon
- *Rallus elegans*  
  King Rail
- *Porphyrio martinica*  
  Purple Gallinule
- *Aramus guarauna*  
  Limpkin
- *Grus canadensis pratensis*  
  Florida Sandhill Crane
- *Grus americana*  
  Whooping Crane
- *Tringa solitaria*  
  Solitary Sandpiper
- *Tringa flavipes*  Lesser Yellowlegs  
- *Tryngites subruficollis*  Buff-breasted Sandpiper  
- *Limnodromus scolopaceus*  Long-billed Dowitcher  
- *Phalaropus tricolor*  Wilson's Phalarope  
- *Chlidonias niger*  Black Tern  
- *Rynchops niger*  Black Skimmer  
- *Euphagus cyanocephalus*  Brewer's Blackbird  

### Amphibians
- *Lithobates capito*  Gopher Frog  
- *Lithobates virgatipes*  Carpenter Frog  
- *Ambystoma tigrinum*  Eastern Tiger Salamander  
- *Desmognathus auriculatus*  Southern Dusky Salamander  

### Reptiles
- *Alligator mississippiensis*  American Alligator  
- *Farancia erytrogramma*  Rainbow Snake  
- *Nerodia cyclopion*  Mississippi Green Watersnake  
- *Semminatrix pygaea cycla*  Southern Florida Swampsnake  
- *Apalone mutica calvata*  Gulf Coast Smooth Softshell  
- *Apalone spinifera aspera*  Gulf Coast Spiny Softshell  
- *Deirochelys reticularia*  Chicken Turtle  
- *Macrochelys temminckii*  Alligator Snapping Turtle  
- *Pseudemys nelsoni*  Florida Red-bellied Cooter (Panhandle Population)  

### Fish
- *Anguilla rostrata*  American Eel  
- *Cyprinodon variegatus hubbsi*  Lake Eustis Pupfish  
- *Acantharchus pomotis*  Mud Sunfish  
- *Enneacanthus chaetodon*  Black Banded Sunfish  

### Invertebrates
- *Amblema plicata*  Threeridge  
- *Anodonta hartfieldorum*  Cypress Floater  
- *Anodonta heardi*  Apalachicola Floater  
- *Utterbackia peggyae*  Florida Floater  
- *Utterbackia peninsularis*  Peninsular Floater  
- *Cambarellus schmitti*  A Crayfish  
- *Macrobrachium acanthurus*  Cinnamon River Shrimp  
- *Macrobrachium carcinus*  Big Claw River Shrimp  
- *Macrobrachium ohione*  Ohio River Shrimp  
- *Anax amazili*  Amazon Darter  
- *Nehalennia pallidula*  Everglades Sprite  
- *Epitheca spinosa*  Robust Tongtail  
- *Gomphus vastus*  Cobra Clubtail  
- *Progomphus alachuensis*  Tawny Sanddragon  
- *Progomphus bellei*  Belle, Belle's Sanddragon  
- *Lestes inaequalis*  Elegant Spreadwing  
- *Lestes spumarius*  Antillean Spreadwing  
- *Libellula Jesseana*  Purple Skimmer  
- *Nannothemis bella*  Elfin Skimmer  
- *Hydroptila berneri*  Berner's Microcaddisfly  

Chapter 6: Habitats – Natural Lake
Chapter 6: Habitats – Natural Lake

- *Orthotrichia curta*  
  Short Orthotrichian Microcaddisfly

- *Orthotrichia instabilis*  
  Changeable Orthotrichian Microcaddisfly

- *Oxyethira florida*  
  Florida Cream And Brown Microcaddisfly

- *Ceraclea limnetes*  
  Sandhill Lake Caddisfly

- *Nectopsyche tava*  
  Tavares White Miller Caddisfly

- *Oecetis parva*  
  Little Oecetis Longhorned Caddisfly

- *Oecetis porteri*  
  Porter's Long-horn Caddisfly

- *Triaenodes dendyi*  
  A Caddisfly

- *Triaenodes florida*  
  Floridian Triaenode Caddisfly

- *Triaenodes furcellus*  
  Little-fork Triaenode Caddisfly

- *Cernotina truncona*  
  Florida Cernotinan Caddisfly

- *Poanes viator zizaniae*  
  Broad-winged Skipper

 Conservations Threats

Threats to the Natural Lake habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Chemicals and toxins
- Conversion to agriculture
- Conversion to commercial/industrial development
- Conversion to housing and urban development
- Groundwater withdrawal
- Incompatible recreational activities
- Invasive animals
- Invasive plants
- Nutrient loads–agriculture
- Nutrient loads–urban
- Surface water withdrawal and diversion

Many of the threats to this habitat stem directly or indirectly from lakefront development which is ubiquitous on natural lakes throughout Florida. Like many wetland habitats, Natural Lakes, even those relatively unaffected by direct threats, suffer from an altered landscape context as surrounding uplands have been developed for housing and agricultural development. Additional threats specific to this habitat include the operation of dams or control structures, especially on lakes in central and south Florida.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Altered landscape mosaic or context</td>
<td>High</td>
</tr>
<tr>
<td>B  Altered hydrologic regime</td>
<td>High</td>
</tr>
<tr>
<td>C  Altered species composition/dominance</td>
<td>High</td>
</tr>
<tr>
<td>D  Altered water quality of surface water or aquifer: nutrients</td>
<td>High</td>
</tr>
<tr>
<td>E  Erosion/sedimentation</td>
<td>Medium</td>
</tr>
<tr>
<td>F  Altered community structure</td>
<td>Medium</td>
</tr>
<tr>
<td>G  Habitat degradation/disturbance</td>
<td>Medium</td>
</tr>
<tr>
<td>H  Insufficient size/extent of characteristic communities or ecosystems</td>
<td>Medium</td>
</tr>
<tr>
<td>I  Habitat destruction or conversion</td>
<td>Medium</td>
</tr>
<tr>
<td>J  Altered water quality of surface water or aquifer: contaminants</td>
<td>Medium</td>
</tr>
</tbody>
</table>
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Invasive plants</td>
<td>High</td>
<td>C</td>
</tr>
<tr>
<td>2 Dam operations</td>
<td>High</td>
<td>B, C</td>
</tr>
<tr>
<td>3 Nutrient loads–urban</td>
<td>High</td>
<td>C, D, E, F</td>
</tr>
<tr>
<td>4 Conversion to housing and urban development</td>
<td>High</td>
<td>A, C, D, F, I</td>
</tr>
<tr>
<td>5 Surface water withdrawal</td>
<td>Medium</td>
<td>B, C</td>
</tr>
<tr>
<td>6 Nutrient loads–agriculture</td>
<td>Medium</td>
<td>C, D, E, F</td>
</tr>
<tr>
<td>7 Invasive animals</td>
<td>Medium</td>
<td>C</td>
</tr>
<tr>
<td>8 Conversion to commercial and industrial development</td>
<td>Medium</td>
<td>A, C, D, I</td>
</tr>
<tr>
<td>9 Conversion to agriculture</td>
<td>Medium</td>
<td>A, H</td>
</tr>
<tr>
<td>10 Chemicals and toxins</td>
<td>Medium</td>
<td>J</td>
</tr>
<tr>
<td>11 Groundwater withdrawal</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>12 Incompatible recreational activities</td>
<td>Low</td>
<td>G</td>
</tr>
<tr>
<td>13 Incompatible residential activities</td>
<td>Low</td>
<td>G</td>
</tr>
<tr>
<td>14 Management of nature–aquatic plant treatment</td>
<td>Low</td>
<td>F</td>
</tr>
<tr>
<td>15 Incompatible agricultural practices</td>
<td>Low</td>
<td>B, C, D, E</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: High

**Conservation Actions**

Actions to abate the threats to Natural Lakes that were also identified as statewide threats (invasive plants, nutrient loads–urban, conversion to housing and urban development, surface water withdrawal and diversion, nutrient loads–agriculture, invasive animals, conversion to commercial/industrial development, conversion to agriculture, chemicals and toxins, groundwater withdrawal, incompatible recreational activities) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat were only applicable to Natural Lakes and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Cypress Swamp, Freshwater Marsh and Wet Prairie, Reservoir/Managed Lake, Seepage/Steephead Stream, Softwater Stream, Spring and Spring Run, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. Additional actions were developed to address threats specific to this habitat. These actions are intended to improve the condition of lake-fringe wetland habitat by managing lake levels to more closely resemble a natural hydrologic regime, maintain the amounts of littoral vegetation on lake edges necessary to sustain ecosystem function, improve the compatibility of lakefront development with wildlife habitat conservation, and increase our knowledge of the impact of chemicals and toxins on lake ecosystems.
### Dam Operations

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Coordinate interstate Action Plan actions to ensure that all fish and wildlife resources in all states are protected when changing dam operations in shared basins (USFWS).</td>
<td>M</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Coordinate multiagency review of USACE activities, including biological aspects (fish spawn guidelines, protection of fish and wildlife resources) of water control plans for interstate water projects, fish spawn guidelines, re-establishing natural seasonal fluctuation of flows.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Integrate lake management activities to coordinate multiple species and habitat conservation, restoration, and invasive plant management (FWC).</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Continue developing and implementing hydrologic management plans that restore the natural seasonal fluctuation to lakes in order to successfully manage sediment-dwelling wildlife.</td>
<td>M</td>
<td>H</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop a position paper on the impacts of lake level stabilization and absence of dry-season drawdown on littoral zone vegetation and dependent wildlife, and sediment accumulation in managed natural lakes.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Evaluate feasibility of incentive programs to remove small rural impoundments.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

### Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage conservation of lake frontage, riparian habitats and their floodplains.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

### Conversion to Agriculture

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create incentives for maintenance and conversion of lands to agricultural uses that use less water and result in lower nutrient outputs into Florida's waters and wetlands, and create market-based incentives to compensate private landowners for the environmental services they provide to the state through management that increases water storage and nutrient reduction.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

### Chemicals and Toxins

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop management techniques and recommendations for private landowners that minimize runoff of chemicals and toxins into wetlands and aquatic systems.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Develop management techniques and design protocols to minimize exposure of wading birds and other wetland wildlife to contaminants.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
### Chapter 6: Habitats – Natural Lake

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Conduct research defining appropriate sediment quality standards for the various aquatic and marine systems. Fund research defining the relationship between sediment contamination (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>Conduct research defining standards for persistent organic contaminants for the various aquatic and marine systems. Fund research defining the relationship between contamination from organics (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

**Incompatible Recreational Activities**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Identify a specified percentage of littoral vegetation clearing that does not reduce lake ecological integrity, and explore incentives for reaching that percentage on public and private lands.</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
</tbody>
</table>

**Incompatible Residential Activities**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Expand the scale of the Florida Yards and Neighborhoods program from certifying individual landowners to whole neighborhoods; certification should be renewed biennially and any time property ownership changes.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Support incentives for residential property owners to resolve issues of incompatible use of Natural Lakes, including pesticide use, pet control, feeding of wildlife, household or yard waste disposal, landscape plants, irrigation use, prescribed fire tolerance, and lighting in coastal areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Identify and promote effective reward models for homeowners, maintenance companies, and municipalities for reducing impacts on neighboring conservation areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Develop a voluntary program directed at developers to provide on-site site-specific educational materials and recommendations to homeowner associations about incompatible residential activities.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage and support continuing education opportunities for landscape maintenance industry that includes appropriate use of chemicals, irrigation, plants, and disposal of yard waste.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Develop and implement management techniques for management of shoreline vegetation to reduce movement of sediment into water bodies.</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop and promote management techniques that allow homeowners not to exceed recommended safe pesticide levels.</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>
Natural Pineland

Habitat Description

**FNAI type:** Mesic Flatwoods, Scrubby Flatwoods, Wet Flatwoods, Upland Pine Forest

This category includes natural pine forests, excluding pine rocklands, sandhills, and sand pine scrub, which are listed as separate categories. Natural Pineland habitats include mesic, hydric and scrubby flatwoods, and upland pine forests. Before human settlement, much of north and central Florida was covered by Natural Pineland. Much of this habitat type has been altered by humans as a result of conversion to agriculture and pine plantations, alteration of fire regimes, and introduced species. Pine flatwoods occur on flat sandy terrain where the overstory is characterized by longleaf pine, slash pine, or pond pine. The type of pineland habitat present is usually related to soil differences and small variations in topography. Hydroperiod is an important factor determining what kind of pineland is represented. Generally, flatwoods dominated by longleaf pine occur on

Status
Current condition: Poor and declining.

According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 3,095,165 acres (1,252,569 ha) of Natural Pinelands are present in Florida. Of that total, 30% (917,949 acres; 371,481 ha) are in existing conservation or managed areas, 7% (206,899 acres; 83,729 ha) are on private lands encompassed by Florida Forever projects, 8% (235,176 acres; 95,172 ha) are SCHA-identified lands, and the remaining 56% (1,735,141 acres; 702,187 ha) are within other private lands.

Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.
well-drained sites while pond pine-dominated sites occur in poorly drained areas, and slash pine-dominated sites occupy intermediate or moderately moist areas. The understory and ground cover within these three communities are somewhat similar and include several common species such as saw palmetto, gallberry, wax myrtle, and a wide variety of grasses and herbs. Generally, wiregrass and runner oak dominate longleaf pine sites; fetterbush and bay trees are found in pond pine areas, while saw palmetto, gallberry, and rusty lyonia occupy slash pine flatwoods sites. Scrubby flatwoods habitat typically occurs on drier ridges, many of which formed originally on or near old coastal dunes. Longleaf pine or slash pine dominates the overstory, whereas the ground cover is similar to that present in xeric oak scrub habitat. Cypress domes, bay heads, titi swamps, and freshwater marshes are commonly interspersed in isolated depressions throughout natural pineland habitats. A wide variety of animals utilize this habitat including the white-tailed deer, eastern diamondback rattlesnake, red-cockaded woodpecker, and pine woods tree frog. Fire is an important factor that helps to maintain and shape Natural Pineland communities; almost all of the plants and animals found here are adapted to having fires occur at least every one to eight years.

### Associated Species of Greatest Conservation Need

#### Mammals
- *Sorex longirostris eionis* Homosassa Shrew
- *Eptesicus fuscus* Big Brown Bat
- *Eumops floridanus* Florida Bonneted Bat
- *Lasiurus borealis borealis* Red Bat
- *Lasiurus cinereus cinereus* Hoary Bat
- *Lasiurus intermedius floridanus* Northern Yellow Bat
- *Lasiurus seminolus* Seminole Bat
- *Myotis grisescens* Gray Bat
- *Tadarida brasiliensis cynocephala* Brazilian Free-tailed Bat
- *Microtus pinetorum ssp.* Pine Vole
- *Podomys floridanus* Florida Mouse
- *Sciurus niger avicennia* Big Cypress Fox Squirrel
- *Sciurus niger niger* Southeastern Fox Squirrel
- *Sciurus niger shermani* Sherman's Fox Squirrel
- *Mustela frenata olivacea* Southeastern Weasel
- *Mustela frenata peninsulae* Florida Long-tailed Weasel
- *Neovison vison evergladensis* Everglades Mink
- *Neovison vison halimnetes* Gulf Salt Marsh Mink
- *Neovison vison lutensis* Atlantic Salt Marsh Mink
- *Neovison vison ssp.* Mink
- *Puma concolor coryi* Florida Panther
- *Spilogale putorius ssp.* Spotted Skunk
- *Ursus americanus floridanus* Florida Black Bear
- *Odocoileus virginianus clavium* Key Deer

#### Birds
- *Elanoides forficatus* Swallow-tailed Kite
- *Ictinia mississippiensis* Mississippi Kite
- *Haliaeetus leucocephalus* Bald Eagle
- *Buteo brachyurus* Short-tailed Hawk
- *Falco sparverius paulus* Southeastern American Kestrel
- *Scolopax minor* American Woodcock
- **Columbina passerina** Common Ground-Dove
- **Megascops asio** Eastern Screech-Owl
- **Chordeiles minor** Common Nighthawk
- **Caprimulgus carolinensis** Chuck-will's-widow
- **Caprimulgus vociferus** Eastern Whip-poor-will
- **Melanerpes erythrocephalus** Red-headed Woodpecker
- **Picoïdes villosus** Hairy Woodpecker
- **Picoïdes borealis** Red-cockaded Woodpecker
- **Colaptes auratus** Northern Flicker
- **Aphelocoma coerulescens** Florida Scrub-Jay
- **Sitta carolinensis** White-breasted Nuthatch
- **Vermivora chrysoptera** Golden-winged Warbler
- **Vermivora cyanoptera** Blue-winged Warbler
- **Limnothlypis swainsonii** Swainson's Warbler
- **Setophaga ruticilla** American Redstart
- **Setophaga castanea** Bay-breasted Warbler
- **Setophaga dominica stoddardi** Stoddard's Yellow-throated Warbler
- **Setophaga discolor discolor** Prairie Warbler
- **Peucaea aestivalis** Bachman's Sparrow
- **Ammodramus henslowii** Henslow's Sparrow

**Amphibians**
- **Hyla andersonii** Pine Barrens Treefrog
- **Lithobates capito** Gopher Frog
- **Lithobates okaloosae** Florida Bog Frog
- **Lithobates virgatipes** Carpenter Frog
- **Pseudacris ornata** Ornate Chorus Frog
- **Ambystoma bishopi** Reticulated Flatwoods Salamander
- **Ambystoma cingulatum** Frosted Flatwoods Salamander
- **Ambystoma tigrinum** Eastern Tiger Salamander
- **Amphiuma pholeter** One-toed Amphiuma
- **Eurycea chamberlaini** Chamberlain's Dwarf Salamander
- **Eurycea cf. quadridigitata** Bog Dwarf Salamander
- **Notophthalmus perstriatus** Striped Newt
- **Sterechilus marginatus** Many-lined Salamander

**Reptiles**
- **Anolis carolinensis seminolus** Southern Green Anole
- **Plestiodon anthracinus pluvialis** Southern Coal Skink
- **Plestiodon egregius insularis** Cedar Key Mole Skink
- **Plestiodon egregius onocrepis** Peninsula Mole Skink
- **Plestiodon reynoldsi** Florida Sand Skink
- **Rhineura floridana** Florida Wormlizard
- **Sceloporus woodi** Florida Scrub Lizard
- **Agristodon contortrix contortrix** Southern Copperhead
- **Cemophora coccinea coccinea** Florida Scarletsnake
- **Crotalus adamanteus** Eastern Diamond-backed Rattlesnake
- **Crotalus horridus** Timber Rattlesnake
- **Drymarchon couperi** Eastern Indigo Snake
- **Heterodon platirhinus** Eastern Hog-nosed Snake
- **Heterodon simus** Southern Hog-nosed Snake
- **Lampropeltis calligaster** Yellow-bellied Kingsnake
**Chapter 6: Habitats - Natural Pineland**

- **Lampropeltis extenuata** Short-tailed Snake
- **Lampropeltis getula** Eastern Kingsnake
- **Pituophis melanoleucus mugitus** Florida Pinesnake
- **Seminatrix pygaea cyclas** Southern Florida Swampland Snake
- **Tantilla coronata** Southeastern Crowned Snake
- **Tantilla relicta** Florida Crowned Snake
- **Virginia valeriae valeriae** Eastern Smooth Earthsnake (Highlands Co.)
- **Clemmys guttata** Spotted Turtle
- **Deirochelys reticularia** Chicken Turtle
- **Gopherus polyphemus** Gopher Tortoise
- **Terrapene carolina** Eastern Box Turtle

**Invertebrates**

- **Procambarus apalachicolae** A Crayfish
- **Procambarus capillatus** A Crayfish
- **Procambarus econfinae** Panama City Crayfish
- **Procambarus escambiensis** A Crayfish
- **Procambarus latipleurum** A Crayfish
- **Procambarus rathbunae** Combclaw Crayfish
- **Procambarus rogersi rogersi** A Crayfish
- **Sminthurus floridanus** Florida Sminthurus Springtail
- **Cicindela nigror** Autumn Tiger Beetle
- **Cicindela rufiventris rufiventris** Eastern Red-bellied Tiger Beetle
- **Cicindela scabrosa** Scrub Tiger Beetle
- **Cicindela sexguttata** Six-spotted Tiger Beetle
- **Typocerus fulvocinctus** Yellow-banded Typocerus Long-horned Beetle
- **Mycotrupes cartwrighti** Cartwright's Mycotrupes Beetle
- **Mycotrupes pedester** Southwest Florida Mycotrupes Beetle
- **Geopsammodius relictillus** Relictual Tiny Sand-loving Scarab
- **Phyllophaga clemens** Clemens' June Beetle
- **Achalurus lyciades** Hoary Edge
- **Amblyscirtes alternata** Dusky Roadside-skimmer
- **Atrytonopsis loammi** Loammi Skipper
- **Erynnis baptisiae** Wild Indigo Duskywing
- **Erynnis martialis** Mottled Duskywing
- **Hesperia meskei straton** Eastern Meske's Skipper
- **Megathymus cofaqui** Cofaqui Skipper
- **Megathymus yuccae** Yucca Skipper
- **Nastra neamathla** Neamathla Skipper
- **Polites baracoa** Baracoa Skipper
- **Callophrys irus** Frosted Elfin
- **Callophrys niphon** Eastern Pine Elfin
- **Cupido comynas** Eastern Tailed Blue
- **Catocala grisatra** Grisatara Underwing
- **Idia gopheri** Gopher Tortoise Noctuid Moth
- **Neonympha helicta dadeensis** Helicta Satyr (Miami-Dade Subspecies)
- **Merycomyia brunnea** Brown Merycomyian Tabanid Fly
Conservation Threats

Threats to Natural Pineland habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to agriculture
- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Conversion to recreation areas
- Groundwater withdrawal
- Incompatible fire
- Incompatible forestry practices
- Incompatible recreational activities
- Incompatible resource extraction: mining/drilling
- Invasive animals
- Invasive plants
- Roads
- Surface water withdrawal

Threats specific to Natural Pinelands included the siting of utility corridors through this habitat, particularly on public lands, which results in fragmentation and loss of habitat. This habitat is also threatened by conversion to more intensive land uses and insufficient management of invasive plant species such as Japanese climbing fern.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Altered fire regime</td>
</tr>
<tr>
<td>B</td>
<td>Altered hydrologic regime</td>
</tr>
<tr>
<td>C</td>
<td>Habitat destruction or conversion</td>
</tr>
<tr>
<td>D</td>
<td>Altered community structure</td>
</tr>
<tr>
<td>E</td>
<td>Altered species composition/dominance</td>
</tr>
<tr>
<td>F</td>
<td>Fragmentation of habitats, communities, ecosystems</td>
</tr>
<tr>
<td>G</td>
<td>Insufficient size/extent of characteristic communities or ecosystems</td>
</tr>
<tr>
<td>H</td>
<td>Altered landscape mosaic or context</td>
</tr>
<tr>
<td>I</td>
<td>Keystone species missing or lacking in abundance</td>
</tr>
<tr>
<td>J</td>
<td>Missing key communities, functional guilds, or seral stages</td>
</tr>
<tr>
<td>K</td>
<td>Altered soil structure and/or chemistry</td>
</tr>
<tr>
<td>L</td>
<td>Excessive depredation and/or parasitism</td>
</tr>
<tr>
<td>M</td>
<td>Habitat degradation/disturbance</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Roads</td>
<td>Very High</td>
<td>A, B, C, D, E, F, G, H</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>Very High</td>
<td>A, B, C, F, G, H</td>
</tr>
<tr>
<td>3 Surface water withdrawal</td>
<td>High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>Sources of Stress</td>
<td>Habitat Source Rank</td>
<td>Related Stresses (see above)</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>---------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>4 Incompatible fire</td>
<td>High</td>
<td>A, B, C, D, E, H</td>
</tr>
<tr>
<td>5 Conversion to commercial and industrial development</td>
<td>High</td>
<td>A, B, C, F, G, H</td>
</tr>
<tr>
<td>6 Invasive plants</td>
<td>High</td>
<td>A, B, D, E</td>
</tr>
<tr>
<td>7 Incompatible recreational activities</td>
<td>High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>8 Incompatible forestry practices</td>
<td>High</td>
<td>A, B, C, D, E, F</td>
</tr>
<tr>
<td>9 Groundwater withdrawal</td>
<td>Medium</td>
<td>A, B, D, E</td>
</tr>
<tr>
<td>10 Conversion to recreation areas</td>
<td>Medium</td>
<td>A, B, C, F, G</td>
</tr>
<tr>
<td>11 Utility corridors</td>
<td>Medium</td>
<td>A, B, C, D, E, F, G</td>
</tr>
<tr>
<td>12 Conversion to agriculture</td>
<td>Low</td>
<td>H</td>
</tr>
<tr>
<td>13 Incompatible grazing and ranching</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>14 Invasive animals</td>
<td>Low</td>
<td>D, E</td>
</tr>
<tr>
<td>15 Incompatible resources extraction: mining/drilling</td>
<td>Low</td>
<td>C, F, H</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: Very High

**Conservation Actions**

Actions to abate the threats to Natural Pinelands that were also identified as statewide threats (see list above in Conservation Threats section) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Natural Pineland habitat are below. These actions were designed to reduce habitat loss and fragmentation from utility rights-of-way and conversion to more intensive silviculture on public lands. Control of Japanese climbing fern was also identified as necessary where pine straw is harvested.

