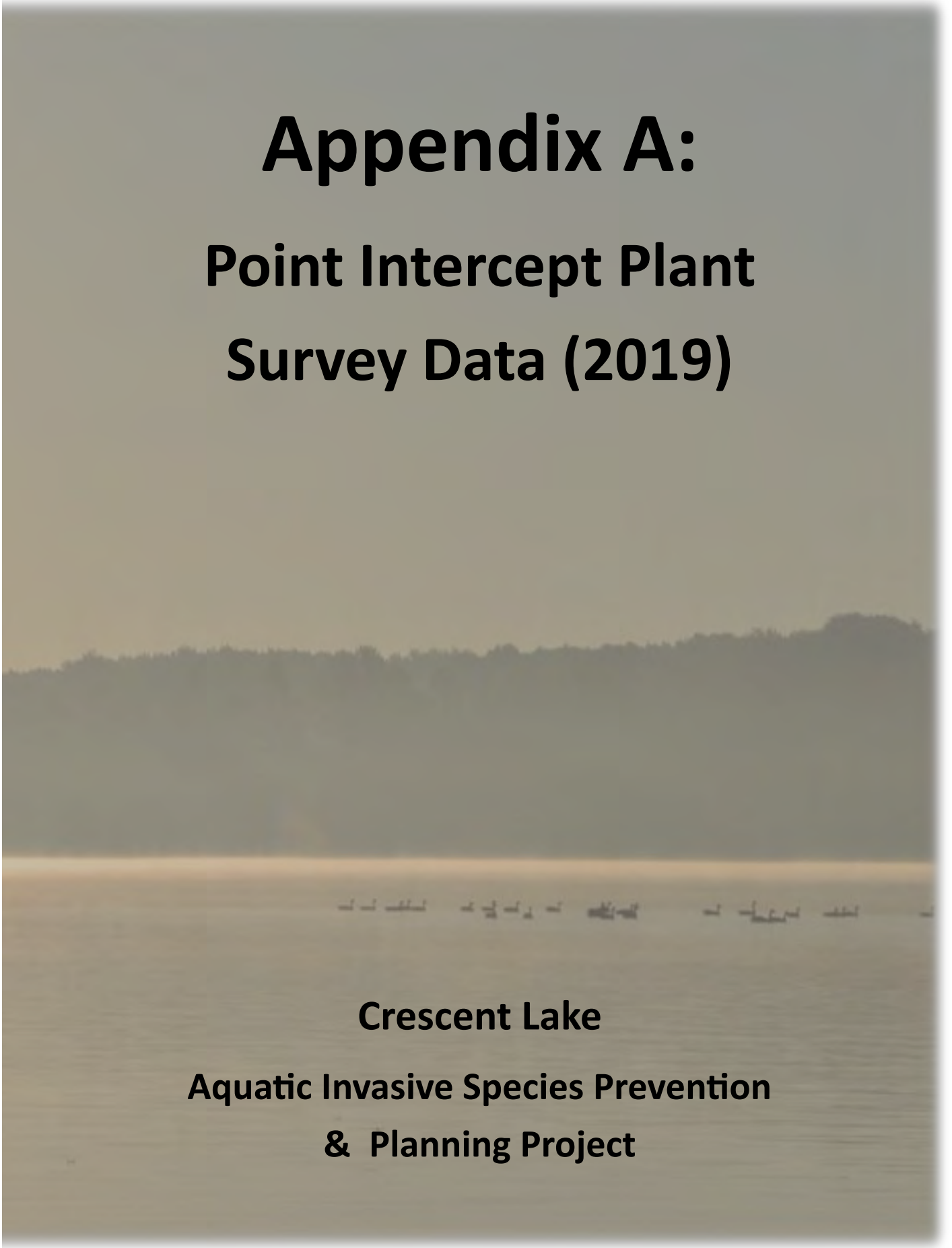


# Appendix A:

## Point Intercept Plant Survey Data (2019)

**Crescent Lake**

**Aquatic Invasive Species Prevention & Planning Project**

| Plants surveyed by boat | | | | | |
|---|---|---|---|---|---|
| **Lake** | Crescent Lake | | | | |
| **County** | Oneida | | | | |
| **WBIC** | 1564200 | | | | |
| **Date of Survey** | 8/8/2019 | | | | |
| **Field Crew** | Barb Gajewski & Bill Artwich | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| **Nearest Point** | **SPECIES** | | | | |
| 2 | POCO14 | LYSA2 | | | |
| 7 | POCO14 | | | | |
| 8 | POCO14 | SAG SP. | CAPA | SCAC3 | |
| 12 | SAG. SP. | | | | |
| 13 | SCAC3 | POCO14 | | | |
| 14 | POCO14 | TYPHA SP. | NUVA2 | | |
| 15 | POCO14 | NUVA2 | | | |
| 16 | POCO14 | TYPHA SP. | | | |
| 18 | SAG. SP. | | | | |
| 23 | SAG. SP. | | | | |
| 29 | SAG. SP. | | | | |
| 35 | POCO14 | TYPHA SP. | SCAC3 | | |
| 72 | SAG. SP. | | | | |
| 105 | POCO14 | TYPHA SP. | | | |
| 131 | POCO14 | | | | |
| 190 | NYOD | NUVA2 | POCO14 | TYPHA SP. | |
| 206 | SAG. SP. | | | | |
| 226 | POCO14 | | | | |
| 227 | NYOD | NUVA2 | POCO14 | | |
| 266 | DUAR3 | POCO14 | SCAC3 | | |
| 267 | BRSC | SCAC3 | NYOD | POCO14 | TYPHA SP. |
| 268 | POCO14 | TYPHA SP. | | | |
| 309 | POCO14 | TYPHA SP. | LYSA2 | | |
| 351 | SCTA2 | POCO14 | | | |
| 352 | BRSC | | | | |
| 353 | NUVA2 | | | | |
| 359 | LYSA2 | POCO14 | TYPHA SP. | NUVA2 | |
| 400 | POCO14 | SCAC3 | | | |
| 404 | POCO14 | NYOD | | | |
| 429 | LYSA2 | | | | |
| 456 | POCO14 | | | | |
| 457 | POCO14 | | | | |
| 459 | POCO14 | BRSC | TYPHA SP. | | |
| 510 | SAG. SP. | | | | |

| Plants surveyed by boat | | | | | |
|---|---|---|---|---|---|
| **Lake** | Crescent Lake | | | | |
| **County** | Oneida | | | | |
| **WBIC** | 1564200 | | | | |
| **Date of Survey** | 8/8/2019 | | | | |
| **Field Crew** | Barb Gajewski & Bill Artwich | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| **Nearest Point** | **SPECIES** | | | | |
| 516 | POCO14 | SCAC3 | NUVA2 | BRSC | |
| 517 | POCO14 | SCAC3 | NUVA2 | BRSC | |
| 565 | SCAC3 | | | | |
| 572 | POCO14 | SCAC3 | | | |
| 623 | POCO14 | | | | |
| 624 | POCO14 | LYSA2 | | | |
| 673 | POCO14 | SCAC3 | | | |
| 725 | POCO14 | | | | |
| 774 | SCAC3 | | | | |
| 867 | SCAC3 | | | | |
| 913 | SAG. SP. | POCO14 | SCAC3 | | |
| 914 | SAG. SP. | | | | |
| 916 | SCAC3 | | | | |
| 1057 | SAG. SP. | | | | |
| 1082 | SAG. SP. | | | | |
| 1098 | SAG. SP. | | | | |
| 1124 | SAG. SP. | | | | |
| 1164 | SAG. SP. | | | | |
| 1174 | SAG. SP. | | | | |
| 1202 | SAG. SP. | | | | |
| 1241 | SAG. SP. | | | | |
| 1271 | SAG. SP. | | | | |
| 1303 | SAG. SP. | | | | |
| 1499 | SAG. SP. | | | | |
| 1512 | SAG. SP. | | | | |
| 1524 | SAG. SP. | SPAR SP. (FLOATING) | | | |
| 1551 | SAG. SP. | | | | |
| 1552 | SAG. SP. | | | | |
| | | | | | |

