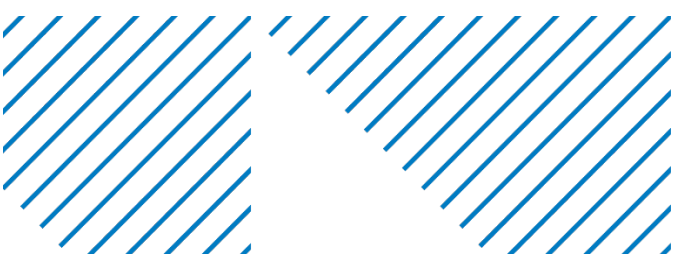




## Exhibit F

# Hunt Bay 2020 Post-Treatment Monitoring Results



## Memorandum

**To:** Beaver Dam Lake Management District (Board of Commissioners)  
**From:** Barr Engineering Co. (Meg Rattei)  
**Subject:** Hunt Bay 2020 Post-Treatment Monitoring Results  
**Date:** November 12, 2020  
**Project:** 49030011.21  
**c:** James Bartlett (Lake Restoration, Inc.) and Alex Smith (WDNR)

The purpose of this memorandum is to present the results of the 2020 post-treatment aquatic plant monitoring of Hunt Bay. This memo includes discussion of:

- Herbicide treatment of Eurasian watermilfoil (EWM, *Myriophyllum spicatum*) in Hunt Bay during 2019.
- Hunt Bay plant survey sample methods.
- Hunt Bay EWM treatment results.
- Pre-treatment and post-treatment comparison of plants in Hunt Bay.

### 1.0 2019 Herbicide Treatment of Hunt Bay

On August 19, 2019, a total of 3.38 acres in Hunt Bay were treated with ProcellaCOR EC (Florpyrauxifen-benzyl) at a dose of 4 Prescription Dose Units (PDU) per acre-foot (Figure 1).

ProcellaCOR residue samples were collected following the treatment as a part of a study completed by the Wisconsin Department of Natural Resources (WDNR). The Beaver Dam Lake Management District's contractor, Lake Restoration, Inc., collected the samples and the WDNR paid the cost of laboratory analyses. Samples were collected from three locations, BD-1, BD-2, and BD-Out (Figure 1). A grab sample was taken at elbow depth from each sample location at 3 Hours After Treatment (HAT), 6 HAT, 9 HAT, 12 HAT, 24 HAT, and 48 HAT. ProcellaCOR residue was not detected in any of the samples (Table 1).