### Invasive Plants

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Educate the forest management consulting community about the illegality of selling pine straw bales contaminated with Japanese climbing fern, and appropriate control methods.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Create a system where landowners can voluntarily have their plantations certified as Lygodium-free. Provide incentive programs so that landowners increase profits by having certified pine straw.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>
**Utility Corridors**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Develop private-public partnerships that facilitate placement of utilities on existing FDOT rights-of-way and vice-versa to minimize their cumulative impacts on habitats.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>M</td>
<td>Provide data on sensitive habitats to utilities and Florida Public Service Commission (FPSC) early in the utility siting and planning process to minimize conflicts between wildlife, important habitats, and utility corridors.</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage language (e.g., Efficient Transportation Decision Making, ETDM) in utility siting process for co-location that minimizes fragmentation of natural areas.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Explore options to reduce fragmentation of public lands caused by incompatible utility placement and land use. Promote awareness of this issue and encourage compatible alternate routes and land uses.</td>
<td>M</td>
<td>VH</td>
<td>H</td>
</tr>
</tbody>
</table>

**Conversion to Agriculture**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Protection</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Explore opportunities to encourage avoidance of converting natural habitats on public conservation lands to other uses.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>
Pelagic

Status
Current condition: Unknown. Due to the lack of sufficient map data for this habitat category, no acreage estimates are currently available.

Habitat Description

FNAI type: None

The Pelagic environment includes the waters lying over the continental shelf (neritic zone) and waters beyond the continental shelf. The Pelagic community lives in the water column above the seafloor and below the surface. This community does not depend on the seabed, although its members may visit it occasionally. The community consists of free-swimming creatures known as nekton and less- or non-motile plankton.

In Florida, this environment extends three nautical miles off of the Florida east coast and nine nautical miles off of the Florida Gulf coast. Maximum depths vary from approximately 30 feet (9 m) in the Gulf of Mexico to more than 1,000 feet (304 m) off of the Florida Keys and southeast Florida.

Associated Species of Greatest Conservation Need

Mammals
- *Eubalaena glacialis* (incl. *australis*) North Atlantic Right Whale

Birds
- *Aythya marila* Greater Scaup
- *Aythya affinis* Lesser Scaup
- *Gavia stellata* Red-throated Loon
- **Gavia immer** Common Loon
- **Podiceps auritus** Horned Grebe
- **Pterodroma hasitata** Black-capped Petrel
- **Calonectris diomedea** Cory's Shearwater
- **Puffinus gravis** Great Shearwater
- **Puffinus griseus** Sooty Shearwater
- **Puffinus lherminieri** Audubon's Shearwater
- **Oceanodroma castro** Band-rumped Storm-Petrel
- **Fregata magnificens** Magnificent Frigatebird
- **Sula leucogaster** Brown Booby
- **Pelecanus occidentalis** Brown Pelican
- **Anous stolidus** Brown Noddy
- **Onychoprion fuscatus** Sooty Tern
- **Onychoprion anaethetus** Bridled Tern
- **Gelochelidon nilotica** Gull-billed Tern
- **Hydroprogne caspia** Caspian Tern
- **Sterna dougallii** Roseate Tern
- **Thalasseus maximus** Royal Tern

### Reptiles
- **Caretta caretta** Loggerhead Sea Turtle
- **Chelonia mydas** Green Sea Turtle
- **Dermochelys coriacea** Leatherback Sea Turtle
- **Eretmochelys imbricata** Hawksbill Sea Turtle
- **Lepidochelys kempii** Kemp's Ridley Sea Turtle

### Fish
- **Acipenser oxyrinchus desotoi** Gulf of Mexico Sturgeon
- **Acipenser oxyrinchus oxyrinchus** Atlantic Sturgeon
- **Anguilla rostrata** American Eel
- **Alosa aestivalis** Blueback Herring
- **Alosa alabamae** Alabama Shad
- **Aetobatus narinari** Spotted Eagle Ray
- **Alopias superciliosus** Bigeye Thresher Shark
- **Carcharhinus falciformis** Silky Shark
- **Carcharhinus obscurus** Dusky Shark
- **Carcharhinus perezi** Reef Shark
- **Carcharhinus signatus** Night Shark
- **Carcharias taurus** Sand Tiger Shark
- **Carcharodon carcharias** White Shark
- **Cetorhinus maximus** Basking Shark
- **Galeocerdo cuvier** Tiger Shark
- **Heptanchias perlo** Sevengill, Perlon, 1-fin Shark
- **Isurus paucus** Longfin Mako Shark
- **Manta birostris** Giant Manta Ray
- **Negaprion brevirostris** Lemon Shark
- **Rhinodon typus** Whale Shark
- **Sphyra lewini** Scalloped Hammerhead
- **Sphyra mokarran** Great Hammerhead
- **Sphyra zygaena** Smooth Hammerhead
- **Squalus acanthias** Cape Shark, Piked Dogfish, Spurdog
- **Agonostomus monticola** Mountain Mullet
Conservation Threats

Threats to the Pelagic habitats that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Harmful algal blooms
- Incompatible fishing pressure
- Incompatible industrial operations
- Incompatible wildlife and fisheries management strategies
- Invasive animals
- Key predator/herbivore loss
- Nutrient loads–urban

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Altered primary productivity</td>
<td>High</td>
</tr>
<tr>
<td>B  Altered species composition</td>
<td>High</td>
</tr>
<tr>
<td>C  Altered water quality–nutrients</td>
<td>High</td>
</tr>
<tr>
<td>D  Altered water quality–physical, chemistry</td>
<td>High</td>
</tr>
<tr>
<td>E  Missing key communities or functional guilds/trophic shift</td>
<td>High</td>
</tr>
<tr>
<td>F  Keystone species missing or lacking in abundance</td>
<td>High</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Harmful algal blooms</td>
<td>High</td>
<td>A, B, C, E</td>
</tr>
<tr>
<td>2 Inadequate stormwater management</td>
<td>High</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>3 Key predator/herbivore losses</td>
<td>High</td>
<td>B, E, F</td>
</tr>
<tr>
<td>4 Nutrient loads–all sources</td>
<td>Medium</td>
<td>A, C, E</td>
</tr>
<tr>
<td>5 Incompatible fishing pressure</td>
<td>Medium</td>
<td>B, F</td>
</tr>
<tr>
<td>6 Invasive animals</td>
<td>Medium</td>
<td>B</td>
</tr>
<tr>
<td>7 Placement of artificial structures</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>8 Incompatible aquaculture operations</td>
<td>Low</td>
<td>C</td>
</tr>
<tr>
<td>9 Channel modification/shipping lanes</td>
<td>Low</td>
<td>D</td>
</tr>
<tr>
<td>10 Incompatible industrial operations</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>11 Incompatible wildlife and fisheries management strategies</td>
<td>Low</td>
<td>B, F</td>
</tr>
<tr>
<td>12 Vessel impacts</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>
### Conservation Actions

Actions to abate the threats to Pelagic habitats that were also identified as statewide threats (see list above) are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Many of the threats to Pelagic habitats are the same as for several other marine and estuarine habitats. Consequently, actions to abate these threats will be the same or similar to the actions recommended for abating threats to several other marine and estuarine habitats (e.g., Coral Reef, Hard Bottom, Seagrass).
Chapter 6: Habitats - Pine Rockland

Pine Rockland

Status
Current condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 2,959 acres (1,197 ha) of Pine Rockland habitat exist, of which 77% (2,275 ac; 921 ha) are in existing conservation or managed areas. Another 13% (382 ac; 155 ha) are Florida Forever projects and 1% (25 ac; 10 ha) are SHCA-identified lands. The remaining 9% (277 ac; 112 ha) are other private lands.

Habitat Description

FNAI type: Pine Rocklands

Pine Rockland is a unique type of pine flatwoods that is found exclusively on limestone substrate in the Florida Keys, the Big Cypress Swamp, and the Miami Rock Ridge (the limestone outcropping that rises from the Everglades to heights of 23 feet (7 m) above sea level). The overstory of Pine Rockland habitat contains a single canopy species, South Florida slash pine. The dominant pines tower over a savanna-like understory of saw palmettos, locust berry, willow bustic, beauty berry, broom grasses, silver palms, and a rich herbaceous layer. This community is often associated with rockland hammock and other short-hydroperiod freshwater wetland communities. These sub-tropical pine trees and understory plants have adapted to seasonal wildfires and the lack of soil on the exposed limerock. Pine Rockland communities are globally imperiled and support federal and state listed plant species, such as deltoid spurge and Small’s milkwort which only occur in this habitat.

Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.
## Associated Species of Greatest Conservation Need

### Mammals
- **Eumops floridanus** - Florida Bonneted Bat
- **Lasiurus intermedius floridanus** - Northern Yellow Bat
- **Lasiurus seminolus** - Seminole Bat
- **Sylvilagus palustris hefneri** - Lower Keys Marsh Rabbit
- **Sciurus niger avicennia** - Big Cypress Fox Squirrel
- **Sigmodon hispidus exsputus** - Lower Keys Cotton Rat
- **Neovison vison evergladensis** - Everglades Mink
- **Procyon lotor auspicatus** - Key Vaca Raccoon
- **Procyon lotor incautus** - Key West Raccoon
- **Procyon lotor inesperatus** - Matecumbe Key Raccoon
- **Puma concolor coryi** - Florida Panther
- **Spilogale putorius** - Spotted Skunk
- **Ursus americanus floridanus** - Florida Black Bear
- **Odocoileus virginianus clavium** - Key Deer

### Birds
- **Colinus virginianus** - Northern Bobwhite
- **Elanoides forficatus** - Swallow-tailed Kite
- **Haliaeetus leucocephalus** - Bald Eagle
- **Falco sparverius paulus** - Southeastern American Kestrel
- **Coccyzus minor** - Mangrove Cuckoo
- **Chordeiles minor** - Common Nighthawk
- **Caprimulgus carolinensis** - Chuck-will's-widow
- **Caprimulgus vociferus** - Eastern Whip-poor-will
- **Picoides villosus** - Hairy Woodpecker
- **Picoides borealis** - Red-cockaded Woodpecker
- **Tyrannus dominicensis** - Gray Kingbird
- **Lanius ludovicianus** - Loggerhead Shrike
- **Vireo altioloquus** - Black-whiskered Vireo
- **Sitta pusilla** - Brown-headed Nuthatch
- **Vermivora chrysoptera** - Golden-winged Warbler
- **Vermivora cyanoptera** - Blue-winged Warbler
- **Setophaga ruticilla** - American Redstart
- **Setophaga castanea** - Bay-breasted Warbler
- **Setophaga petechia gundlachi** - Cuban Yellow Warbler
- **Setophaga discolor discolor** - Prairie Warbler
- **Cardellina canadensis** - Canada Warbler

### Reptiles
- **Plestiodon egregius egregius** - Florida Keys Mole Skink
- **Sphaerodactylus notatus notatus** - Florida Reef Gecko
- **Cemophora coccinea coccinea** - Florida Scarletsnake
- **Crotalus adamanteus** - Eastern Diamond-backed Rattlesnake
- **Diadophis punctatus acricus** - Key Ring-necked Snake
- **Drymarchon couperi** - Eastern Indigo Snake
- **Heterodon platirhinos** - Eastern Hog-nosed Snake
- **Lampropeltis getula** - Eastern Kingsnake
- **Pantherophis guttatus** - Red Cornsnake (Lower Keys population)
• Storeria victa  Florida Brownsnake (Keys Population)
• Tantilla oolitica  Rim Rock Crowned Snake
• Thamnophis sauritus sackenii  Peninsula Ribbonsnake (Lower Keys Population)
• Deirochelys reticularia  Chicken Turtle
• Gopherus polyphemus  Gopher Tortoise
• Kinosternon baurii  Striped Mud Turtle (Lower Keys Population)
• Terrapene carolina  Eastern Box Turtle

Invertebrates
• Thermocyclops parvus  A Copepod
• Nehalennia minuta  Tropical Sprite
• Gryllus cayensis  South Florida Taciturn Wood Cricket
• Belocephalus micanopy  Big Pine Key Conehead Katydid
• Belocephalus sleighti  Keys Short-winged Conehead Katydid
• Cicindela scabrosa floridana  Miami Tiger Beetle
• Stizocera floridana  Florida Privet Long-horned Beetle
• Anomala robinsoni  Robinson's Anomala Scarab Beetle
• Pseudocharis minima  Lesser Wasp Moth
• Euphyes pilatka klotsi  Klots' Skipper
• Euphyes pilatka klotsi  Rockland Grass Skipper- Keys Race
• Polites baracoa  Baracoa Skipper
• Cyclargus ammon  Nickerbean Blue
• Eumaeus atala  Atala
• Ministrymon azia  Gray Ministreak
• Strymon acis bartrami  Bartram's Scrub-hairstreak
• Anaea troglodyta floridalis  Florida Leafwing
• Anthamassa frisia  Cuban Crescent
• Merycomyia brunnea  Brown Merycomyian Tabanid Fly

Conservation Threats

Threats to Pine Rockland habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

• Chemicals and toxins
• Conversion to commercial and industrial development
• Conversion to housing and urban development
• Incompatible fire
• Invasive animals
• Invasive plants
• Roads

Threats specific to Pine Rockland were limited to incompatible residential activities that include movement of fertilizer, herbicide, and invasive species from landscape maintenance, activities of people, their pets, and nuisance species, and disposal of yard and household waste.
The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Altered fire regime</td>
<td>High</td>
</tr>
<tr>
<td>B  Altered landscape mosaic or context</td>
<td>High</td>
</tr>
<tr>
<td>C  Habitat destruction or conversion</td>
<td>High</td>
</tr>
<tr>
<td>D  Fragmentation of habitats, communities, ecosystems</td>
<td>Medium</td>
</tr>
<tr>
<td>E  Altered community structure</td>
<td>Medium</td>
</tr>
<tr>
<td>F  Altered species composition/dominance</td>
<td>Medium</td>
</tr>
<tr>
<td>G  Excessive depredation and/or parasitism</td>
<td>Medium</td>
</tr>
<tr>
<td>H  Insufficient size/extent of characteristic communities or ecosystems</td>
<td>Medium</td>
</tr>
<tr>
<td>I  Habitat degradation/disturbance</td>
<td>Medium</td>
</tr>
<tr>
<td>J  Altered hydrologic regime</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Roads</td>
<td>High</td>
<td>A, B, C</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>High</td>
<td>A, B, C</td>
</tr>
<tr>
<td>3 Conversion to commercial and industrial development</td>
<td>High</td>
<td>A, B, C</td>
</tr>
<tr>
<td>4 Incompatible fire</td>
<td>Medium</td>
<td>A, B, C</td>
</tr>
<tr>
<td>5 Invasive plants</td>
<td>Low</td>
<td>A, B, C</td>
</tr>
<tr>
<td>6 Invasive animals</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>7 Chemicals and toxins</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>8 Incompatible residential activities</td>
<td>Low</td>
<td>A, C</td>
</tr>
<tr>
<td>9 Incompatible agricultural practices</td>
<td>Low</td>
<td>B</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**

Very High

**Conservation Actions**

Actions to abate the threats to Pine Rockland that were also identified as statewide threats (roads, conversion to housing and urban development, incompatible fire, invasive plants, invasive animals, chemicals and toxins) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Pine Rockland habitat are below, although none were ranked of high priority for implementation. These actions were designed to reduce the impacts from activities of residents adjacent to this habitat.
### Incompatible Residential Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Expand the scale of the Florida Yards and Neighborhoods program from certifying individual landowners to whole neighborhoods; certification should be renewed biennially and any time property ownership changes.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Support incentives for residential property owners to resolve issues of incompatible use, including pesticide use, pet control, feeding of wildlife, household or yard waste disposal, landscape plants, irrigation use, prescribed fire tolerance, and lighting use in coastal areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Identify and promote effective reward models for homeowners, maintenance companies, and municipalities for reducing impacts on neighboring conservation areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Develop a voluntary program directed at developers to provide on-site site-specific educational materials and recommendations to homeowner associations about incompatible residential activities.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

### Education and Awareness

| Overall Rank |  |  |  |
|--------------|Feasibility | Benefits | Cost |
| M            | H           | M         | M    |

Implement and fund continuing education courses for the landscape maintenance industry that includes appropriate use of chemicals, irrigation, plants, and disposal of yard waste.
Reservoir/Managed Lake

Status
Current condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 601,902 acres (243,581 ha) of Reservoir/Managed Lake habitat exist.

Habitat Description

FNAI type: None

This habitat category consists exclusively of man-made standing water bodies, each created by the damming of a flowing stream or excavation within a terrestrial habitat. These landscape features range from farm ponds and borrow pits of less than one acre (0.4 ha) to municipal reservoirs of more than 30,000 acres (12,141 ha). Reservoir/Managed Lake habitats are essentially permanent, although some of them dry completely during droughts.

Associated Species of Greatest Conservation Need

Mammals
- Corynorhinus rafinesquii  
  Rafinesque's Big-eared Bat
- Eptesicus fuscus  
  Big Brown Bat
- Eumops floridanus  
  Florida Bonneted Bat
- Lasiurus borealis borealis  
  Red Bat
- Lasiurus cinereus cinereus  
  Hoary Bat
- Lasiurus intermedius floridanus  
  Northern Yellow Bat
- Lasiurus seminolus  
  Seminole Bat
- Myotis austroriparius  
  Southeastern Myotis
- Myotis grisescens  
  Gray Bat
- Perimyotis subflavus  
  Tricolored Bat
- *Tadarida brasiliensis cynocephala* Brazilian Free-tailed Bat
- *Lontra canadensis lataxina* River Otter
- *Trichechus manatus latirostris* West Indian Manatee

**Birds**
- *Anas rubripes* American Black Duck
- *Anas fulvigula* Mottled Duck
- *Aythya marila* Greater Scaup
- *Aythya affinis* Lesser Scaup
- *Gavia immer* Common Loon
- *Mycteria americana* Wood Stork
- *Pelecanus occidentalis* Brown Pelican
- *Botaurus lentiginosus* American Bittern
- *Ixobrychus exilis* Least Bittern
- *Ardea herodias* Great Blue Heron
- *Ardea alba* Great Egret
- *Egretta thula* Snowy Egret
- *Egretta caerulea* Little Blue Heron
- *Egretta rufescens* Tricolored Heron
- *Egretta tricolor* Reddish Egret
- *Butorides virescens* Green Heron
- *Nycticorax nycticorax* Black-crowned Night-Heron
- *Nyctanassa violacea* Yellow-crowned Night-Heron
- *Eudocimus albus* White Ibis
- *Plegadis falcinellus* Glossy Ibis
- *Platalea ajaja* Roseate Spoonbill
- *Pandion haliaetus* Osprey
- *Rostrhamus sociabilis* Snail Kite
- *Haliaeetus leucocephalus* Bald Eagle
- *Falco columbarius* Merlin
- *Falco peregrinus* Peregrine Falcon
- *Rallus elegans* King Rail
- *Porphyrio martinica* Purple Gallinule
- *Aramus guarauna* Limpkin
- *Grus canadensis pratensis* Florida Sandhill Crane
- *Grus americana* Whooping Crane
- *Recurvirostra americana* American Avocet
- *Tringa solitaria* Solitary Sandpiper
- *Tringa flavipes* Lesser Yellowlegs
- *Tryngites subruficollis* Buff-breasted Sandpiper
- *Limnodromus scolopaceus* Long-billed Dowitcher
- *Phalaropus tricolor* Wilson's Phalarope
- *Sternula antillarum* Least Tern
- *Hydroprogne caspia* Caspian Tern
- *Chlidonias niger* Black Tern
- *Euphagus cyanocephalus* Brewer's Blackbird

**Reptiles**
- *Alligator mississippiensis* American Alligator
- *Farancia erytrogramma* Rainbow Snake
- *Nerodia cyclopion* Mississippi Green Watersnake
- *Apalone mutica calvata* Gulf Coast Smooth Softshell
• *Graptemys barbouri* Barbour's Map Turtle
• *Macrochelys temminckii* Alligator Snapping Turtle
• *Pseudemys suwanniensis* Suwannee Cooter

**Fish**
• *Anguilla rostrata* American Eel
• *Cyprinodon variegatus hubbsi* Lake Eustis Pupfish
• *Acantharchus pomotis* Mud Sunfish

**Invertebrates**
• *Utterbackia peggyae* Florida Floater
• *Utterbackia peninsularis* Peninsular Floater
• *Villosa amygdala* Florida Rainbow
• *Procambarus latipleurum* A Crayfish
• *Macrobrachium acanthurus* Cinnamon River Shrimp
• *Macrobrachium carcinus* Big Claw River Shrimp
• *Macrobrachium ohione* Ohio River Shrimp
• *Poanes viator zizaniae* Broad-winged Skipper

**Conservation Threats**

Threats to the Reservoir/Managed Lake habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Chemicals and toxins
- Incompatible forestry practices
- Incompatible recreational activities
- Invasive animals
- Invasive plants
- Nutrient loads—agriculture
- Nutrient loads—urban

Threats specific to Reservoir/Managed Lake, as well as other habitats, include runoff from chemicals and toxins. Reservoirs are created for multiple purposes, some of which may be incompatible with their role as wildlife habitat. At the same time, reservoirs, especially instream impoundments, were themselves identified as important sources of fragmentation, altered hydrology, and other stresses to river and stream habitats.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered species composition/dominance</td>
<td>High</td>
</tr>
<tr>
<td>B Altered water quality of surface water or aquifer: contaminants</td>
<td>High</td>
</tr>
<tr>
<td>C Erosion/sedimentation</td>
<td>High</td>
</tr>
<tr>
<td>D Altered water quality of surface water or aquifer: nutrients</td>
<td>High</td>
</tr>
</tbody>
</table>
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Nutrient loads–urban</td>
<td>High</td>
<td>A, D</td>
</tr>
<tr>
<td>2 Invasive animals</td>
<td>High</td>
<td>A</td>
</tr>
<tr>
<td>3 Incompatible recreational activities</td>
<td>High</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>4 Invasive plants</td>
<td>High</td>
<td>A</td>
</tr>
<tr>
<td>5 Incompatible construction practices</td>
<td>Medium</td>
<td>C, D</td>
</tr>
<tr>
<td>6 Nutrient loads–agriculture</td>
<td>Medium</td>
<td>A, D</td>
</tr>
<tr>
<td>7 Chemicals and toxins</td>
<td>Medium</td>
<td>B</td>
</tr>
<tr>
<td>8 Incompatible agricultural practices</td>
<td>Medium</td>
<td>B, C</td>
</tr>
<tr>
<td>9 Incompatible forestry practices</td>
<td>Low</td>
<td>C</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**

High

**Conservation Actions**

Actions to abate the threats to Reservoir/Managed Lake habitats that were also identified as statewide threats (nutrient loads–urban, invasive animals, incompatible recreational activities, invasive plants, nutrient loads–agriculture, chemicals and toxins, incompatible forestry practices) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat were only applicable to Reservoir/Managed Lake and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Cypress Swamp, Freshwater Marsh and Wet Prairie, Natural Lake, Seepage/Steephead Stream, Softwater Stream, Spring and Spring Run, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. Additional actions were developed to address threats specific to this habitat. These actions are intended to prevent degradation of water quality in reservoirs, prevent excessive withdrawal of water from reservoirs that would exacerbate the downstream hydrologic alteration caused by the dam, prevent reservoirs from becoming points of introduction or refugia for invasive species, operate dams such that the timing, frequency, duration, and magnitude of releases are compatible with the hydrologic needs of downstream aquatic habitat, operate and/or retrofit dams and other structures to facilitate movement of anadromous fishes through and upstream of reservoirs.
### Chemicals and Toxins

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop and encourage use of recommendations for private landowners that minimize runoff of chemicals and toxins into wetlands and aquatic systems.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Develop management techniques and design protocols to minimize exposure of wading birds and other wetland wildlife to contaminants.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Evaluate cumulative impacts of small rural impoundments on fish and wildlife.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Conduct research defining appropriate sediment quality standards for the various aquatic and marine systems. Fund research defining the relationship between sediment contamination (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>Conduct research defining standards for persistent organic contaminants for the various aquatic and marine systems. Fund research defining the relationship between contamination from organics (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>
Salt Marsh

Status
Current condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 442,577 acres (179,105 ha) of Salt Marsh habitat exist, of which 71% (316,033 ac; 127,894 ha) are in conservation or managed areas. Another 6% (26,740 ac; 10,821 ha) are in Florida Forever projects and 8% (33,222 ac; 13,444 ha) are in SHCA-designated lands. The remaining 15% (66,582 ac; 26,945 ha) are other private lands.