| | STATS | Total vegetation | *Myriophyllum spicatum,Eurasian water milfoil* | Brasenia schreberi, Watershield | Ceratophyllum demersum, Coontail | Chara sp., Muskgrasses | Elatine minima, Waterwort | Eleocharis acicularis, Needle spikerush | Elodea canadensis, Common waterweed | Elodea nuttallii, Slender waterweed | Isoetes sp., Quillwort | Juncus pelocarpus f. submersus, Brown-fruited rush | Myriophyllum sibiricum, Northern water-milfoil | Myriophyllum tenellum, Dwarf water-milfoil | Najas flexilis, Slender naiad | Najas guadalupensis, Southern naiad | Nitella sp., Nitella | Nuphar variegata, Spatterdock | Nymphaea odorata, White water lily | Pontederia cordata, Pickerelweed | Potamogeton amplifolius, Large-leaf pondweed | Potamogeton foliosus, Leafy pondweed | Potamogeton friesii, Fries' pondweed | Potamogeton gramineus, Variable pondweed | Potamogeton praelongus, White-stem pondweed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lake** | Crescent Lake | | | | | | | | | | | | | | | | | | | | | | | | |
| **County** | Oneida | | | | | | | | | | | | | | | | | | | | | | | | |
| **WBIC** | 1564200 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Survey Date** | 08/08/19 | | | | | | | | | | | | | | | | | | | | | | | | |
| | **INDIVIDUAL SPECIES STATS:** | | | | | | | | | | | | | | | | | | | | | | | | |
| | **Frequency of occurrence within vegetated areas (%)** | | 6.20 | 0.36 | 31.20 | 16.97 | 0.18 | 3.65 | 44.53 | 0.36 | 1.28 | 0.18 | 13.14 | 3.28 | 5.47 | 0.18 | 1.64 | 0.18 | 0.18 | | 15.33 | 2.37 | 70.07 | 12.23 | 1.09 |
| | **Frequency of occurrence at sites shallower than maximum depth of plants** | | 4.29 | 0.25 | 21.56 | 11.73 | 0.13 | 2.52 | 30.77 | 0.25 | 0.88 | 0.13 | 9.08 | 2.27 | 3.78 | 0.13 | 1.13 | 0.13 | 0.13 | | 10.59 | 1.64 | 48.42 | 8.45 | 0.76 |
| | **Relative Frequency (%)** | | 1.8 | 0.1 | 9.2 | 5.0 | 0.1 | 1.1 | 13.1 | 0.1 | 0.4 | 0.1 | 3.9 | 1.0 | 1.6 | 0.1 | 0.5 | 0.1 | 0.1 | | 4.5 | 0.7 | 20.6 | 3.6 | 0.3 |
| | Relative Frequency (squared) | 0.10 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 |
| | **Number of sites where species found** | | 34 | 2 | 171 | 93 | 1 | 20 | 244 | 2 | 7 | 1 | 72 | 18 | 30 | 1 | 9 | 1 | 1 | | 84 | 13 | 384 | 67 | 6 |
| | **Average Rake Fullness** | 2.48 | 1.03 | 1.00 | 1.14 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.07 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.18 | 1.00 | 1.27 | 1.01 | 1.00 |
| | **#visual sightings** | | 38 | 3 | | | | | | | | | | | | | | | | 2 | | | | 2 | |
| | **present (visual or collected)** | | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present | present |

| | STATS | Total vegetation | Potamogeton pusillus, Small pondweed | Potamogeton richardsonii, Clasping-leaf pondweed | Potamogeton robbinsii, Fern pondweed | Potamogeton spirillus, Spiral-fruited pondweed | Potamogeton strictifolius, Stiff pondweed | Potamogeton zosteriformis, Flat-stem pondweed | Ranunculus aquatilis, White water crowfoot | Schoenoplectus acutus, Hardstem bulrush | Schoenoplectus heterochaetus, Slender bulrush | Utricularia intermedia, Flat-leaf bladderwort | Wolffia borealis, Northern watermeal | Potamogeton berchtoldii |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lake** | Crescent Lake | | | | | | | | | | | | | |
| **County** | Oneida | | | | | | | | | | | | | |
| **WBIC** | 1564200 | | | | | | | | | | | | | |
| **Survey Date** | 08/08/19 | | | | | | | | | | | | | |
| | **INDIVIDUAL SPECIES STATS:** | | | | | | | | | | | | | |
| | **Frequency of occurrence within vegetated areas (%)** | | 38.87 | 0.91 | 0.18 | 11.31 | 0.73 | 16.79 | 30.84 | 0.36 | 0.18 | 0.55 | 8.76 | 0.18 |
| | **Frequency of occurrence at sites shallower than maximum depth of plants** | | 26.86 | 0.63 | 0.13 | 7.82 | 0.50 | 11.60 | 21.31 | 0.25 | 0.13 | 0.38 | 6.05 | 0.13 |
| | **Relative Frequency (%)** | | 11.4 | 0.3 | 0.1 | 3.3 | 0.2 | 4.9 | 9.1 | 0.1 | 0.1 | 0.2 | 2.6 | 0.1 |
| | Relative Frequency (squared) | 0.10 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **Number of sites where species found** | | 213 | 5 | 1 | 62 | 4 | 92 | 169 | 2 | 1 | 3 | 48 | 1 |
| | **Average Rake Fullness** | 2.48 | 1.19 | 1.00 | 1.00 | 1.06 | 1.00 | 1.00 | 1.03 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | **#visual sightings** | | | | | | | | | 2 | | | | |
| | **present (visual or collected)** | | present | present | present | present | present | present | present | present | present | present | present | present |

| SUMMARY STATS: Crescent Lake, Oneida Co, 8/8/2019 | |
|---|---|
| Total number of sites visited | 1482 |
| Total number of sites with vegetation | 548 |
| Total number of sites shallower than maximum depth of plants | 793 |
| Frequency of occurrence at sites shallower than maximum depth of plants | 69.10 |
| Simpson Diversity Index | 0.90 |
| Maximum depth of plants (ft)** | 20.00 |
| Number of sites sampled using rake on Rope (R) | 355 |
| Number of sites sampled using rake on Pole (P) | 517 |
| Average number of all species per site (shallower than max depth) | 2.35 |
| Average number of all species per site (veg. sites only) | 3.40 |
| Average number of native species per site (shallower than max depth) | 2.30 |
| Average number of native species per site (veg. sites only) | 3.34 |
| Species Richness | 34 |
| Species Richness (including visuals) | 35 |

**SEE "MAX DEPTH GRAPH" WORKSHEET TO CONFIRM

| | |
|---|---|
| **Lake** | Crescent Lake |
| **County** | Oneida |
| **Date** | 08/08/19 |
| **Township** | |
| **Range** | |
| **Section** | |

| Species | Common Name | C | species pre-sent=1 | |
|---|---|---|---|---|
| *Acorus americanus* | Sweet-flag | 7 | 0 | 0 |
| *Alisma triviale* | Northern water-plantain | 4 | 0 | 0 |
| *Bidens beckii* | Water marigold | 8 | 0 | 0 |
| *Bolboschoenus fluviatilis* | River bulrush | 6 | 0 | 0 |
| *Brasenia schreberi* | Watershield | 6 | 1 | 6 |
| *Calla palustris* | Wild calla | 9 | 0 | 0 |
| *Callitriche hermaphroditica* | Autumnal water-starwort | 9 | 0 | 0 |
| *Callitriche heterophylla* | Large water-starwort | 9 | 0 | 0 |
| *Callitriche palustris* | Common water-starwort | 8 | 0 | 0 |
| *Carex comosa* | Bottle brush sedge | 5 | 0 | 0 |
| *Catabrosa aquatica* | Brook grass | 10 | 0 | 0 |
| *Ceratophyllum demersum* | Coontail | 3 | 1 | 3 |
| *Ceratophyllum echinatum* | Spiny hornwort | 10 | 0 | 0 |
| *Chara* | Muskgrasses | 7 | 1 | 7 |
| *Dulichium arundinaceum* | Three-way sedge | 9 | 0 | 0 |
| *Elatine minima* | Waterwort | 9 | 1 | 9 |
| *Elatine triandra* | Greater waterwort | 9 | 0 | 0 |
| *Eleocharis acicularis* | Needle spikerush | 5 | 1 | 5 |
| *Eleocharis erythropoda* | Bald spikerush | 3 | 0 | 0 |
| *Eleocharis palustris* | Creeping spikerush | 6 | 0 | 0 |
| *Elodea canadensis* | Common waterweed | 3 | 1 | 3 |
| *Elodea nuttallii* | Slender waterweed | 7 | 1 | 7 |
| *Equisetum fluviatile* | Water horsetail | 7 | 0 | 0 |
| *Eriocaulon aquaticum* | Pipewort | 9 | 0 | 0 |
| *Glyceria borealis* | Northern manna grass | 8 | 0 | 0 |
| *Gratiola aurea* | Golden hedge-hyssop | 10 | 0 | 0 |
| *Heteranthera dubia* | Water star-grass | 6 | 0 | 0 |
| *Isoetes echinospora* | Spiny-spored quillwort | 8 | 0 | 0 |
| *Isoetes lacustris* | Lake quillwort | 8 | 0 | 0 |
| *Isoetes sp.* | Quillwort | 8 | 1 | 8 |
| *Juncus pelocarpus f. submersus* | Brown-fruited rush | 8 | 1 | 8 |
| *Juncus torreyi* | Torrey's rush | 4 | 0 | 0 |
| *Lemna minor* | Small duckweed | 4 | 0 | 0 |
| *Lemna perpusilla* | Least duckweed | 10 | 0 | 0 |
| *Lemna trisulca* | Forked duckweed | 6 | 0 | 0 |
| *Littorella uniflora* | Littorella | 10 | 0 | 0 |

| | |
|---|---|
| **Lake** | Crescent Lake |
| **County** | Oneida |
| **Date** | 08/08/19 |
| **Township** | |
| **Range** | |
| **Section** | |

