BENTHIC ASSESSMENT OF CANALS IN PHASE 1B

January 15, 2018

prepared for:

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Phase 1B: Tape Grass Restoration Benthic Sampling
Johnson Engineering Inc. Ft. Myers, FL
January 15, 2018

Methods:

On November 30, 2017 Johnson Engineering ecologists conducted a stratified ground-truthing of benthic habitat conditions in the Gator Dredging Phase 1B canals to survey sediment conditions and qualitatively identify percent composition of various components. The purpose of the monitoring is to verify that the *Lyngbya* sp. and organic substrate has been sufficiently removed to support *Vallisneria americana* restoration, colonization and survival. We collected twenty (20) core/dredge samples were collected (10 from each canal) in a stratified pattern on both sides and center of the canals. Sediment constituents were categorized as mud/muck, sand, shell, rock, clay, woody debris (including leaves and sticks), *Lyngbya* and any other submerged aquatic vegetation. An estimate of the percent composition for each constituent was recorded for each sample collected, along with a photograph and/or video of each dredge sample. Substrate samples were GPS located and are presented on aerial map (Figure 1). For comparison, an additional three (3) Ponar samples were collected from locations in the unrestored section of the main canal near the northern terminus of Canal 4.

Underwater video was taken from each of the areas sampled (Canal 1 and Canal 4) in the Phase 1B Restoration Area to document de-mucking and the petite Ponar dredge samples. Representative video files for transects in canal 1 and canal 4 are included on the enclosed Kingston flash drive.

Results:

Sediment sample results are presented in Table 1. Photographic documentation for each sediment sample, along with GPS coordinates are also presented for cross referencing with the Table. Samples were coded to identify Phase and location, such that sample **1BE4 =** Phase **1B**, **E**astern Canal, Sample **#4**.

Control Samples (C1,C2, C3)

Petite Ponar dredge samples from the unrestored "control" section of the main canal contained 95%, 95% and 90% mud/muck for C1. C2, and C3 respectively. C1 also contained approximately 4% sand and 1% clay. C2 and C3 also contained about 5% *Lyngbya* and C3 also contained 5% shell material from dead snails. The deep mud/muck content was consistent in unrestored areas and mostly unconsolidated with anoxic odor indicators (methane or sulfide). Depths of mud/muck were not quantified in this assessment

(due to budget constraints) but were estimated to be several centimeters (10-20 cm) deep in many areas. These unrestored areas have very limited suitable habitat for growth and reproduction of *Vallisneria americana* due to the depth of organic muck with a blanket of *Lyngbya.*

Eastern Canal (1BE1- 1BE10)

The easternmost canal (Canal 1) had an average depth of 4.7 feet based on our ten samples collected. Canal 1 contained an average of 43% mud/muck with content ranging from 0-90% (Table 1). Two samples (1BE6 and 1BE7) contained 90% mud/muck with a depth of at least 10 cm, but no *Lyngbya* was found in these samples. Sample 1BE8 contained 85% mud/muck, 10% sand, and approximately 5% *Lyngbya.* Sand content averaged 41% with content ranging from 2-90%. Rock was dominant with 95% content at one location where there appeared to be a small vent. Small amounts of clay, shell, woody debris were also found at some locations. A *Vallisneria americana* planting unit was incidentally collected by petite Ponar at 1BE9 while southern naiad (*Najas* sp.) was collected at 1BE10. Overall, the sediments in the eastern canal (Canal 1) were considered suitable for *Vallisneria americana* planting units with the possible exception of three locations with 85-90% mud/muck in the middle area of the eastern canal. These locations were deeper than most of the other sites and it appears that these three samples with 85-90% mud/muck represent a section of the canal that was missed in the de-mucking process. Video of this area (attached) in Canal 1 also show relatively high *Lyngbya* cover compared to other areas in Phase 1B.

Western Canal (1BW1 -1BW10)

The western canal (Canal 4) had an average depth of 8.24 feet. Sediment sample results were quite variable with mud/muck averaging 27% with a range of 0-70%. Sand content averaged 37% with a range of 5-80%. Clay content averaged 31% with a range of 0-90%. Shell, rock and woody debris were also present but scattered and in low abundance. *Lyngbya* was present at 5% in three samples and the northernmost end of Canal 4. These sites contained suitable sediments for growth and spread of *Vallisneria americana* with a mixture of mud, sand and clay material and it appears that *Lyngbya* has been reintroduced by tidal movements over time since the dredging was completed. The dredging operation opened at least one large warm water spring near sample site 1BW6 that had sufficient flow to disturb the surface from more that 10 feet below the water surface. Video was collected at this location and is included in the attachments to this report along with representative video of the benthic conditions and a planted exclosure.

Summary:

Johnson Engineering aquatic ecologists conducted a qualitative benthic assessment for Save Crystal River by sampling Canals 1 and 4 using a petite Ponar benthic sampling device. A total of 20 Ponar samples were collected from the dredged portions of these two canals along with three Ponar samples from an un-dredged Control area (Figure 1). The relative amount of mud/muck, sand, clay, shell, rock and woody debris was recorded and photographed for comparison and future reference. The eastern canal (Canal 1) was shallow with an average depth of 4.7 feet and contained an estimated average of 43% mud/muck. Three of the ten samples contained 85-90% mud/muck (Table 1) indicating that 20-30% of this canal may have been missed by the dredging operation. *Lyngbya* was also relatively high in this same area of the canal as evidences by underwater video taken on November 30, 2017. The remainder of the canal sediments appeared suitable for growth and spread of *Vallisneria americana*. The western canal of Phase 1B (Canal 4) was deeper with an average depth of 8.24 feet with an estimated average of 27% muck. Benthic samples from ten locations indicated that sediment conditions are suitable for growth and spread of *Vallisneria americana* throughout the canal. Water clarity was impaired on November 30, and December 1, 2017 by a planktonic algae bloom. A warm-water spring was also opened up as a result of the dredging at sampling site labeled 1BW6 (Figure 1 and Table 1). Water clarity greatly improved by the end of December when Hester-Dendy substrates and benthic invertebrate samples were collected. Some growth and spread of Vallisneria americana was evident between the November 30 and December 28, 2017 sampling events.

