BACKGROUND

The influence of submersed plants in Kings Bay spans its ecology from water clarity to wildlife. For example, the opportunity to dive using SCUBA and observe West Indian manatees (Trichechus manatus) represents one of the principal attractions in Kings Bay (Buckingham 1989). Manatees use the bay primarily as a thermal refuge in the winter, but they also feed on submersed aquatic vegetation (Hauxwell et al. 2004a, b). Furthermore, recent research implicates reduced coverage of rooted aquatic macrophytes as the predominant factor contributing to diminished water clarity in this system (Hoyer et al. 2001). In fact, the distributions and abundances of native macrophytes, especially Vallisneria americana, have decreased noticeably in recent years, with invasive plant and algal species, e.g., Myriophyllum spicatum and Lyngbya spp., becoming more prevalent (Frazer and Hale 2001; Hauxwell et al. 2003; Notestein et al. 2005, 2006; Jacoby et al. 2007).

The distribution of submersed aquatic vegetation (SAV) within the bay is thought to reflect a complex interaction of physical, chemical and biological factors. For example, short-term and long-term variations in salinity regimes; variable nutrient loads to the system; variation in water clarity and light transmission; the introduction of non-native plants, e.g., Hydrilla verticillata and Myriophyllum spicatum; and grazing from manatees potentially influence the appearance and function of the SAV assemblage (Hauxwell et al. 2004a, b; Jacoby et al. 2007).

Water quality and quantity interact with several of the factors affecting SAV by altering light penetration, salinity regimes, residence times, loading rates and other hydrologic processes. Thus, coupling spatial and temporal patterns in SAV abundance with data related to water chemistry, salinity fluctuations and other variables represents an important task for the Southwest Florida Water Management District.

This project provides an evaluation of vegetation for the Kings Bay–Crystal River system that compares to one conducted in 2004, 2005 and 2006 (Jacoby et al. 2007). This final report and the accompanying databases document results from October 2010 through November 2013.

METHODS

Study system

Kings Bay is a tidally influenced, spring-fed system located near the City of Crystal River in Citrus County on the west coast of peninsular Florida (approximate coordinates 28° 53.3’ N and -82° 35.9’ W). The bay comprises approximately 1.75 km² of water from 1 m to 3 m deep (Haller et al. 1983; Hammett et al. 1996; Bachmann et al. 2001). Numerous springs supply groundwater to the bay, with the total discharge averaging 27.6 m³ s⁻¹ (Yobbi and Knochenmus 1989). Kings Bay forms the headwaters of the Crystal River, which flows westward for approximately 10 km to the Gulf of Mexico.

Field sampling and laboratory processing

Sampling was conducted at 71 previously established stations (Frazer and Hale 2001; Figure 1; Appendix A). At each station, divers sampled three, haphazardly placed, replicate quadrats. In each quadrat, they visually estimated total percent cover of all plants and percent cover for different taxa. Previous sampling yielded data for eleven types of vegetation: filamentous algae (including Lyngbya spp.¹), Ceratophyllum demersum, Chara sp., Hydroilla verticillata, Myriophyllum spicatum, Najas guadalupensis, Potamogeton pectinatus, Potamogeton pusillus, Ruppia maritima, Vallisneria americana, and Zannichellia palustris. After making these estimates, the divers removed all aboveground

¹ Filamentous algae often appeared to be a single species, but samples collected in February 2004 revealed multiple species in the entangled mats (Notestein et al. 2005). Therefore, only attached macroalgae in the genus Chara were identified separately. Lyngbya spp. consistently comprised a major component of filamentous algae.
plant biomass and placed it into a uniquely labeled plastic bag. Bags were transported to the University of Florida for processing.

**Figure 1. An illustration of the 71 sampling stations previously established in Kings Bay.**

In the laboratory, samples from each quadrat were rinsed in fresh water and sorted into taxonomic categories. Samples for each category were dried at 70 °C to a constant weight. These dry weights, recorded to the nearest 0.001 g, represented a quantitative measure of biomass.²

Percent cover and biomass provide complementary views of submersed aquatic vegetation. Percent cover data elucidate the distribution of plants and algae and provide a quantitative measure of abundance based on the amount of “space” occupied. Space was considered three-dimensional because quadrats typically contained multiple layers of plants and algae. Due to layering, the coverage of plants, algae, and bare substratum (the area without vegetation) can sum to more than 100%, but values reported here are scaled to 100%. Biomass, expressed as kilograms dry weight per square meter (kg DW m⁻²), provides additional data on the distribution of plants and algae and yields a quantitative measure of abundance as standing crop, which indicates the amount of carbon, nutrients and other resources sequestered in the tissues of plants and algae.

**Production of maps**
Maps of percent cover and biomass were created in ArcGIS Desktop v.10.1 (ESRI 2012) using Transverse Mercator projection and the North American 1983 HARN Geographic Coordinate System (Appendices C and D). To be consistent with Frazer and Hale (2001) and Jacoby et al. (2007), interpolations were based on Inverse Distance Weighting (IDW). Interpolations for composite categories and taxa were based on means of data from each of the 71 sampling stations.

Estimated values were interpolated into a grid using the ESRI ArcMap v.10.1 IDW algorithm (Geostatistical Wizard). Key parameters were:
- power = 3
- neighborhood search or neighbors included = 5 (include at least 5 neighboring values)
- searching ellipse angle = 0
- radii of semimajor and semiminor axes = 400
- sector mode = 0

The resulting grid was converted to a shapefile containing polygons. Each polygon represented either:

i) one of five Braun–Blanquet percent cover classes (< 5%, 5–25%, 25–50%, 50–75% or > 75%; Braun–Blanquet 1965)

ii) one of five biomass classes (0.000–0.001, 0.001–0.010, 0.010–0.100, 0.100–1.000 or 1.000–10.000 kg dry weight m⁻²)

**RESULTS**

Sampling from October 2010 through August 2013 yielded 852 SAV samples. Submersed aquatic vegetation was found at all stations in at least one quarter. Eleven types of vegetation were recorded: i.e., filamentous algae (including *Lyngbya* spp.), *Ceratophyllum demersum*, *Chara* sp., *Hydrilla verticillata*, *Myriophyllum spicatum*, *Najas guadalupensis*, *Potamogeton pectinatus*,

² For most taxa, dry weights can be converted to wet weights using ratios that were determined in 2004 (Appendix B).
Potamogeton pusillus, Ruppia maritima, Vallisneria americana, and Zannichellia palustris. These data supported preparation of interpolated maps based on mean values (Appendices C and D).