| Species | Common Name | C | species pre-sent=1 | |
|---|---|---|---|---|
| *Lobelia dortmanna* | Water lobelia | 10 | 0 | 0 |
| *Ludwigia palustris* | Marsh purslane | 4 | 0 | 0 |
| *Myriophyllum alterniflorum* | Alternate-flowered water-milfoil | 10 | 0 | 0 |
| *Myriophyllum farwellii* | Farwell's water-milfoil | 8 | 0 | 0 |
| *Myriophyllum heterophyllum* | Various-leaved water-milfoil | 7 | 0 | 0 |
| *Myriophyllum sibiricum* | Northern water-milfoil | 6 | 1 | 6 |
| *Myriophyllum tenellum* | Dwarf water-milfoil | 10 | 1 | 10 |
| *Myriophyllum verticillatum* | Whorled water-milfoil | 8 | 0 | 0 |
| *Najas flexilis* | Slender naiad | 6 | 1 | 6 |
| *Najas gracillima* | Northern naiad | 7 | 0 | 0 |
| *Najas guadalupensis* | Southern naiad | 8 | 1 | 8 |
| *Nelumbo lutea* | American lotus | 7 | 0 | 0 |
| *Nitella* | Nitella | 7 | 1 | 7 |
| *Nuphar advena* | Yellow pond lily | 8 | 0 | 0 |
| *Nuphar microphylla* | Small pond lily | 9 | 0 | 0 |
| *Nuphar X rubrodisca* | Intermediate pond lily | 9 | 0 | 0 |
| *Nuphar variegata* | Spatterdock | 6 | 1 | 6 |
| *Nymphaea odorata* | White water lily | 6 | 1 | 6 |
| *Phragmites australis* | Common reed | 1 | 0 | 0 |
| *Polygonum amphibium* | Water smartweed | 5 | 0 | 0 |
| *Polygonum punctatum* | Dotted smartweed | 5 | 0 | 0 |
| *Pontederia cordata* | Pickerelweed | 8 | 0 | 0 |
| *Potamogeton alpinus* | Alpine pondweed | 9 | 0 | 0 |
| *Potamogeton amplifolius* | Large-leaf pondweed | 7 | 1 | 7 |
| *Potamogeton bicupulatus* | Snail-seed pondwwed | 9 | 0 | 0 |
| *Potamogeton confervoides* | Algal-leaved pondweed | 10 | 0 | 0 |
| *Potamogeton diversifolius* | Water-thread pondweed | 8 | 0 | 0 |
| *Potamogeton epihydrus* | Ribbon-leaf pondweed | 8 | 0 | 0 |
| *Potamogeton foliosus* | Leafy pondweed | 6 | 1 | 6 |
| *Potamogeton friesii* | Fries' pondweed | 8 | 1 | 8 |
| *Potamogeton gramineus* | Variable pondweed | 7 | 1 | 7 |
| *Potamogeton berchtoldii* | | 7 | 1 | 7 |
| *Potamogeton illinoensis* | Illinois pondweed | 6 | 0 | 0 |
| *Potamogeton natans* | Floating-leaf pondweed | 5 | 0 | 0 |
| *Potamogeton nodosus* | Long-leaf pondweed | 7 | 0 | 0 |
| *Potamogeton oakesianus* | Oakes' pondweed | 10 | 0 | 0 |

| | |
|---|---|
| **Lake** | Crescent Lake |
| **County** | Oneida |
| **Date** | 08/08/19 |
| **Township** | |
| **Range** | |
| **Section** | |

| Species | Common Name | C | species pre-sent=1 | |
|---|---|---|---|---|
| *Potamogeton obtusifolius* | Blunt-leaf pondweed | 9 | 0 | 0 |
| *Potamogeton praelongus* | White-stem pondweed | 8 | 1 | 8 |
| *Potamogeton pulcher* | Spotted pondweed | 10 | 0 | 0 |
| *Potamogeton pusillus* | Small pondweed | 7 | 1 | 7 |
| *Potamogeton richardsonii* | Clasping-leaf pondweed | 5 | 1 | 5 |
| *Potamogeton robbinsii* | Fern pondweed | 8 | 1 | 8 |
| *Potamogeton spirillus* | Spiral-fruited pondweed | 8 | 1 | 8 |
| *Potamogeton strictifolius* | Stiff pondweed | 8 | 1 | 8 |
| *Potamogeton vaseyi* | Vasey's pondweed | 10 | 0 | 0 |
| *Potamogeton zosteriformis* | Flat-stem pondweed | 6 | 1 | 6 |
| *Ranunculus aquatilis* | White water crowfoot | 8 | 1 | 8 |
| *Ranunculus flabellaris* | Yellow water crowfoot | 8 | 0 | 0 |
| *Ranunculus flammula* | Creeping spearwort | 9 | 0 | 0 |
| *Riccia fluitans* | Slender riccia | 7 | 0 | 0 |
| *Ruppia cirrhosa* | Ditch grass | 8 | 0 | 0 |
| *Sagittaria brevirostra* | Midwestern arrowhead | 9 | 0 | 0 |
| *Sagittaria cuneata* | Arum-leaved arrowhead | 7 | 0 | 0 |
| *Sagittaria graminea* | Grass-leaved arrowhead | 9 | 0 | 0 |
| *Sagittaria latifolia* | Common arrowhead | 3 | 0 | 0 |
| *Sagittaria rigida* | Sessile-fruited arrowhead | 8 | 0 | 0 |
| *Schoenoplectus acutus* | Hardstem bulrush | 6 | 1 | 6 |
| *Schoenoplectus heterochaetus* | Slender bulrush | 10 | 1 | 10 |
| *Schoenoplectus pungens* | Three-square bulrush | 5 | 0 | 0 |
| *Schoenoplectus subterminalis* | Water bulrush | 9 | 0 | 0 |
| *Schoenoplectus tabernaemontani* | Softstem bulrush | 4 | 0 | 0 |
| *Sparganium americanum* | American bur-reed | 8 | 0 | 0 |
| *Sparganium androcladum* | Branched bur-reed | 8 | 0 | 0 |
| *Sparganium angustifolium* | Narrow-leaved bur-reed | 9 | 0 | 0 |
| *Sparganium emersum* | Short-stemmed bur-reed | 8 | 0 | 0 |
| *Sparganium eurycarpum* | Common bur-reed | 5 | 0 | 0 |
| *Sparganium fluctuans* | Floating-leaf bur-reed | 10 | 0 | 0 |
| *Sparganium natans* | Small bur-reed | 9 | 0 | 0 |
| *Spirodela polyrhiza* | Large duckweed | 5 | 0 | 0 |
| *Stuckenia filiformis* | Fine-leaved pondweed | 8 | 0 | 0 |
| *Stuckenia pectinata* | Sago pondweed | 3 | 0 | 0 |
| *Stuckenia vaginata* | Sheathed pondweed | 9 | 0 | 0 |

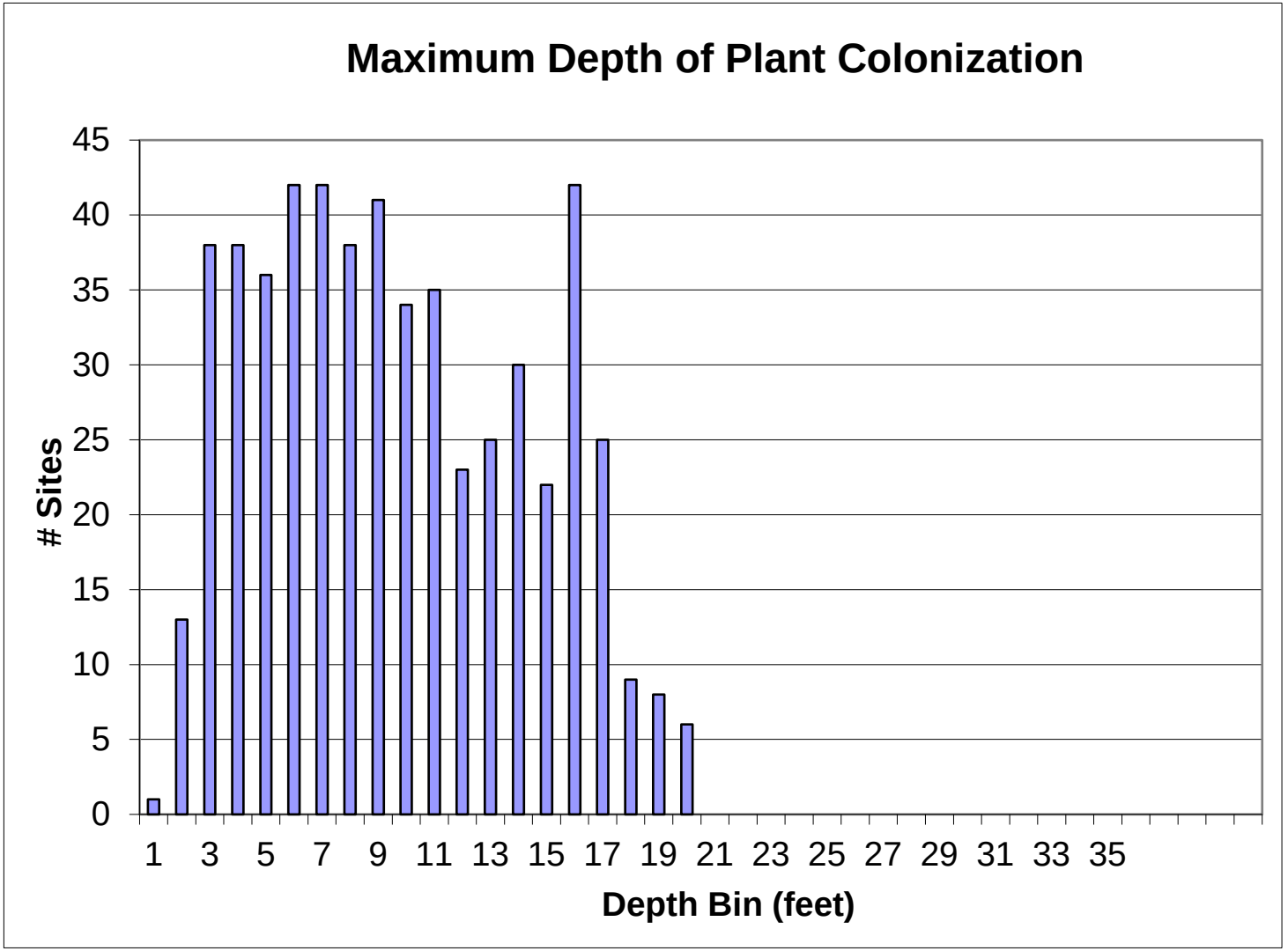
| | |
|---|---|
| **Lake** | Crescent Lake |
| **County** | Oneida |
| **Date** | 08/08/19 |
| **Township** | |
| **Range** | |
| **Section** | |