Habitat Description

FNAI type: Tidal Marsh

Salt Marsh is vegetated almost completely by herbaceous plants, primarily grasses, sedges, and rushes. This community type occurs within the intertidal zone of coastal areas and may be infrequently (high marsh) to frequently (low marsh) inundated by salt or brackish water. Salt Marsh develops where wave energies are low and where mangroves are absent. Mangroves may extirpate shade-intolerant marsh species. The size of a Salt Marsh depends on the extent of the intertidal zone in which it occurs. Salt Marshes of larger sizes are usually dissected by numerous tidal creeks. Areas that have low topographic relief and relatively high tidal ranges are likely to have larger Salt Marsh extents. Within Salt Marsh, plant species are often distributed unevenly, especially in transitional areas. Species distributions are affected by biotic and abiotic variables such as elevation, substrate type, degree of slope, wave energy, competing species, and salinity. Smooth cordgrass typically occupies the lower elevations and is usually adjacent to tidal creeks and pools. Needle rush dominates the slightly less frequently inundated zone. Vegetation at the higher
elevations forms transitional areas to uplands and may contain species such as marsh-hay, glassworts, saltwort, saltgrass, sea ox-eye daises, marsh-elder, and saltbush as well as many other species.

The Salt Marsh habitat is among the most productive communities in the world. Primary production is greatly affected by soil salinity and tidal frequency. Salt Marshes vary in extent and species composition throughout Florida and support diverse local faunas.

**Associated Species of Greatest Conservation Need**

### Mammals
- *Tadarida brasiliensis cynocephala*  
  Brazilian Free-tailed Bat  
- *Sylvilagus palustris hefneri*  
  Lower Keys Marsh Rabbit  
- *Microtus pennsylvanicus dukecampbelli*  
  Florida Salt Marsh Vole  
- *Neofiber allenii ssp.*  
  Round-tailed Muskrat  
- *Oryzomys palustris natator*  
  Silver Rice Rat  
- *Oryzomys palustris planirostris*  
  Pine Island Marsh Rice Rat  
- *Oryzomys palustris sanibelii*  
  Sanibel Island Marsh Rice Rat  
- *Sigmodon hispidus exsputus*  
  Lower Keys Cotton Rat  
- *Sigmodon hispidus insulicola*  
  Insular Cotton Rat  
- *Lontra canadensis lataxina*  
  River Otter  
- *Procyon lotor auspicatus*  
  Key Vaca Raccoon  
- *Procyon lotor incautus*  
  Key West Raccoon  
- *Procyon lotor inesperatus*  
  Matecumbe Key Raccoon  
- *Trichechus manatus latirostris*  
  West Indian Manatee

### Birds
- *Anas rubripes*  
  American Black Duck  
- *Anas fulvigula*  
  Mottled Duck  
- *Aythya affinis*  
  Lesser Scaup  
- *Mycteria americana*  
  Wood Stork  
- *Pelecanus occidentalis*  
  Brown Pelican  
- *Ardea herodias*  
  Great Blue Heron  
- *Ardea herodias occidentalis*  
  Great White Heron  
- *Ardea alba*  
  Great Egret  
- *Egretta thula*  
  Snowy Egret  
- *Egretta caerulea*  
  Little Blue Heron  
- *Egretta tricolor*  
  Tricolored Heron  
- *Egretta rufescens*  
  Reddish Egret  
- *Butorides virescens*  
  Green Heron  
- *Nycticorax nycticorax*  
  Black-crowned Night-Heron  
- *Nyctanassa violacea*  
  Yellow-crowned Night-Heron  
- *Eudocimus albus*  
  White Ibis  
- *Platalea ajaja*  
  Roseate Spoonbill  
- *Haliaeetus leucocephalus*  
  Bald Eagle  
- *Falco columbarius*  
  Merlin  
- *Falco peregrinus*  
  Peregrine Falcon  
- *Laterallus jamaiicensis*  
  Black Rail  
- *Rallus longirostris insularum*  
  Mangrove Clapper Rail  
- *Rallus longirostris scottii*  
  Florida Clapper Rail
• Pluvialis squatarola  Black-bellied Plover
• Pluvialis dominica  American Golden-Plover
• Haematopus palliatus  American Oystercatcher
• Recurvirostra americana  American Avocet
• Tringa semipalmata semipalmata  Eastern Willet
• Tringa semipalmata inornata  Western Willet
• Tringa flavipes  Lesser Yellowlegs
• Numenius phaeopus  Whimbrel
• Numenius americanus  Long-billed Curlew
• Limosa fedoa  Marbled Godwit
• Arenaria interpres  Ruddy Turnstone
• Calidris canutus  Red Knot
• Calidris canutus rufa  Red Knot (rufa)
• Calidris mauri  Western Sandpiper
• Limnodromus griseus  Short-billed Dowitcher
• Limnodromus scolopaceus  Long-billed Dowitcher
• Sterna antillarum  Least Tern
• Gelochelidon nilotica  Gull-billed Tern
• Hydroprogne caspia  Caspian Tern
• Chlidonias niger  Black Tern
• Thalasseus maximus  Royal Tern
• Rynchops niger  Black Skimmer
• Asio flammeus  Short-eared Owl
• Cistothorus palustris griseus  Worthington's Marsh Wren
• Cistothorus palustris marianae  Marian's Marsh Wren
• Ammodramus caudacutus  Saltmarsh Sparrow
• Ammodramus maritimus fisheri  Louisiana Seaside Sparrow
• Ammodramus maritimus macgillivraii  Macgillivray's Seaside Sparrow
• Ammodramus maritimus peninsulae  Scott's Seaside Sparrow
• Ammodramus maritimus junicolus  Wakulla Seaside Sparrow
• Euphagus carolinus  Rusty Blackbird

Reptiles
• Alligator mississippiensis  American Alligator
• Crocodylus acutus  American Crocodile
• Crotalus adamanteus  Eastern Diamond-backed Rattlesnake
• Drymarchon couperi  Eastern Indigo Snake
• Farancia erytrogramma  Rainbow Snake
• Lampropeltis getula  Eastern Kingsnake
• Nerodia clarkii clarkii  Gulf Saltmarsh Watersnake
• Nerodia clarkii compressicauda  Mangrove Saltmarsh Watersnake
• Nerodia clarkii taeniata  Atlantic Saltmarsh Watersnake
• Storeria dekayi limnetes  Marsh Brownsnake
• Thamnophis sauritus sackenii  Peninsula Ribbonsnake (Lower Keys Population)
• Caretta caretta  Loggerhead Sea Turtle
• Chelonia mydas  Green Sea Turtle
• Lepidochelys kempii  Kemp's Ridley Sea Turtle
• Malaclemys terrapin  Diamond-backed Terrapin
• Pseudemys suwanniensis  Suwannee Cooter
• Terrapene carolina  Eastern Box Turtle
Fish

- *Menidia conchorum*  
  Key Silverside
- *Fundulus jenkinsi*  
  Saltmarsh Topminnow
- *Atractosteus spatula*  
  Alligator Gar
- *Agonostomus monticola*  
  Mountain Mullet
- *Awaous banana*  
  River Goby
- *Ctenogobius pseudofasciatus*  
  Slashcheek Goby
- *Microphis brachyurus*  
  Opossum Pipefish

Invertebrates

- *Uca pugnax*  
  Mud Fiddler
- *Cicindela severa*  
  A Tiger Beetle
- *Cicindela striga*  
  Elusive Tiger Beetle
- *Tetracha floridana*  
  A Tiger Beetle
- *Micronaspis floridana*  
  Florida Intertidal Firefly
- *Poanes viator zizaniae*  
  Broad-winged Skipper
- *Aphrissa statira*  
  Statira
- *Kricogonia lyside*  
  Lyside Sulphur

Conservation Threats

Threats to Salt Marsh habitats that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Chemicals and toxins
- Climate variability
- Coastal development
- Dam operations/incompatible release of water (quality, quantity, timing)
- Disruption of longshore transport of sediments
- Incompatible industrial operations
- Incompatible wildlife and fisheries management strategies
- Invasive plants
- Industrial spills
- Management of nature (beach nourishment and impoundments)
- Military activities
- Roads, bridges and causeways
- Shoreline hardening
- Surface water and groundwater withdrawal
- Vessel impacts

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Habitat destruction</td>
<td>Very High</td>
</tr>
<tr>
<td>B Habitat fragmentation</td>
<td>Very High</td>
</tr>
<tr>
<td>C Sedimentation</td>
<td>Very High</td>
</tr>
<tr>
<td>D Altered structure</td>
<td>Medium</td>
</tr>
<tr>
<td>E Altered water quality–contaminants</td>
<td>Medium</td>
</tr>
<tr>
<td>F Altered water quality–physical, chemistry</td>
<td>Medium</td>
</tr>
<tr>
<td>G Altered weather regime/sea level rise</td>
<td>Medium</td>
</tr>
<tr>
<td>H Erosion</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Chapter 6: Habits - Salt Marsh
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Coastal development</td>
<td>Very High</td>
<td>A, B, C, E, I, K</td>
</tr>
<tr>
<td>2 Roads, bridges and causeways</td>
<td>High</td>
<td>A, B, I, K</td>
</tr>
<tr>
<td>3 Incompatible industrial operations</td>
<td>High</td>
<td>A, B, E, I, K</td>
</tr>
<tr>
<td>4 Dam operations/incompatible release of water (quality, quantity, timing)</td>
<td>High</td>
<td>A, C, D, E, F, H, I, J, K</td>
</tr>
<tr>
<td>5 Climate variability</td>
<td>High</td>
<td>D, G, H, K</td>
</tr>
<tr>
<td>6 Inadequate stormwater management</td>
<td>High</td>
<td>A, B, C, D, E, F, I, J, K</td>
</tr>
<tr>
<td>7 Surface water withdrawal</td>
<td>High</td>
<td>D, F, I, K</td>
</tr>
<tr>
<td>8 Channel modification/shipping lanes</td>
<td>High</td>
<td>A, B, C, F, H</td>
</tr>
<tr>
<td>9 Incompatible wildlife and fisheries management strategies</td>
<td>High</td>
<td>A, B, I, K</td>
</tr>
<tr>
<td>10 Management of nature (beach nourishment, impoundments)</td>
<td>High</td>
<td>A, B, D, E, K</td>
</tr>
<tr>
<td>11 Disruption of longshore transport of sediments</td>
<td>High</td>
<td>C, H</td>
</tr>
<tr>
<td>12 Invasive plants</td>
<td>Medium</td>
<td>A, B, D, J, K</td>
</tr>
<tr>
<td>13 Shoreline hardening</td>
<td>Medium</td>
<td>A, B</td>
</tr>
<tr>
<td>14 Chemicals and toxins</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>15 Industrial spills</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>16 Utility corridors</td>
<td>Medium</td>
<td>A, B</td>
</tr>
<tr>
<td>17 Boating impacts</td>
<td>Medium</td>
<td>A, H</td>
</tr>
<tr>
<td>18 Military activities</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>19 Vessel impacts</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>20 Placement of artificial structures</td>
<td>Low</td>
<td>A</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat** | Very High

**Conservation Actions**

Actions to abate the threats to Salt Marsh habitats that were also identified as statewide threats (see list above), are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Many of the threats to Salt Marsh are the same as for several other marine and estuarine habitats.
Consequently, actions to abate these threats will be the same or similar to the actions recommended for abating threats to several other marine and estuarine habitats (e.g., Coastal Tidal River or Stream, Seagrass, Mangrove Swamp, Coral Reef, Beach/Surf Zone).
Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.

**Habitat Description**

**FNAI type:** Sandhill

Sandhill communities occur only in north and central Florida in areas of gently rolling terrain on deep, well-drained, mostly yellow, sterile sands. This xeric community is dominated by an overstory of widely spaced, scattered longleaf pine, along with an understory of turkey oak, sand post oak, and bluejack oak. The park-like ground cover consists of various grasses and herbs, including wiregrass, lopsided Indian grass, bluestems, blazing star, partridge pea, beggars tick, milk pea, queen's delight, and others. Due to the poor water retention properties of the soils and open canopy, temperature and humidity fluctuate rapidly and frequently in this habitat compared to high-moisture closed-canopy forests. However, many temporary wetlands are found throughout Sandhill landscapes and are an integral part of this habitat type, providing breeding and foraging habitat for many wildlife species. Sandhill is a community that is sustained by ground fires with short return intervals to reduce hardwood intrusion and to promote flowering of many grasses and herbs. In the absence of fire, Sandhill will eventually succeed into a xeric hammock. Sand pine can quickly invade Sandhills where seed sources are available and fires are suppressed.
## Associated Species of Greatest Conservation Need

### Mammals
- *Lasiurus borealis borealis*  Red Bat
- *Lasiurus intermedius floridanus*  Northern Yellow Bat
- *Lasiurus seminolus*  Seminole Bat
- *Geomys pinetis pinetis*  Southeastern Pocket Gopher
- *Podomys floridanus*  Florida Mouse
- *Sciurus niger niger*  Southeastern Fox Squirrel
- *Sciurus niger shermani*  Sherman's Fox Squirrel
- *Mustela frenata olivacea*  Southeastern Weasel
- *Mustela frenata peninsulare*  Florida Long-tailed Weasel
- *Spilogale putorius ss.*  Spotted Skunk
- *Ursus americanus floridanus*  Florida Black Bear

### Birds
- *Colinus virginianus*  Northern Bobwhite
- *Elanoides forficatus*  Swallow-tailed Kite
- *Ictinia mississippiensis*  Mississippi Kite
- *Haliaeetus leucocephalus*  Bald Eagle
- *Falco sparverius paulus*  Southeastern American Kestrel
- *Columbina passerina*  Common Ground-Dove
- *Megascops asio*  Eastern Screech-Owl
- *Athene cunicularia*  Burrowing Owl
- *Chordeiles minor*  Common Nighthawk
- *Caprimulgus carolinensis*  Chuck-will's-widow
- *Caprimulgus vociferus*  Eastern Whip-poor-will
- *Melanerpes erythrocephalus*  Red-headed Woodpecker
- *Picoides villosus*  Hairy Woodpecker
- *Picoides borealis*  Red-cockaded Woodpecker
- *Colaptes auratus*  Northern Flicker
- *Sitta pusilla*  Brown-headed Nuthatch
- *Vermivora chrysoptera*  Golden-winged Warbler
- *Vermivora cyanoptera*  Blue-winged Warbler
- *Setophaga ruticilla*  American Redstart
- *Setophaga castanea*  Bay-breasted Warbler
- *Setophaga discolor discolor*  Prairie Warbler
- *Peucaea aestivalis*  Bachman's Sparrow
- *Ammobramus savannarum pratensis*  Grasshopper Sparrow

### Amphibians
- *Hyla andersonii*  Pine Barrens Treefrog
- *Lithobates capito*  Gopher Frog
- *Pseudacris ornata*  Ornate Chorus Frog
- *Ambystoma tigrinum*  Eastern Tiger Salamander
- *Eurycea cf. quadridigitata*  Bog Dwarf Salamander
- *Notophthalmus perstriatus*  Striped Newt

### Reptiles
- *Anolis carolinensis seminolus*  Southern Green Anole
- *Plestiodon egregius lividus*  Blue-tailed Mole Skink
- *Plestiodon egregius onocrepis*  Peninsula Mole Skink
- *Plestiodon reynoldsi*  Florida Sand Skink
- *Rhineura floridana*  Florida Wormlizard
- *Sceloporus woodi*  Florida Scrub Lizard
- *Cenophora coccinea cocinea*  Florida Scarletsnake
- *Crotalus adamanteus*  Eastern Diamond-backed Rattlesnake
- *Crotalus horridus*  Timber Rattlesnake
- *Drymarchon couperi*  Eastern Indigo Snake
- *Heterodon platirhinos*  Eastern Hog-nosed Snake
- *Heterodon simus*  Southern Hog-nosed Snake
- *Lampropeltis calligaster*  Yellow-bellied Kingsnake
- *Lampropeltis extenuata*  Short-tailed Snake
- *Lampropeltis getula*  Eastern Kingsnake
- *Pituophis melanoleucus mugitus*  Florida Pinesnake
- *Tantilla coronata*  Southeastern Crowned Snake
- *Tantilla relicta*  Florida Crowned Snake
- *Virginia valeriae valeriae*  Eastern Smooth Earthsnake (Highlands Co.)
- *Deirochelys reticularia*  Chicken Turtle
- *Gopherus polyphemus*  Gopher Tortoise
- *Terrapene carolina*  Eastern Box Turtle

**Invertebrates**
- *Geolycosa escambiensis*  Escambia Wolf Spider
- *Geolycosa xera*  McCrone's Burrowing Wolf Spider
- *Paraphrynus raptator*  Dusky-handed Tailless Whip Scorpion
- *Progomphus alachuensis*  Tawny Sanddragon
- *Progomphus bellei*  Belle, Belle's Sanddragon
- *Libellula jesseana*  Purple Skimmer
- *Melanoplus adelogyrus*  Volusia Grasshopper
- *Melanoplus apalachicolae*  Apalachicola Grasshopper
- *Melanoplus pygmaeus*  Pygmy Sandhill Grasshopper
- *Melanoplus querneus*  Larger Sandhill Grasshopper
- *Melanoplus withlacoocheensis*  Withlacoochee Melanoplus Grasshopper
- *Schistocerca ceratiola*  Rosemary Grasshopper
- *Cicindela highlandensis*  Highlands Tiger Beetle
- *Selonodon archboldi*  Archbold Cebrionid Beetle
- *Triplax alachuae*  Alachua Pleasing Fungus Beetle
- *Mycotrupes gaigei*  North Peninsular Mycotrupes Beetle
- *Peltotrupes profundus*  Florida Deepdigger Scarab Beetle
- *Chelyoxenus xerobatis*  Gopher Tortoise Hister Beetle
- *Geomysaprinus floridanae*  Equal-clawed Gopher Tortoise Hister Beetle
- *Pptomaphagus geomyzi*  Elongate Pocket Gopher Ptomaphagus Beetle
- *Pptomaphagus schwarzi*  Schwarz' Pocket Gopher Ptomaphagus Beetle
- *Anomala exigua*  Pygmy Anomala Scarab Beetle
- *Aphodius aegrotus*  Small Pocket Gopher Aphodius Beetle
- *Aphodius baileyi*  Bailey's Pocket Gopher Aphodius Beetle
- *Aphodius bakeri*  Baker's Pocket Gopher Aphodius Beetle
- *Aphodius dyspistus*  Surprising Pocket Gopher Aphodius Beetle
- *Aphodius gambrinus*  Amber Pocket Gopher Aphodius Beetle
- *Aphodius hubbelli*  Hubbell's Pocket Gopher Aphodius Beetle
- *Aphodius laevigatus*  Large Pocket Gopher Aphodius Beetle
- *Aphodius pholetus*  Rare Pocket Gopher Aphodius Beetle
Conservation Threats

Threats to Sandhill habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Conversion to recreation areas
- Incompatible fire
- Incompatible recreational activities
- Incompatible resource extraction: mining/drilling
- Invasive animals
- Invasive plants
- Roads

Threats specific to Sandhill were identified for the pathogen-causing Upper Respiratory Tract Disease in gopher tortoises, and movement of other parasites and pathogens from pets to native wildlife. Additionally, siting of utility corridors through this habitat, particularly on public lands, was identified as a cause of fragmentation and loss of habitat. Military base closure threatens potential conservation protection for Sandhill. Insufficient management of invasive plant species, such as Japanese climbing fern and cogongrass, also threatens this habitat and others.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered fire regime</td>
<td>Very High</td>
</tr>
<tr>
<td>B Habitat destruction or conversion</td>
<td>Very High</td>
</tr>
<tr>
<td>C Altered species composition/dominance</td>
<td>High</td>
</tr>
<tr>
<td>D Keystone species missing or lacking in abundance</td>
<td>High</td>
</tr>
<tr>
<td>E Altered hydrologic regime</td>
<td>High</td>
</tr>
<tr>
<td>F Altered community structure</td>
<td>High</td>
</tr>
<tr>
<td>G Fragmentation of habitats, communities, ecosystems</td>
<td>High</td>
</tr>
<tr>
<td>H Insufficient size/extent of characteristic communities or ecosystems</td>
<td>High</td>
</tr>
<tr>
<td>I Altered soil structure and/or chemistry</td>
<td>High</td>
</tr>
<tr>
<td>J Missing key communities, functional guilds, or seral stages</td>
<td>Medium</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Incompatible recreational activities</td>
<td>Very High</td>
<td>B, C, D, E, F, G, I</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>Very High</td>
<td>A, B, D, E, G, H, I</td>
</tr>
<tr>
<td>3 Roads</td>
<td>Very High</td>
<td>A, B, C, D, E, F, G, H, I</td>
</tr>
<tr>
<td>4 Incompatible fire</td>
<td>High</td>
<td>A, C, D, E, F</td>
</tr>
<tr>
<td>5 Utility corridors</td>
<td>High</td>
<td>B, C, E, G, H, I</td>
</tr>
<tr>
<td>6 Parasites/pathogens</td>
<td>High</td>
<td>C, D, F</td>
</tr>
<tr>
<td>7 Conversion to commercial and industrial development</td>
<td>High</td>
<td>A, B, D, E, G, H</td>
</tr>
<tr>
<td>8 Incompatible resource extraction: mining/drilling</td>
<td>Medium</td>
<td>B, E, G</td>
</tr>
<tr>
<td>9 Military activities</td>
<td>Medium</td>
<td>B, F, G</td>
</tr>
<tr>
<td>10 Invasive animals</td>
<td>Medium</td>
<td>C, D, F</td>
</tr>
<tr>
<td>11 Invasive plants</td>
<td>Medium</td>
<td>C, F</td>
</tr>
<tr>
<td>12 Conversion to recreation areas</td>
<td>Medium</td>
<td>B, C, D, E, G, H</td>
</tr>
</tbody>
</table>
## Conservation Actions

Actions to abate the threats to Sandhill that were also identified as statewide threats (incompatible recreational activities, roads, conversion to housing and urban development, incompatible fire, conversion to commercial and industrial development, incompatible resource extraction: mining/drilling, invasive animals, invasive plants (also see actions below), conversion to recreation areas) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Sandhill are below. These actions were designed to reduce the potential for spread of parasites and pathogens, with specific reference to gopher tortoises, reduce habitat loss for utility rights-of-way, and assure that the management and closure of military bases be implemented to retain critical habitat for Florida’s SGCN. Control of Japanese climbing fern was also identified as necessary where pine straw is harvested.

### Utility Corridors

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Develop private-public partnerships that facilitate placement of utilities on existing FDOT rights-of-way and vice-versa to minimize their cumulative impacts on habitats.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>M</td>
<td>Provide data on sensitive habitats to utilities and the Public Service Commission early in the utility siting and planning process to minimize conflicts between wildlife, critical habitats, and utility corridors.</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage language (e.g., ETDM) in utility siting process for co-location and that minimizes fragmentation of natural areas.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Explore options to reduce fragmentation of public lands caused by incompatible utility placement and land use. Promote awareness of this issue and encourage compatible alternate routes and land uses.</td>
<td>M</td>
<td>VH</td>
</tr>
</tbody>
</table>

### Parasites/Pathogens

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Develop an information clearinghouse for existing and emerging pathogens and parasites and their potential impacts on Florida's wildlife.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

| M            | Develop educational materials for the public about gopher tortoises and the spread of upper respiratory tract disease. (Work with the FWC, research community, and Gopher Tortoise Council). | VH | L | M |
### Military Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Establish a permanent consultative group of multi-agency wildlife and habitat professionals that work with USDOD on development of any statewide plans for base expansion, increased usage, and growth or closure needs to enhance positive, or minimize any negative, impacts on wildlife and conservation lands.</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Protection</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Work to develop partnerships to encourage conservation of significant habitats on lands encompassed by federal/state base closures.</td>
<td>H</td>
<td>VH</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create a cooperative program to ensure consistent implementation of management plans on USDOD/state lands with sufficient capacity for conservation management of wildlife and habitats on military lands in Florida (e.g., prescribed fire, invasive species control, monitoring).</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work to develop partnerships to encourage implementation of comprehensive management and mitigation plans that protect high quality habitats and natural resources.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

### Invasive Plants

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Educate the forest management consulting community about the illegality of selling pine straw bales contaminated with Japanese climbing fern, and appropriate control methods.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Create a system where landowners can voluntarily have their plantations certified as Lygodium-free. Provide incentive programs so that landowners increase profits by having certified pine straw.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>
**Scrub**

Status
Current condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 337,458 acres (136,564 ha) of Scrub habitat exist, of which 76% (257,015 ac; 104,010 ha) are in existing protected or managed areas. Another 3% (11,311 ac; 4,577 ha) are in Florida Forever projects, while 4% (14,031 ac; 5,678 ha) are in SHCA-designated lands. The remaining 16% (55,101 ac; 22,299 ha) are other private lands.