Across the samples, percentage cover for all SAV combined ranged from 0.0 to 100.0%, with an overall mean and standard error (SE) of 33.15 ± 0.07% (Table 1). Mean percentage cover of more than 1% was recorded for filamentous algae, Najas guadalupensis, Myriophyllum spicatum, Zannichelia palustris, Vallisneria americana, Chara sp., and Potamogeton pusillus. In comparison to a previous report covering February 2004 through October 2006 (Jacoby et al. 2007), mean percentage cover of all common SAV decreased from 61.47% to 33.15%. Mean percentage cover of filamentous algae decreased from 22.80% to 18.01%, and mean percentage cover of Vallisneria americana decreased from 3.63% to 1.67%, which represented a loss of about half of the cover recorded in 2004–2006. Minor increases in mean percentage cover were recorded for Najas guadalupensis, Potamogeton pectinatus, and Zannichellia palustris.

The overall mean biomass for all SAV combined ± SE was 0.046 ± 0.004 kg DW m⁻² (Table 1). Mean biomass ± SE for the seven taxa covering on average 1% or more of the bottom ranged from 0.00015 ± 0.00002 kg DW m⁻² for Potamogeton pusillus to 0.0334 ± 0.004 kg DW m⁻² for filamentous algae (Table 1). The mean biomass of filamentous algae decreased by 0.084 kg DW m⁻² from the value reported previously (Jacoby et al. 2007). The mean biomass of Vallisneria americana decreased by 0.002 kg DW m⁻² from values recorded between February 2004 and October 2006 (Jacoby et al. 2007).

### Table 1. Summary statistics for percentage cover and biomass calculated from three replicate samples at each of 71 stations. Minimum cover and biomass were zero for all categories. SE = standard error

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<tr>
<th>Category</th>
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<tr>
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<td>Filamentous algae</td>
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DISCUSSION

Sampling from October 2010 through November 2013 documented percentage cover and biomass for eleven taxa of submersed aquatic vegetation across 71 stations in Kings Bay. The application of consistent methods means that these data and the resulting maps can be compared to data and maps from sampling in 2004, 2005 and 2006.

Initial comparisons suggest that vegetation in Kings Bay has changed. For example, on average, cover of the majority of taxa decreased relative to historical records, with the mean ± SE for percent cover of all submerged aquatic vegetation decreasing by over 25%. These changes represent a concern for managers of Kings Bay and its flora and fauna.

ACKNOWLEDGMENTS

Thanks go to Savanna Barry, Zanethia Choice, Morgan Edwards and Jessica Frost of the UF/IFAS, School of Forest Resources and Conservation for assistance in the field and laboratory. Funding was provided by the Springs and Environmental Flows Section of the Southwest Florida Water Management District.

REFERENCES


APPENDIX A: COORDINATES FOR SAMPLING STATIONS

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### APPENDIX B: WET WEIGHT TO DRY WEIGHT RATIOS

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<td>Lower</td>
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<sup>1</sup> Wet weights can be estimated by multiplying dry weights by the appropriate ratio. All ratios were determined from data collected in February and May 2004.
APPENDIX C: MAPS OF INTERPOLATED PERCENT COVER BASED ON BRAUN–BLANQUET CATEGORIES (BRAUN–BLANQUET 1965) AND INTERPOLATED BIOMASS

Submerged Aquatic Vegetation

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

October 2010

Submerged Aquatic Vegetation

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

February 2011

March, 2011
Submerged Aquatic Vegetation

March, 2014
Ceratophyllum demersum

May 2013

August 2013

Ceratophyllum demersum
Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

UF IFAS
University of Florida
March, 2014

SFRC

UF IFAS
University of Florida
March, 2014
Chara sp. was not found in any quadrat in February 2011
**Chara sp.**

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

October 2011

UF UNIVERSITY OF FLORIDA
IFAS

June, 2013

**Chara sp.**

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

February 2012

UF UNIVERSITY OF FLORIDA
IFAS

June, 2013
Myriophyllum spicatum
Percent cover per square meter

- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

May 2012

June, 2013

Myriophyllum spicatum
Percent cover per square meter

- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

July 2012

June, 2013
Najas guadalupensis

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

October 2010

February 2011

March, 2011

Kings Bay vegetation evaluation – Contract 12C00000055, Project 00099409
Kings Bay vegetation evaluation – Contract 12C00000055, Project 00099409

Najas guadalupensis

Percent cover per square meter
less than 5%
5 to 25%
25 to 50%
50 to 75%
greater than 75%

November 2013

March, 2014

UF IFAS
UNIVERSITY of FLORIDA

S F R C

N

0 250 500 750 1,000 Meters

Najas guadalupensis

Percent cover per square meter
less than 5%
5 to 25%
25 to 50%
50 to 75%
greater than 75%

2011

March, 2014

UF IFAS
UNIVERSITY of FLORIDA

S F R C

N

0 250 500 750 1,000 Meters
Ruppia maritima was not found in any quadrat in October 2010

Ruppia maritima was not found in any quadrat in February 2011

Ruppia maritima was not found in any quadrat in May 2011

Ruppia maritima was not found in any quadrat in October 2011

Ruppia maritima was not found in any quadrat in February 2012

Ruppia maritima was not found in any quadrat in May 2012

Ruppia maritima was not found in any quadrat in July 2012

Ruppia maritima was not found in any quadrat in November 2012

Ruppia maritima was not found in any quadrat in February 2013

Ruppia maritima was not found in any quadrat in May 2013

Ruppia maritima was not found in any quadrat in August 2013

Ruppia maritima was not found in any quadrat in November 2013
Vallisneria americana