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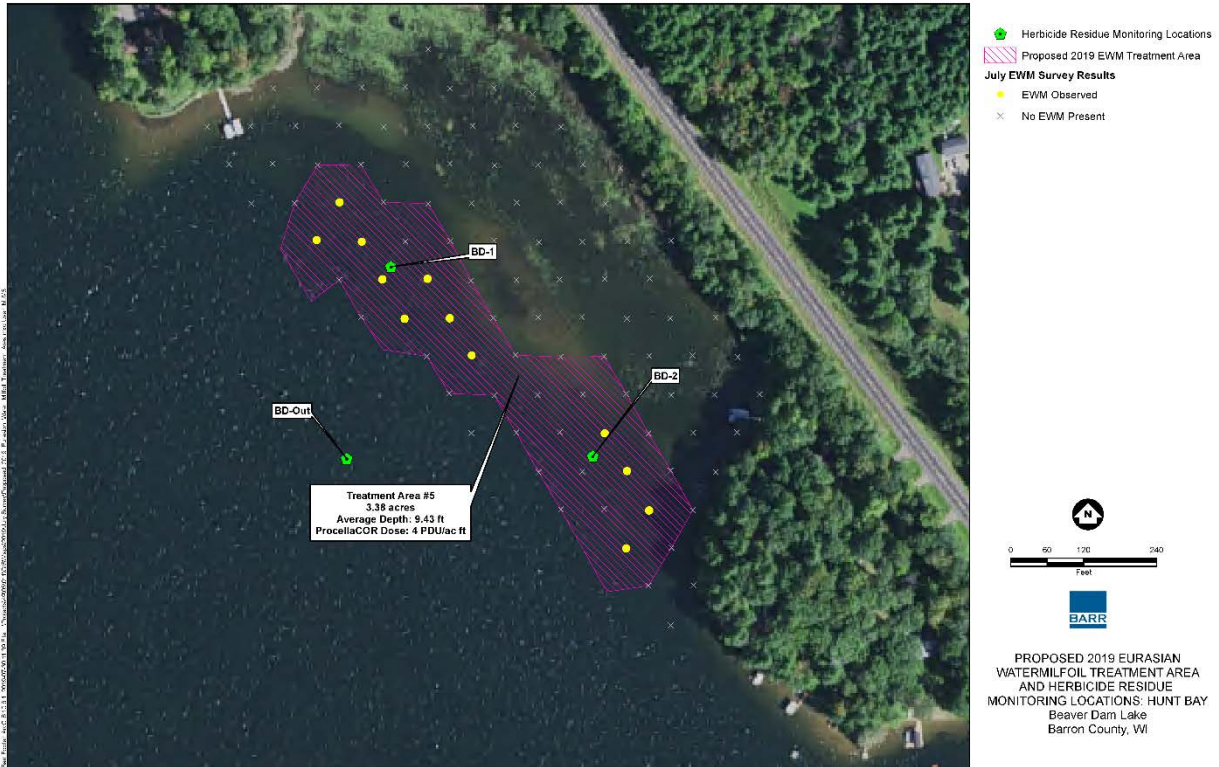


Figure 1 2019 Hunt Bay Treatment Area and Herbicide Residue Monitoring Locations

Table 1 2019 Hunt Bay ProcellaCOR Residue Results (Table Credit: WDNR)

BEAVER DAM: HUNT BAY	Hours After Treatment (HAT)					
	3	6	9	12	24	48
BD-1	< 1	< 1	< 1	< 1	< 1	< 1
BD-2	< 1	< 1	< 1	< 1	< 1	< 1
BD-Out	< 1	< 1	< 1	< 1	< 1	< 1
TARGET (PDU)	4 PDU	4 PDU	4 PDU	4 PDU	4 PDU	4 PDU

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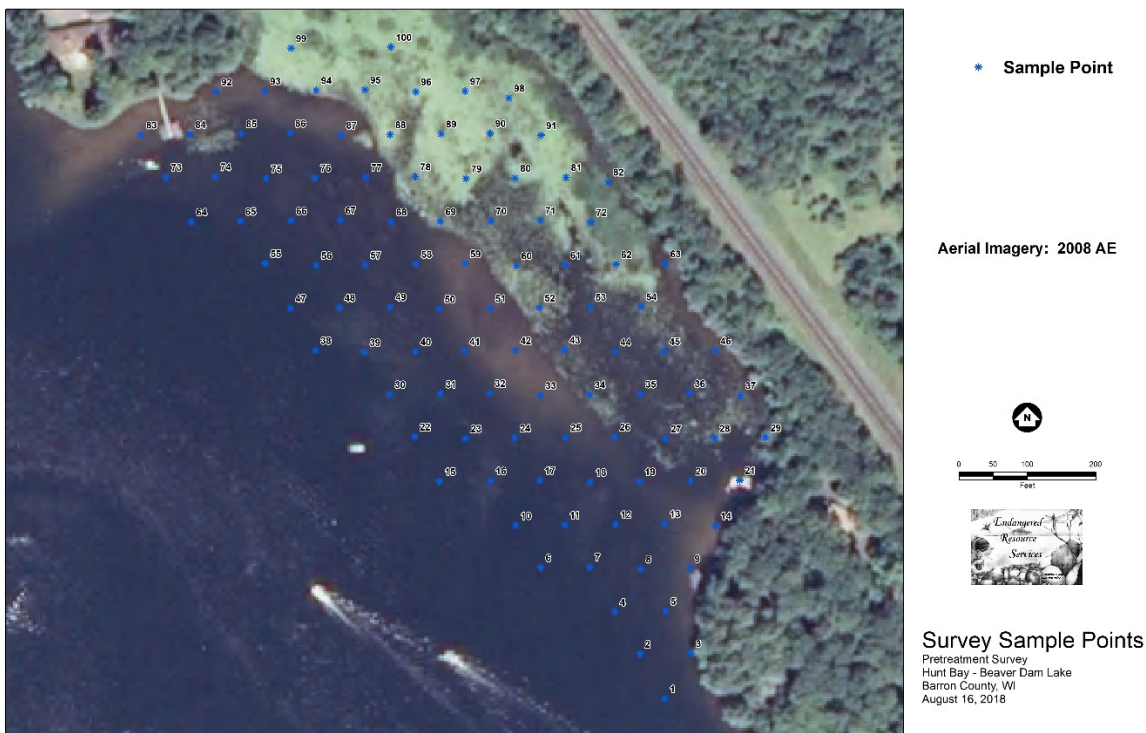
## 2.0 Aquatic Plant Survey Methods