Habitat Description

**FNAI type:** Scrub

This habitat occurs on areas of deep, well-drained, infertile sandy soils that are typically white or near white. Scrub has a patchy distribution and occurs in both inland and coastal areas, from the panhandle through subtropical regions of the peninsula. The largest and most important patches of Scrub occur along the central ridge of the peninsula near Ocala and in Polk and Highlands counties. This habitat is fire-dependent; it is maintained by fires that are usually very hot or intense, but occur infrequently at intervals of 10-20 years, or more. Generally, Scrub is dominated by evergreen, or nearly evergreen, oaks and/or Florida rosemary, with or without a pine overstory. A relatively large suite of plant species is endemic to Scrub (e.g., scrub holly and inopina oak); the rarest endemic plant species are restricted to the Lake Wales area of the central ridge (e.g., pygmy fringe tree and scrub plum). Some species of wildlife also are endemic or largely restricted to Scrub habitat (e.g., Florida scrub-jay and sand skink). Several types of Scrub are recognized. Oak Scrub is a hardwood community typically consisting of clumped patches of low growing oaks interspersed with patches of bare, white sand. Pines are uncommon or absent. Oak Scrub is
dominated by myrtle oak, Chapman's oak, sand-live oak, inopina oak, scrub holly, scrub plum, scrub hickory, rosemary, scrub palmetto, and saw palmetto. Sand Pine Scrub occurs on former shorelines and islands of ancient seas. This plant community is dominated by an overstory of sand pine and has an understory of myrtle oak, Chapman's oak, sand-live oak, rusty lyonia, wild olive, scrub bay, and scrub holly. Ground cover is usually sparse to absent, especially in mature stands, and rosemary and lichens occur in some open areas. Rosemary Scrub has few or no sand pines or scrub oaks but is dominated by rosemary with scattered lichen cover, scrub hypericum, and paper nailwort. Scrubby Flatwoods, differing from Scrub by having a sparse canopy of slash pine, is addressed in the Natural Pineland habitat section. Additionally, many temporary wetlands are found throughout the Scrub landscape and are an integral part of this habitat type, providing breeding and foraging habitat for many wildlife species.

**Associated Species of Greatest Conservation Need**

**Mammals**
- *Lasiurus borealis borealis* (Red Bat)
- *Lasiurus intermedius floridanus* (Northern Yellow Bat)
- *Lasiurus seminolus* (Seminole Bat)
- *Geomys pinetis pinetis* (Southeastern Pocket Gopher)
- *Peromyscus polionotus allophrys* (Choctawhatchee Beach Mouse)
- *Peromyscus polionotus leucocephalus* (Santa Rosa Beach Mouse)
- *Peromyscus polionotus niveiventris* (Southeastern Beach Mouse)
- *Peromyscus polionotus peninsularis* (St. Andrew Beach Mouse)
- *Peromyscus polionotus phasma* (Anastasia Island Beach Mouse)
- *Peromyscus polionotus trissyllepsis* (Perdido Key Beach Mouse)
- *Podomys floridanus* (Florida Mouse)
- *Sciurus niger shermani* (Sherman's Fox Squirrel)
- *Mustela frenata olivacea* (Southeastern Weasel)
- *Mustela frenata peninsularae* (Florida Long-tailed Weasel)
- *Puma concolor coryi* (Florida Panther)
- *Spilogale putorius* (Spotted Skunk)
- *Ursus americanus floridanus* (Florida Black Bear)

**Birds**
- *Colinus virginianus* (Northern Bobwhite)
- *Elanoides forficatus* (Swallow-tailed Kite)
- *Falco sparverius paulus* (Southeastern American Kestrel)
- *Columbina passerina* (Common Ground-Dove)
- *Athene cunicularia* (Burrowing Owl)
- *Chordeiles minor* (Common Nighthawk)
- *Caprimulgus vociferus* (Eastern Whip-poor-will)
- *Melanerpes erythrocephalus* (Red-headed Woodpecker)
- *Picoides villosus* (Hairy Woodpecker)
- *Colaptes auratus* (Northern Flicker)
- *Lanius ludovicianus* (Loggerhead Shrike)
- *Aphelocoma coerulescens* (Florida Scrub-Jay)
- *Vermivora chrysoptera* (Golden-winged Warbler)
- *Vermivora cyanoptera* (Blue-winged Warbler)
- *Setophaga ruticilla* (American Redstart)
- *Setophaga kirtlandii* (Kirtland's Warbler)
• *Setophaga castanea*  Bay-breasted Warbler
• *Setophaga discolor discolor*  Prairie Warbler
• *Cardellina canadensis*  Canada Warbler

**Amphibians**
• *Lithobates capito*  Gopher Frog
• *Notophthalmus perstriatus*  Striped Newt

**Reptiles**
• *Anolis carolinensis seminolus*  Southern Green Anole
• *Plestiodon egregius insularis*  Cedar Key Mole Skink
• *Plestiodon egregius lividus*  Blue-tailed Mole Skink
• *Plestiodon egregius onocrepis*  Peninsula Mole Skink
• *Plestiodon reynoldsi*  Florida Sand Skink
• *Rhineura floridana*  Florida Wormlizard
• *Sceloporus woodi*  Florida Scrub Lizard
• *Cemophora coccinea coccinea*  Florida Scarletsnake
• *Crotalus adamanteus*  Eastern Diamond-backed Rattlesnake
• *Drymarchon couperi*  Eastern Indigo Snake
• *Heterodon platirhinos*  Eastern Hog-nosed Snake
• *Heterodon simus*  Southern Hog-nosed Snake
• *Lampropeltis extenuata*  Short-tailed Snake
• *Pituophis melanoleucus mugitus*  Florida Pinesnake
• *Tantilla coronata*  Southeastern Crowned Snake
• *Tantilla relicta*  Florida Crowned Snake
• *Virginia valeriae valeriae*  Eastern Smooth Earthsnake (Highlands Co.)
• *Gopherus polyphemus*  Gopher Tortoise
• *Terrapene carolina*  Eastern Box Turtle

**Invertebrates**
• *Praticolella bakeri*  Ridge Scrubsnail
• *Geolycosa escamensis*  Escambia Wolf Spider
• *Geolycosa xera*  McCrone's Burrowing Wolf Spider
• *Lycoa ericeticola*  Rosemary Wolf Spider
• *Sosippus placidus*  Lake Placid Funnel Wolf Spider
• *Phidippus workmani*  Workman's Jumping Spider
• *Latreudectus bishopi*  Red Widow Spider
• *Floridobolus penneri*  Florida Scrub Millipede
• *Melanoplus adelogyrus*  Volusia Grasshopper
• *Melanoplus forcipatus*  Broad Cercus Scrub Grasshopper
• *Melanoplus gurneyi*  Gurney's Spurthroat Grasshopper
• *Melanoplus indicifer*  East Coast Scrub Grasshopper
• *Melanoplus nanciae*  Ocala Claw-cercus Grasshopper
• *Melanoplus ordwayae*  Ordway Melanoplus Grasshopper
• *Melanoplus pygmaeus*  Pygmy Sandhill Grasshopper
• *Melanoplus scapularis*  Lesser Fork-tailed Grasshopper
• *Melanoplus tequestae*  Tequesta Grasshopper
• *Schistocerca ceratiola*  Rosemary Grasshopper
• *Telamona archboldi*  Archbold's Treehopper
• *Keltonia robusta*  Condradina Mirid Bug
• *Keltonia rubrofemorata*  Scrub Wireweed Mirid Bug
• *Cicindela highlandensis*  Highlands Tiger Beetle

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• Cicindela nigrior
  Autumn Tiger Beetle

• Cicindela scabrosa
  Scrub Tiger Beetle

• Aethecerinus hornii
  Horn's Aethecerinus Long-horned Beetle

• Aneflomorpha delongi
  Delong's Aneflomorpha Long-horned Beetle

• Enaphalodes archboldi
  Archbold Scrub Long-horned Beetle

• Plesioclytus relictus
  Florida Relictual Long-horned Beetle

• Romulus globosus
  Round-necked Romulus Long-horned Beetle

• Typocerus fulvocinctus
  Yellow-banded Typocerus Long-horned Beetle

• Selonodon archboldi
  Archbold Cebrionid Beetle

• Ischyrus dunedinensis
  Three Spotted Pleasing Fungus Beetle

• Triplex alachuae
  Alachua Pleasing Fungus Beetle

• Peltotrupes profundus
  Florida Deepdigger Scarab Beetle

• Peltotrupes youngi
  Ocala Deepdigger Scarab Beetle

• Chelyoxenus xerobatis
  Gopher Tortoise Hister Beetle

• Pleotomodes needhami
  Ant-loving Scrub Firefly

• Mycterus marmoratus
  Marbled Mycterus Beetle

• Odontotaenius floridanus
  Archbold Bess Beetle

• Anomala eximia
  Archbold Anomala Scarab Beetle

• Aphodius troglodytes
  Gopher Tortoise Aphodius Beetle

• Copris gopheri
  Gopher Tortoise Copris Beetle

• Diploptaxis rafa
  Red Diplotaxis Beetle

• Geopsammodius fuscus
  Dark Tiny Sand-loving Scarab

• Geopsammodius marmoseti
  Morris' Tiny Sand-loving Scarab

• Geopsammodius relictillus
  Relictual Tiny Sand-loving Scarab

• Geopsammodius withlacoochee
  Withlacoochee Tiny Sand-loving Scarab

• Haroldiataenius saramari
  Sand Pine Scrub Ataenius Beetle

• Hypotrichia spissipes
  Florida Hypotrichia Scarab Beetle

• Onthophagus aciculatulus
  Sandyland Onthophagus Beetle

• Onthophagus polyphemus polyphemus
  Punctate Gopher Tortoise Onthophagus Beetle

• Onthophagus polyphemus sparsisetosus
  Smooth Gopher Tortoise Onthophagus Beetle

• Phyllophaga elizoria
  Elizoria June Beetle

• Phyllophaga elongata
  Elongate June Beetle

• Phyllophaga okeechobea
  Diurnal Scrub June Beetle

• Phyllophaga panorpata
  Southern Lake Wales Ridge June Beetle

• Polyphylta starkae
  Auburndale Scrub Scarab Beetle

• Serica frosti
  Frost's Silky June Beetle

• Serica pusilla
  Pygmy Silky June Beetle

• Trigonopeltastes floridanus
  Scrub Palmetto Flower Scarab Beetle

• Onychomira floridensis
  A Comb-clawed Beetle

• Caupolicana floridana
  Giant Scrub Plasterer Bee

• Dorymyrmex flavopectus
  Bi-colored Scrub Cone Ant

• Dasymutilla archboldi
  Lake Wales Ridge Velvet Ant

• Photomorphus archboldi
  Nocturnal Scrub Velvet Ant

• Hesperia attalus slossonae
  Seminole Skipper

• Callophrys gryneus
  Olive Hairstreak

• Ministrymon azia
  Gray Ministreak

• Idia gopheri
  Gopher Tortoise Noctuid Moth

• Asaphomyia floridensis
  Florida Asaphomyian Tabanid Fly

• Eurosta lateralis
  A fruit fly
Chapter 6: Habitats - Scrub

Conservation Threats

Threats to Scrub habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to agriculture
- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Conversion to recreation areas
- Incompatible fire
- Incompatible forestry practices
- Incompatible recreational activities
- Incompatible resource extraction: mining/drilling
- Invasive animals
- Invasive plants
- Roads

Threats specific to Scrub habitat include Incompatible forestry practices because this habitat supports Florida scrub-jays, which are not tolerant of dense pine stands adjacent to or within Scrub sites. Habitat-specific threats from mining includes habitat loss both when areas are mined and when dredge spoil is deposited on Scrub and mitigation activities that result in small, fragmented areas rather than more contiguous areas of this habitat. Military base closure threatens potential loss of protection of Scrub.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Fragmentation of habitats, communities, ecosystems</td>
</tr>
<tr>
<td>B</td>
<td>Insufficient size/extent of characteristic communities or ecosystems</td>
</tr>
<tr>
<td>C</td>
<td>Altered community structure</td>
</tr>
<tr>
<td>D</td>
<td>Altered fire regime</td>
</tr>
<tr>
<td>E</td>
<td>Habitat destruction or conversion</td>
</tr>
<tr>
<td>F</td>
<td>Altered soil structure and chemistry</td>
</tr>
<tr>
<td>G</td>
<td>Altered species composition/dominance</td>
</tr>
<tr>
<td>H</td>
<td>Altered landscape mosaic or context</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Incompatible fire</td>
<td>Very High</td>
</tr>
<tr>
<td>2</td>
<td>Conversion to housing and urban development</td>
<td>Very High</td>
</tr>
<tr>
<td>3</td>
<td>Roads</td>
<td>Very High</td>
</tr>
<tr>
<td>4</td>
<td>Incompatible forestry practices</td>
<td>Very High</td>
</tr>
<tr>
<td>5</td>
<td>Incompatible resource extraction: mining/drilling</td>
<td>Very High</td>
</tr>
<tr>
<td>6</td>
<td>Conversion to agriculture</td>
<td>Very High</td>
</tr>
<tr>
<td>7</td>
<td>Conversion to commercial and industrial</td>
<td>Very High</td>
</tr>
</tbody>
</table>
Chapter 6: Habitats - Scrub

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Management of nature – stormwater facilities</td>
<td>High</td>
<td>A, E, F, H</td>
</tr>
<tr>
<td>9 Management of nature – dredge spoil deposition</td>
<td>High</td>
<td>A, E, F</td>
</tr>
<tr>
<td>10 Conversion to recreation areas</td>
<td>Medium</td>
<td>A, D, E</td>
</tr>
<tr>
<td>11 Invasive animals</td>
<td>Medium</td>
<td>C, D, E, G</td>
</tr>
<tr>
<td>12 Incompatible recreational activities</td>
<td>Medium</td>
<td>A, C, E</td>
</tr>
<tr>
<td>13 Military activities</td>
<td>Medium</td>
<td>A, B, D, E, H</td>
</tr>
<tr>
<td>14 Invasive plants</td>
<td>Medium</td>
<td>C, G</td>
</tr>
<tr>
<td>15 Incompatible agricultural practices</td>
<td>Medium</td>
<td>F</td>
</tr>
<tr>
<td>16 Incompatible grazing and ranching</td>
<td>Low</td>
<td>C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statewide Threat Rank of Habitat</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td></td>
</tr>
</tbody>
</table>

Conservation Actions

Actions to abate the threats to Scrub that were also identified as statewide threats (conversion to agriculture, conversion to commercial and industrial development, conversion to housing and urban development, conversion to recreation areas, incompatible fire, incompatible forestry practices (also see actions below), incompatible recreational activities, incompatible resource extraction: mining/drilling (also see actions below), invasive animals, invasive plants, roads) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Scrub are below. These actions were designed to reduce the impacts of adjacent incompatible forest management, mining and mine mitigation, habitat loss from public facility siting, and potential management or loss on Avon Park Air Force Range.

Incompatible Forestry Practices

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Promote importance of bird viability in management decisions on public lands where silvicultural management is in conflict with maintaining viable populations of imperiled grassland and scrub birds.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

Incompatible Resource Extraction: Mining/Drilling

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Encourage preservation of large contiguous patches of scrub and other sensitive upland habitats in lieu of current practice of protecting habitat piecemeal.</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Create voluntary incentives to avoid loss of, and impacts to, SHCAs and sensitive habitats from mining, particularly wet and dry prairie, scrub, and bat caves.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

Chapter 6: Habitats - Scrub
<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop a coalition of groups to identify local restoration projects where spoil material can be used.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

**Management of Nature – Stormwater/Wastewater Facilities**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Promote the importance of scrub habitat and encourage placement of county or municipal water treatment facilities in other areas when imperiled species utilize proposed scrub sites.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

**Military Activities**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Establish a permanent consultative group of multi-agency wildlife and habitat professionals that work with USDOD on development of any statewide plans for base expansion, increased usage, and growth or closure needs to enhance positive, or minimize any negative impacts on wildlife and conservation lands.</td>
<td>M</td>
<td>H</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Protection</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Work to develop partnerships to encourage conservation of significant habitats on lands encompassed by federal/state base closures.</td>
<td>H</td>
<td>VH</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Support a collaborative effort among the USFWS, Avon Park Air Force Range, Archbold Biological Station, and the FWC to develop and implement a mitigation and management plan to accommodate military needs and maintain habitat and species viability.</td>
<td>VH</td>
<td>M</td>
<td>VH</td>
</tr>
<tr>
<td>M</td>
<td>Create a cooperative program to ensure consistent implementation of management plans on USDOD lands with sufficient capacity for conservation management of wildlife and habitats on military lands in Florida (e.g., prescribed fire, invasive species control, monitoring).</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work to develop partnerships to encourage implementation of comprehensive management and mitigation plans that protect high quality habitats and natural resources.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>
Seagrass

Status
Current condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 2,419,458 acres (979,120 ha) of seagrass beds exist.

Habitat Description

FNAI type: Algal Bed, Seagrass Bed, Composite Substrate

Seagrasses are marine flowering plants adapted to grow and reproduce in the underwater environment. Florida estuaries and nearshore coastal waters contain the nation’s largest seagrass resources (more than two-million acres), as well as its two most extensive, contiguous seagrass beds (i.e., Florida Bay and the Big Bend region). Factors that affect the establishment and growth of seagrass include light availability, water temperature, salinity, sediment composition, nutrient levels, wave energy, and tidal range. Seagrass most often occurs in areas of low to moderate current velocities where the water is clear; thereby allowing sunlight to penetrate to the leaf blades. Seagrass communities are highly productive, faunally rich, and ecologically important systems. Hundreds to thousands of species of flora and fauna may inhabit seagrass habitats utilizing food, substrate, and shelter provided by the plants. Seagrasses also stabilize sediments and help maintain water clarity.

Associated Species of Greatest Conservation Need

Mammals
- *Trichechus manatus latirostris*  
  West Indian Manatee

Chapter 6: Habitats - Seagrass
### Birds
- **Aythya affinis** (Lesser Scaup)
- **Gavia immer** (Common Loon)
- **Podiceps auritus** (Horned Grebe)
- **Mycteria americana** (Wood Stork)
- **Pelecanus occidentalis** (Brown Pelican)
- **Ardea herodias occidentalis** (Great White Heron)
- **Egretta tricolor** (Tricolored Heron)
- **Egretta rufescens** (Reddish Egret)
- **Platalea ajaja** (Roseate Spoonbill)
- **Haliaeetus leucocephalus** (Bald Eagle)
- **Numenius phaeopus** (Whimbrel)
- **Onychoprion fuscatus** (Sooty Tern)
- **Sternula antillarum** (Least Tern)
- **Gelochelidon nilotica** (Gull-billed Tern)
- **Hydroprogne caspia** (Caspian Tern)
- **Sternula dougallii** (Roseate Tern)
- **Thalasseus maximus** (Royal Tern)
- **Thalasseus sandvicensis** (Sandwich Tern)
- **Rynchops niger** (Black Skimmer)

### Reptiles
- **Crocodylus acutus** (American Crocodile)
- **Nerodia clarkii compressicauda** (Mangrove Saltmarsh Watersnake)
- **Caretta caretta** (Loggerhead Sea Turtle)
- **Chelonia mydas** (Green Sea Turtle)
- **Eretmochelys imbricata** (Hawksbill Sea Turtle)
- **Lepidochelys kempii** (Kemp's Ridley Sea Turtle)
- **Malaclemys terrapin** (Diamond-backed Terrapin)

### Fish
- **Acipenser brevirostrum** (Shortnose Sturgeon)
- **Acipenser oxyrinchus desotoi** (Gulf of Mexico Sturgeon)
- **Acipenser oxyrinchus oxyrinchus** (Atlantic Sturgeon)
- **Menidia conchorum** (Key Silverside)
- **Alosa aestivalis** (Blueback Herring)
- **Alosa alabamae** (Alabama Shad)
- **Aetobatus narinari** (Spotted Eagle Ray)
- **Carcharhinus plumbeus** (Sandbar Shark)
- **Galeocerdo cuvier** (Tiger Shark)
- **Negaprion brevirostris** (Lemon Shark)
- **Pristis pectinata** (Smalltooth Sawfish)
- **Pristis pristis** (Largetooth Sawfish)
- **Agonostomus monticola** (Mountain Mullet)
- **Ctenogobius stigmaturus** (Spottail Goby)
- **Epinephelus itajara** (Goliath Grouper)
- **Lutjanus mahogoni** (Mahogany Snapper)
- **Microphis brachyurus** (Opossum Pipefish)
- **Syngnathus fuscus** (Northern Pipefish)

### Invertebrates
- **Bartholomea annulata** (Ringed (Curlique Or Corkscrew) Anemone)

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Chapter 6: Habitats - Seagrass
Conservation Threats

The most serious threat to Florida’s seagrass habitats is reduced water quality from anthropogenic nutrient loading and sometimes sediments. Non-point source pollution (e.g., stormwater run-off) is the most significant source. Other important human related threats are:

- Boat groundings and propeller scarring
- Boat wakes
- Coastal construction (including dock construction and seagrass shading from docks)
- Dredging and filling activities
- Hydrological modifications to estuarine systems that disrupt natural salinity patterns

Natural sources of seagrass loss (e.g., pathogens and large storms) are much smaller threats than human activities. Threats to Seagrass habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Boating impacts
- Channel modification/shipping lanes
• Chemicals and toxins
• Climate variability
• Coastal development
• Dam operations/incompatible release of water (quality, quantity, timing)
• Disruption of longshore transport of sediments
• Fishing gear impacts
• Harmful algal blooms
• Incompatible fishing pressure
• Incompatible industrial operations
• Incompatible recreational activities
• Industrial spills
• Invasive animals
• Invasive plants
• Key predator/herbivore loss
• Management of nature (beach nourishment and impoundments)
• Nutrient loads–urban
• Roads, bridges and causeways
• Shoreline hardening
• Surface water and groundwater withdrawal
• Vessel impacts

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered water quality–physical, chemistry</td>
<td>Very High</td>
</tr>
<tr>
<td>B Habitat destruction</td>
<td>Very High</td>
</tr>
<tr>
<td>C Altered species composition</td>
<td>Very High</td>
</tr>
<tr>
<td>D Sedimentation</td>
<td>Very High</td>
</tr>
<tr>
<td>E Altered water quality–contaminants</td>
<td>High</td>
</tr>
<tr>
<td>F Altered water quality–nutrients</td>
<td>High</td>
</tr>
<tr>
<td>G Altered structure</td>
<td>High</td>
</tr>
<tr>
<td>H Erosion</td>
<td>High</td>
</tr>
<tr>
<td>I Altered hydrologic regime</td>
<td>High</td>
</tr>
<tr>
<td>J Altered primary productivity</td>
<td>High</td>
</tr>
<tr>
<td>K Habitat fragmentation</td>
<td>Medium</td>
</tr>
<tr>
<td>L Habitat disturbance</td>
<td>Low</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Coastal development</td>
<td>Very High</td>
<td>A, B, C, D, E, F, G, H, I, K</td>
</tr>
<tr>
<td>2 Harmful algal blooms</td>
<td>Very High</td>
<td>A, B, C, F, J</td>
</tr>
<tr>
<td>3 Inadequate stormwater management</td>
<td>Very High</td>
<td>A, B, C, D, E, F, H, J</td>
</tr>
<tr>
<td>4 Channel modification/shipping lanes</td>
<td>Very High</td>
<td>A, B, D, G, H, I, J, K</td>
</tr>
<tr>
<td>5 Nutrient loads–all sources</td>
<td>High</td>
<td>A, B, C, D, F, G, J, K</td>
</tr>
<tr>
<td>6 Incompatible industrial operations</td>
<td>High</td>
<td>A, B, C, D, E, G, H, J, K</td>
</tr>
<tr>
<td>7 Dam operations/incompatible release of water (quality, quantity, timing)</td>
<td>High</td>
<td>A, B, C, D, E, F, H, I, J</td>
</tr>
<tr>
<td>8 Climate variability</td>
<td>High</td>
<td>B, C, G, H, I, J</td>
</tr>
</tbody>
</table>

Chapter 6: Habitats - Seagrass
<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface water withdrawal</td>
<td>High</td>
<td>A, B, C, I, J</td>
</tr>
<tr>
<td>Invasive plants</td>
<td>High</td>
<td>B, C, F, G, J</td>
</tr>
<tr>
<td>Groundwater withdrawal</td>
<td>High</td>
<td>A, B, C, I, J</td>
</tr>
<tr>
<td>Roads, bridges and causeways</td>
<td>High</td>
<td>A, B, C, D, E, F, G, H, I, J</td>
</tr>
<tr>
<td>Shoreline hardening</td>
<td>High</td>
<td>A, B, C, E, F, H, J</td>
</tr>
<tr>
<td>Invasive animals</td>
<td>High</td>
<td>B, C</td>
</tr>
<tr>
<td>Incompatible fishing pressure</td>
<td>High</td>
<td>C, E, G</td>
</tr>
<tr>
<td>Destruction of longshore transport of sediments</td>
<td>High</td>
<td>A, C, D, F, H, J</td>
</tr>
<tr>
<td>Management of nature (beach nourishment, impoundments)</td>
<td>Medium</td>
<td>A, B, C, D, H, I, J, K</td>
</tr>
<tr>
<td>Boating impacts</td>
<td>Medium</td>
<td>A, B, C, D, E, F, G, H, J, K</td>
</tr>
<tr>
<td>Chemicals and toxins</td>
<td>Medium</td>
<td>A, B, C, J</td>
</tr>
<tr>
<td>Incompatible recreational activities</td>
<td>Medium</td>
<td>A, B, C, D, E, F, G, H</td>
</tr>
<tr>
<td>Key predator/herbivore losses</td>
<td>Medium</td>
<td>B, C, J</td>
</tr>
<tr>
<td>Incompatible aquarium trade</td>
<td>Medium</td>
<td>C</td>
</tr>
<tr>
<td>Utility corridors</td>
<td>Medium</td>
<td>B, G, K</td>
</tr>
<tr>
<td>Fishing gear impacts</td>
<td>Medium</td>
<td>B, C, G</td>
</tr>
<tr>
<td>Industrial spills</td>
<td>Medium</td>
<td>A, B, C, E, J</td>
</tr>
<tr>
<td>Incompatible aquaculture operations</td>
<td>Medium</td>
<td>A, B, C, D, F, G, H, J, K</td>
</tr>
<tr>
<td>Vessel impacts</td>
<td>Medium</td>
<td>B, E, G</td>
</tr>
<tr>
<td>Parasites/pathogens</td>
<td>Medium</td>
<td>C</td>
</tr>
<tr>
<td>Placement of artificial structure</td>
<td>Medium</td>
<td>B, C, D, G, J</td>
</tr>
<tr>
<td>Thermal pollution</td>
<td>Medium</td>
<td>B, K</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>Low</td>
<td>B, G, J</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat** Very High

**Conservation Actions**

Actions to abate the threats to Seagrass that were also identified as statewide threats are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Outcomes identified for this habitat address increasing the understanding of recreational boaters to reduce the likelihood of impacts to sensitive habitats, especially damage to seagrass from propellers. Assessment of the effects of pathogens on seagrasses is also necessary to increase our understanding of the scope and severity of this threat.