October 2010

December, 2010

February 2011

March, 2011
Vallisneria americana

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

May 2011

July 2011

September, 2012

UF Florida IFAS

SFRC
Vallisneria americana

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

May 2013

UF/IFAS
UNIVERSITY OF FLORIDA
SFRC

March, 2014

Vallisneria americana

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

August 2013

UF/IFAS
UNIVERSITY OF FLORIDA
SFRC

March, 2014
**Vallisneria americana**

Percent cover per square meter

- Less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- Greater than 75%

November 2013

UF/IFAS UNIVERSITY of FLORIDA

March, 2014

---

**Vallisneria americana**

Percent cover per square meter

- Less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- Greater than 75%

2011

UF/IFAS UNIVERSITY of FLORIDA

March, 2014
Zannichellia palustris

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

November 2012

UF/IFAS
UNIVERSITY OF FLORIDA
SFRC

March, 2014

Zannichellia palustris

Percent cover per square meter
- less than 5%
- 5 to 25%
- 25 to 50%
- 50 to 75%
- greater than 75%

February 2013

UF/IFAS
UNIVERSITY OF FLORIDA
SFRC

March, 2014
Submerged Aquatic Vegetation

Biomass
(kg dry weight per square meter)

- 0 to 0.001
- 0.001 to 0.01
- 0.01 to 0.1
- 0.1 to 1
- 1 to 10

November 2012

Submerged Aquatic Vegetation

Biomass
(kg dry weight per square meter)

- 0 to 0.001
- 0.001 to 0.01
- 0.01 to 0.1
- 0.1 to 1
- 1 to 10

February 2013
Submerged Aquatic Vegetation

Biomass
(kg dry weight per square meter)

- 0 to 0.001
- 0.001 to 0.01
- 0.01 to 0.1
- 0.1 to 1
- 1 to 10

November 2013

2011

February, 2014

March, 2014
Ceratophyllum demersum

Biomass (kg dry weight per square meter)

- 0 to 0.001
- 0.001 to 0.01
- 0.01 to 0.1
- 0.1 to 1
- 1 to 10

May 2012

June, 2013

Ceratophyllum demersum

Biomass (kg dry weight per square meter)

- 0 to 0.001
- 0.001 to 0.01
- 0.01 to 0.1
- 0.1 to 1
- 1 to 10

July 2012

June, 2013

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IFAS
SFRC

UF
UNIVERSITY OF FLORIDA
IFAS
SFRC
Ceratophyllum demersum

Biomass
(kg dry weight per square meter)

- 0 to 0.001
- 0.001 to 0.01
- 0.01 to 0.1
- 0.1 to 1
- 1 to 10

November 2012

UF/IFAS
UNIVERSITY OF FLORIDA
SFRC
February, 2014

Ceratophyllum demersum

Biomass
(kg dry weight per square meter)

- 0 to 0.001
- 0.001 to 0.01
- 0.01 to 0.1
- 0.1 to 1
- 1 to 10

February 2013

UF/IFAS
UNIVERSITY OF FLORIDA
SFRC
February, 2014
Chara sp. was not found in any quadrat in February 2011
Myriophyllum spicatum

<table>
<thead>
<tr>
<th>Biomass (kg dry weight per square meter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 0.001</td>
</tr>
<tr>
<td>0.001 to 0.01</td>
</tr>
<tr>
<td>0.01 to 0.1</td>
</tr>
<tr>
<td>0.1 to 1</td>
</tr>
<tr>
<td>1 to 10</td>
</tr>
</tbody>
</table>

May 2011

July 2011

September, 2012
Kings Bay vegetation evaluation – Contract 12C00000055, Project 00099409

Najas guadalupensis

Biomass
(kg dry weight per square meter)

- 0 to 0.001
- 0.001 to 0.01
- 0.01 to 0.1
- 0.1 to 1
- 1 to 10

May 2011

September, 2012

July 2011

September, 2012
*Ruppia maritima* was not found in any quadrat in October 2010

*Ruppia maritima* was not found in any quadrat in February 2011

*Ruppia maritima* was not found in any quadrat in May 2011

*Ruppia maritima* was not found in any quadrat in October 2011

*Ruppia maritima* was not found in any quadrat in February 2012

*Ruppia maritima* was not found in any quadrat in May 2012

*Ruppia maritima* was not found in any quadrat in July 2012

*Ruppia maritima* was not found in any quadrat in November 2012

*Ruppia maritima* was not found in any quadrat in February 2013

*Ruppia maritima* was not found in any quadrat in May 2013

*Ruppia maritima* was not found in any quadrat in August 2013

*Ruppia maritima* was not found in any quadrat in November 2013
APPENDIX D: METADATA FOR MAPS OF INTERPOLATED PERCENT COVER AND BIOMASS DATA

METADATA FOR MAPS OF INTERPOLATED PERCENT COVER DATA

- Identification Information
- Data Quality Information
- Spatial Data Organization Information
- Spatial Reference Information
- Entity and Attribute Information
- Distribution Information
- Metadata Reference Information

Identification_Information:

Citation:

Citation_Information:

Originator:
Frazer, T.K., C.A. Jacoby and R.A. Swett; Program of Fisheries and Aquatic Sciences, Institute of Food and Agricultural Sciences, University of Florida

Publication_Date: March 2014


Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: N/A

Description:

Abstract:
A series of polygon shapefiles (ESRI, Inc.) were created (in ArcGIS 10.1) that contain estimates (interpolations) of percent areal coverage for 12 SAV community components in Kings Bay, Citrus County, Florida for the years 2010, 2011, 2012, and 2013. The estimates of percent areal coverage at unsampled locations in the Bay are based on measurements made at 71 sample locations that were distributed throughout the bay. The twelve SAV components observed and measured were: (1) total SAV (the combination of all angiosperms and macroalgae), (2) *Ceratophyllum demersum*, (3) *Chara* spp., (4) filamentous algae (including *Lyngbya* spp.), (5) *Hydrilla verticillata*, (6) *Myriophyllum spicatum*, (7) *Najas guadalupensis*, (8) *Potamogeton pectinatus*, (9) *Potamogeton pusillus*, (10) *Ruppia maritima*, (11) *Vallisneria americana*, and (12) *Zannichellia palustris*. For each of the 12 SAV components, thirteen polygon shapefiles of interpolated areal coverage were created: one for each of the relevant sampling periods (February, May, July/August, and October/November) over four years (2010, 2011, 2012, and 2013).