Hunt Bay pre-treatment point-intercept plant surveys were completed August 16, 2018 and July 24, 2019 and a post-treatment point intercept plant survey was completed August 24, 2020. A total of 100 sample points were surveyed during each plant survey (Figure 2). The plant surveyor located equally spaced preset points in the field with a global positioning system (GPS) and took measurements at each point. His measurements included the following:

1. Individual species present
2. Overall density of plants, as measured by rake method
3. Density of individual species, as measured by rake method
4. Water depth
5. Dominant sediment type



**A rake (pictured above) was used to collect plants for the plant surveys. Rake fullness is a measure of plant density.**



**Figure 2 2018-2020 Hunt Bay Point Intercept Survey Sample Points**

### 3.0 Hunt Bay EWM Treatment Results

EWM was not observed in Hunt Bay after the successful 2019 Hunt Bay herbicide treatment (Figure 3). Pre-treatment plant surveys in 2018 and 2019 documented that EWM was collected on the rake at 4 percent to 9 percent of sample points and was visually observed at an additional 6 percent to 8 percent of sample points shallower than the maximum depth at which plants grew in Hunt Bay. EWM was not collected on the rake or visually observed in Hunt Bay during the 2020 post-treatment plant survey.

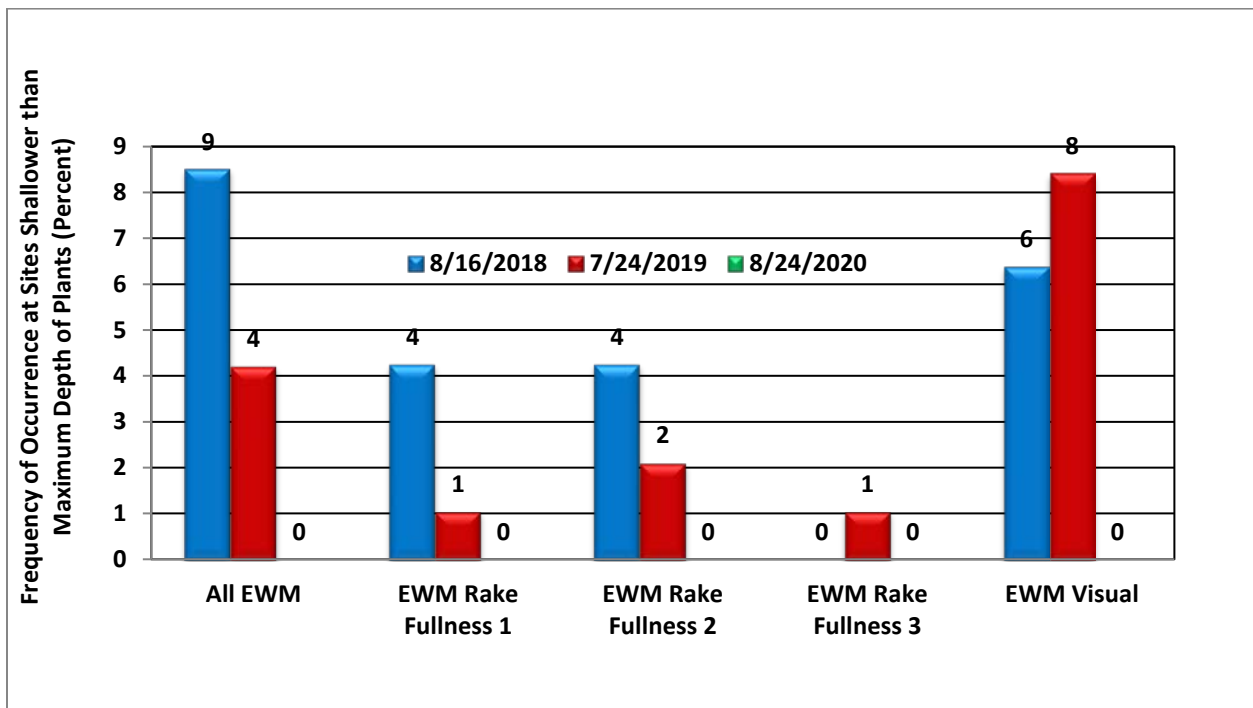


Figure 3 Hunt Bay 2018-2020 Changes in EWM Frequency of Occurrence at Sites Shallower than Maximum Depth of Plants (Percent)

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## 4.0 Pre-treatment and Post-treatment Comparison of Plants in Hunt Bay

A pre-treatment and post-treatment comparison of plants in Hunt Bay indicates the plant community remained relatively stable after treatment (Table 2 and Table 3). Post-treatment data were generally within the range of pre-treatment data (Table 2).

- Post-treatment species richness (29 species) was within the range of pre-treatment data (28-35).
- Post-treatment average number of native species per site shallower than maximum depth at which plants grew (2.26) was within the range of pre-treatment data (2.06-2.62).