Attachments:

Map of Sample Locations
Table 1. Results of petite Ponar Samples collected on November 30, 2017
Photographs of Control Samples
Photographs of Eastern Canal 1 Samples
Photographs of Western Canal 4 Samples
Kingston Flash Drive with Video Documentation

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King's Bay Restoration - Phase 1B Sample Sites

DATE	PROJECT	FILE NO.	SCALE	SHEET
Dec. 2017	20170047-000	21-17-18	As Shown	Fig. 2

Table 1. Results of petite Ponar Samples collected on November 30 and December 1, 2017

King's Bay Ponar Sample Locations				Estimated Percent (%) Composition: petite Ponar								
Site	**Latitude**	**Longitude**	**Depth**	**Mud/Muck**	**Sand**	**Shell**	**Clay**	**Rock**	**Woody I**	**Lyngbya**	**Vallisneria**	**Najas**
1B E1	28.5312	-82.3509	5	80	20	0	0	0	0	0	0	0
1B E2	28.5312	-82.3509	5	2	2	0	0	95	1	0	0	0
1B E3	28.5312	-82.351	4.5	50	50	0	0	0	0	0	0	0
1B E4	28.5315	-82.3509	4.5	0	90	5	0	4	1	0	0	0
1B E5	28.5316	-82.3509	3	20	70	0	0	0	5	5	0	0
1B E6	28.5318	-82.3509	6.5	90	5	2	3	0	0	0	0	0
1B E7	28.5319	-82.3509	5.5	90	5	0	0	0	5	0	0	0
1B E8	28.5318	-82.351	5.3	85	10	0	0	0	0	5	0	0
1B E9	28.5318	-82.3512	4	15	80	4	0	0	0	0	1	0
1B E10	28.5319	-82.3516	4	0	80	10	0	0	3	5	0	2
1B W1	28.5304	-82.3528	9.7	15	70	0.5	14.5	0	0	0	0	0
1B W2	28.5307	-82.3528	5.6	70	20	10	0	0	0	0	0	0
1B W3	28.5308	-82.3529	6	35	60	5	0	0	0	0	0	0
1B W4	28.5311	-82.3528	10	2	60	3	35	0	0	0	0	0
1B W5	28.5315	-82.3529	6.2	10	80	0	2	0	8	0	0	0
1B W6	**28.532**	**-82.3529**	9.2	0	5	0	90	5	0	0	0	0
1B W7	28.5321	-82.353	8.2	3	5	0	90	0	5	0	0	0
1B W8	28.5322	-82.3529	8.5	50	30	1	14	0	0	5	0	0
1B W9	28.5325	-82.3529	10	15	20	0	60	0	0	5	0	0
1B W10	28.5326	-82.3529	9	70	20	0	5	0	0	5	0	0
	Control											
C-1	28.5327	-82.3526	5	95	4	0	1	0	0	0	0	0
C-2	28.5327	-82.3529	6	95	0	0	0	0	0	5	0	0
C-3	28.5327	-82.3533	5	90	0	5	0	0	0	5	0	0

1B W6 = new warmwater spring

Site 1B control 1. N: 28.5327 W: -82.3526. Depth - 5.0’

Site 1B control 2. N: 28.5327 W: -82.3529. Depth - 6.0’

Site 1B control 3. N: 28.5327 W: -82.3533. Depth - 5.0’

Sites 1BE1 and 1BE2 (video also). 1BE1- N: 28.5310 W: -82.3509. 1BE2- N: 28.5312 W: - 82.3509. Depth for both - 5.0’

Site 1BE3. N: 28.5312 W: -82.3510. Depth - 4.5’

Site 1BE4. N: 28.5315 W: -82.3509. Depth - 4.5’

Site 1BE5. N: 28.5316 W: -82.3509. Depth - 3.0’

Site 1BE6. N: 28.5318 W: -82.3509. Depth - 6.5’

Site 1BE7 N: 28.5318 W: -82.3509. Depth - 5.5’

Site 1BE8. N: 28.5318 W: -82.3510. Depth - 5.3’

Site 1BE9. N: 28.5318 W: -82.3512. Depth - 4.0’

Site 1BE10. N: 28.5319 W: -82.3516. Depth - 2.5’

Site 1BW1. N: 28.5304 W: -82.3528. Depth - 9.7’

Site 1BW1

Site 1BW2. N: 28.5307 W: -82.3528. Depth - 5.6’

Site 1BW3. N: 28.5308 W: -82.3529. Depth - 6.0’

Site 1BW4. N: 28.5311 W: -82.3528. Depth – 10.0’

Site 1BW5. N: 28.5315 W: -82.3529. Depth - 6.2’

Site 1BW6. N: 28.5320 W: -82.3529. Depth - 9.2’ (upwelling)

Site 1BW7. N: 28.5321 W: -82.3530. Depth - 8.2’

Site 1BW8. N: 28.5322 W: -82.3529. Depth - 8.5’

Site 1BW9. N: 28.5325 W: -82.3529. Depth – 10.0’

Site 1BW10 N: 28.5326 W: -82.3529. Depth 9.0’