The measurements of percent areal coverage made for each of the 12 SAV components at each of the 71 field stations were used to estimate percent coverage values at unsampled locations within Kings Bay. To be consistent with methods employed by Frazer and Hale in 2001 (i.e., An Atlas of Submersed Aquatic Vegetation of Kings Bay, Citrus County, FL), Inverse Distance Weighting (IDW) was used as the interpolation method. Estimated values were interpolated into a grid using the ESRI ArcMap v.10.x IDW algorithm (Geostatistical Wizard) using the following values for the method parameters: power = 3, neighborhood search, neighbors to include = 5 (include at least 5), searching ellipse angle = 0, major and minor semiaxis radius = 400, and sector mode = 0. The resulting grid was converted to a shapefile containing polygonal geometry, with each polygon representing one of the following classes of percent coverage: less than 5 percent coverage; 5 to 25 percent coverage; 25 to 50 percent coverage; 50 to 75 percent coverage; and greater than 75 percent coverage.
The naming convention for each of the shapefiles that represent percent cover is as follows:

1) **SAV**: SAV_Cover_Feb201x, SAV_Cover_May201x, SAV_Cover_July201x or SAV_Cover_Aug201x, SAV_Cover_Oct201x or SAV_Cover_Nov201x, SAV_Cover_201xAnnual

2) **Ceratophyllum demersum**: Cera_Cover_Feb201x, Cera_Cover_May201x, Cera_Cover_July201x or Cera_Cover_Aug201x, Cera_Cover_Oct201x or Cera_Cover_Nov201x, Cera_Cover_201xAnnual

3) **Chara** sp.: Chara_Cover_Feb201x, Chara_Cover_May201x, Chara_Cover_July201x or Chara_Cover_Aug201x, Chara_Cover_Oct201x or Chara_Cover_Nov201x, Chara_Cover_201xAnnual

4) **Filamentous algae**: Falg_Cover_Feb201x, Falg_Cover_May201x, Falg_Cover_July201x or Falg_Cover_Aug201x, Falg_Cover_Oct201x or Falg_Cover_Nov201x, Falg_Cover_201xAnnual

5) **Hydrilla verticillata**: Hydr_Cover_Feb201x, Hydr_Cover_May201x, Hydr_Cover_July201x or Hydr_Cover_Aug201x, Hydr_Cover_Oct201x or Hydr_Cover_Nov201x, Hydr_Cover_201xAnnual

6) **Myriophyllum spicatum**: Myrio_Cover_Feb201x, Myrio_Cover_May201x, Myrio_Cover_July201x or Myrio_Cover_Aug201x, Myrio_Cover_Oct201x or Myrio_Cover_Nov201x, Myrio_Cover_201xAnnual

7) **Najas guadalupensis**: Najas_Cover_Feb2010x, Najas_Cover_May201x, Najas_Cover_July201x or Najas_Cover_Aug201x, Najas_Cover_Oct201x or Najas_Cover_Nov201x, Najas_Cover_201xAnnual

8) **Potamogeton pectinatus**: Ppec_Cover_Feb201x, Ppec_Cover_May201x, Ppec_Cover_July201x or Ppec_Cover_Aug201x, Ppec_Cover_Oct201x or Ppec_Cover_Nov201x, Ppec_Cover_201xAnnual

9) **Potamogeton pusillus**: Ppus_Cover_Feb201x, Ppus_Cover_May201x, Ppus_Cover_July201x or Ppus_Cover_Aug201x, Ppus_Cover_Oct201x or Ppus_Cover_Nov201x, Ppus_Cover_201xAnnual

10) **Ruppia maritima**: Rup_Cover_Feb201x, Rup_Cover_May201x, Rup_Cover_July201x or Rup_Cover_Aug201x, Rup_Cover_Oct201x or Rup_Cover_Nov201x, Rup_Cover_201xAnnual

11) **Vallisneria americana**: Val_Cover_Feb201x, Val_Cover_May201x, Val_Cover_July201x or Val_Cover_Aug201x, Val_Cover_Oct201x or Val_Cover_Nov201x, Val_Cover_201xAnnual

12) **Zannichellia palustris**: Zan_Cover_Feb201x, Zan_Cover_May201x, Zan_Cover_July201x or Zan_Cover_Aug201x, Zan_Cover_Oct201x or Zan_Cover_Nov201x, Zan_Cover_201xAnnual

**Purpose:**

The polygon shapefiles were produced as part of a quantitative estimate of submerged aquatic vegetation within Kings Bay for the years 2010, 2011, 2012, and 2013. The project objective was to establish a vegetation evaluation and monitoring program to complement other activities and data acquisition efforts in Kings Bay.

**Time_Period_of_Content:**

**Time_Period_Information:**

**Multiple_Dates/Times:**

**Single_Date/Time:**

**Calendar_Date**: February, 2011, 2012, and 2013
Data were collected in 2010, 2011, 2012, and 2013 during winter (February), spring (May), summer (July or August) and fall (October or November)

Status:
Data collection complete for the 2010, 2011, 2012, and 2013 study

Maintenance_and_Update_Frequency: No updates are planned

Spatial_Domain:
Bounding_Coordinates:
West_BoundingCoordinate: -82.609222
East_BoundingCoordinate: -82.589508
North_BoundingCoordinate: 28.899136
South_BoundingCoordinate: 28.876374

Keywords:
Theme:
Theme_Keyword_Thesaurus: Other
Theme_Keyword: SAV
Theme_Keyword: Submersed Aquatic Vegetation
Theme_Keyword: Ceratophyllum demersum
Theme_Keyword: Chara sp.
Theme_Keyword: Filamentous algae
Theme_Keyword: Hydrilla verticillata
Theme_Keyword: Myriophyllum spicatum
Theme_Keyword: Najas guadalupensis
Theme_Keyword: Potamogeton pectinatus
Theme_Keyword: Potamogeton pusillus
Theme_Keyword: Ruppia maritima
Theme_Keyword: Vallisneria americana
Theme_Keyword: Zannichellia palustris

Place:
Place_Keyword_Thesaurus: Other
Place_Keyword: Kings Bay
Place_Keyword: Citrus County
Place_Keyword: Florida

Temporal:

Access_Constraints: None
Use_Constraints:
Abundance of benthic vegetation likely varies due to many physical and biological factors, including seasonal changes, grazing, and mechanical harvest.