- The post-treatment mean coefficient of conservatism (C) value (6.6) was higher than pre-treatment data (6.04-6.40), indicating the average quality of the post-treatment plant community was higher than the pre-treatment plant community.
- The post-treatment Floristic Quality Index (FQI) (34.80) was within the range of pre-treatment data (31.37-35.05).
- The post-treatment mean rake fullness at vegetated sites (2.08) was higher than pre-treatment data (1.57 to 1.90).
- The post-treatment Simpson Diversity Index value (0.91) was lower, but very close to the pre-treatment data (0.94).
- The post-treatment frequency of occurrence of plants at sites shallower than the maximum depth of plants (91.30) was lower, but very close to the pre-treatment data (91.58 to 94.68).
- The maximum depth at which plants grew was lower in 2020 (14 feet) than pre-treatment years (17-18 feet).

Parameter	Pre-treatment		Post-treatment
	8/16/2018	7/24/2019	8/24/2020
Total number of sites visited	100	100	100
Total number of sites with vegetation	89	87	84
Total number of sites shallower than maximum depth of plants	94	95	92
Frequency of occurrence at sites shallower than maximum depth of plants	94.68	91.58	91.30
Simpson Diversity Index	0.94	0.94	0.91
Maximum depth of plants (ft)**	18.00	17.00	14.00
Number of sites sampled using rake on Rope (R)	5	4	4

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Parameter	Pre-treatment		Post-treatment
	8/16/2018	7/24/2019	8/24/2020
Number of sites sampled using rake on Pole (P)	94	95	95
Average number of all species per site (shallower than max depth)	2.70	2.11	2.26
Average number of all species per site (veg. sites only)	2.85	2.30	2.48
Average number of native species per site (shallower than max depth)	2.62	2.06	2.26
Average number of native species per site (veg. sites only)	2.80	2.25	2.48
Species Richness	31	28	28
Species Richness (including visuals)	35	28	29
Species Richness (including visuals and boat survey)	35	28	29
Mean depth of plants (ft)	4.83	5.41	4.79
Median depth of plants (ft)	4.00	4.00	4.00
Mean rake fullness (veg. sites only)	1.90	1.57	2.08
Mean C	6.40	6.04	6.60
FQI	35.05	31.37	34.80