Chapter 6: Habitats - Seagrass
Highest ranked actions identified for abating this source of stress focus on:

- Improving environmental and boating safety around Seagrass
- Reducing land-based nutrient input to coastal habitats
- Improving education on ecological importance and the impacts of damage to Seagrass

Additional actions included:

- Developing and implementing access plans and Seagrass management and restoration plans

The following actions, organized by action type were identified to abate this threat:

**Incompatible Recreation including Boating**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Promote understanding of environmental and boating regulations.</td>
<td>VH</td>
<td>H</td>
<td>VH</td>
</tr>
<tr>
<td>H</td>
<td>Improve understanding of and use of boating techniques that reduce the likelihood of propeller scars.</td>
<td>VH</td>
<td>M</td>
<td>VH</td>
</tr>
<tr>
<td>H</td>
<td>Assist in a multi-agency process in the identification and designation of no-motor zones in ecologically sensitive areas.</td>
<td>VH</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Improve understanding of and compliance with existing regulations in sensitive fish and wildlife resource areas. Assist in the multi-agency development of management plans for those areas.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>M</td>
<td>Investigate and analyze the potential of watercraft restricted areas based on environmental sensitivity and safety.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>M</td>
<td>Develop and implement management/remediation activities based on synthesis of existing information on effects of use of and potential remediation of marine and estuarine habitats (see research).</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Place mooring buoys at intensively used natural areas.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage multi-agency cooperation/collaboration to review and revise seagrass protection measures.</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Promote knowledge of basic boat operation and navigation as a component of boat registration.</td>
<td>L</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>Raise awareness and understanding of impacts from propeller scarring.</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

**Parasites/Pathogens**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Synthesize and consolidate understanding, and identification of gaps in understanding, of marine flora/fauna diseases, pathogens, biotoxins, including slime mold on seagrasses and oyster disease.</td>
<td>VH</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>
Seepage/Steephead Stream

**Status**
Current condition: Good and declining.
According to the best available GIS information at this time (see Appendix D: GIS Data Tables), 515 miles (2,639 km) of seepage/steephead stream exist.

**Habitat Description**

**FNAI type:** Seepage Stream, Seepage Slope

This habitat includes seepage bogs and streams that typically have deep sand bottoms with slow, constant, percolated groundwater inflow of clear, cool, unpolluted water. Seepage/Steephead Streams are usually less than 40 feet (12 m) wide, shallow, often form the headwaters of many Alluvial and blackwater streams, and are biologically diverse. These streams are usually sheltered by a dense overstory and therefore have little to no aquatic vegetation. Green algae may occur intermittently within the stream, while mosses, ferns and liverworts can sometimes occur in clumps at the waters edge. Seepage/Steephead Streams are usually accompanied by seepage slopes. These slopes have acidic, low-nutrient soils which are constantly saturated with moisture flowing from upslope. Steephead streams are formed when drainage water begins to collect underground from a slope and flow outward to the surface. The resulting flow brings about an erosion of the slopes base, which forms a cut out in the underside of the hill. Seepage bogs exist in areas where the land gradually slopes to just above, or slightly intersects the water table. These bogs do not have regular standing water and are not as wet as swamps or marshes. Seepage bogs are dominated by low growing plant species, such as grasses and carnivorous plants, which occasionally must burn to remain healthy. Classic Florida examples are found in the Apalachicola drainage, but streams of this type also occur elsewhere in the state where there is topographic relief. This category includes seepage streams in ravines, and the hillside pitcher plant bogs found at the head of or along seepage streams on Eglin Air Force Base and Blackwater River State Forest.
### Associated Species of Greatest Conservation Need

#### Mammals
- **Corynorhinus rafinesquii** — Rafinesque's Big-eared Bat
- **Eptesicus fuscus** — Big Brown Bat
- **Lasiurus borealis borealis** — Red Bat
- **Lasiurus cinereus cinereus** — Hoary Bat
- **Lasiurus intermedius floridanus** — Northern Yellow Bat
- **Lasiurus seminolus** — Seminole Bat
- **Myotis austroriparius** — Southeastern Myotis
- **Myotis grisescens** — Gray Bat
- **Perimyotis subflavus** — Tricolored Bat
- **Lontra canadensis lataxina** — River Otter

#### Birds
- **Egretta caerulea** — Little Blue Heron
- **Elanoides forficatus** — Swallow-tailed Kite
- **Catharus bicknelli** — Bicknell's Thrush
- **Parkesia motacilla** — Louisiana Waterthrush

#### Amphibians
- **Hyla andersonii** — Pine Barrens Treefrog
- **Lithobates okaloosae** — Florida Bog Frog
- **Pseudacris ornata** — Ornate Chorus Frog
- **Amphiiuma pholter** — One-toed Amphiiuma
- **Desmognathus apalachicolae** — Apalachicola Dusky Salamander
- **Desmognathus auriculatus** — Southern Dusky Salamander
- **Desmognathus cf. conanti** — Eglin Ravine Spotted Dusky Salamander
- **Desmognathus monticola** — Seal Salamander
- **Eurycea chamberlaini** — Chamberlain's Dwarf Salamander
- **Eurycea cf. quadridigitata** — Bog Dwarf Salamander
- **Hemidactylium scutatum** — Four-toed Salamander

#### Reptiles
- **Plestiodon anthracinus pluvialis** — Southern Coal Skink
- **Agkistrodon contortrix contortrix** — Southern Copperhead
- **Lampropeltis getula** — Eastern Kingsnake
- **Terrapene carolina** — Eastern Box Turtle

#### Fish
- **Anguilla rostrata** — American Eel
- **Luxilus chrysocephalus** — Striped Shiner
- **Lythrurus atrapiculus** — Blacktip Shiner
- **Nocomis leptocephalus** — Bluehead Chub
- **Notropis baileyi** — Rough Shiner
- **Pteronotropis welaka** — Bluenose Shiner
- **Acantharchus pomotis** — Mud Sunfish
- **Etheostoma histrio** — Harlequin Darter
- **Etheostoma okaloosae** — Okaloosa Darter
- **Etheostoma olimstedi** — Tessellated Darter
- **Etheostoma parvipinne** — Goldstripe Darter
### Invertebrates

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ptychobranchus jonesi</td>
<td>Southern Kidneyshell</td>
</tr>
<tr>
<td>Floridobia monroensis</td>
<td>Enterprise Siltsnail</td>
</tr>
<tr>
<td>Cambarus pyronotus</td>
<td>Fire-back Crayfish</td>
</tr>
<tr>
<td>Fallicambarus byersi</td>
<td>Lavender Burrowing Crayfish</td>
</tr>
<tr>
<td>Procambarus rogersi expletus</td>
<td>A Crayfish</td>
</tr>
<tr>
<td>Diphetor hageni</td>
<td>A Mayfly</td>
</tr>
<tr>
<td>Baetisca becki</td>
<td>A Mayfly</td>
</tr>
<tr>
<td>Dolania americana</td>
<td>American Sand-burrowing Mayfly</td>
</tr>
<tr>
<td>Gomphus westfalli</td>
<td>Westfall's Clubtail</td>
</tr>
<tr>
<td>Somatochlora calvertii</td>
<td>Calvert, Calvert's Emerald</td>
</tr>
<tr>
<td>Somatochlora georgiana</td>
<td>Coppery Emerald</td>
</tr>
<tr>
<td>Somatochlora provocans</td>
<td>Treetop Emerald</td>
</tr>
<tr>
<td>Allocapnia starki</td>
<td>Slender Winter Stonefly</td>
</tr>
<tr>
<td>Leuctra ferruginea</td>
<td>A Stonefly</td>
</tr>
<tr>
<td>Leuctra triloba</td>
<td>A Stonefly</td>
</tr>
<tr>
<td>Amphinemura nigritta</td>
<td>A Stonefly</td>
</tr>
<tr>
<td>Acronoeuria lycorias</td>
<td>A Stonefly</td>
</tr>
<tr>
<td>Eccoptura xanthenes</td>
<td>A Stonefly</td>
</tr>
<tr>
<td>Neoperla carlsoni</td>
<td>A Stonefly</td>
</tr>
<tr>
<td>Isogenoides varians</td>
<td>Rock Island Springfly</td>
</tr>
<tr>
<td>Heteroplectron americanum</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Cheumatopsyche gordoniae</td>
<td>Gordon's Little Sister Sedge Caddisfly</td>
</tr>
<tr>
<td>Cheumatopsyche petersi</td>
<td>Peters' Cheumatopsyche Caddisfly</td>
</tr>
<tr>
<td>Hydroptila apalachicola</td>
<td>Apalachicola Hydroptila Caddisfly</td>
</tr>
<tr>
<td>Hydroptila bibriae</td>
<td>Kriebel's Hydroptila Caddisfly</td>
</tr>
<tr>
<td>Hydroptila eglinensis</td>
<td>Saberlike Hydroptila Caddisfly</td>
</tr>
<tr>
<td>Hydroptila hamiltoni</td>
<td>Hamilton's Hydroptila Caddisfly</td>
</tr>
<tr>
<td>Orthotrichia curta</td>
<td>Short Orthotrichian Microcaddisfly</td>
</tr>
<tr>
<td>Oxyethira chrysocara</td>
<td>Gold Head Branch Caddisfly</td>
</tr>
<tr>
<td>Oxyethira elerobi</td>
<td>Elerob's Microcaddisfly</td>
</tr>
<tr>
<td>Oxyethira florida</td>
<td>Florida Cream And Brown Microcaddisfly</td>
</tr>
<tr>
<td>Oxyethira kelleyi</td>
<td>Kelly's Cream And Brown Mottled Microcaddisfly</td>
</tr>
<tr>
<td>Oxyethira novasota</td>
<td>Novasota Oxyethiran Microcaddisfly</td>
</tr>
<tr>
<td>Oxyethira pescadori</td>
<td>Pescador's Bottle-cased Caddisfly</td>
</tr>
<tr>
<td>Oxyethira setosa</td>
<td>Setose Cream And Brown Mottled Microcaddisfly</td>
</tr>
<tr>
<td>Lepidostoma griseum</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Lepidostoma latipenne</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Lepidostoma morsei</td>
<td>Morse's Little Plain Brown Sedge</td>
</tr>
<tr>
<td>Lepidostoma serratum</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Nectopsyche paludicola</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Oecetis daytona</td>
<td>Daytona Long-horned Caddisfly</td>
</tr>
<tr>
<td>Triaenodes bicornis</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Triaenodes taenia</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Psilotreta frontalis</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Chimarra falculata</td>
<td>A Caddisfly</td>
</tr>
<tr>
<td>Chimarra florida</td>
<td>Floridian Finger-net Caddisfly</td>
</tr>
<tr>
<td>Agrynia vestita</td>
<td>Unbanded Agrynia Caddisfly</td>
</tr>
<tr>
<td>Cernotina truncona</td>
<td>Florida Cernotinan Caddisfly</td>
</tr>
<tr>
<td>Nyctiophylax morsei</td>
<td>Morse's Dinky Light Summer Sedge</td>
</tr>
<tr>
<td>Polycentropus floridensis</td>
<td>Florida Brown Checkered Summer Sedge</td>
</tr>
</tbody>
</table>
• *Agarodes libalis*  Spring-loving Psiloneuran Caddisfly
• *Agarodes logani*  Logan's Agarodes Caddisfly
• *Agarodes ziczac*  Zigzag Blackwater River Caddisfly
• *Amblyscirtes aesculapius*  Lace-winged Roadside Skipper
• *Amblyscirtes hegon*  Pepper and Salt Skipper
• *Amblyscirtes reversa*  Reversed Roadside-skipper
• *Amblyscirtes vialis*  Common Roadside-skipper
• *Autochton cellus*  Golden-banded Skipper
• *Callophrys augustinus*  Brown Elfin
• *Callophrys henrici*  Henry's Elfin
• *Feniseca tarquinius*  Harvester
• *Satyrium kingi*  King's Hairstreak
• *Satyrium liparops floridensis*  Sparkleberry Hairstreak
• *Proserpinus gaurae*  Proud Sphinx

### Conservation Threats

Threats to the Seepage/Steephead Stream habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to commercial/industrial development
- Conversion to housing and urban development
- Incompatible fire
- Invasive animals
- Incompatible forestry practices
- Incompatible resource extraction—mining/drilling
- Roads

Threats to this habitat are those common to most unprotected low-order of headwater stream systems in Florida and these threats include outright conversion to other land uses, especially housing, roads and commercial forests. Herbaceous seepage systems suffer from inadequate fire, often leading to succession of associated herbaceous communities to hardwood swamp wetlands. Additional threats specific to this habitat include the operation of dams or control structures on small steephead and seepage streams, especially in north Florida, where these systems have historically been utilized for small-scale water supplies or fishing impoundments.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Altered hydrologic regime</td>
<td>High</td>
</tr>
<tr>
<td>B  Altered community structure</td>
<td>Medium</td>
</tr>
<tr>
<td>C  Altered successional dynamics</td>
<td>Medium</td>
</tr>
<tr>
<td>D  Erosion/sedimentation</td>
<td>Medium</td>
</tr>
<tr>
<td>E  Habitat destruction or conversion</td>
<td>Medium</td>
</tr>
<tr>
<td>F  Altered species composition/dominance</td>
<td>Medium</td>
</tr>
<tr>
<td>G  Fragmentation of habitats, communities, ecosystems</td>
<td>Low</td>
</tr>
<tr>
<td>H  Altered water quality of surface water or aquifer: nutrients</td>
<td>Low</td>
</tr>
</tbody>
</table>
The sources of stress, or threats, were used to generate conservation actions. The table below lists the sources of stress, their relative ranks, and related stresses.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Invasive animals</td>
<td>Medium</td>
<td>A, D</td>
</tr>
<tr>
<td>2 Conversion to housing and urban development</td>
<td>Medium</td>
<td>A, D</td>
</tr>
<tr>
<td>3 Conversion to commercial and industrial development</td>
<td>Medium</td>
<td>A, D</td>
</tr>
<tr>
<td>4 Management of nature–water control structures</td>
<td>Medium</td>
<td>A, B</td>
</tr>
<tr>
<td>5 Roads</td>
<td>Medium</td>
<td>A, B, D</td>
</tr>
<tr>
<td>6 Incompatible resource extraction: mining/drilling</td>
<td>Medium</td>
<td>D</td>
</tr>
<tr>
<td>7 Incompatible fire</td>
<td>Medium</td>
<td>A, B, C</td>
</tr>
<tr>
<td>8 Incompatible forestry practices</td>
<td>Low</td>
<td>A, D</td>
</tr>
</tbody>
</table>

### Statewide Threat Rank of Habitat

**Medium**

**Conservation Actions**

Actions to abate the threats to Seepage/Steephead Stream that were also identified as statewide threats (invasive animals, conversion to housing and urban development, conversion to commercial/industrial development, roads, incompatible resource extraction: mining/drilling, incompatible fire, incompatible forestry practices) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat were only applicable to Seepage/Steephead Stream and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Cypress Swamp, Freshwater Marsh and Wet Prairie, Natural Lake, Reservoir/Managed Lake, Softwater Stream, Spring and Spring Run, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. Additional actions were developed to address threats specific to this habitat. These actions are intended to ensure that road crossings for these streams are designed to prevent creation of impoundments and reduce introduction of sediments, maintain natural riparian buffers in developing areas, raise awareness of the need for fire in these systems and reduce impacts caused by dams and water control structures through targeted restoration projects.

#### Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage conservation of lake frontage, riparian habitats and their floodplains.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Support incentives program that encourages a buffer zone between new development and river, stream or floodplain edges, of a minimum distance (e.g., Farm Bill programs).</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
### Management of Nature – Water Control Structures

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Review existing Farm Bill programs and explore options for enhancing economic benefits to landowners that improve or remove water control structures.</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Encourage the development of partnerships to enhance wetland restoration projects on private lands that involve removing small, local water control structures.</td>
<td>VH</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Support research to identify the habitat needs and movement requirements of native aquatic species, inventory water control structures, and identify the extent to which particular existing water control structures negatively affect species ecology.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Support research to investigate the cumulative impacts of small farm ponds on low-order streams in north Florida.</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Roads

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work with USFWS to improve coordination of the Technical Advisory Committee for the Stream Crossing Technical Center (SCTC).</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Based on a stream crossing inventory and prioritization, develop funding opportunities for road stabilization projects in Florida counties.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Provide training to road maintenance personnel on methods for minimizing sediment movement to water bodies.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Fund the start-up and operation of the SCTC to promote recovery and conservation of aquatic ecosystems from interactions between unpaved road-stream crossings that result in sediment movement into streams.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Incompatible Fire

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Develop and disseminate a focused education program for ranchers and plantation owners on the value of growing season burns and burning in wetlands. Review and improve existing agency outreach materials to address these issues.</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

Chapter 6: Seepage/Steephead Stream
Shrub Swamp

Status
Current condition: Unknown.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 1,069,770 acres (432,921 ha) of Shrub Swamp habitat exist, of which 49% (521,957 ac; 211,229ha) are in existing conservation or managed areas. Another 7% (74,135 ac; 30,001 ha) are Florida Forever projects and 8% (88,325 ac; 35,744 ha) are SHCA-identified lands. The remaining 36% (385,353 ac; 155,947ha) are other private lands.

Some habitat distributions or locations may be misrepresented on this map due to size, resolution and insufficient data sources.

Habitat Description

FNAI type: None

Shrub Swamps are wetland communities dominated by dense, low-growing, woody shrubs or small trees. Shrub Swamps are usually characteristic of wetland areas that are experiencing environmental change, and are early to mid-successional in species complement and structure. These changes are a result of natural or man-induced perturbations due to increased or decreased hydroperiod, fire, clear cutting or land clearing, and siltation.

Shrub Swamps statewide may be dominated by one species, such as willow, or an array of opportunistic plants may form a dense, low canopy. Common species include willow, wax myrtle, primrose willow, buttonbush, and saplings of red maple, sweetbay, black gum, and other hydric tree species indicative of wooded wetlands. In northern Florida, some Shrub Swamps are a fire-maintained subclimax of Bay Swamps. These dense shrubby areas are dominated by black titi, swamp cyrilla, fetterbush, sweet pepperbush, doghobble, large gallberry, and myrtle-leaf holly.
Associated Species of Greatest Conservation Need

Mammals
- Corynorhinus rafinesquii  
  Rafinesque's Big-eared Bat
- Lontra canadensis lataxina  
  River Otter
- Puma concolor coryi  
  Florida Panther
- Ursus americanus floridanus  
  Florida Black Bear

Birds
- Anas fulvigula  
  Mottled Duck
- Ixobrychus exilis  
  Least Bittern
- Egretta thula  
  Snowy Egret
- Egretta caerulea  
  Little Blue Heron
- Nycticorax nycticorax  
  Black-crowned Night-Heron
- Nyctanassa violacea  
  Yellow-crowned Night-Heron
- Rostrhamus sociabilis  
  Snail Kite
- Vermivora chrysoptera  
  Golden-winged Warbler
- Vermivora cyanoptera  
  Blue-winged Warbler
- Protonotaria citrea  
  Prothonotary Warbler
- Limnothlypis swainsonii  
  Swainson’s Warbler
- Setophaga ruticilla  
  American Redstart
- Setophaga discolor discolor  
  Prairie Warbler
- Cardellina canadensis  
  Canada Warbler
- Euphagus carolinus  
  Rusty Blackbird

Amphibians
- Hyla andersonii  
  Pine Barrens Treefrog
- Lithobates okaloosae  
  Florida Bog Frog
- Lithobates virgatipes  
  Carpenter Frog
- Ambystoma tigrinum  
  Eastern Tiger Salamander
- Pseudobranchus striatus striatus  
  Broad-striped Dwarf Siren
- Stereochilus marginatus  
  Many-lined Salamander

Reptiles
- Alligator mississippiensis  
  American Alligator
- Anolis carolinensis seminolus  
  Southern Green Anole
- Plesiostodon anthracinus pluvialis  
  Southern Coal Skink
- Crotalus horridus  
  Timber Rattlesnake
- Drymarchon couperi  
  Eastern Indigo Snake
- Lampropeltis getula  
  Eastern Kingsnake
- Clemmys guttata  
  Spotted Turtle
- Terrapene carolina  
  Eastern Box Turtle

Fish
- Anguilla rostrata  
  American Eel
- Enneacanthus chaetodon  
  Black Banded Sunfish

Invertebrates
- Procambarus apalachicolae  
  A Crayfish

Chapter 6: Shrub Swamp
Conservation Threats

Because of serious problems interpreting this habitat in the workshops, threats could not be clearly identified and hence no specific conservation actions were developed by The Nature Conservancy’s process (FWC 2005). Spatial extent of this habitat has increased significantly from its likely natural distribution through hydrologic alteration and fire exclusion in adjacent wetland habitats. When experts examined the distribution of this cover type, they suggested that some of the Shrub Swamp habitat, especially in north Florida, consists of heavily degraded wet flatwoods that have become dominated by willow and titi. Most of this Shrub Swamp habitat was once savanna, wet prairie, or pine flatwoods in north and central Florida. In south and central Florida a substantial amount of Shrub Swamp is associated with the freshwater marsh/wet prairie habitat where fire has been excluded. Nevertheless, Shrub Swamp is habitat for species like bears, tree frogs, migratory birds, and salamanders. If the habitat is maintained as shrub swamp, those animals that are using it, can continue using it.

This habitat is not stressed by fragmentation or development, since most is in public ownership. However, this habitat will spread if similar or adjacent areas are drained and fire suppressed. The experts agreed that the spatial extent of this habitat should not be allowed to increase as a result of these factors. Additionally, fire and management are needed so that this habitat will not succeed into Bay Swamp. As a result, the experts recommend active management to decrease the area of this habitat and restore the more natural habitats that have been overgrown by shrubs in many areas.

The recommendation of the experts was to subsume this habitat under the habitats from which it has succeeded due to fire and hydrological changes. For these reasons, threats and actions are presented as bulleted lists with no prioritization.

The following stresses threaten this habitat:

- Altered community structure
- Altered fire regime - timing, frequency, intensity, extent
- Altered hydrologic regime - timing, duration, frequency, extent
- Altered soil structure and chemistry
- Altered species composition/dominance
- Altered water quality of surface water or aquifer: contaminants
- Altered water quality of surface water or aquifer: nutrients

The sources of stress, or threats, were used to generate conservation actions.
● Ground water withdrawal
● Incompatible fire
● Invasive animals
● Invasive plants
● Surface water withdrawal

Conservation Actions

Actions to abate threats to Shrub Swamp were designed to reduce the impacts to this habitat and increase the suitability to wildlife. Most threats were statewide (incompatible fire, invasive animals, invasive plants, and surface and groundwater withdrawal).

The actions to abate threats that were identified for Shrub Swamp habitat are below, though none were prioritized for implementation.

**Capacity Building**

- Form and facilitate partnerships, alliances and networks of organizations willing to research, conserve and manage this habitat

**Land/Water/Species Management**

- Convert invasive-dominated sites into early-successional habitat, and maintain

**Research, Education and Awareness**

- Target education for homeowners, developers, construction contractors, and policy makers to benefit wildlife in their day-to-day activities
- Research plans for restoration of this habitat and its hydrology
- Better define and map current condition, and develop management practices to achieve the future condition of this habitat
Softwater Stream

Status
Current condition: Variable by size. Large Softwater Streams were considered good and declining, but small Softwater Streams were judged poor and declining. According to the best available GIS information at this time (See Appendix C: GIS Data Tables), 19,401 miles (31,223 km) Softwater Stream habitat exists.