Point_of_Contact:
Contact_Information:
Contact_Person_Primary: T.K. Frazer
Contact_Organization: School of Natural Resources and Environment, Institute of Food and Agricultural Sciences, University of Florida
Contact_Position: Professor and Director
Contact_Address:
Address_Type: mailing address
Address: Box 116455, 103 Black Hall
City: Gainesville
State_orProvince: Florida
Postal_Code: 32611
Country: USA
Contact_Voice_Telephone: 352-392-9230
Contact_Facsimile_Telephone: 352-392-9748
Contact_Electronic_Mail_Address: frazer@ufl.edu

Data_Set_Credit:
Jason Hale, Emily Hall, Stephen Larson, Chanda Littles, Kelly Robinson, Darlene Saindon, Kristen Dormsjo, Katherine Lazar, Vince Politano, Ray Valla, Savanna Barry, Zanethia Choice, Morgan Edwards and Jessica Frost of the UF/IFAS, Program of Fisheries and Aquatic Sciences for assistance in the field and lab. Joyce Kleen and James Kraus of the USFWS, Crystal River National Wildlife Refuge for facilitating the project and providing data. Citrus County Aquatic Management for providing data. Amy Remley, Veronica Craw, Gary Williams and Chris Anastasiu of the Southwest Florida Water Management District for guidance and assistance as project managers. Funding provided through the Southwest Florida Water Management District.

Security_Information:
Security_Classification_System: N/A
Security_Classification: Unclassified
Native_Data_Set_Environment:
Microsoft Windows 7 Enterprise Service Pack 1; ESRI ArcGIS Desktop 10.1.1.3143

Data_Quality_Information:
Completeness_Report:
Field sampling was conducted in 2010, 2011, 2012, and 2013 during winter (February), spring (May), summer (July or August) and fall (October or November) at 71 stations previously established by Frazer and Hale (2001, An Atlas of Submersed Aquatic Vegetation of Kings Bay, Citrus County, FL, University of Florida; the ESRI shapefile SamplePts contains the locations of the 71 stations). At each of the 71 sampling stations in each of the aforementioned sampling periods, divers visually estimated the percent cover of all SAV (broadly defined as angiosperms and macroalgae) present within three replicate 0.25 square meter quadrats. Separate areal coverage estimates were made for angiosperms (flowering, vascular plants) by species as well as attached macroalgae and filamentous forms. Following the in situ collection of all coverage data, the aboveground biomass within these same quadrats was removed by the divers, placed into uniquely labeled plastic bags and transported to the University of Florida for subsequent processing in the laboratory. In the laboratory, SAV from each quadrat sample were cleaned and hand separated by
species/type and dried at 70° C to a constant dry weight. Fresh weight measurements were made of 2,556 SAV samples that had been gently blotted with absorbent paper to remove adhering water. Vegetation weights typically were recorded to the nearest 0.001 g to quantify biomass for each of the sorted plant and algal groups. The 2010, 2011, 2012, and 2013 Kings Bay sampling effort resulted in 2,769 unique SAV quadrats. For subsequent analyses, data were averaged by station for each sampling period (February, May, July/August, and October/November). Interpolated maps of coverage and biomass were generated, using mean data from each of the aforementioned 71 sampling stations, for (1) each of the recognized taxonomic groupings (see abstract) and (2) each of the 13 sampling periods.

**Positional Accuracy:**
**Horizontal Positional Accuracy:**
**Horizontal Positional Accuracy Report:**
No correction for SA of GPS signals yields horizontal accuracy between 5 and 30 m.

**Vertical Positional Accuracy:**
**Vertical Positional Accuracy Report:** N/A

**Lineage:**
**Process Step:**

The measurements of percent areal coverage made for each of the 12 SAV components (see metadata abstract and metadata completeness report) at each of the 71 field stations were used to estimate percent coverage values at unsampled locations within Kings Bay. To be consistent with methods employed by Frazer and Hale in 2001 (i.e., An Atlas of Submersed Aquatic Vegetation of Kings Bay, Citrus County, FL), Inverse Distance Weighting (IDW) was used as the interpolation method. Estimated values were interpolated into a grid using the ESRI ArcMap v.10.x IDW algorithm (Geostatistical Wizard) using the following parameter values: power = 3, neighborhood search, neighbors to include = 5 (include at least 5), searching ellipse angle = 0, major and minor semiaxis radius = 400, and sector mode = 0. The resulting grid was converted to a shapefile containing polygonal geometry. Each polygon represented one of the following classes of percent coverage: less than 5 percent coverage; 5 to 25 percent coverage; 25 to 50 percent coverage; 50 to 75 percent coverage; and greater than 75 percent coverage.

**Process Date:** December 2010, March 2011, September 2012, June 2013, and March 2014

**Process Contact:**

**Contact Information:**
**Contact Person Primary:** Garin Davidson
**Contact Organization:** University of Florida, Institute of Food and Agricultural Sciences, Florida Sea Grant
**Contact Position:** Senior GIS Analyst
**Contact Voice Telephone:** 352-392-5870
**Contact Electronic Mail Address:** gdavids@ufl.edu

**Spatial Data Organization Information:**
**Direct Spatial Reference Method:** Vector
**SDTS Terms Description:**
**SDTS Point and Vector Object Type:** G-polygon
**Point and Vector Object Count:** Varies
Spatial Reference Information:
  Horizontal Coordinate System Definition:
  Planar:
  Map Projection:
    Map Projection Name: Transverse Mercator
    Transverse Mercator:
      Scale Factor at Central Meridian: 0.999600
      Longitude of Central Meridian: -81.000000
      Latitude of Projection Origin: 0.000000
      False Easting: 500000.000000
      False Northing: 0.000000
  Planar Coordinate Information:
    Planar Coordinate Encoding Method: coordinate pair
    Coordinate Representation:
      Abscissa Resolution: 0.000004
      Ordinate Resolution: 0.000004
    Planar Distance Units: meters
  Geodetic Model:
    Horizontal Datum Name: D North American 1983 HARN
    Ellipsoid Name: Geodetic Reference System 80
    Semimajor Axis: 6378137.000000
    Denominator of Flattening Ratio: 298.257222