Species	Frequency of Occurrence at Sites Shallower than Maximum Depth of Plants (Percent)		
	Pre-treatment		Post-treatment
	8/16/2018	7/24/2019	8/24/2020
<i>Najas flexilis</i>	35.11	21.05	45.65
<i>Chara sp.</i>	24.47	14.74	23.91
<i>Potamogeton natans</i>	24.47	11.58	11.96
<i>Potamogeton gramineus</i>	23.40	16.84	21.74
<i>Potamogeton robbinsii</i>	19.15	14.74	3.26
<i>Vallisneria americana</i>	17.02	18.95	26.09
<i>Brasenia schreberi</i>	11.70	5.26	7.61
<i>Elodea canadensis</i>	10.64	4.21	3.26
<i>Nitella sp.</i>	10.64	7.37	3.26
<i>Pontederia cordata</i>	10.64	7.37	8.70

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Table 3 Hunt Bay 2018-2020 Frequency of Occurrence of Plant Species at Sites Shallower than Maximum Depth of Plants (Percent)			
Species	Frequency of Occurrence at Sites Shallower than Maximum Depth of Plants (Percent)		
	Pre-treatment		Post-treatment
	8/16/2018	7/24/2019	8/24/2020
<i>Schoenoplectus acutus</i>	9.57	9.47	9.78
<i>Myriophyllum spicatum</i>	8.51	4.21	0.00
<i>Ceratophyllum demersum</i>	7.45	18.95	3.26
<i>Nymphaea odorata</i>	7.45	12.63	10.87
<i>Potamogeton amplifolius</i>	7.45	2.11	2.17
<i>Potamogeton richardsonii</i>	7.45	1.05	2.17
<i>Schoenoplectus subterminalis</i>	7.45	10.53	9.78
<i>Potamogeton praelongus</i>	5.32	13.68	10.87
<i>Potamogeton zosteriformis</i>	4.26	1.05	0.00
<i>Utricularia purpurea</i>	4.26	1.05	1.09
Filamentous algae	2.13	1.05	5.43
<i>Potamogeton foliosus</i>	2.13	0	2.17
<i>Potamogeton pusillus</i>	2.13	0	0.00
<i>Bidens beckii</i>	1.06	0	1.09
<i>Eleocharis palustris</i>	1.06	2.11	1.09
<i>Heteranthera dubia</i>	1.06	3.16	4.35
<i>Lemna minor</i>	1.06	0	0.00
<i>Najas gracillima</i>	1.06	0	0.00
<i>Nuphar variegata</i>	1.06	1.05	1.09
<i>Polygonum amphibium</i>	1.06	1.05	1.09
<i>Potamogeton illinoensis</i>	1.06	0	0.00
<i>Sagittaria cristata</i>	1.06	0	4.35
<i>Eleocharis acicularis</i>	0	1.05	1.09
<i>Eleocharis erythropoda</i>	0	2.11	0.00
<i>Stuckenia pectinata</i>	0	1.05	0.00
<i>Utricularia minor</i>	0	0	1.09
<i>Carex utriculata</i>	**	0	0
<i>Potamogeton vaseyi</i>	**	0	0.00
<i>Typha X glauca</i>	**	0	**
<i>Utricularia vulgaris</i>	**	2.11	3.26

Chi squared analyses were used to assess pre-treatment and post-treatment plant surveys to document significant changes in frequency. The results of the analyses indicated four native species significantly changed in frequency during the pre-treatment years (Figure 4) and four native species significantly changed in frequency following herbicide treatment (Figure 5). Hence, the plant community was relatively stable following treatment, exhibiting changes similar in magnitude as occurred in pre-treatment years. The following significant frequency changes in native species were documented in pre-treatment years (Figure 4):

- Coontail (*Ceratophyllum demersum*) from 7 percent in 2018 to 19 percent in 2019.
- Slender naiad (*Najas flexilis*) from 35 percent in 2018 to 21 percent in 2019).
- Floating-leaf pondweed (*Potamogeton natans*) from 25 percent in 2018 to 12 percent in 2019.
- Claspingleaf pondweed (*Potamogeton richardsonii*) from 7 percent in 2018 to 1 percent in 2019.