Habitat Description

FNAI type: Blackwater Stream

Typical Softwater Streams originate from sandy flats containing broad wetlands which collect rainfall and slowly release water into the stream. This habitat category has water with low pH, low carbonate, that may be stained by tannins and humic acids filtered from the drainage of swamps and marshes. The flow rate is usually gentle in smaller streams to moderate in larger, but is altogether influenced by seasonal local rainfall. These streams typically have sand or silt bottoms with varying amounts of aquatic vegetation. Plants include golden club, smartweed, sedges, and grasses. Softwater Streams differ from Alluvial Streams by having high, steep banks, and by lacking extensive floodplains and natural levees. This habitat is well distributed throughout Florida, except in the regions of north and central Florida dominated by Calcareous Streams, and in the Everglades/Big Cypress region of south Florida, where wetlands and coastal streams dominate the aquatic landscape. Most of the streams in this category are small natural streams originating in pinelands or swamps or small natural segments of otherwise channelized streams in south central Florida. Smaller Softwater Streams examples include Big Coldwater Creek, Pine Barren Creek, Big Escambia Creek, Big Sweetwater Creek. Large Softwater Stream examples include the Blackwater, Wacassassa, Yellow, Perdido, Econfina, Aucilla, Sopchoppy, St. Marys, or Ochlockonee rivers.
## Associated Species of Greatest Conservation Need

### Mammals
- Corynorhinus rafinesquii, Rafinesque's Big-eared Bat
- Eptesicus fuscus, Big Brown Bat
- Eumops floridanus, Florida Bonneted Bat
- Lasiurus borealis borealis, Red Bat
- Lasiurus cinereus cinereus, Hoary Bat
- Lasiurus intermedius floridanus, Northern Yellow Bat
- Lasiurus seminolus, Seminole Bat
- Myotis austroriparius, Southeastern Myotis
- Myotis grisescens, Gray Bat
- Perimyotis subflavus, Tricolored Bat
- Tadarida brasiliensis cynocephala, Brazilian Free-tailed Bat
- Lontra canadensis lataxina, River Otter
- Trichechus manatus latirostris, West Indian Manatee

### Birds
- Ardea herodias, Great Blue Heron
- Ardea alba, Great Egret
- Egretta caerulea, Little Blue Heron
- Butoirides virescens, Green Heron
- Elanoides forficatus, Swallow-tailed Kite
- Haliaeetus leucocephalus, Bald Eagle
- Aramus guarauna, Limpkin
- Parkesia motacilla, Louisiana Waterthrush

### Amphibians
- Amphiuma pholeter, One-toed Amphiuma
- Desmognathus auriculatus, Southern Dusky Salamander

### Reptiles
- Alligator mississippiensis, American Alligator
- Nerodia cyclopion, Mississippi Green Watersnake
- Seminatrix pygaea cyclas, Southern Florida Swampsnake
- Apalone mutica calvata, Gulf Coast Smooth Softshell
- Apalone spinifera aspera, Gulf Coast Spiny Softshell
- Clemmys guttata, Spotted Turtle
- Graptemys barbouri, Barbour's Map Turtle
- Graptemys ernsti, Escambia Map Turtle
- Macrochelys temminckii, Alligator Snapping Turtle
- Pseudemys suwanniensis, Suwannee Cooter

### Fish
- Acipenser brevirostrum, Shortnose Sturgeon
- Acipenser oxyrinchus desotoi, Gulf of Mexico Sturgeon
- Acipenser oxyrinchus oxyrinchus, Atlantic Sturgeon
- Anguilla rostrata, American Eel
- Alosa aestivalis, Blueback Herring
- Alosa alabamae, Alabama Shad
- Hybognathus hayi, Cypress Minnow

Chapter 6: Habitats - Softwater Stream
• Luxilus chrysocephalus  Striped Shiner
• Luxilus zonistius  Bandfin Shiner
• Lythrurus atrapiculus  Blacktip Shiner
• Macrhybopsis n. sp. cf. aestivalis  Florida Chub/Speckled Chub
• Moxostoma n. sp. cf. poecilurum  Grayfin Redhorse
• Nocomis leptcephalus  Bluehead Chub
• Notropis baileyi  Rough Shiner
• Notropis harperi  Redeye Chub
• Pteronotropis velaka  Bluenose Shiner
• Cyprinodon variegatus hubssi  Lake Eustis Pupfish
• Fundulus blairae  Lowland Topminnow
• Umbra pygmaea  Eastern Mudminnow
• Atractosteus spatula  Alligator Gar
• Agonostomus monticola  Mountain Mullet
• Awaous banana  River Goby
• Acantharus pomotis  Mud Sunfish
• Enneacanthus chaetodon  Black Banded Sunfish
• Etheostoma histrio  Harlequin Darter
• Etheostoma okaloosae  Okaloosa Darter
• Etheostoma olmstedi  Tessellated Darter
• Etheostoma parvipinne  Goldstripe Darter
• Etheostoma proeliare  Cypress Darter
• Micropterus cataractae  Shoal Bass
• Micropterus notius  Suwannee Bass
• Percina austroperca  Southern Logperch
• Percina vigil  Saddleback Darter
• Ameiurus serracanthus  Spotted Bullhead

Invertebrates
• Alasmidonta wrightiana  Ochlockonee Arcmussel
• Anodontoides radiatus  Rayed Creekshell
• Elliptio arctica  Delicate Spike
• Elliptio chipolaensis  Chipola Slabshell
• Elliptio mcmichaeli  Fluted Elephant-ear
• Elliptoidea sloatianus  Purple Bankclimber
• Fusconaia burkei  Tapered Pigtoe
• Fusconaia escambia  Narrow Pigtoe
• Fusconaia rotulata  Round Ebonyshell
• Hamiota subangulata  Shiny-rayed Pocketbook
• Lampsilis floridensis  Yellow Sandshell
• Lampsilis ornata  Southern Pocketbook
• Medionidus simpsonianus  Ochlockonee Moccasinshell
• Medionidus walkerii  Suwannee Moccasinshell
• Megalonaias nervosa  Washboard
• Pleurobema pyriforme  Oval Pigtoe
• Pleurobema strodeanum  Fuzzy Pigtoe
• Psychobranchus jonesi  Southern Kidneyshell
• Quadrula infucata  Sculptured Pigtoe
• Quadrula kleiniana  Suwannee Pigtoe
• Utterbackia peninsularis  Peninsular Floater
• Villosa choctawensis  Choctaw Bean
• Villosa villosa  Downy Rainbow
- **Elimia albanyensis**  Black-crested Elimia Snail
- **Elimia clenchii**  Clench's Goniobasis
- **Floridobia fraterna**  Creek Siltsnail
- **Cambarus miltus**  Rusty Grave Digger
- **Procamburus latipleurum**  A Crayfish
- **Procamburus pictus**  Black Creek Crayfish
- **Procamburus youngi**  Florida Longbeak Crayfish
- **Procloeon rubropictum**  A Mayfly
- **Procloeon rufostrigatum**  A Mayfly
- **Baetisca becki**  A Mayfly
- **Baetisca escamiensis**  A Mayfly
- **Baetisca gibbera**  A Mayfly
- **Baetisca obesa**  A Mayfly
- **Baetisca rogersi**  A Mayfly
- **Dolania americana**  American Sand-burrowing Mayfly
- **Sparbarus nasutus**  A Mayfly
- **Attenella attenuata**  Hirsute Mayfly
- **Dannella simplex**  A Mayfly
- **Hexagenia bilineata**  A Mayfly
- **Heptagenia flavescens**  A Mayfly
- **Macdunnoa brunnea**  A Mayfly
- **Pseudiron centralsis**  White Sand-river Mayfly
- **Asioplax dolani**  A Mayfly
- **Siphloplecton brunneum**  A Mayfly
- **Siphloplecton fuscum**  A Mayfly
- **Siphloplecton simile**  A Mayfly
- **Homoeoneuria dolani**  Blue Sand-river Mayfly
- **Isonychia bernerii**  A Mayfly
- **Isonychia sicca**  A Mayfly
- **Hetaerina americana**  American Rubyspot
- **Neurocordulia molesta**  Smoky Shadowfly
- **Neurocordulia obsoleta**  Umber Shadowfly
- **Macromia alleghaniensis**  Allegheny River Cruiser
- **Allocapnia starki**  Slender Winter Stonefly
- **Alloperla prognoides**  A Stonefly
- **Leuctra cottaquilla**  A Stonefly
- **Leuctra ferruginea**  A Stonefly
- **Amphinemura nigritta**  A Stonefly
- **Tallaperla cornelia**  Southeastern Roachfly
- **Acronura evoluta**  A Stonefly
- **Acronura lycorias**  A Stonefly
- **Agnetina annulipes**  A Stonefly
- **Neoperla carlsoni**  A Stonefly
- **Perlinella zwicki**  A Stonefly
- **Helopicus bogaloosa**  A Stonefly
- **Helopicus subvarians**  A Stonefly
- **Hydroperla phormidia**  A Stonefly
- **Isogenoides varians**  Rock Island Springfly
- **Pteronarcys dorsata**  A Stonefly
- **Taeniopteryx burksi**  Eastern Willowfly
- **Taeniopteryx hirica**  A Stonefly
- **Cicindela blanda**  Sandbar Tiger Beetle
- **Cicindela hirticollis**  Hairy-necked Tiger Beetle
Conservation Threats

Threats to the Softwater Stream habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Chemicals and toxins
- Conversion to agriculture
- Conversion to commercial/industrial development
- Conversion to housing and urban development
- Groundwater withdrawal
- Incompatible recreational activities
- Incompatible forestry practices
- Incompatible resource extraction—mining/drilling
- Invasive animals
Softwater Streams, commonly known as “blackwater streams,” are among the most ubiquitous stream habitats in Florida and the Southeast. As such, they are subject to a wide variety of threats, many of them serious and statewide in scope. The majority of Softwater Streams are creeks and small rivers and are particularly vulnerable to conversion of riparian and floodplain areas to various forms of development. Softwater Streams are naturally low nutrient systems and are likewise vulnerable to even modest increases in nutrient loading. Fragmentation of this habitat occurs as a result of riparian conversion, channelization and loss of connection with floodplain wetlands. Additional threats specific to this habitat include the effects of stream channelization, operation of dams or control structures on small to medium sized Softwater Streams statewide and the impacts of sedimentation caused by road crossings and boat wakes.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Fragmentation of habitats, communities, ecosystems</td>
</tr>
<tr>
<td>B</td>
<td>Altered hydrologic regime</td>
</tr>
<tr>
<td>C</td>
<td>Altered landscape mosaic or context</td>
</tr>
<tr>
<td>D</td>
<td>Erosion/sedimentation</td>
</tr>
<tr>
<td>E</td>
<td>Altered water quality of surface water or aquifer: nutrients</td>
</tr>
<tr>
<td>F</td>
<td>Altered community structure</td>
</tr>
<tr>
<td>G</td>
<td>Altered species composition/dominance</td>
</tr>
<tr>
<td>H</td>
<td>Altered water quality of surface water or aquifer: contaminants</td>
</tr>
<tr>
<td>I</td>
<td>Habitat destruction or conversion</td>
</tr>
<tr>
<td>J</td>
<td>Altered water salinity, pH, conductivity or other physical water quality characteristics</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Surface water withdrawal</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Conversion to agriculture</td>
<td>High</td>
</tr>
<tr>
<td>3</td>
<td>Nutrient loads - agriculture</td>
<td>High</td>
</tr>
<tr>
<td>4</td>
<td>Roads</td>
<td>High</td>
</tr>
<tr>
<td>5</td>
<td>Conversion to housing and urban development</td>
<td>High</td>
</tr>
<tr>
<td>6</td>
<td>Dam operations</td>
<td>Medium</td>
</tr>
<tr>
<td>7</td>
<td>Nutrient loads – urban</td>
<td>Medium</td>
</tr>
<tr>
<td>8</td>
<td>Incompatible resource extraction: mining/drilling</td>
<td>Medium</td>
</tr>
<tr>
<td>9</td>
<td>Chemicals and toxins</td>
<td>Medium</td>
</tr>
</tbody>
</table>
### Conservation Actions

Actions to abate the threats to Softwater Stream that were also identified as statewide threats (surface water withdrawal and diversion, conversion to agriculture, nutrient loads–urban, nutrient loads–agriculture, roads, conversion to housing and urban development, nutrient loads–urban, incompatible resource extraction: mining/drilling, chemicals and toxins, conversion to commercial/industrial development, invasive animals, invasive plants, incompatible recreational activities, incompatible forestry practices, groundwater withdrawal) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat were only applicable to Softwater Stream and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Cypress Swamp, Freshwater Marsh and Wet Prairie, Natural Lake, Reservoir/Managed Lake, Seepage/Steephead Stream, Spring and Spring Run, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. Additional actions were developed to address threats specific to this habitat. These actions are intended to prevent harm to aquatic ecosystems by setting limits on the magnitude, duration and frequency of downstream water releases required to support aquatic habitat and remediating the damage to Softwater Streams caused by channelization, dams and phosphate mining through targeted restoration projects.

### Surface Water Withdrawal

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Support funding of the Kissimmee River Restoration Headwaters Revitalization Projects, and assess the value of expansion to apply to SGCN.</td>
<td>VH</td>
<td>H</td>
<td>VH</td>
</tr>
</tbody>
</table>
### Conversion to Agriculture

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage incentives for maintenance and conversion of lands to agricultural uses that use less water and result in lower nutrient outputs into Florida's waters and wetlands and encourage market-based incentives to compensate private landowners for the environmental services they provide to the State through management that increases water storage and nutrient reduction.</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

### Roads

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work with USFWS to improve coordination of the Technical Advisory Committee for the Stream Crossing Technical Center (SCTC).</td>
<td>VH</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Based on a stream crossing inventory and prioritization, develop funding opportunities for road stabilization projects in Florida counties.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Provide training to road maintenance personnel on methods for minimizing sediment movement to water bodies.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Support the start-up and operation of the Stream Crossing Technical Center (SCTC) to promote recovery and conservation of aquatic ecosystems from interactions between unpaved road-stream crossings that result in sediment movement into streams.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Conversion to Housing and Urban Development

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Encourage conservation of lake frontage, riparian habitats and their floodplains.</td>
<td>M</td>
<td>L</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Support incentives program that encourages development of and use of a buffer zone between new development and river or floodplain edges, of a minimum distance (e.g., Farm Bill programs).</td>
<td>M</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Dam Operations

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Capacity Building</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Coordinate interstate Action Plan actions to ensure that all fish and wildlife resources in all states are protected when changing dams operations in shared basins. (USFWS)</td>
<td>M</td>
<td>H</td>
<td>L</td>
</tr>
</tbody>
</table>

| L            | Coordinate multiagency review of USACE activities, including biological aspects (fish spawn guidelines, protection of fish and wildlife resources) of water control plans for interstate water projects, fish spawn guidelines, re-establishing natural seasonal fluctuation of flows. | H | L | M |
### Incompatible Resource Extraction: Mining/Drilling

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Fund and create incentives for completing the reclamation of impaired stream systems identified in the Non-mandatory Land Reclamation Report for phosphate mining region.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

### Chemicals and Toxins

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop management techniques and recommendations for private landowners that minimize runoff of chemicals and toxins into wetlands and aquatic systems.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Conduct research defining appropriate sediment quality standards for the various aquatic and marine systems. Fund research defining the relationship between sediment contamination (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine systems.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>Conduct research defining standards for persistent organic contaminants for the various aquatic and marine systems. Fund research defining the relationship between contamination from organics (individually and in chemical interactions) and key biological indicators of degradation in different aquatic and marine.</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

### Invasive Plants

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Research methods for control of aquatic invasive species in flowing waters where current control methods for those species are only effective in non-flowing waters.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
Spring and Spring Run

Status
Current condition: Poor and declining. According to the best available GIS information at this time (Appendix C: GIS Data Tables), there are approximately 570 springs arising from the Floridian Aquifer, constituting a total spring-run length of about 572 miles (921 km).

Habitat Description

FNAI type: Spring-run Stream

This habitat is present in the north and central regions of Florida, in most of the same areas occupied by Calcareaous Stream habitat, where underlying limestone is close to the surface. Spring and Spring Run often represent headwaters or low-order tributaries of, and thus share many characteristics with Calcareaous Streams. The Spring and Spring Run originate from and have direct outflow as artesian openings in the underground, limestone, Floridan aquifer. Because of the calcareous nature of the limestone aquifer, the outflow from most springs carries dissolved mineral ions such as calcium, magnesium, bicarbonate, sulfate, and sodium. Springs typically have high water clarity, low sedimentation, stable channels, and openings that are less than 40 feet (12.2 m) wide. Individual springs are stable systems, with very little change in water temperature, water flow, or chemical composition, but those characteristics can vary from one spring to the next. The bottoms of spring runs are generally sand or exposed limestone along a central, stable channel. Vegetation in Spring and Spring Run consists of submerged aquatic vegetation, aquatic algae covering limestone outcroppings, and species such as tape grass, wild rice, and giant cutgrass located in the spring runs. The constant temperatures of springs provide essential habitat for manatees and some species of fish. Examples of Spring and Spring Run include Silver Springs, Manatee Springs, Spring Creek, Blue Spring, and Rainbow Springs.
## Associated Species of Greatest Conservation Need

### Mammals
- **Corynorhinus rafinesquii** - Rafinesque's Big-eared Bat
- **Eptesicus fuscus** - Big Brown Bat
- **Lasiurus borealis borealis** - Red Bat
- **Lasiurus cinereus cinereus** - Hoary Bat
- **Lasiurus intermedius floridanus** - Northern Yellow Bat
- **Lasiurus seminolus** - Seminole Bat
- **Myotis austroriparius** - Southeastern Myotis
- **Myotis grisescens** - Gray Bat
- **Perimyotis subflavus** - Tricolored Bat
- **Tadarida brasiliensis cynocephala** - Brazilian Free-tailed Bat
- **Lontra canadensis lataxina** - River Otter
- **Neovison vison halilimnetes** - Gulf Salt Marsh Mink
- **Trichechus manatus latirostris** - West Indian Manatee

### Birds
- **Ixobrychus exilis** - Least Bittern
- **Ardea herodias** - Great Blue Heron
- **Ardea alba** - Great Egret
- **Egretta thula** - Snowy Egret
- **Egretta caerulea** - Little Blue Heron
- **Butorides virescens** - Green Heron
- **Nycticorax nycticorax** - Black-crowned Night-Heron
- **Nyctanassa violacea** - Yellow-crowned Night-Heron
- **Elanoides forficatus** - Swallow-tailed Kite
- **Ictinia mississippiensis** - Mississippi Kite
- **Aramus guarauna** - Limpkin
- **Protonotaria citrea** - Prothonotary Warbler

### Amphibians
- **Amphiuma pholenter** - One-toed Amphiuma
- **Desmognathus auriculatus** - Southern Dusky Salamander

### Reptiles
- **Alligator mississippiensis** - American Alligator
- **Farancia erytrogramma** - Rainbow Snake
- **Graptemys barbouri** - Barbour's Map Turtle
- **Macrochelys temminckii** - Alligator Snapping Turtle
- **Pseudemys nelsoni** - Florida Red-bellied Cooter (Panhandle Population)
- **Pseudemys suwanniensis** - Suwannee Cooter

### Fish
- **Acipenser brevirostrum** - Shortnose Sturgeon
- **Acipenser oxyrinchus desotoi** - Gulf of Mexico Sturgeon
- **Acipenser oxyrinchus oxyrinchus** - Atlantic Sturgeon
- **Anguilla rostrata** - American Eel
- **Alosa aestivalis** - Blueback Herring
- **Alosa alabamae** - Alabama Shad
- **Luxilus chrysocephalus** - Striped Shiner
- Luxilus zonistius: Bandfin Shiner
- Lythrurus atrapiculus: Blacktip Shiner
- Notropis harperi: Redeye Chub
- Cyprinodon variegatus hubbsi: Lake Eustis Pupfish
- Atractosteus spatula: Alligator Gar
- Agonostomus monticola: Mountain Mullet
- Awaous banana: River Goby
- Acantharchus pomotis: Mud Sunfish
- Enneacanthus chaetodon: Black Banded Sunfish
- Etheostoma histrio: Harlequin Darter
- Etheostoma okaloosae: Okaloosa Darter
- Etheostoma olmstedi: Tessellated Darter
- Etheostoma parvipinne: Goldstripe Darter
- Micropterus cataractae: Shoal Bass
- Micropterus notius: Suwannee Bass
- Percina vigil: Saddleback Darter
- Ameiurus brunnneus: Snail Bullhead
- Ameiurus serracanthus: Spotted Bullhead

**Invertebrates**

- Elliptio chipolaensis: Chipola Slabshell
- Hamiola subangulata: Shiny-rayed Pocketbook
- Medionidus acutissimus: Alabama Moccasinshell
- Medionidus penicillatus: Gulf Moccasinshell
- Medionidus walkeri: Suwannee Moccasinshell
- Pleurobema pyriforme: Oval Pigtoe
- Psychobranchus jonesi: Southern Kidneyshell
- Quadrula infucata: Sculptured Pigtoe
- Quadrula kleiniana: Suwannee Pigtoe
- Villosa amygdala: Florida Rainbow
- Villosa villosa: Downy Rainbow
- Amnicola rhombostoma: Squaremouth Amnicola
- Aphastracon asthenes: Blue Spring Hydrobe Snail
- Aphastracon chalarogyrus: Freemouth Hydrobe Snail
- Aphastracon monas: Wekiwa Hydrobe, Wekiwa Springs Aphastracon
- Aphastracon pycnus: Dense Hydrobe Snail
- Aphastracon theiocrenetum: Clifton Springs Hydrobe Snail
- Aphastracon xynoelictum: Fenney Springs Hydrobe Snail
- Dasycisia franzii: Shaggy Ghostsnail
- Elimia albanyensis: Black-crested Elimia Snail
- Elimia clenchii: Clench's Goniobasis
- Floridobia alexander: Alexander Spring Siltsnail
- Floridobia helicogyra: Crystal Siltsnail
- Floridobia leptospira: Flatwood Siltsnail
- Floridobia mica: Ichetucknee Siltsnail
- Floridobia monroensis: Enterprise Siltsnail
- Floridobia parva: Pygmy Siltsnail
- Floridobia petrifons: Rock Springs Siltsnail
- Floridobia ponderosa: Ponderous Spring Siltsnail
- Floridobia porterae: Green Cove Spring Siltsnail
- Floridobia vanhyningi: Seminole Spring Siltsnail
- Floridobia wekiwae: Wekiwa Siltsnail
- Somatogyrus sp.  Somatogyrus sp.
- Cambarellus schmitti  A Crayfish
- Procambarus youngi  Florida Longbeak Crayfish
- Macrobrachium acanthurus  Cinnamon River Shrimp
- Macrobrachium carcinus  Big Claw River Shrimp
- Macrobrachium ohione  Ohio River Shrimp
- Diphetor hageni  A Mayfly
- Caenis eglinensis  Eglin Caenis Mayfly
- Stenacron floridense  A Mayfly
- Cordulegaster obliqua fasciata  Banded Spiketail
- Cordulegaster sayi  Say's Spiketail
- Neurocordulia molesta  Smoky Shadowfly
- Dromogomphus armatus  Southeastern Spinyleg
- Gomphus geminatus  Twin-striped Clubtail
- Gomphus hodgesi  Hodges' Clubtail
- Gomphus hybridus  Cocoa Clubtail
- Gomphus modestus  Gulf Coast Clubtail
- Progomphus bellei  Belle, Belle's Sanddragon
- Macromia alleghaniensis  Allegheny River Cruiser
- Allocapnia starki  Slender Winter Stonefly
- Leuctra ferruginea  A Stonefly
- Leuctra triloba  A Stonefly
- Helopus subvarians  A Stonefly
- Hydroperla phormidia  A Stonefly
- Isogenoides varians  Rock Island Springfly
- Spanglerogyrus albiventris  Red Hills Unique Whirligig Beetle
- Heteropteron americanum  A Caddisfly
- Cheumatopsyche gordonae  Gordon's Little Sister Sedge Caddisfly
- Cheumatopsyche petersi  Peters' Cheumatopsyche Caddisfly
- Hydroptila apalachicola  Apalachicola Hydroptila Caddisfly
- Hydroptila bernerii  Berner's Microcaddisfly
- Hydroptila briobae  Kriebel's Hydroptila Caddisfly
- Hydroptila eglinensis  Saberlike Hydroptila Caddisfly
- Hydroptila hamiltoni  Hamilton's Hydroptila Caddisfly
- Hydroptila molsonae  Molson's Microcaddisfly
- Hydroptila okaloosa  Rogue Creek Hydroptila Caddisfly
- Hydroptila sarahae  Sarah's Hydroptila Caddisfly
- Hydroptila sykorai  Sykora's Hydroptila Caddisfly
- Hydroptila wakulla  Wakulla Springs Vari-colored Microcaddisfly
- Neotrichia rasmussenii  Rasmussen's Neotrichia Caddisfly
- Ochotrichia apalachicola  Apalachicola Ochotrichian Caddisfly
- Orthotrichia cartta  Short Orthotrichian Microcaddisfly
- Orthotrichia dentata  Dentate Orthotrichian Microcaddisfly
- Ochotrichia okaloosa  Okaloosa Somber Microcaddisfly
- Oxyethira chrysocara  Gold Head Branch Caddisfly
- Oxyethira elerobii  Elerob's Microcaddisfly
- Oxyethira florida  Florida Cream And Brown Microcaddisfly
- Oxyethira kelleyi  Kelly's Cream And Brown Mottled Microcaddisfly
- Oxyethira novasota  Novasota Oxyethiran Microcaddisfly
- Oxyethira pescadori  Pescador's Bottle-cased Caddisfly
- Oxyethira setosa  Setose Cream And Brown Mottled Microcaddisfly
- Lepidostoma morsei  Morse's Little Plain Brown Sedge
- Nectopsyche tavara  Tavares White Miller Caddisfly
• *Oecetis daytona*  Daytona Long-horned Caddisfly
• *Oecetis morsei*  Morse's Long-horned Sedge
• *Oecetis parva*  Little Oecetis Longhorned Caddisfly
• *Triaenodes furcellus*  Little-fork Triaenode Caddisfly
• *Psilotreta frontalis*  A Caddisfly
• *Chimarra florida*  Floridian Finger-net Caddisfly
• *Cernotina truncona*  Florida Cernotinan Caddisfly
• *Nyctiophylax morsei*  Morse's Dinky Light Summer Sedge
• *Polycentropus floridensis*  Florida Brown Checkered Summer Sedge
• *Agarodes libalis*  Spring-loving Psiloneuran Caddisfly
• *Agarodes ziczac*  Zigzag Blackwater River Caddisfly