| Species | Common Name | C | species present=1 | |
|---|---|---|---|---|
| *Typha angustifolium* | Narrow-leaved cattail | 1 | 0 | 0 |
| *Typha latifolia* | Broad-leaved cattail | 1 | 0 | 0 |
| *Typha sp.* | Cattail | 1 | 0 | 0 |
| *Utricularia cornuta* | Horned bladderwort | 10 | 0 | 0 |
| *Utricularia geminiscapa* | Twin-stemmed bladderwort | 9 | 0 | 0 |
| *Utricularia gibba* | Creeping bladderwort | 9 | 0 | 0 |
| *Utricularia intermedia* | Flat-leaf bladderwort | 9 | 1 | 9 |
| *Utricularia minor* | Small bladderwort | 10 | 0 | 0 |
| *Utricularia purpurea* | Large purple bladderwort | 9 | 0 | 0 |
| *Utricularia resupinata* | Small purple bladderwort | 9 | 0 | 0 |
| *Utricularia vulgaris* | Common bladderwort | 7 | 0 | 0 |
| *Vallisneria americana* | Wild celery | 6 | 0 | 0 |
| *Wolffia borealis* | Northern watermeal | 6 | 1 | 6 |
| *Wolffia columbiana* | Common watermeal | 5 | 0 | 0 |
| *Zannichellia palustris* | Horned pondweed | 7 | 0 | 0 |
| *Zizania aquatica* | Southern wild rice | 8 | 0 | 0 |
| *Zizania palustris* | Northern wild rice | 8 | 0 | 0 |
| *Zizania sp.* | Wild rice | 8 | 0 | 0 |
| | | | | |
| **N** | | | 33 | |
| **mean C** | | | | 6.9394 |
| **FQI** | | | | 39.864 |

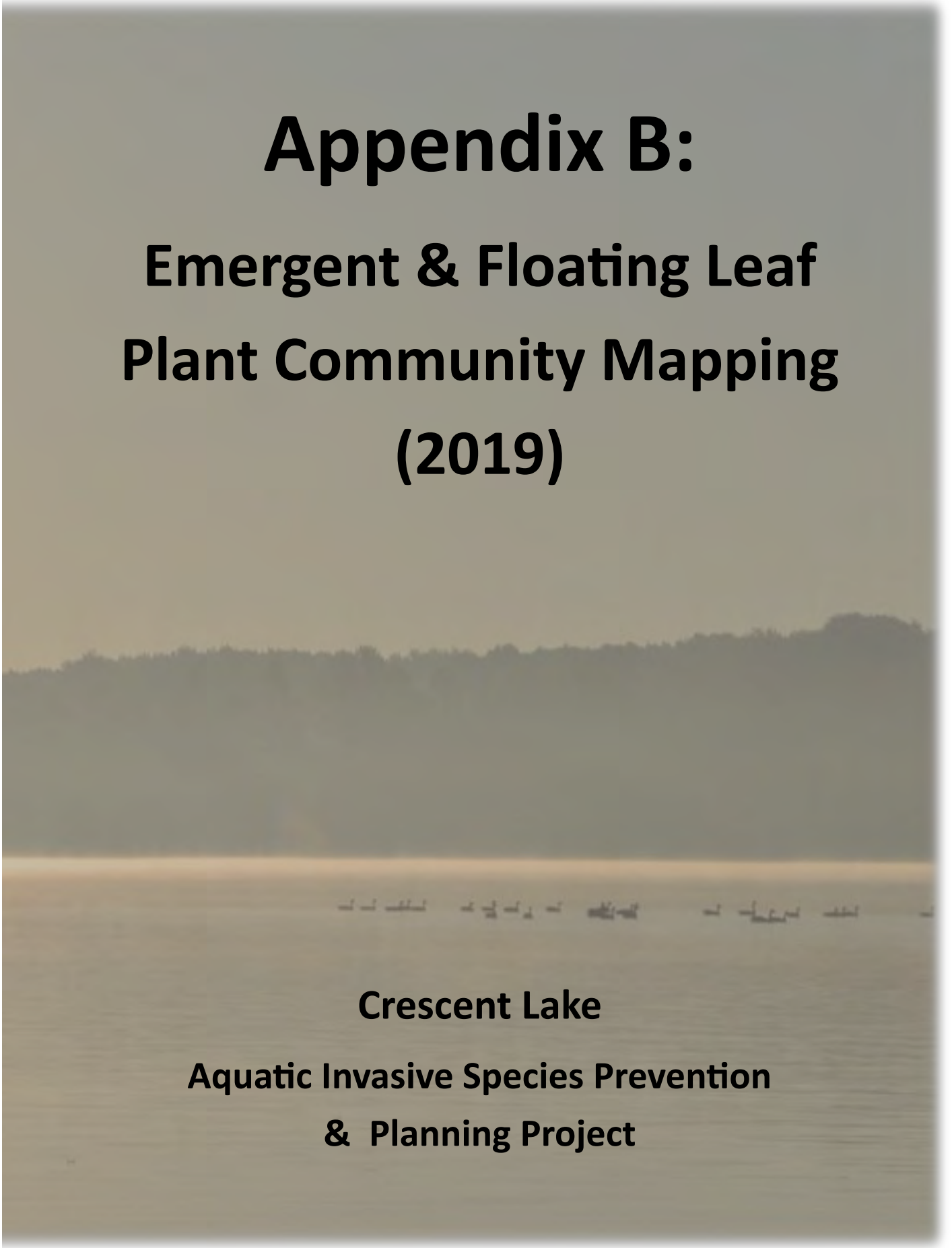
CITATION: **Nichols, SA. 1999. Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications. Journal of Lake and Reservoir Management, 15(2):133-141.**

CITATION: **University of Wisconsin-Madison, 2001. Wisconsin Floristic Quality Assessment (WFQA). Retrived October 27, 2009 from: http://www.botany.wisc.edu/WFQA.asp**

| DEPTH BIN (FT) | # SITES (NO ENTRY) |
|---|---|
| 1 | 1 |
| 2 | 13 |
| 3 | 38 |
| 4 | 38 |
| 5 | 36 |
| 6 | 42 |
| 7 | 42 |
| 8 | 38 |
| 9 | 41 |
| 10 | 34 |
| 11 | 35 |
| 12 | 23 |
| 13 | 25 |
| 14 | 30 |
| 15 | 22 |
| 16 | 42 |
| 17 | 25 |
| 18 | 9 |
| 19 | 8 |
| 20 | 6 |
| 21 | 0 |
| 22 | 0 |
| 23 | 0 |
| 24 | 0 |
| 25 | 0 |
| 26 | 0 |
| 27 | 0 |
| 28 | 0 |
| 29 | 0 |
| 30 | 0 |
| 31 | 0 |
| 32 | 0 |
| 33 | 0 |
| 34 | 0 |
| 35 | 0 |




**Note:** The X-axis (Depth Bin) can be scaled to better fit the plant distribution data.
Click on the outermost portion of the graph, and adjust the selection box in Column A.