Entity and Attribute Information:
  Detailed Description:
  Entity Type:
    Entity Type Label: See metadata abstract for shapefile names
  Attribute:
    Attribute Label: FID
    Attribute Definition: Internal feature number.
    Attribute Definition Source: ESRI
    Attribute Domain Values:
    Unrepresentable Domain:
      Sequential unique whole numbers that are automatically generated.
  Attribute:
    Attribute Label: Shape
    Attribute Definition: Feature geometry.
    Attribute Definition Source: ESRI
    Attribute Domain Values:
    Unrepresentable Domain: Coordinates defining the features.
  Attribute:
    Attribute Label: Classes
    Attribute Definition: Defines the range of percent cover that the polygon encompasses
    Attribute Domain Values:
    Enumerated Domain:
      Enumerated Domain Value: 0
      Enumerated Domain Value Definition: less than 5 percent cover
    Enumerated Domain:
      Enumerated Domain Value: 1
      Enumerated Domain Value Definition: 5 to 25 percent cover
Enumerated_Domain:
Enumerated_Domain_Value: 2
Enumerated_Domain_Value_Definition: 25 to 50 percent cover
Enumerated_Domain:
Enumerated_Domain_Value: 3
Enumerated_Domain_Value_Definition: 50 to 75 percent cover
Enumerated_Domain:
Enumerated_Domain_Value: 4
Enumerated_Domain_Value_Definition: greater than 75 percent cover

Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy:
Based on IDW interpolation using 71 sample stations in Kings Bay
Attribute_Value_Accuracy_Explanation:
See metadata abstract and processing steps for method description
Attribute:
Attribute_Label: Value_Min
Attribute_Definition: Minimum percent cover within the class
Attribute:
Attribute_Label: Value_Max
Attribute_Definition: Maximum percent cover within the class

Distribution_Information:
Resource_Description: Downloadable Data
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Transfer_Size: varies

Metadata_Reference_Information:
Metadata_Date: 20140304
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: G.F. Davidson or T.K. Frazer
Contact_Organization:
School of Natural Resources and Environment, Institute of Food and Agricultural Sciences, University of Florida
Contact_Position: Senior GIS Analyst and Research Professor
Contact_Address:
Address_Type: mailing address
Address: Box 116455, 103 Black Hall
City: Gainesville
State_orProvince: FL
Postal_Code: 32611
Country: USA
Contact_Voice_Telephone: 352-392-5870 or 352-392-9230
Contact_Electronic_Mail_Address: gdavids@ufl.edu or frazer@ufl.edu
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Identification Information:

Citation:

Publication Date: March 2014


Abstract:

A series of polygon shapefiles (ESRI, Inc.) were created (in ArcGIS 10.1) that contain estimates (interpolations) of biomass (kg dry weight per square meter) for 12 SAV community components in Kings Bay, Citrus County, Florida for the years 2010, 2011, 2012, and 2013. The estimates of biomass at unsampled locations in the Bay are based on measurements made at 71 sample locations that were distributed throughout the bay. The twelve SAV components observed and measured were: (1) total SAV (the combination of all angiosperms and macroalgae), (2) Ceratophyllum demersum, (3) Chara sp., (4) filamentous algae, (5) Hydrilla verticillata, (6) Myriophyllum spicatum, (7) Najas guadalupensis, (8) Potamogeton pectinatus, (9) Potamogeton pusillus, (10) Ruppia maritima, (11) Vallisneria americana, and (12) Zannichellia palustris. For each of the 12 SAV components, sixteen polygon shapefiles of interpolated biomass were created: one for each of the relevant sampling periods (February, May, July/August, and October/November) over four years (2010, 2011, 2012, and 2013).

The measurements of biomass made for each of the 12 SAV components at each of the 71 field stations were used to estimate biomass values at unsampled locations within Kings Bay. To be consistent with methods employed by Frazer and Hale in 2001 (i.e., An Atlas of Submersed Aquatic Vegetation of Kings Bay, Citrus County, FL), Inverse Distance Weighting (IDW) was
used as the interpolation method. Estimated values were interpolated into a grid using the ESRI ArcMap v.10.x IDW algorithm (Geostatistical Wizard) using the following values for the method parameters: power = 3, neighborhood search, neighbors to include = 5 (include at least 5), searching ellipse angle = 0, major and minor semiaxis radius = 400, and sector mode = 0. The resulting grid was converted to a shapefile containing polygonal geometry, with each polygon representing one of the following biomass classes (kg dry weight per square meter): 0 to 0.001; 0.001 to 0.01; 0.01 to 1.0; and 1.0 to 10.0.

The naming convention for each of the shapefiles that present biomass estimates is as follows:

1) **SAV**: SAV_BM_Feb201x, SAV_BM_May201x, SAV_BM_July201x or SAV_BM_Aug201x, SAV_BM_Oct201x or SAV_BM_Nov201x, SAV_BM_201xAnnual

2) **Ceratophyllum demersum**: Cera_BM_Feb201x, Cera_BM_May201x, Cera_BM_July201x or Cera_BM_Aug201x, Cera_BM_Oct201x or Cera_BM_Nov201x, Cera_BM_201xAnnual

3) **Chara sp.**: Chara_BM_Feb201x, Chara_BM_May201x, Chara_BM_July201x or Chara_BM_Aug201x, Chara_BM_Oct201x or Chara_BM_Nov201x, Chara_BM_201xAnnual

4) **Filamentous algae**: Falg_BM_Feb201x, Falg_BM_May201x, Falg_BM_July201x or Falg_BM_Aug201x, Falg_BM_Oct201x or Falg_BM_Nov201x, Falg_BM_201xAnnual

5) **Hydrilla verticillata**: Hydr_BM_Feb201x, Hydr_BM_May201x, Hydr_BM_July201x or Hydr_BM_Aug201x, Hydr_BM_Oct201x or Hydr_BM_Nov201x, Hydr_BM_201xAnnual

6) **Myriophyllum spicatum**: Myrio_BM_Feb201x, Myrio_BM_May201x, Myrio_BM_July201x or Myrio_BM_Aug201x, Myrio_BM_Oct201x or Myrio_BM_Nov201x, Myrio_BM_201xAnnual