**Conservation Threats**

Threats to Spring and Spring Run habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Conversion to commercial/industrial development
- Conversion to recreation areas
- Groundwater withdrawal
- Incompatible forestry practices
- Incompatible recreational activities
- Invasive animals
- Invasive plants
- Nutrient loads–agriculture
- Nutrient loads–urban
- Surface water withdrawal/diversion

Nutrient loading of groundwater, perhaps in conjunction with other threats, has led to profound changes in the ecological functioning and composition of Spring and Spring Run similar to those resulting from eutrophication in lake and wetland systems. This eutrophication alters species composition and community structure, contributing to the productivity and population growth of algae and invasive plant and animal species. Increased withdrawal of groundwater in urbanizing areas of central and north Florida threatens to significantly alter the hydrology of these systems over the next five to ten years. Additional habitat-specific threats were identified, including decreased water input from recharge areas as both the impervious surface within springsheds and groundwater withdrawals increase and the presence of numerous invasive animals in the systems, especially fishes and freshwater snails, the effects of which are likely to be profound, but which are relatively less well studied than are those of invasive plants.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Altered species composition/dominance</td>
<td>Very High</td>
</tr>
<tr>
<td>B Altered water quality of surface water or aquifer: nutrients</td>
<td>Very High</td>
</tr>
<tr>
<td>C Altered community structure</td>
<td>High</td>
</tr>
<tr>
<td>D Habitat destruction or conversion</td>
<td>High</td>
</tr>
<tr>
<td>E Altered hydrologic regime</td>
<td>High</td>
</tr>
<tr>
<td>F Erosion/sedimentation</td>
<td>Medium</td>
</tr>
<tr>
<td>G Altered water quality of surface water or aquifer: contaminants</td>
<td>Low</td>
</tr>
</tbody>
</table>
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Nutrient loads – urban</td>
<td>Very High</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>2 Invasive plants</td>
<td>Very High</td>
<td>A, C, D</td>
</tr>
<tr>
<td>3 Nutrient loads – agriculture</td>
<td>High</td>
<td>A, B, C, D</td>
</tr>
<tr>
<td>4 Invasive animals</td>
<td>High</td>
<td>A, C</td>
</tr>
<tr>
<td>5 Incompatible recreational activities</td>
<td>Medium</td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>6 Surface water withdrawal</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>7 Groundwater withdrawal</td>
<td>Medium</td>
<td>C, D, E</td>
</tr>
<tr>
<td>8 Conversion to recreation areas</td>
<td>Low</td>
<td>A, C, D</td>
</tr>
<tr>
<td>9 Incompatible forestry practices</td>
<td>Low</td>
<td>C, D</td>
</tr>
<tr>
<td>10 Conversion to commercial and industrial development</td>
<td>Low</td>
<td>D</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**  Very High

**Conservation Actions**

Actions to abate the threats to Springs and Spring Run that were also identified as statewide threats (nutrient loads–urban, invasive plants, nutrient loads–agriculture, invasive animals, incompatible recreational activities, surface water diversion and withdrawal, groundwater withdrawal, conversion to recreation areas, incompatible forestry practices, conversion to commercial/industrial development) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat were only applicable to Spring and Spring Run and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Cypress Swamp, Freshwater Marsh and Wet Prairie, Natural Lake, Reservoir/Managed Lake, Seepage/Steephead Stream, Softwater Stream, Terrestrial Cave, and Coastal Tidal River or Stream) and are listed below. These actions were designed to prevent harm to stream ecosystems influenced by groundwater inflows by placing limits on the total permissible nutrient loads, to substantially increase the acreage of spring recharge lands protected from development, to ensure that development in unprotected springsheds is designed to maintain recharge functions, minimize groundwater withdrawals, reduce nutrient loading to groundwater and reduce recreational pressure on springs by limiting use to scientifically-based estimates of carrying capacity.

**Nutrient Loads – Urban**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Monitor effects on groundwater ecosystems as well as biota where groundwater discharges to springs and other surface waters.</td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

Chapter 6: Habitats - Spring and Spring Run
### Invasive Plants

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Research methods for control of aquatic invasive species in flowing waters where current control methods for those species are only effective in non-flowing waters.</td>
<td>VH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Incompatible Recreational Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Research</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Determine how variation in recreational carrying capacities affect wildlife and wildlife habitat in Spring and Spring Runs.</td>
<td>H</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

### Groundwater Withdrawal

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water Protection</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>Support programs to conserve important natural habitats significant to watershed recharge and springs.</td>
<td>H</td>
<td>VH</td>
<td>VH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Support implementation of recommendations of the Florida Springs Task Force in its report Florida’s Springs: Strategies for Protection and Restoration, November 2000.</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Explore options and alternative methods to protect submarine springs.</td>
<td>H</td>
<td>H</td>
<td>L</td>
</tr>
</tbody>
</table>
Chapter 6: Habitats - Subtidal Unconsolidated Marine/Estuary Sediment

Status
Current condition: Unknown.
Due to the lack of sufficient map data for this habitat category, no acreage estimates are currently available.

Habitat Description

FNAI type: Unconsolidated Substrate

This habitat consists of mineral based natural communities generally characterized as expansive, relatively open areas within subtidal, intertidal, and supratidal zones that are zero to less than 10% colonized by seagrasses or corals. Substrates include coralgae, marl, mud, mud/sand, sand or shell. Types and distribution of unconsolidated sediments vary greatly throughout Florida and originate from parent sources, such as decaying plant tissues (e.g., mud) or from calcium carbonate depositions of plants or animals (e.g., coralgae, marl and shell substrates). While marl and coralgae substrates are primarily restricted to the southern portion of the state, unconsolidated sediments composed of mud, mud/sand, sand, and shell, are found throughout the coastal areas of Florida. This habitat category may support large populations of infaunal, transient planktonic and pelagic organisms (e.g., tube worms, sand dollars, mollusks, isopods, amphipods, burrowing shrimp, and an assortment of crabs). The intertidal and supratidal zones are important feeding areas for many shorebird and invertebrate species. Furthermore, infaunal organisms in subtidal zones can reach densities of the tens of thousands per meter square, making these areas important feeding grounds for many bottom feeding fish.

Associated Species of Greatest Conservation Need

Mammals
- *Trichechus manatus latirostris*  
  West Indian Manatee
Chapter 6: Habitats - Subtidal Unconsolidated Marine/Estuary Sediment

**Birds**
- *Ardea herodias* Great Blue Heron
- *Ardea alba* Great Egret
- *Nycticorax nycticorax* Black-crowned Night-Heron
- *Nyctanassa violacea* Yellow-crowned Night-Heron
- *Platalea ajaja* Roseate Spoonbill

**Reptiles**
- *Crocodylus acutus* American Crocodile
- *Nerodia clarkii clarkii* Gulf Saltmarsh Watersnake
- *Nerodia clarkii compressicauda* Mangrove Saltmarsh Watersnake
- *Seminatrix pygaea cyclas* Southern Florida Swampsnake
- *Caretta caretta* Loggerhead Sea Turtle
- *Chelonia mydas* Green Sea Turtle
- *Eretmochelys imbricata* Hawksbill Sea Turtle
- *Lepidochelys kempii* Kemp's Ridley Sea Turtle
- *Malaclemys terrapin* Diamond-backed Terrapin

**Fish**
- *Acipenser brevirostrum* Shortnose Sturgeon
- *Acipenser oxyrinchus desotoi* Gulf of Mexico Sturgeon
- *Acipenser oxyrinchus oxyrinchus* Atlantic Sturgeon
- *Alosa aestivalis* Blueback Herring
- *Alosa alabamae* Alabama Shad
- *Aetobatus narinari* Spotted Eagle Ray
- *Alopias superciliosus* Bigeye Thresher Shark
- *Carcharhinus obscurus* Dusky Shark
- *Carcharhinus perezi* Reef Shark
- *Carcharhinus plumbeus* Sandbar Shark
- *Carcharias taurus* Sand Tiger Shark
- *Carcharodon carcharias* White Shark
- *Galeocerdo caviar* Tiger Shark
- *Manta birostris* Giant Manta Ray
- *Negaprion brevirostris* Lemon Shark
- *Pristis pectinata* Smalltooth Sawfish
- *Pristis pristis* Largetooth Sawfish
- *Sphyrna lewini* Scalloped Hammerhead
- *Sphyrna mokarran* Great Hammerhead
- *Sphyrna zygaena* Smooth Hammerhead
- *Squalus acanthias* Cape Shark, Piked Dogfish, Spurdog
- *Atractosteus spatula* Alligator Gar
- *Agonostomus monticola* Mountain Mullet
- *Ctenogobius pseudofasciatus* Slashcheek Goby
- *Ctenogobius stigmatus* Spottail Goby
- *Epinephelus drummondhayi* Speckled Hind
- *Epinephelus itajara* Goliath Grouper
- *Epinephelus nigritus* Warsaw Grouper

**Invertebrates**
- *Epicystis crucifer* Beaded (Rock) Anemone
- *Acropora cervicornis* Staghorn Coral
- Manicina areolata Rose Coral
- Solenastrea hyades Knobby Star Coral
- Pseudobiceros splendidus Red-rim Flatworm, Splendid Flatworm
- Crassostrea virginica Eastern Oyster
- Panopea bitruncata Atlantic Geoduck
- Calliostoma javanicum Chocolate-lined Topsnail
- Lithopoma americanum American Star Snail
- Cassis flamma Flame Helmet
- Cassis tuberosa King Helmet
- Cypraea cervus Atlantic Deer Cowrie
- Charonia tritonis variegata Atlantic Trumpet Triton
- Strombus gallus Roostertail Conch
- Strombus gigas Queen Conch
- Fasciolaria lilium Banded Tulip
- Dolabrifera dolabrifera Warty Seacat
- Cyerce crystallina Harlequin Glass-slug
- Elysia clarki Lettuce Sea Slug
- Elysia picta Painted Elysia
- Octopus burryi Brownstripe Octopus
- Octopus joubini Atlantic Pygmy Octopus
- Luidia senegalensis Nine-armed Sea Star
- Oreaster reticulatus Cushion Star, Bahama Star
- Astropyga magnifica Magnificent Urchin
- Diadema antillarum Long-spined Urchin
- Clypeaster chesheri A Sea Biscuit
- Clypeaster luetkeni A Sea Biscuit
- Clypeaster rosaceus West Indian Sea Biscuit
- Clypeaster subdepressus Sea Biscuit
- Ocnus suspectus A Sea Cucumber
- Havelockia inermis A Sea Cucumber
- Neothyoniidium parvum A Sea Cucumber
- Euthyonidiella destichada A Sea Cucumber
- Euthyonidiella trita A Sea Cucumber
- Actinopyga agassizii Five-toothed Sea Cucumber, West Indian Sea Cucumber
- Holothuria mexicana Donkey Dung Sea Cucumber
- Holothuria parvula A Sea Cucumber

Conservation Threats

Threats to Subtidal Unconsolidated Marine/Estuary Sediment habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Channel modification/shipping lanes
- Chemicals and toxins
- Coastal development
- Dam operations/incompatible release of water (quality, quantity, timing)
- Incompatible industrial operations
- Incompatible recreational activities
- Invasive animals
- Management of nature (beach nourishment and impoundments)
- Nutrient loads–urban
- Roads, bridges and causeways
- Surface water and groundwater withdrawal
The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Altered water quality–contaminants</td>
</tr>
<tr>
<td>B</td>
<td>Habitat disturbance</td>
</tr>
<tr>
<td>C</td>
<td>Altered species composition</td>
</tr>
<tr>
<td>D</td>
<td>Altered water quality–nutrients</td>
</tr>
<tr>
<td>E</td>
<td>Altered water quality–physical, chemistry</td>
</tr>
<tr>
<td>F</td>
<td>Habitat destruction</td>
</tr>
<tr>
<td>G</td>
<td>Altered hydrologic regime</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dam operations/incompatible release of water (quality, quantity, timing)</td>
<td>High</td>
<td>A, B, D, E, G</td>
</tr>
<tr>
<td>2 Inadequate stormwater management</td>
<td>High</td>
<td>A, B, C, D, E, G</td>
</tr>
<tr>
<td>3 Coastal development</td>
<td>High</td>
<td>A, B, F, G</td>
</tr>
<tr>
<td>4 Chemicals and toxins</td>
<td>High</td>
<td>A, B, C</td>
</tr>
<tr>
<td>6 Incompatible industrial operations</td>
<td>High</td>
<td>A, F, G</td>
</tr>
<tr>
<td>7 Channel modification/shipping lanes</td>
<td>Medium</td>
<td>B, F, G</td>
</tr>
<tr>
<td>8 Fishing gear impacts</td>
<td>Medium</td>
<td>B, F</td>
</tr>
<tr>
<td>9 Incompatible recreational activities</td>
<td>Medium</td>
<td>B</td>
</tr>
<tr>
<td>10 Roads, bridges and causeways</td>
<td>Medium</td>
<td>B</td>
</tr>
<tr>
<td>11 Management of nature (beach nourishment, impoundments)</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>12 Boating impacts</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>13 Nutrient loads</td>
<td>Low</td>
<td>C</td>
</tr>
<tr>
<td>14 Invasive animals</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>15 Thermal pollution</td>
<td>Low</td>
<td>B, E</td>
</tr>
<tr>
<td>16 Solid waste</td>
<td>Low</td>
<td>B</td>
</tr>
<tr>
<td>17 Surface water withdrawal</td>
<td>Low</td>
<td>E</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat** | High

**Conservation Actions**

Most threats to Subtidal Unconsolidated Marine/Estuary Sediment habitat were also identified as statewide threats (see list above). Actions to abate them are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Habitat-specific threats to Subtidal Unconsolidated Marine/Estuary Sediment are boating impacts, solid waste, and thermal pollution, which also affect
several other marine and estuarine habitats. Consequently, actions to abate these threats will be the same or similar to the actions recommended for abating threats to several other marine and estuarine habitats (e.g., Coastal Tidal River or Stream, Mangrove Swamp, Seagrass, Subtidal Unconsolidated Marine/Estuary Sediment, Tidal Flat) and are not repeated here.
Terrestrial Cave

Status
Current condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), several hundred Terrestrial Caves are likely to exist in Florida, although most have not been mapped. Of the Terrestrial Caves currently mapped, 19% (7) are in existing conservation or managed areas, 22% (8) are in private lands encompassed by Florida Forever project areas, and 11% (4) are in SCHA-identified lands, and the remaining 47% (17) occur in other private lands.

Habitat Description

FNAI type: Terrestrial Cave

Terrestrial Caves are cavities below the surface of the ground that do not contain permanent standing water. However, some cave systems can contain both aquatic and terrestrial cave conditions with Terrestrial Cave conditions existing in fissures over standing water. Due to the rise and fall of water levels many terrestrial caves have alternately been aquatic caves. Terrestrial Caves are known to occur in at least 26 Florida counties and are limited to north and central Florida. Caves develop in areas of karst topography; water moves through underlying limestone and dissolves it and creates fissures and caverns. Caves have stable internal environments with temperature and humidity levels remaining fairly constant. In the twilight zones of caves, where some light is present, some plants may exist, although these are limited to mosses, liverworts, ferns, and algae. Beyond the twilight zone, no plants are found and the food chain is dependent on detritus and fecal matter entering the cave.
Associated Species of Greatest Conservation Need

Mammals
- *Myotis australis*  
  Southeastern Myotis
- *Myotis grisescens*  
  Gray Bat
- *Perimyotis subflavus*  
  Tricolored Bat

Invertebrate
- *Centromerus latidens*  
  A Sheetweaver Spider
- *Islandiana sp. 2*  
  Marianna Cave Sheetweb Weaver Spider
- *Pseudosinella pecki*  
  Peck's Cave Springtail

Conservation Threats

Threats to the Terrestrial Caves habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Incompatible recreational activities
- Incompatible resource extraction: mining/drilling

Threats specific to Terrestrial Cave also included mining activities causing destruction of habitat. Mining has been known to open up new cave habitat that was previously inaccessible to bats, but can also close off or destroy existing habitat. Habitat-specific incompatible recreation includes gating cave entrances and filling in cave openings to prevent trespass from unauthorized recreation. Caves support unique/irreplaceable species and those with very unique adaptations that may be sensitive to small increases in levels of contaminants, shifts in air temperature or food webs.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Habitat degradation/disturbance</td>
<td>High</td>
</tr>
<tr>
<td>B  Keystone species missing or lacking in abundance</td>
<td>High</td>
</tr>
<tr>
<td>C  Habitat destruction or conversion</td>
<td>Medium</td>
</tr>
<tr>
<td>D  Altered species composition/dominance</td>
<td>Low</td>
</tr>
<tr>
<td>E  Altered water and/or soil temperature</td>
<td>Low</td>
</tr>
</tbody>
</table>
The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Incompatible recreational activities</td>
<td>High</td>
<td>A, B, C</td>
</tr>
<tr>
<td>2 Solid waste</td>
<td>Medium</td>
<td>A, B, C</td>
</tr>
<tr>
<td>3 Incompatible resource extraction: mining/drilling</td>
<td>Medium</td>
<td>B, C</td>
</tr>
</tbody>
</table>

Statewide Threat Rank of Habitat: Medium

**Conservation Actions**

Actions to abate the threats to Terrestrial Caves that were also identified as statewide threats (incompatible recreational activities, incompatible resource extraction: mining/drilling) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Several of the actions developed for a statewide threat that were only applicable to Terrestrial Caves and a few other habitats (i.e., Aquatic Cave, Calcareous Stream, Cypress Swamp, Freshwater Marsh and Wet Prairie, Natural Lake, Reservoir/Managed Lake, Seepage/Steephead Stream, Softwater Stream, Spring and Spring Run, and Coastal Tidal River or Stream) and are listed below. These actions are intended to prevent harm to cave and other ecosystems influenced by groundwater by developing numeric nutrient criteria specific to cave systems and to prevent physical destruction or degradation of cave habitat from recreational activities and facilitate movement of bats and other species through upgrading or retrofitting cave entrances and infrastructure for access.

**Incompatible Recreational Activities**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Provide incentives (e.g., liability limitations where appropriate management procedures have been taken), cost-sharing, or design advice to secure cave entrances with bat-friendly gates.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

**Incompatible Resource Extraction: Mining/Drilling**

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic and Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Create incentives to avoid loss of, and impacts to, SHCAs and sensitive habitats from mining, particularly wet and dry prairie, scrub, and bat caves.</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>
Tidal Flat

Status
Current condition: Poor and declining. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 442,500 acres (179,073 ha) of Tidal Flat habitat exist, of which 71% (316,000 ac; 127,881 ha) are protected in reserves and easements. Another 14% (60,000 ac; 24,281 ha) are proposed for acquisition. The remaining 15% (66,500 ac; 26,912 ha) are other private lands.

Habitat Description

FNAI type: None

Tidal flats are non-vegetated areas of sand or mud protected from wave action and composed primarily of mud transported by tidal channels. An important characteristic of the tidal flat environment is its alternating tidal cycle of submergence and exposure to the atmosphere.

Associated Species of Greatest Conservation Need

Mammals
- *Lontra canadensis lataxina*  River Otter
- *Neovison vison hallimnetes*  Gulf Salt Marsh Mink
- *Neovison vison lutensis*  Atlantic Salt Marsh Mink
- *Neovison vison ssp.*  Mink
- *Procyn lotor auspicus*  Key Vaca Raccoon
- *Procyn lotor incaucus*  Key West Raccoon
- *Procyn lotor inesperatus*  Matecumbe Key Raccoon
- *Trichechus manatus latirostris*  West Indian Manatee
Birds

- **Anas fulvigula**  Mottled Duck
- **Pelecanus occidentalis**  Brown Pelican
- **Ardea herodias**  Great Blue Heron
- **Ardea herodias occidentalis**  Great White Heron
- **Ardea alba**  Great Egret
- **Egretta thula**  Snowy Egret
- **Egretta tricolor**  Tricolored Heron
- **Egretta rufescens**  Reddish Egret
- **Nycticorax nycticorax**  Black-crowned Night-Heron
- **Nyctanassa violacea**  Yellow-crowned Night-Heron
- **Platalea ajaja**  Roseate Spoonbill
- **Haliaeetus leucocephalus**  Bald Eagle
- **Falco columbarius**  Merlin
- **Falco peregrinus**  Peregrine Falcon
- **Pluvialis squatarola**  Black-bellied Plover
- **Pluvialis dominica**  American Golden-Plover
- **Charadrius nivosus**  Snowy Plover
- **Charadrius wilsonia**  Wilson's Plover
- **Charadrius melodus**  Piping Plover
- **Haematopus palliatus**  American Oystercatcher
- **Tringa semipalmata semipalmata**  Eastern Willet
- **Tringa semipalmata inornata**  Western Willet
- **Tringa flavipes**  Lesser Yellowlegs
- **Numenius phaeopus**  Whimbrel
- **Numenius americanus**  Long-billed Curlew
- **Limosa fedoa**  Marbled Godwit
- **Arenaria interpres**  Ruddy Turnstone
- **Calidris canutus**  Red Knot
- **Calidris canutus rufa**  Red Knot (rufa)
- **Calidris pusilla**  Semipalmated Sandpiper
- **Calidris mauri**  Western Sandpiper
- **Calidris fascicollis**  White-rumped Sandpiper
- **Calidris alpina**  Dunlin
- **Calidris himantopus**  Stilt Sandpiper
- **Limnodromus griseus**  Short-billed Dowitcher
- **Limnodromus scolopaceus**  Long-billed Dowitcher
- **Phalaropus tricolor**  Wilson's Phalarope
- **Chlidonias niger**  Black Tern

Reptiles

- **Crocodylus acutus**  American Crocodile
- **Farancia erytrogramma**  Rainbow Snake
- **Nerodia clarkii clarkii**  Gulf Saltmarsh Watersnake
- **Nerodia clarkii compressicauda**  Mangrove Saltmarsh Watersnake
- **Nerodia clarkii taeniata**  Atlantic Saltmarsh Watersnake
- **Caretta caretta**  Loggerhead Sea Turtle
- **Lepidochelys kempii**  Kemp's Ridley Sea Turtle
- **Malaclemys terrapin**  Diamond-backed Terrapin

Fish

- **Acipenser oxyrinchus desotoi**  Gulf of Mexico Sturgeon
- **Acipenser oxyrinchus oxyrinchus**  Atlantic Sturgeon
• *Alosa aestivalis*  Blueback Herring
• *Alosa alabamae*  Alabama Shad
• *Aetobatus narinari*  Spotted Eagle Ray
• *Carcharhinus plumbeus*  Sandbar Shark
• *Carcharias taurus*  Sand Tiger Shark
• *Negaprion brevirostris*  Lemon Shark
• *Pristis pectinata*  Smalltooth Sawfish
• *Pristis pristis*  Largetooth Sawfish
• *Atractosteus spatula*  Alligator Gar
• *Agonostomus monticola*  Mountain Mullet
• *Epinephelus itajara*  Goliath Grouper

**Invertebrates**

• *Panopea bitruncata*  Atlantic Geoduck
• *Uca minax*  Red-jointed Fiddler, Brackish Water Fiddler
• *Uca pugilator*  Sand Fiddler
• *Uca pugnax*  Mud Fiddler
• *Cicindela togata togata*  White-cloaked Tiger Beetle

**Conservation Threats**

Threats to Tidal Flat habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

• Channel modification/shipping lanes
• Chemicals and toxins
• Climate variability
• Coastal development
• Dam operations/incompatible release of water (quality, quantity, timing)
• Disruption of longshore transport of sediments
• Fishing gear impacts
• Harmful algal blooms
• Incompatible industrial operations
• Incompatible recreational activities
• Industrial spills
• Invasive animals
• Management of nature (beach nourishment and impoundments)
• Roads, bridges and causeways
• Shoreline hardening
• Surface and groundwater withdrawal
• Vessel impacts