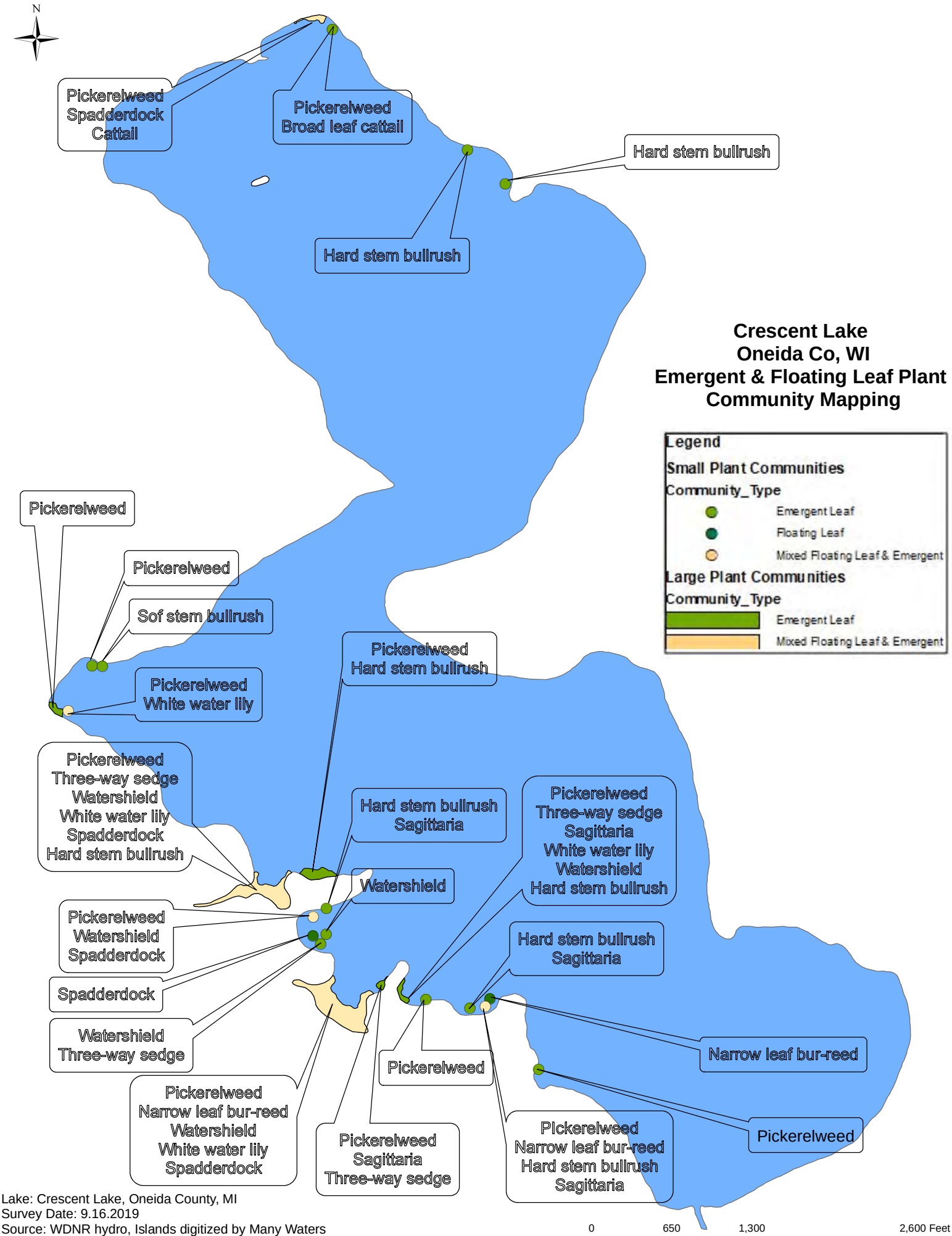


# Appendix B:

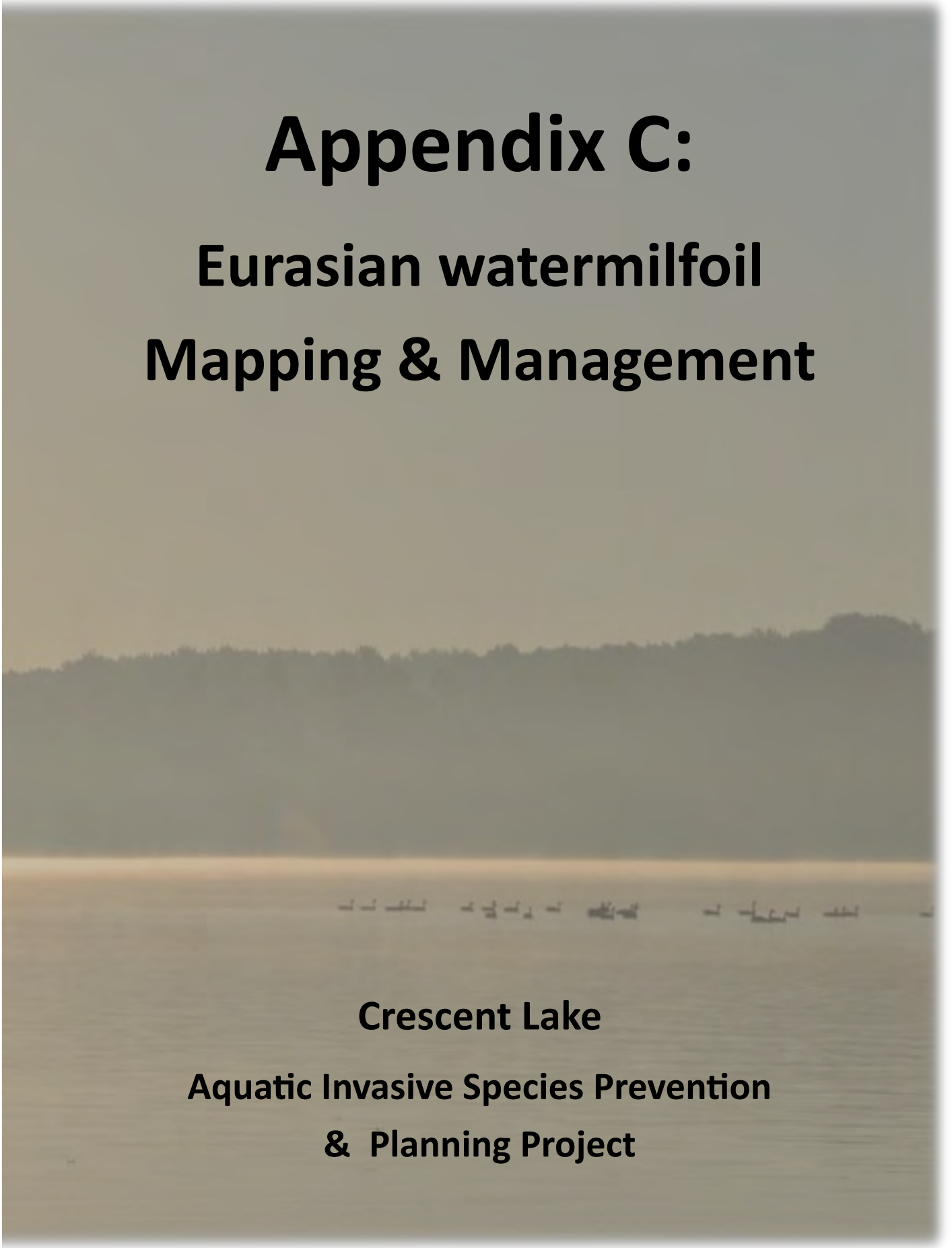
## Emergent & Floating Leaf Plant Community Mapping (2019)

**Crescent Lake**

**Aquatic Invasive Species Prevention & Planning Project**




Lake: Crescent Lake, Oneida County, MI
Survey Date: 9.16.2019
Source: WDNR hydro, Islands digitized by Many Waters
File: Crescent_EFL_2019