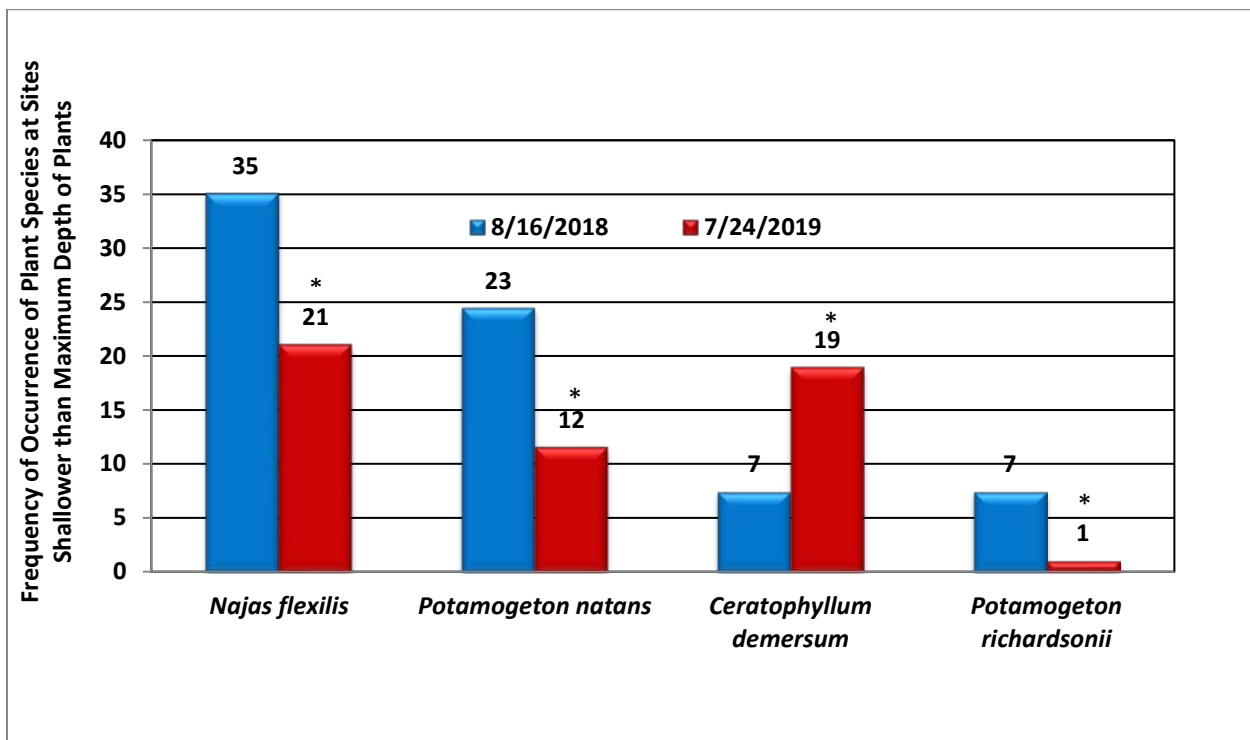


Figure 4 Hunt Bay 2018-2019 Pre-Treatment Statistically Significant Changes in Frequency of Occurrence of Plant Species at Sites Shallower than Maximum Depth of Plants

The 2020 post-treatment plant survey documented a significant decline in EWM, the target species, following herbicide treatment (from 4 percent to 0 percent) (Figure 5). Additionally, the following significant frequency changes in native species were documented in the 2020 post-treatment plant survey (Figure 5):

- Slender naiad from 21 percent in 2019 to 46 percent in 2020
- Crested arrowhead from 0 percent in 2019 to 4 percent in 2020
- Coontail from 19 percent in 2019 to 3 percent in 2020, and
- Fern pondweed from 15 percent in 2019 to 3 percent in 2020.