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Altered water quality – physical, chemistry</td>
</tr>
<tr>
<td>B</td>
<td>Altered species composition</td>
</tr>
<tr>
<td>C</td>
<td>Altered water quality - contaminants</td>
</tr>
<tr>
<td>D</td>
<td>Habitat destruction</td>
</tr>
<tr>
<td>E</td>
<td>Habitat disturbance</td>
</tr>
<tr>
<td>F</td>
<td>Altered hydrological regime</td>
</tr>
<tr>
<td>G</td>
<td>Altered weather regime/sea level rise</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.
### Sources of Stress

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal development</td>
<td>Very High</td>
<td>B, C, D, E, F</td>
</tr>
<tr>
<td>Incompatible industrial operations</td>
<td>Very High</td>
<td>B, C, D, E, F</td>
</tr>
<tr>
<td>Incompatible recreational activities</td>
<td>High</td>
<td>B, E</td>
</tr>
<tr>
<td>Roads, bridges and causeways</td>
<td>High</td>
<td>D, E, F</td>
</tr>
<tr>
<td>Inadequate stormwater management</td>
<td>High</td>
<td>A, B, C, E, F</td>
</tr>
<tr>
<td>Management of nature (beach nourishment, impoundments)</td>
<td>High</td>
<td>B, E, F</td>
</tr>
<tr>
<td>Invasive animals</td>
<td>High</td>
<td>B, E</td>
</tr>
<tr>
<td>Chemicals and toxins</td>
<td>High</td>
<td>C</td>
</tr>
<tr>
<td>Industrial spills</td>
<td>High</td>
<td>B, C</td>
</tr>
<tr>
<td>Dam operations/incompatible release of water (quality, quantity, timing)</td>
<td>High</td>
<td>A, C, F</td>
</tr>
<tr>
<td>Solid waste</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>Disruption of longshore transport of sediments</td>
<td>Medium</td>
<td>A, B, D, F</td>
</tr>
<tr>
<td>Climate variability</td>
<td>Medium</td>
<td>G</td>
</tr>
<tr>
<td>Shoreline hardening</td>
<td>Medium</td>
<td>D, F</td>
</tr>
<tr>
<td>Boating impacts</td>
<td>Medium</td>
<td>E</td>
</tr>
<tr>
<td>Channel modification/shipping lanes</td>
<td>Medium</td>
<td>D, E, F</td>
</tr>
<tr>
<td>Surface water withdrawal</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>Groundwater withdrawal</td>
<td>Medium</td>
<td>A</td>
</tr>
<tr>
<td>Vessel impacts</td>
<td>Medium</td>
<td>D, E</td>
</tr>
<tr>
<td>Harmful algal blooms</td>
<td>Medium</td>
<td>B</td>
</tr>
<tr>
<td>Fishing gear impacts</td>
<td>Low</td>
<td>E</td>
</tr>
</tbody>
</table>

### Conservation Actions

Actions to abate the threats to Tidal Flat habitats that were also identified as statewide threats (see list above) are in Chapter 7: Multiple Habitat Threats and Conservation Actions. Many of the threats to Tidal Flats are the same as for several other marine and estuarine habitats. Consequently, actions to abate these threats will be the same or similar to the actions recommended for abating threats to several other marine and estuarine habitats (e.g., **Beach/Surf Zone**, **Mangrove Swamp**, **Seagrass**, **Coastal Tidal River or Stream**).
Tropical Hardwood Hammock

Status
Current condition: Poor and declining.
According to the best available GIS information at this time (see Appendix C: GIS Data Tables), 15,232 acres (6,164 ha) of Tropical Hardwood Hammock habitat exist, of which 71% (10,867 ac; 4,398 ha) are in existing conservation or managed areas. Another 10% (1,470 ac; 595 ha) are Florida Forever projects and 5% (783 ac; 317 ha) are SHCA-identified lands. The remaining 14% (2,112 ac; 855 ha) are other private lands.

Habitat Description

FNAI type: Rockland Hammock

These upland hardwood forests occur only in south Florida and are characterized by tree and shrub species on the northern edge of a range that extends southward into the Caribbean. These communities are sparsely distributed along coastal uplands south of a line from about Vero Beach on the Atlantic coast to Sarasota on the Gulf coast. They occur on many tree islands in the Everglades and on uplands throughout the Florida Keys. This cold-intolerant tropical community has very high plant species diversity, sometimes containing over 35 species of trees and about 65 species of shrubs. Characteristic tropical plants include strangler fig, gumbo-limbo, mastic, bustic, lancewood, ironwoods, poisonwood, pigeon plum, Jamaica dogwood, and Bahama lysiloma. Live oak and cabbage palm are also sometimes found within this community. Tropical Hardwood Hammocks in the Florida Keys may also contain several plants, including lignum vitae, mahogany, thatch palms, and manchineel, which are extremely rare within the United States.
Associated Species of Greatest Conservation Need

Mammals
- *Eumops floridanus* Florida Bonneted Bat
- *Lasiurus intermedius floridanus* Northern Yellow Bat
- *Lasiurus seminolus* Seminole Bat
- *Perimyotis subflavus* Tricolored Bat
- *Sylvilagus palustris hefneri* Lower Keys Marsh Rabbit
- *Neotoma floridana smalli* Key Largo Woodrat
- *Peromyscus gossypinus allapaticola* Key Largo Cotton Mouse
- *Neovison vison evergladensis* Everglades Mink
- *Procyon lotor auspicatus* Key Vaca Raccoon
- *Procyon lotor incautus* Key West Raccoon
- *Procyon lotor inesperatus* Matecumbe Key Raccoon
- *Puma concolor coryi* Florida Panther
- *Ursus americanus floridanus* Florida Black Bear
- *Odocoileus virginianus clavium* Key Deer

Birds
- *Colinus virginianus* Northern Bobwhite
- *Buteo brachyrurus* Short-tailed Hawk
- *Falco columbarius* Merlin
- *Falco peregrinus* Peregrine Falcon
- *Patagioenas leucocephala* White-crowned Pigeon
- *Coccyzus minor* Mangrove Cuckoo
- *Megascops asio* Eastern Screech-Owl
- *Vireo altiloquus* Black-whiskered Vireo
- *Helmitheros vermivorum* Worm-eating Warbler
- *Parkesia motacilla* Louisiana Waterthrush
- *Vermivora chrysoptera* Golden-winged Warbler
- *Vermivora cyanoptera* Blue-winged Warbler
- *Protonotaria citrea* Prothonotary Warbler
- *Lindrochilus swainsonii* Swainson's Warbler
- *Setophaga ruticilla* American Redstart
- *Setophaga cerulea* Cerulean Warbler
- *Setophaga castanea* Bay-breasted Warbler
- *Setophaga petechia gundlachi* Cuban Yellow Warbler
- *Setophaga discolor discolor* Prairie Warbler
- *Setophaga discolor paludicola* Florida Prairie Warbler
- *Cardellina canadensis* Canada Warbler

Reptiles
- *Plestiodon egregius egregius* Florida Keys Mole Skink
- *Sphaerodactylus notatus notatus* Florida Reef Gecko
- *Crotalus adamanteus* Eastern Diamond-backed Rattlesnake
- *Diadophis punctatus acrius* Key Ring-necked Snake
- *Drymarchon couperi* Eastern Indigo Snake
- *Heterodon platirhinos* Eastern Hog-nosed Snake
- *Lampropeltis getula* Eastern Kingsnake
- *Pantherophis guttatus* Red Cornsake (Lower Keys population)
- Storeria victa  
  Florida Brownsnake (Keys Population)
- Tantilla oolitica  
  Rim Rock Crowned Snake
- Thamnophis sauritus sackenii  
  Peninsula Ribbonsnake (Lower Keys Population)
- Kinosternon baurii  
  Striped Mud Turtle (Lower Keys Population)
- Terrapene carolina  
  Eastern Box Turtle

Invertebrates
- Drymaeus multilineatus latizonatus  
  Wide-banded Forest Snail
- Liguus fasciatus  
  Florida Tree Snail
- Orthalicus floridensis  
  Banded Tree Snail
- Orthalicus reses (not incl. nesodryas)  
  Stock Island Tree Snail
- Orthalicus reses nesodryas  
  Florida Keys Tree Snail
- Hojeda inaguensis  
  Keys Mudcloak
- Cychlodinella poeyana  
  Truncate Urocoptid
- Stenodontes chevrolati  
  Crenulate Horn
- Eustala eleutherana  
  Eleuthera Orb Weaver
- Coenobita clypeatus  
  Land Hermit Crab
- Cardisoma guanhumi  
  Great Land Crab (Blue Land Crab)
- Bolocephalus sleighti  
  Keys Short-winged Conehead Katydid
- Cycloptilum irregularis  
  Keys Scaly Cricket
- Eburia stroheckeri  
  Strohecker's Ivory-spotted Long-horned Beetle
- Linsleyonides albomaculatus  
  Tropical White-spotted Long-horned Beetle
- Stenodonta chevrollati  
  Chevrolat's Tropical Long-horned Beetle
- Phyllophaga clemens  
  Clemens' June Beetle
- Phyllophaga youngi  
  Young's June Beetle
- Rutela formosa  
  Handsome Flower Scarab Beetle
- Eparyleus zestos  
  Zestos Skipper
- Chlorostrymon naeis  
  Amethyst Hairstreak
- Chlorostrymon simaethis  
  Silver-banded Hairstreak
- Cyclargus thomasi bethunebakeri  
  Miami Blue
- Eumaeus atala  
  Atala
- Ministrymon azia  
  Gray Ministreak
- Strymon martialis  
  Martial Scrub-hairstreak
- Anthamassa frisia  
  Cuban Crescent
- Eunica monima  
  Dingy Purplewing
- Eunica tatila tatilista  
  Florida Purplewing
- Neonympha helicta dadeensis  
  Helicta Satyr (Miami-Dade Subspecies)
- Siproeta stelenes  
  Malachite
- Heraclides aristodemus ponceanus  
  Schaus Swallowtail Butterfly
- Papilio andraemon bonhotei  
  Bahamian Swallowtail
- Papilio aristodemus ponceanus  
  Schaus' Swallowtail
- Appias drusilla  
  Florida White
- Eurema nise  
  Mimosa Yellow
- Kricogonia lyside  
  Lyside Sulphur
- Pyrisitia dina  
  Dina Yellow
Conservation Threats

Threats to Tropical Hardwood Hammock habitat that were also identified for multiple other habitats are addressed in Chapter 7: Multiple Habitat Threats and Conservation Actions. These threats include:

- Chemicals and toxins
- Invasive animals
- Conversion to housing and urban development
- Invasive plants
- Groundwater withdrawal
- Roads
- Incompatible fire
- Surface water withdrawal

Threats specific to Tropical Hardwood Hammock were limited to incompatible residential activities that include movement of fertilizer, herbicide, and invasive species from landscape maintenance, activities of people, their pets, and nuisance species, and disposal of yard and household waste. Feral or pet cats and roof rats were specifically identified as threatening SGCN in this habitat.

The following stresses and sources of stress threaten this habitat:

<table>
<thead>
<tr>
<th>Stresses</th>
<th>Habitat Stress Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Altered landscape mosaic or context (S and E of canal L-31)</td>
</tr>
<tr>
<td>B</td>
<td>Excessive depredation and/or parasitism</td>
</tr>
<tr>
<td>C</td>
<td>Altered species composition/dominance</td>
</tr>
<tr>
<td>D</td>
<td>Altered hydrologic regime</td>
</tr>
<tr>
<td>E</td>
<td>Altered community structure</td>
</tr>
<tr>
<td>F</td>
<td>Fragmentation of habitats, communities, ecosystems (in urban)</td>
</tr>
<tr>
<td>G</td>
<td>Habitat destruction or conversion (on private lands)</td>
</tr>
<tr>
<td>H</td>
<td>Altered fire regime</td>
</tr>
<tr>
<td>I</td>
<td>Altered soil structure and chemistry (on Rock Ridge)</td>
</tr>
<tr>
<td>J</td>
<td>Insufficient size/extent of characteristic communities or ecosystems</td>
</tr>
<tr>
<td>K</td>
<td>Habitat degradation/disturbance</td>
</tr>
<tr>
<td>L</td>
<td>Missing key communities, functional guilds, or seral stages</td>
</tr>
</tbody>
</table>

The sources of stress, or threats, were used to generate conservation actions.

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Invasive animals</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Invasive plants</td>
<td>High</td>
</tr>
<tr>
<td>3</td>
<td>Incompatible fire</td>
<td>Medium</td>
</tr>
<tr>
<td>4</td>
<td>Groundwater withdrawal</td>
<td>Medium</td>
</tr>
<tr>
<td>5</td>
<td>Conversion to housing and urban development</td>
<td>Medium</td>
</tr>
</tbody>
</table>
### Sources of Stress

<table>
<thead>
<tr>
<th>Sources of Stress</th>
<th>Habitat Source Rank</th>
<th>Related Stresses (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface water withdrawal</td>
<td>Medium</td>
<td>C, D</td>
</tr>
<tr>
<td>Incompatible vegetation harvest</td>
<td>Low</td>
<td>B, C</td>
</tr>
<tr>
<td>Nuisance animals</td>
<td>Low</td>
<td>A, B, C</td>
</tr>
<tr>
<td>Chemicals and toxins</td>
<td>Low</td>
<td>A, C</td>
</tr>
<tr>
<td>Incompatible wild animal harvest</td>
<td>Low</td>
<td>B, C</td>
</tr>
<tr>
<td>Roads</td>
<td>Low</td>
<td>A, D</td>
</tr>
<tr>
<td>Incompatible residential activities</td>
<td>Low</td>
<td>A</td>
</tr>
<tr>
<td>Incompatible agricultural practices</td>
<td>Low</td>
<td>A</td>
</tr>
</tbody>
</table>

**Statewide Threat Rank of Habitat**  
High

### Conservation Actions

Actions to abate the threats to Tropical Hardwood Hammock that were also identified as statewide threats (see list above in Conservation Threats section) are in Chapter 7: Multiple Habitat Threats and Conservation Actions.

Actions to abate specific threats that were identified for Tropical Hardwood Hammock are below, though none were ranked of high priority for implementation. These actions were designed to reduce the impacts from activities of residents adjacent to this habitat and the animals that accompany residential development.

### Nuisance Animals

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Land/Water/Species Management</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Work with the USDA Animal and Plant Health Inspection Service to establish and implement a trapping program for controlling feral cats in specific tropical hardwood hammocks to protect native species from excessive depredation.</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Planning and Standards</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Develop management techniques for waste management in areas where SGCN or habitats are subject to high depredation or disturbance rates by exotic and nuisance animals with populations elevated by garbage (providing a supplemental food source).</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Policy</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Assist counties, municipalities, and homeowners associations to develop and implement curbside pick-up of yard and household waste.</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Promote increased awareness and understanding of potential impacts of outdoor pet feeding on wildlife, and encourage homeowners to feed pets indoors.</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L</td>
<td>Support local governments to ensure that home and business owners have wildlife-proof garbage containers.</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>
### Incompatible Residential Activities

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Economic And Other Incentives</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Expand the scale of the Florida Yards and Neighborhoods program from certifying individual landowners to whole neighborhoods; certification should be renewed biennially and any time property ownership changes.</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Support incentives for residential property owners to resolve issues of incompatible use of and including pesticide use, pet control, feeding of wildlife, household or yard waste disposal, landscape plants, irrigation use, prescribed fire tolerance, and light-use in coastal areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Identify and promote effective reward models for homeowners, maintenance companies, and municipalities for reducing impacts on neighboring conservation areas.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>Develop a voluntary program directed at developers to provide on-site specific educational materials and recommendations to homeowner associations about incompatible residential activities.</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>Education and Awareness</th>
<th>Feasibility</th>
<th>Benefits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Encourage and support continuing education opportunities for landscape maintenance industry that includes appropriate use of chemicals, irrigation, plants, and disposal of yard waste.</td>
<td>H</td>
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</tbody>
</table>
Urban/Developed

Status
Current condition: Not applicable. According to the best available GIS information at this time (see Appendix C: GIS Data Tables), approximately 4,222,166 acres (1,708,650 ha) of Urban/Developed areas are present in Florida.

Habitat Description

FNAI type: None

This habitat includes a mixture of built structure (e.g., roads, residential and commercial buildings, and parking lots) and vegetation including lawns, golf courses, road shoulders, airports, park facilities, and natural remnants surrounded by or located near residential/commercial development. Many secondary roads are included in this category.

Associated Species of Greatest Conservation Need

Mammals
- *Eptesicus fuscus*  Big Brown Bat
- *Eumops floridanus*  Florida Bonneted Bat
- *Lasiurus borealis borealis*  Red Bat
- *Lasiurus intermedius floridanus*  Northern Yellow Bat
- *Lasiurus seminolus*  Seminole Bat
- *Tadarida brasiliensis cynocephala*  Brazilian Free-tailed Bat
- *Geomys pinetis pinetis*  Southeastern Pocket Gopher
- *Sciurus niger avicennia*  Big Cypress Fox Squirrel
- *Tamias striatus*  Eastern Chipmunk
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**Procyon lotor auspicatus** Key Vaca Raccoon
**Procyon lotor incautus** Key West Raccoon
**Procyon lotor inesperatus** Matecumbe Key Raccoon
**Puma concolor coryi** Florida Panther
**Ursus americanus floridanus** Florida Black Bear
**Odocoileus virginianus clavium** Key Deer

**Birds**
- *Anas fulvigula* Mottled Duck
- *Mergus americana* Wood Stork
- *Ardea herodias occidentalis* Great White Heron
- *Egretta thula* Snowy Egret
- *Egretta caerulea* Little Blue Heron
- *Egretta tricolor* Tricolored Heron
- *Egretta rufescens* Reddish Egret
- *Nycticorax nycticorax* Black-crowned Night-Heron
- *Nyctanassa violacea* Yellow-crowned Night-Heron
- *Pandion haliaetus* Osprey
- *Haliaeetus leucocephalus* Bald Eagle
- *Falco sparverius paulus* Southeastern American Kestrel
- *Falco peregrinus* Peregrine Falcon
- *Grus canadensis pratensis* Florida Sandhill Crane
- *Haematopus palliatus* American Oystercatcher
- *Tringa solitaria* Solitary Sandpiper
- *Sternula antillarum* Least Tern
- *Sturnus dougallii* Roseate Tern
- *Rynchos niger* Black Skimmer
- *Columbina passerina* Common Ground-Dove
- *Colaptes auratus* Northern Flicker
- *Tyrannus dominicensis* Gray Kingbird
- *Lanius ludovicianus* Loggerhead Shrike
- *Aphelocoma coerulescens* Florida Scrub-Jay
- *Progne subis* Purple Martin
- *Hirundo rustica* Barn Swallow
- *Vermivora chrysoptera* Golden-winged Warbler
- *Vermivora cyanoptera* Blue-winged Warbler
- *Setophaga ruticilla* American Redstart
- *Setophaga kirtlandii* Kirtland's Warbler
- *Setophaga castanea* Bay-breasted Warbler
- *Setophaga dominica stoddardi* Stoddard's Yellow-throated Warbler
- *Setophaga discolor discolor* Prairie Warbler
- *Cardellina canadensis* Canada Warbler
- *Euphagus cyanocephalus* Brewer's Blackbird

**Reptiles**
- *Anolis carolinensis seminolus* Southern Green Anole
Chapter 6: Habitats - Urban/Developed

- *Plestiodon reynoldsi* Florida Sand Skink
- *Sceloporus woodi* Florida Scrub Lizard
- *Diadophis punctatus acricus* Key Ring-necked Snake
- *Drymarchon couperi* Eastern Indigo Snake
- *Heterodon platurhinos* Eastern Hog-nosed Snake
- *Heterodon simus* Southern Hog-nosed Snake
- *Lampropeltis extenuata* Short-tailed Snake
- *Pantherophis guttatus* Red Cornsake (Lower Keys population)
- *Storeria victa* Florida Brownsnake (Keys Population)
- *Tantilla oolitica* Rim Rock Crowned Snake
- *Tantilla relicta* Florida Crowned Snake
- *Virginia valeriae valeriae* Eastern Smooth Earthsnake (Highlands Co.)
- *Gopherus polyphemus* Gopher Tortoise
- *Terrapene carolina* Eastern Box Turtle

**Invertebrates**

- *Nastra neamathla* Neamathla Skipper
- *Polites baracoa* Baracoa Skipper
- *Eumaeus atala* Atala
- *Satyrium titus* Coral Hairstreak
- *Strymon martialis* Martial Scrub-hairstreak
- *Neonympha helicta dadeensis* Helicta Satyr (Miami-Dade Subspecies)
- *Siproeta stelenes* Malachite
- *Aphrissa statira* Statira

**Conservation Threats**

While threats to its conservation as well as remedial actions were identified during earlier workshops, the Urban/Developed habitat category was not addressed in the Threat and Action Workshops (FWC 2005) that generated tables of ranked threats and actions, as seen in most other habitat categories. The decision to not rank threats and actions for this habitat was made to maximize discussion time for higher-priority habitats and because of some disagreement over recognition of this habitat type as important to wildlife conservation. Therefore, threats and actions are presented as bulleted lists with no prioritization.

The following stresses threaten this habitat:

- Absent or insufficient biological legacies
- Altered community structure
- Altered fire regime - timing, frequency, intensity, extent
- Altered hydrologic regime - timing, duration, frequency, extent
- Altered landscape pattern or mosaic
- Altered soil structure and chemistry
- Altered species composition/dominance
- Altered successional dynamics
- Altered water and/or soil temperature
- Altered water quality of surface water or aquifer: contaminants
- Altered water quality of surface water or aquifer: nutrients
- Erosion/sedimentation
- Excessive depredation and/or parasitism
- Fragmentation of habitats, communities, ecosystems
- Habitat degradation/disturbance
Chapter 6: Habitats - Urban/Developed

- Insufficient size/extent of characteristic communities/ecosystems
- Keystone species missing or lacking in abundance
- Missing key communities, functional guilds, or seral stages

The sources of stress, or threats, were used to generate conservation actions.

- Chemicals and toxins
- Conversion to commercial and industrial development
- Conversion to housing and urban development
- Incompatible fire
- Incompatible recreational activities
- Incompatible wildlife and fisheries management strategies
- Invasive animals
- Invasive plants
- Light pollution
- Management of nature–impoundments
- Nuisance animals
- Nutrient loads–urban
- Parasites/pathogens
- Roads
- Solid waste
- Sonic pollution

**Conservation Actions**

Actions to abate threats to Urban/Developed were designed to reduce the impacts of urban activities and increase the habitat’s suitability to wildlife. Many threats were statewide (chemicals and toxins, conversion to commercial and industrial development, conversion to housing and urban development, incompatible fire, incompatible recreational activities, invasive animals, invasive plants, nutrient loads–urban, roads, and incompatible wildlife and fisheries management strategies).

The actions to abate threats that were identified for Urban/Developed habitat are below, though none were prioritized for implementation.

**Land/Water Protection**
- Develop low intensity recreation parks with native vegetation.
- Acquire open space with an emphasis on greenways and wildlife corridors

**Land/Water/Species Management**
- Restore hydrology by removing ditches, levees, and dams

**Law and Policy**
- Develop effective comprehensive land management for wildlife habitat enhancement
- Protect coast preserves with lighting ordinances
- Minimize connectivity impacts to wildlife through land use planning (e.g., avoid constructing new roads near wildlife crossings or water sources)
- Support incentives for residential property owners to resolve issues of incompatible use to enhance wildlife habitat or reduce development effects on wildlife and wildlife habitat
- Include green infrastructure (Glossary of Terms) costs in cost-benefit analyses of development
• Support policies that increase ease of recycling and reduce waste (e.g., curb-side pick-up of recyclable material)

**Research, Education and Awareness**

• Target education for homeowners, developers, construction contractors, and policy makers to benefit wildlife in their day-to-day activities
• Encourage wildlife-friendly landscaping (e.g., retaining dead leaves on palms for nesting and roosting animals, dead trees for cavity-nesting birds, etc.)
• Educate nuisance wildlife trappers and pest control operators on the proper methods for animal exclusion devices, especially ensuring breeding seasons are considered
• Educate architects about benefits of native plants for landscaping
• Educate homeowners about energy and water conservation
• Educate citizens about the dangers of feeding wildlife
• Support research on effective urban design to benefit wildlife
• Train policy makers on true smart growth and make wildlife issues a consideration
• Involve community volunteers in wildlife conservation efforts and increase their opportunities for involvement
• Educate homeowners about proper pesticide and fertilizer use and disposal

**Economic and Other Incentives**

• Provide incentives to improve land for wildlife
• Provide incentives to enhance the creation of developments that conserve wildlife habitat (e.g., permits are expedited)
• Support economic incentives for “green development” practices that enhance and benefit wildlife
• Provide awards to organizations and individuals that implement wildlife-friendly design and management practices
• Provide funds and materials for landowners to remove invasive exotics
• Support spay or neuter programs for cats and dogs and reduce number of free-ranging pets

**Capacity Building**

• Develop wildlife-friendly storm water runoff ponds
• Develop mass transit, pedestrian-friendly communities, and bike paths to reduce transport footprint