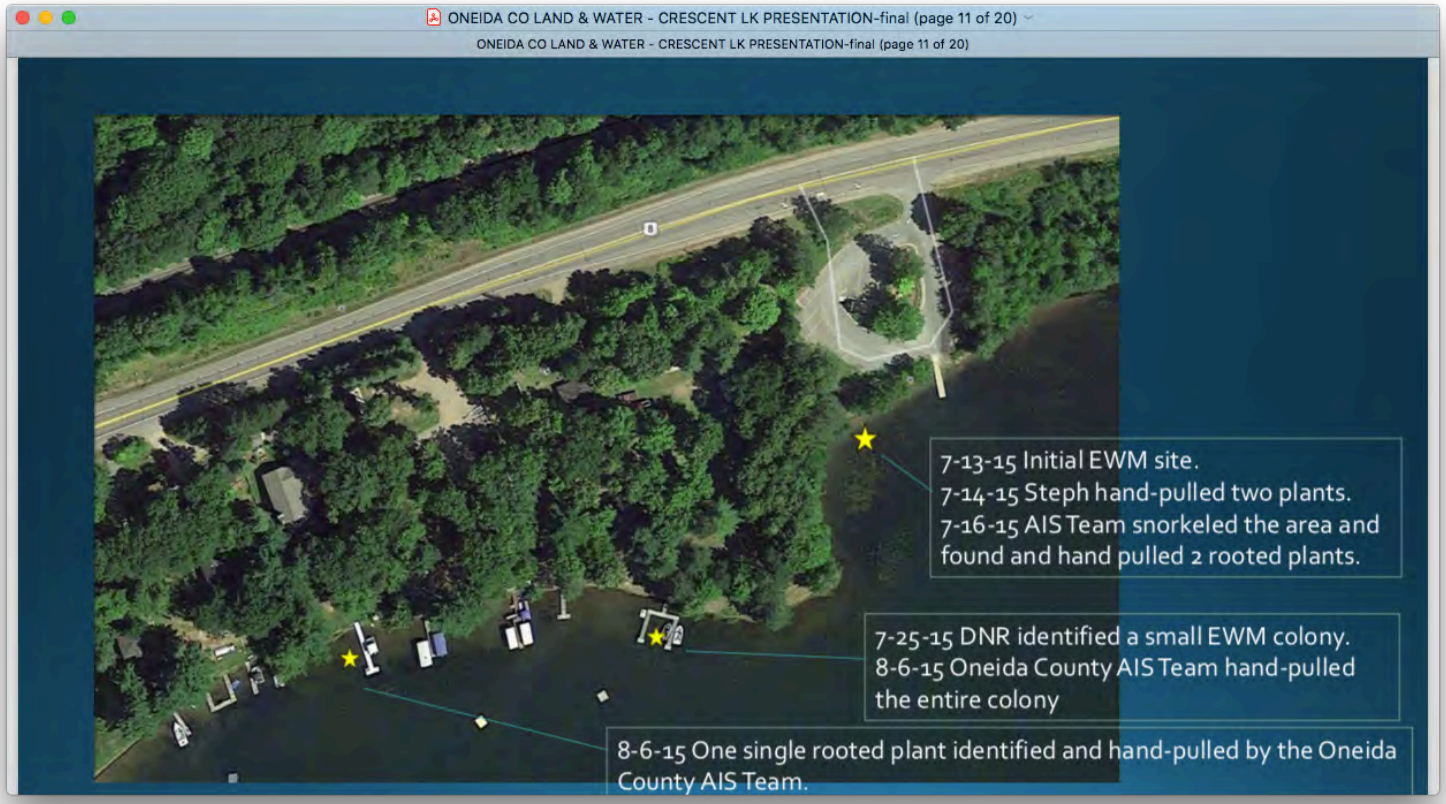
# Appendix C:

## Eurasian watermilfoil Mapping & Management

**Crescent Lake**

**Aquatic Invasive Species Prevention & Planning Project**

# Map 1


ONEIDA CO LAND & WATER - CRESCENT LK PRESENTATION-final (page 11 of 20)
ONEIDA CO LAND & WATER - CRESCENT LK PRESENTATION-final (page 11 of 20)
7-13-15 Initial EWM site.
7-14-15 Steph hand-pulled two plants.
7-16-15 AIS Team snorkeled the area and found and hand pulled 2 rooted plants.
7-25-15 DNR identified a small EWM colony.
8-6-15 Oneida County AIS Team hand-pulled the entire colony
8-6-15 One single rooted plant identified and hand-pulled by the Oneida County AIS Team.

From: **James Gehrke** jimgehrke60@gmail.com
Subject: Fwd: Crescent Lake (Oneida County) 2015 EWM Survey Results
Date: September 15, 2015 at 7:14 AM
To: Kay Gehrke kayjimg@gmail.com

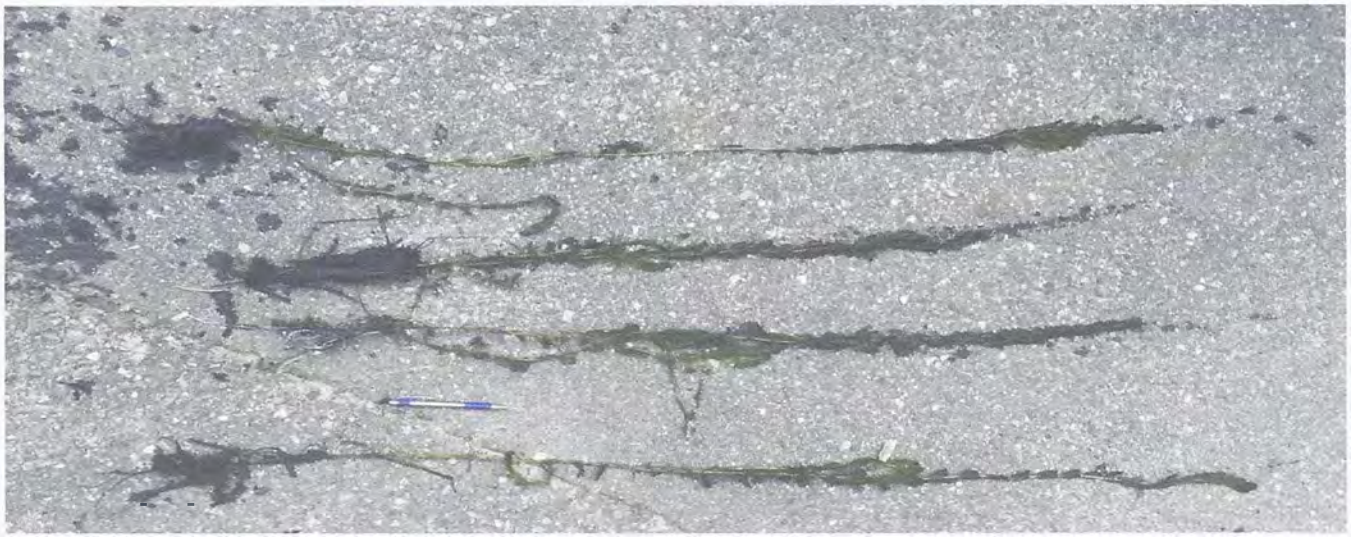
---------- Forwarded message ----------
From: **Eddie Heath** <EHeath@onterra-eco.com>
Date: Wed, Sep 2, 2015 at 4:22 PM
Subject: Crescent Lake (Oneida County) 2015 EWM Survey Results
To: Jim Gehrke <jimgehrke60@gmail.com>
Cc: Tim Hoyman <THoyman@onterra-eco.com>, Brenton Butterfield <BButterfield@onterra-eco.com>, Michele Sadauskas <msadauskas@co.oneida.wi.us>, "Kevin Gauthier (Kevin.GauthierSr@Wisconsin.gov)" <Kevin.GauthierSr@wisconsin.gov>

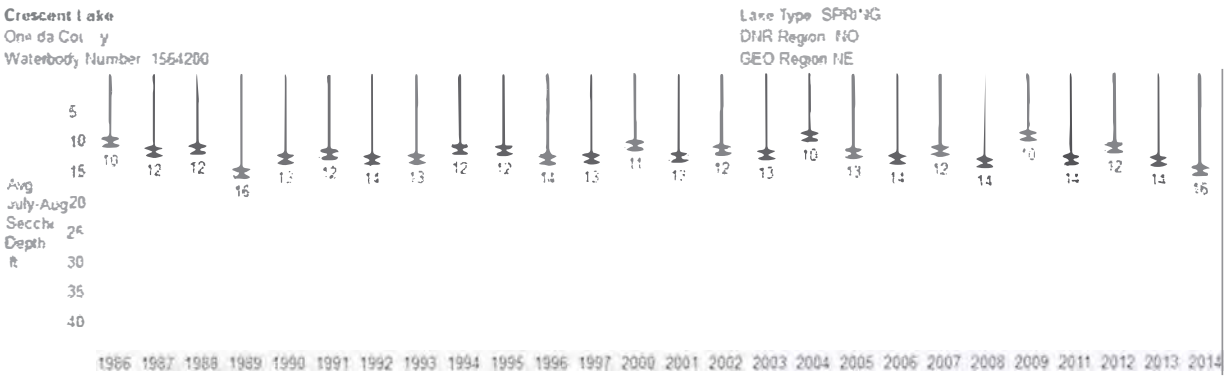
Greetings Jim, As you are aware, Brenton and Steve conducted an EWM survey of Crescent Lake yesterday (9/1/2015). This survey was a visual meander of the entire littoral zone of the lake. The weather conditions were perfect for the survey, calm winds most of the day with full-to-hazy sun. However, the water transparency was about 6.1 feet, lower than historical records located on the WDNR's SWIMS database for your lake (graph shown under my email signature). During the survey, the crew located 6 EWM plants in relatively shallow water (2-3 feet). As shown on the attached map, they were all found near previous findings by the WDNR and/or the OCLWCD. The crew had additional time and hand-removed these 6 plants. Five of them are pictured in the attached image – the 6th plant has been prepared for vouchering and will be sent into a laboratory for genetic testing. Below is a table that contains the GPS coordinates for the findings:

| DATE | EXOTIC | DENSLABEL | DEPTH | Long | Lat |
|---|---|---|---|---|---|
| 9/1/2015 | EWM | Single or Few Plants | 2 | -89.524483 | 45.616338 |
| 9/1/2015 | EWM | Single or Few Plants | 2 | -89.524489 | 45.616345 |
| 9/1/2015 | EWM | Single or Few Plants | 2 | -89.524495 | 45.616378 |
| 9/1/2015 | EWM | Single or Few Plants | 2 | -89.524468 | 45.616264 |
| 9/1/2015 | EWM | Single or Few Plants | 2 | -89.524452 | 45.616248 |
| 9/1/2015 | EWM | Single or Few Plants | 3 | -89.525196 | 45.61598 |
| 9/1/2015 | EWM | Single or Few Plants | 3 | -89.525902 | 45.615952 |
| 9/1/2015 | PL | Single or Few Plants | N/A | -89.522479 | 45.607747 |