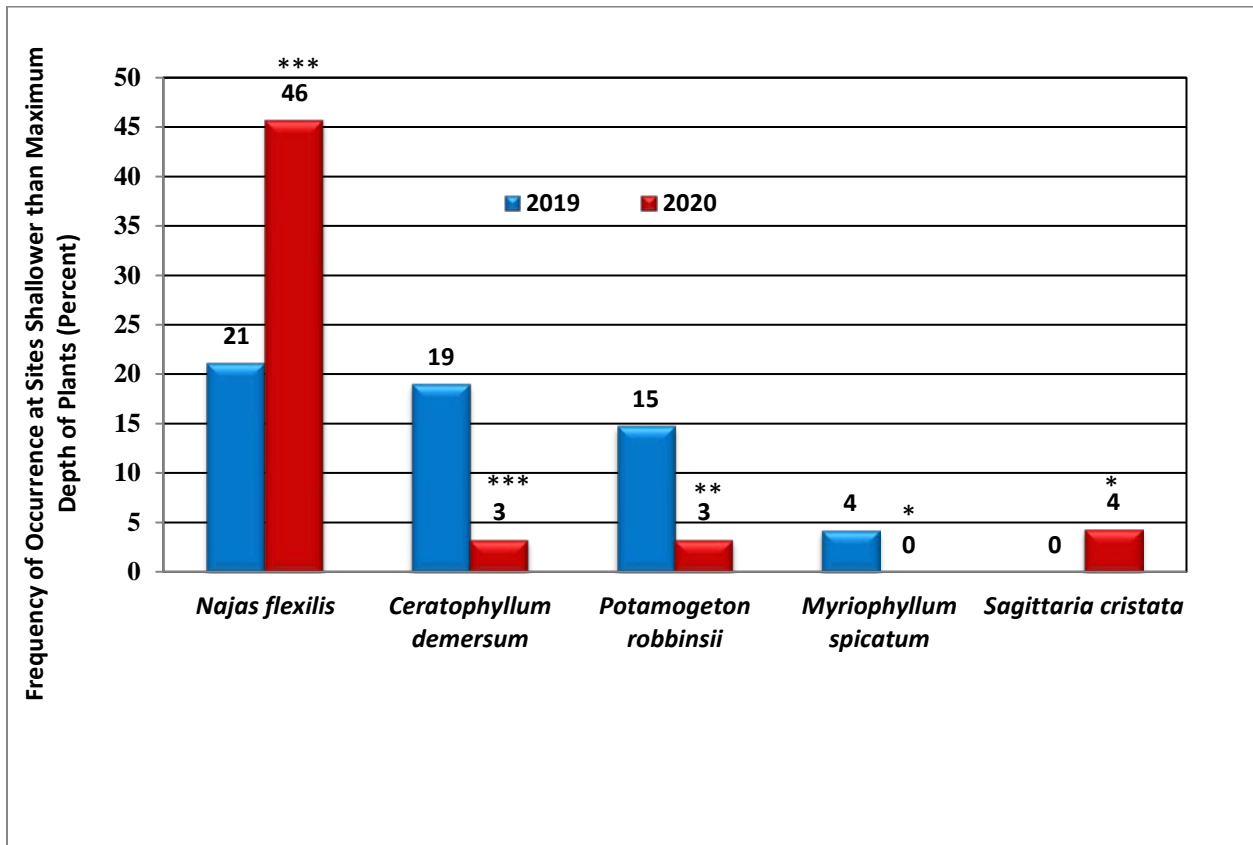


Figure 5 Hunt Bay 2019-2020 Post-Treatment Statistically Significant Changes in Frequency of Occurrence at Sites Shallower than Maximum Depth of Plants (Percent)