7) **Najas guadalupensis**: Najas_BM_Feb2010x, Najas_BM_May201x, Najas_BM_July201x or Najas_BM_Aug201x, Najas_BM_Oct201x or Najas_BM_Nov201x, Najas_BM_201xAnnual

8) **Potamogeton pectinatus**: Ppec_BM_Feb201x, Ppec_BM_May201x, Ppec_BM_July201x or Ppec_BM_Aug201x, Ppec_BM_Oct201x or Ppec_BM_Nov201x, Ppec_BM_201xAnnual

9) **Potamogeton pusillus**: Ppus_BM_Feb201x, Ppus_BM_May201x, Ppus_BM_July201x or Ppus_BM_Aug201x, Ppus_BM_Oct201x or Ppus_BM_Nov201x, Ppus_BM_201xAnnual

10) **Ruppia maritima**: Rup_BM_Feb201x, Rup_BM_May201x, Rup_BM_July201x or Rup_BM_Aug201x, Rup_BM_Oct201x or Rup_BM_Nov201x, Rup_BM_201xAnnual

11) **Vallisneria americana**: Val_BM_Feb201x, Val_BM_May201x, Val_BM_July201x or Val_BM_Aug201x, Val_BM_Oct201x or Val_BM_Nov201x, Val_BM_201xAnnual

12) **Zannichellia palustris**: Zan_BM_Feb201x, Zan_BM_May201x, Zan_BM_July201x or Zan_BM_Aug201x, Zan_BM_Oct201x or Zan_BM_Nov201x, Zan_BM_201xAnnual
Purpose:
The polygon shapefiles were produced as part of a quantitative estimate of submersed aquatic vegetation within Kings Bay for the years 2010, 2011, 2012, and 2013. The project objective was to establish a vegetation evaluation and monitoring program to complement other activities and data acquisition efforts in Kings Bay.

Time_Period_of_Content:
Time_Period_Information:
Multiple_Dates/Times:
Single_Date/Time:
Calendar_Date: February, 2011, 2012, and 2013
Single_Date/Time:
Calendar_Date: May, 2011, 2012, and 2013
Single_Date/Time:
Calendar_Date: July, 2011 and 2012
Single_Date/Time:
Calendar_Date: August, 2013
Single_Date/Time:
Calendar_Date: October, 2010 and 2011
Single_Date/Time:
Calendar_Date: November, 2012 and 2013
Currentness_Reference:
Data were collected in 2010, 2011, 2012, and 2013 during winter (February), spring (May), summer (July or August) and fall (October or November)

Status:
Progress: Data collection complete for the 2010, 2011, 2012, and 2013 study
Maintenance_and_Update_Frequency: No updates are planned

Spatial_Domain:
Bounding_Coordinates:
West_BoundingCoordinate: -82.609222
East_BoundingCoordinate: -82.589508
North_BoundingCoordinate: 28.899136
South_BoundingCoordinate: 28.876374

Keywords:
Theme:
Theme_Keyword_Thesaurus: Other
Theme_Keyword: Biomass
Theme_Keyword: SAV
Theme_Keyword: Submersed Aquatic Vegetation
Theme_Keyword: Ceratophyllum demersum
Theme_Keyword: Chara sp.
Theme_Keyword: Filamentous algae
Theme_Keyword: Hydrilla verticillata
Theme_Keyword: Myriophyllum spicatum
Theme_Keyword: Najas guadalupensis
Theme_Keyword: Potamogeton pectinatus
Theme_Keyword: Potamogeton pusillus
Theme_Keyword: Ruppia maritima
Theme_Keyword: Vallisneria americana
Theme_Keyword: Zannichellia palustris
Place:
Place_Keyword_Thesaurus: Other
Abundance of benthic vegetation likely varies due to many physical and biological factors, including seasonal changes, grazing, and mechanical harvest.

**Point_of_Contact:**

**Contact Information:**

**Contact Person Primary:** T.K. Frazer

**Contact Organization:** School of Natural Resources and Environment, Institute of Food and Agricultural Sciences, University of Florida

**Contact Position:** Professor and Director

**Contact Address:**

**Address Type:** mailing address

**Address:** Box 116455, 103 Black Hall

**City:** Gainesville

**State or Province:** Florida

**Postal Code:** 32611

**Country:** USA

**Contact Voice Telephone:** 352-392-9230

**Contact Facsimile Telephone:** 352-392-9748

**Contact Electronic Mail Address:** frazer@ufl.edu

**Data Set Credit:**

Jason Hale, Emily Hall, Stephen Larson, Chanda Littles, Kelly Robinson, Darlene Saindon, Kristen Dormsjo, Katherine Lazar, Vince Politano, Ray Valla, Savanna Barry, Zanethia Choice, Morgan Edwards and Jessica Frost of the UF/IFAS, Program of Fisheries and Aquatic Sciences for assistance in the field and lab. Joyce Kleen and James Kraus of the USFWS, Crystal River National Wildlife Refuge for facilitating the project and providing data. Citrus County Aquatic Management for providing data. Amy Remley, Veronica Craw, Gary Williams and Chris Anastasiou of the Southwest Florida Water Management District for guidance and assistance as project managers. Funding provided through the Southwest Florida Water Management District.