Also shown on the attached map, a single purple loosestrife plant was found further south along the western shoreline. At this time, we believe that a coordinated hand-harvesting strategy would be the most effective control strategy to implement. In a subsequent set of emails, we will outline a multi-year approach that we feel would help your lake group stay on top of this issue. This would include conducting a survey each year at the beginning of the growing season (~June) and again at the end of the growing season (~August/September), with hand-harvesting occurring between the two surveys. This could be a two-tiered effort, utilizing both volunteers and professional hand-harvesting firms to conduct the hand-removal. The project would take advantage of a 75% cost share grant award of $20,000 that is available from the WDNR through the AIS-Early Detection and Response program. You can anticipate receiving a proposed scope of work from us later this month as our field season winds down. If you decide to accept our proposal, we will assist your lake group in applying for the grant funds at no additional charge.

Eddie Heath Aquatic Ecologist Onterra, LLC voice: 920-338-8860 eheath@onterra-eco.com




Crescent Lake
Lake Type SPRING
DNR Region NO
GEO Region NE
Avg July-Aug Secchi Depth ft
5
10
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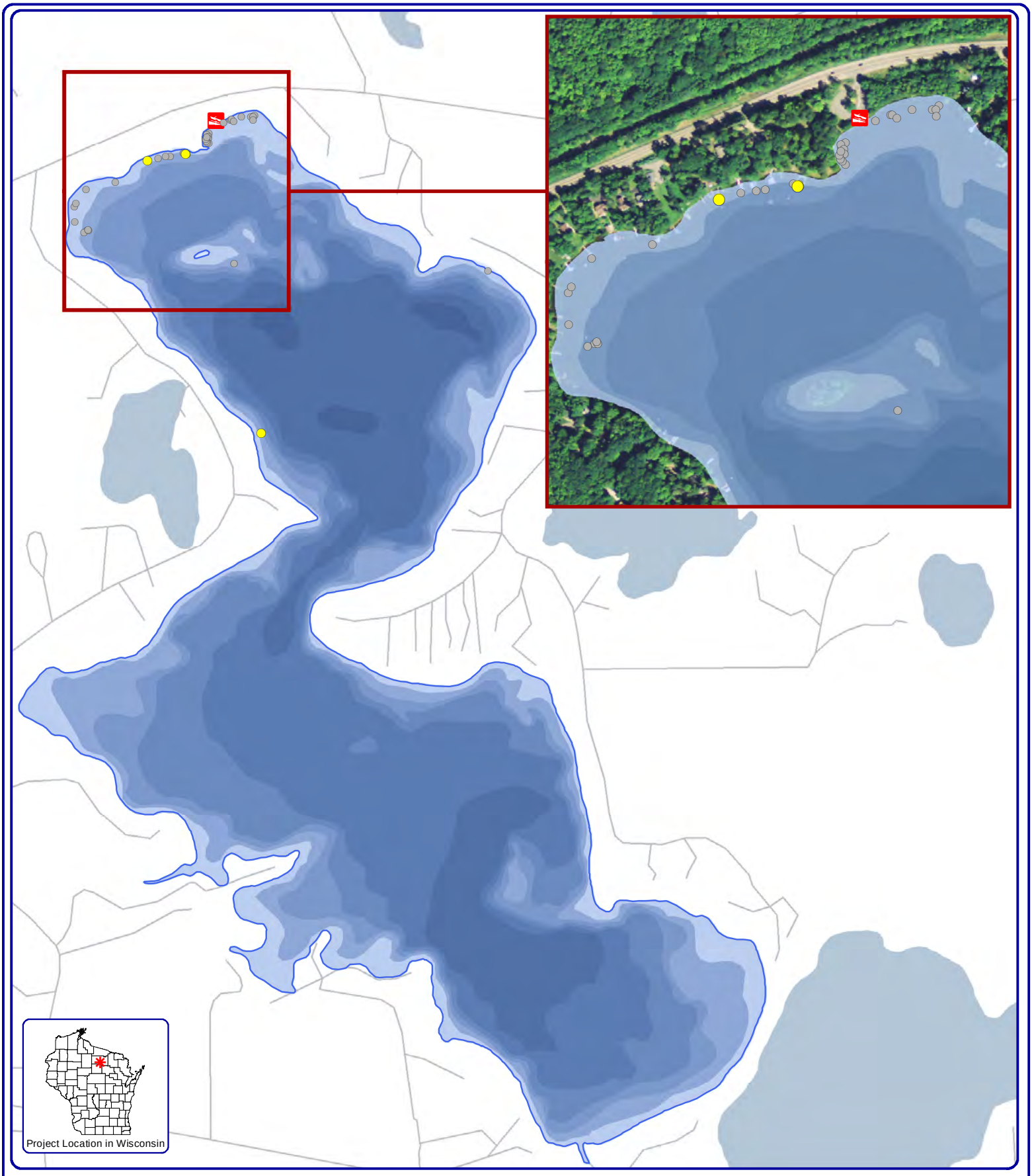
35
40
10 12 12 16 13 12 14 13 12 12 14 13 11 13 12 13 10 13 14 12 14 10 14 12 14 15
1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2011 2012 2013 2014


5-10 Plants, Removed by OCLWCD on 7/16/15
Single Plant Removed by OCLWCD on 8/6/15
Small Plant Colony, Removed by OCLWCD on 8/6/15
Project Location in Wisconsin
1,100
Feet
Onterra LLC
Lake Management Planning
.egen
Eurasian Water Milfoil (Septemb er 2015)
Single or Few Plants
Clumps of Plants
Sma Plant Colony
Purple Loosestrife
X Removed by Onterra
Crescent Lake,
Orveida Co,WI
Sept 2015
EWM Survey Results




N
W E
S

1,200

Feet

## Legend

**Eurasian Water Milfoil (September 2016)**

- Highly Scattered *(none)*
- Scattered *(none)*
- Dominant *(none)*
- Highly Dominant *(none)*
- Surface Matting *(none)*
- Single or Few Plants
- Clumps of Plants
- Small Plant Colony *(none)*

Onterra LLC
Lake Management Planning
815 Prosper Rd
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

**Sources:**
Roads and Hyrdo: WDNR
Bathymetry: WDNR, 1975
Aquatic Plants: Onterra, September 2016

**Map Date:** September 30, 2016

*Filename: Crescent_EWMPB_Summer16.mxd*

# Crescent Lake

Oneida County, Wisconsin

# September 2016 EWM Survey Results

**Spring Eurasian Watermilfoil (Myriophyllum spicatum)**

**Survey of Crescent Lake (1564200), Oneida County, WI**

**John G Skogerboe**

On 5 May, 2017 Carol Warden and I conducted a detailed Eurasian watermilfoil (milfoil) survey on Crescent Lake, Oneida County, WI to quantify the extent of infestation and delineate areas that might require aquatic invasive species management. Crescent Lake is 616 acres in size, has a maximum depth of 32 ft and a mean depth of 17 ft. Crescent Lake is listed as a mesotrophic, spring lake on the WI DNR web site. Milfoil was upright and beginning to grow at the time of this survey, however most natives were either small or had not begun to grown.

A point intercept grid (50 m x 50 m) was developed as a guide to moving through the lake in a systematic manner but was not used exclusively. The goal was to delineate as much of the milfoil as possible so deviations from the grid were common and consideration was given to a map of aquatic plant locations provided at the boat ramp. The survey track was recorded using a Garmin GPSmap 76Cx GPS (Figure 1). A combination of polarized sunglasses, Lowrance Down Looking Structure Scan Sonar, and official WI DNR aquatic plant survey rakse were used to identify milfoil. The locations of milfoil were recorded on Garmin Oregon 550t GPS and the milfoil densities were rated on a scale of 0 to 5:

- 0 – no milfoil plants were observed (no dot on map. Figure 2)
- 1 – 1 milfoil plant was observed (blue dot on map)
- 2 – scattered individual plants (green dot on map)
- 3 – scattered small clumps or clusters of milfoil plants (yellow dot on map)
- 4 – dense but scattered clumps or clusters of milfoil plants (orange dot on map)
- 5 – dense beds of milfoil plants (red dot on map)

A low number of individual milfoil plants were located on the north end of the lake (Figure 2). Only two sites had a density rating of 2 and no sites with ratings greater than 2 were observed. Milfoil currently represents a minor part of the overall aquatic plant community.