**Security Information:**

**Security Classification System:** N/A

**Security Classification:** Unclassified

**Native Data Set Environment:**

Microsoft Windows 7 Enterprise Service Pack 1; ESRI ArcGIS Desktop 10.1.1.3143

**Data Quality Information:**

**Completeness Report:**

Field sampling was conducted in 2010, 2011, 2012, and 2013 during winter (February), spring (May), summer (July or August) and fall (October or November) at 71 stations previously established by Frazer and Hale (2001, An Atlas of Submersed Aquatic Vegetation of Kings Bay,
Citrus County, FL, University of Florida; the ESRI shapefile SamplePts contains the locations of the 71 stations). At each of the 71 sampling stations in each of the aforementioned sampling periods, divers visually estimated the percent cover of all SAV (broadly defined as angiosperms and macroalgae) present within three replicate 0.25 square meter quadrats. Separate areal coverage estimates were made for angiosperms (flowering, vascular plants) by species as well as attached macroalgae and filamentous forms. Following the in situ collection of all coverage data, the aboveground biomass within these same quadrats was removed by the divers, placed into uniquely labeled plastic bags and transported to the University of Florida for subsequent processing in the laboratory. In the laboratory, SAV from each quadrat sample were cleaned and hand separated by species/type and dried at 70° C to a constant dry weight. Fresh weight measurements were made of 2,556 SAV samples that had been gently blotted with absorbent paper to remove adhering water. Vegetation weights typically were recorded to the nearest 0.001 g to quantify biomass for each of the sorted plant and algal groups. The 2010, 2011, 2012, and 2013 Kings Bay sampling efforts resulted in 2,769 unique SAV quadrats. For subsequent analyses, data were typically averaged by station for each sampling period (February, May, July/August, and October/November). Interpolated maps of coverage and biomass were generated, using mean data from each of the aforementioned 71 sampling stations, for (1) each of the recognized taxonomic groupings (see abstract) and (2) each of the 13 sampling periods.

Positional Accuracy:
Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report:
No correction for SA of GPS signals yields horizontal accuracy between 5 and 30 m.

Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: N/A

Lineage:

Process_Description:
The measurements of biomass made for each of the 12 SAV components (see metadata abstract and metadata completeness report) at each of the 71 field stations were used to estimate biomass at unsampled locations within Kings Bay. To be consistent with methods employed by Frazer and Hale in 2001 (i.e., An Atlas of Submersed Aquatic Vegetation of Kings Bay, Citrus County, FL), Inverse Distance Weighting (IDW) was used as the interpolation method. Estimated values were interpolated into a grid using the ESRI ArcMap v.10.x IDW algorithm (Geostatistical Wizard) using the following parameter values: power = 3, neighborhood search, neighbors to include = 5 (include at least 5), searching ellipse angle = 0, major and minor semiaxis radius = 400, and sector mode = 0. The resulting grid was converted to a shapefile containing polygonal geometry, with each polygon representing one of the following biomass classes (kg dry weight per square meter): 0 to 0.001; 0.001 to 0.01; 0.01 to 0.1; 0.1 to 1.0; and 1.0 to 10.0.


Process_Contact:
Contact_Information:
Contact_Person: Garin Davidson
Contact_Organization: University of Florida, Institute of Food and Agricultural Sciences, Florida Sea Grant
Contact_Position: Senior GIS Analyst
Contact_Voice_Telephone: 352-392-5870
Contact_Electronic_Mail_Address: gdavids@ufl.edu
Spatial_Data_Organization_Information:
  Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
  SDTS_Terms_Description:
  SDTS_Point_and_Vector_Object_Type: G-polygon
  Point_and_Vector_Object_Count: Varies

Spatial_Reference_Information:
  Horizontal_Coordinate_System_Definition:
    Planar:
      Map_Projection:
        Map_Projection_Name: Transverse Mercator
        Transverse_Mercator:
          Scale_Factor_at_Central_Meridian: 0.999600
          Longitude_of_Central_Meridian: -81.000000
          Latitude_of_Projection_Origin: 0.000000
          False_Easting: 500000.000000
          False_Northing: 0.000000
      Planar_Coordinate_Encoding_Method: coordinate pair
      Coordinate_Representation:
        Abscissa_Resolution: 0.000004
        Ordinate_Resolution: 0.000004
      Planar_Distance_Units: meters
    Geodetic_Model:
      Horizontal_Datum_Name: D_North_American_1983_HARN
      Ellipsoid_Name: Geodetic Reference System 80
      Semimajor_Axis: 6378137.000000
      Denominator_of_Flattening_Ratio: 298.257222

Entity_and_Attribute_Information:
  Detailed_Description:
    Entity_Type:
      Entity_Type_Label: See metadata abstract for shapefile names
      Attribute:
        Attribute_Label: FID
        Attribute_Definition: Internal feature number.
        Attribute_Definition_Source: ESRI
        Attribute_Domain_Values:
        Unrepresentable_Domain:
          Sequential unique whole numbers that are automatically generated.
      Attribute:
        Attribute_Label: Shape
        Attribute_Definition: Feature geometry.
        Attribute_Definition_Source: ESRI
        Attribute_Domain_Values:
        Unrepresentable_Domain: Coordinates defining the features.
      Attribute:
        Attribute_Label: Classes
**Attribute Definition:** Defines the range of biomass that the polygon encompasses (kg dry weight per square meter)

**Attribute Domain Values:**

<table>
<thead>
<tr>
<th>Enumerated Domain</th>
<th>Enumerated Domain Value</th>
<th>Enumerated Domain Value Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0 to 0.001</td>
</tr>
<tr>
<td>1</td>
<td>0.001</td>
<td>0.001 to 0.01</td>
</tr>
<tr>
<td>2</td>
<td>0.01</td>
<td>0.01 to 0.1</td>
</tr>
<tr>
<td>3</td>
<td>0.1</td>
<td>0.1 to 1.0</td>
</tr>
<tr>
<td>4</td>
<td>1.0</td>
<td>1.0 to 10.0</td>
</tr>
</tbody>
</table>

**Attribute Value Accuracy Information:**
Based on IDW interpolation using 71 sample stations in Kings Bay

**Attribute Value Accuracy Explanation:**
See metadata abstract and processing steps for method description

**Attribute:**
- **Attribute Label:** Value Min
  **Attribute Definition:** Minimum biomass within the class
- **Attribute Label:** Value Max
  **Attribute Definition:** Maximum biomass within the class

**Distribution Information:**
- **Resource Description:** Downloadable Data
- **Standard Order Process:**
- **Digital Form:**
- **Digital Transfer Information:**
  **Transfer Size:** varies

**Metadata Reference Information:**
- **Metadata Date:** 20140304
- **Metadata Contact:**
  **Contact Information:**
  **Contact Person Primary:** G.F. Davidson or T.K. Frazer
  **Contact Organization:**
  School of Natural Resources and Environment, Institute of Food and Agricultural Sciences, University of Florida
- **Contact Position:** Senior GIS Analyst and Research Professor
- **Contact Address:**
  **Address Type:** mailing address