As a scientist in the US Army Corps of Engineers I conducted research on the use of aquatic herbicides to control aquatic invasive plant species so my expertise is in the use of aquatic herbicides. Given the low density of milfoil in Crescent Lake other aquatic plant management strategies should be considered such as monitoring, hand pulling or some type of scuba diver assisted dredging. The following is a list of potential current and future aquatic herbicide management alternatives.

**Small herbicide treatment polygons:** Delineating small polygons or treatment blocks around clusters of plants and treating them with 2,4-D (granule or liquid formulations) or diquat is a common herbicide management strategy (Figure 3). Based on data collected on more than 100 aquatic herbicide treatments conducted in WI, this approach may yield short term nuisance control however milfoil is not at nuisance levels in Crescent Lake. The length of time that herbicides are in contact with submersed aquatic plant species is the critical component to long term successful control of milfoil. The herbicide 2,4-D requires approximately 9 to 12 hours of exposure time at the maximum allowed application rate

(4 mg/L ae) to control milfoil. Herbicide concentration data collected in WI have shown that exposure times in treatment sites less than 5 acres are usually less than 6 hours and frequently less than 3 to 4 hours. Exposure times of less than 1 hour are not uncommon. The size of the treatment polygons in this example range in size from 0.27 to 0.78 acres and would likely have herbicide exposure times of less than 2 hours. The aquatic herbicide diquat probably requires 3 to 4 hours of exposure time to effectively control milfoil and more time yields better control. As stated earlier small area treatments of milfoil may yield some level of nuisance control however expansion of milfoil population remains very possible if Crescent Lake is a suitable environment for milfoil.

**Large block (12 acres) diquat, diquat + endothall, or 2,4-D treatments:** Larger blocks of treatment areas usually result in longer exposure times and better control of EWM, although wind speed and direction also play a significant role. Consideration of shore lines such as whole bays or inlets can also help to expand the exposure times. A larger treatment block of 12 acres in the bay around the boat ramp might result in enough exposure time for the aquatic herbicides to provide longer term milfoil control and help to reduce expansion (Figure 4). Again diquat as well as a combination of diquat + endothall have reduced exposure time requirements and might provide better milfoil control compared to 2,4-D. Diquat + endothall have been shown to be very effective for control of hydrilla in the south, but we do not currently have the data to show that adding endothall improves control of diquat on milfoil. Because milfoil densities are very low and limited in distribution this treatment option may be a consideration for the future should milfoil increase in density and distribution. Diquat and endothall are widely considered to be broad spectrum herbicides, however damage to native aquatic plant species can be greatly reduced by applying them in colder water, less than 65$^{o}$F. Early spring is a good time to apply these herbicides.

**Large block (40 acres) 2,4-D treatment:** Based on DNR data collected in WI, 2,4-D treatments are most effective, long term, when applied to larger areas such as a 40 acre treatment area (Figure 5). Very large treatment areas with much reduced application rates can result in exposure times of days and weeks which have the highest probability of long term control (>1 year). Excellent control has been shown in WI whole lake treatments or whole bay treatments such as the northern half of Crescent Lake. Damage to native plant species may result from these treatments. Careful consideration of application rates is necessary to minimize potential damage. The density and distribution of milfoil in Crescent Lake probably to not currently justify this approach, but it could be a consideration in the future if milfoil populations significantly expand with or without other management scenarios.

**Figure 1. Crescent Lake Eurasian watermilfoil survey and delineation GPS track (5 May 2017)**

**Whole lake** **Northern Bay**

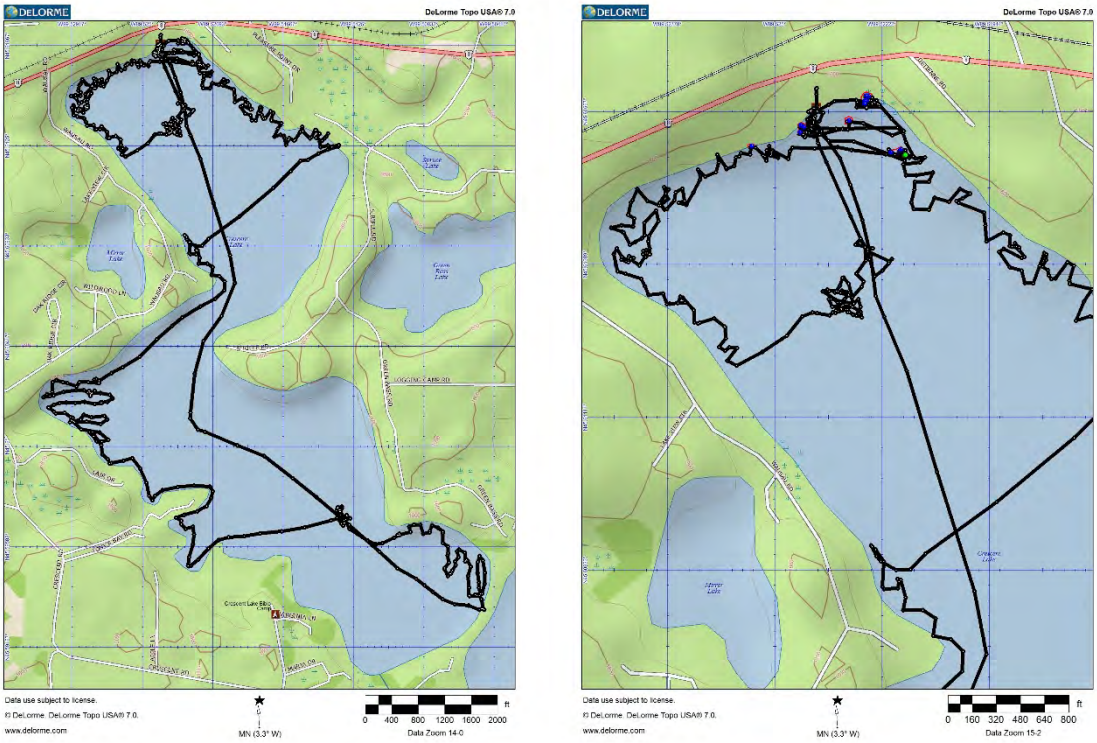


**Figure 2. Crescent Lake Eurasian watermilfoil distribution and densities**

**Whole lake** **Northern Bay**

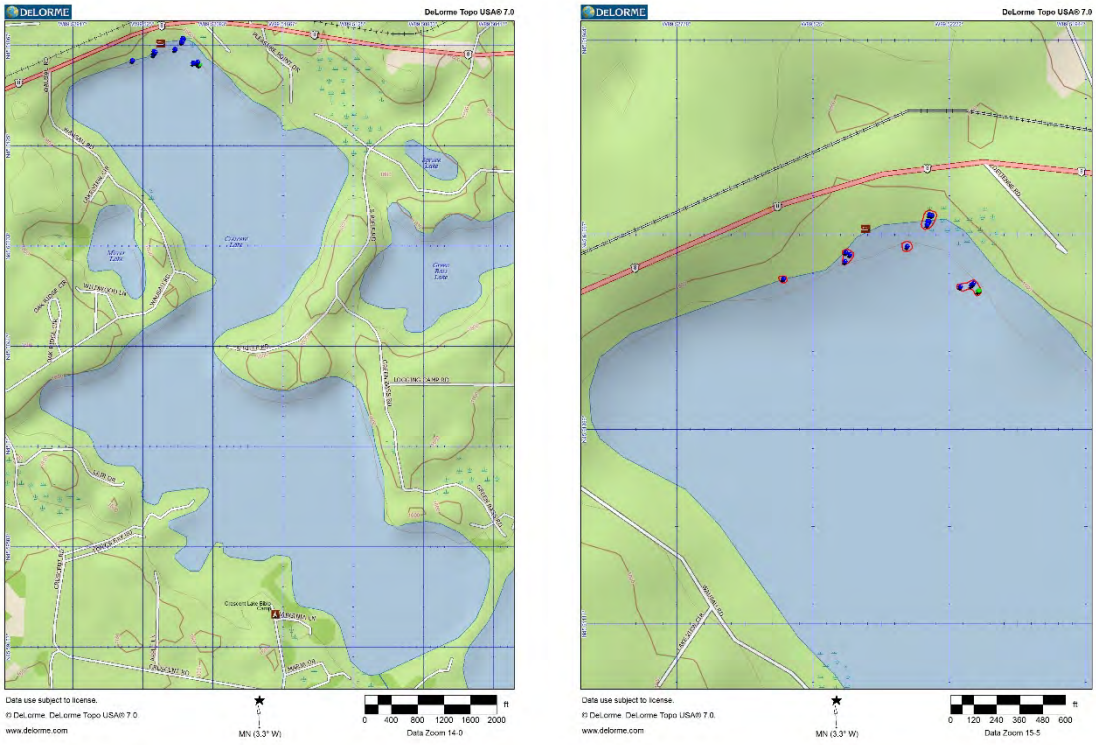


**Figure 3. Crescent Lake Small herbicide treatment polygons**

**Figure 4. Crescent Lake Large block (12 acres) diquat, diquat + endothall, or 2,4-D treatments**

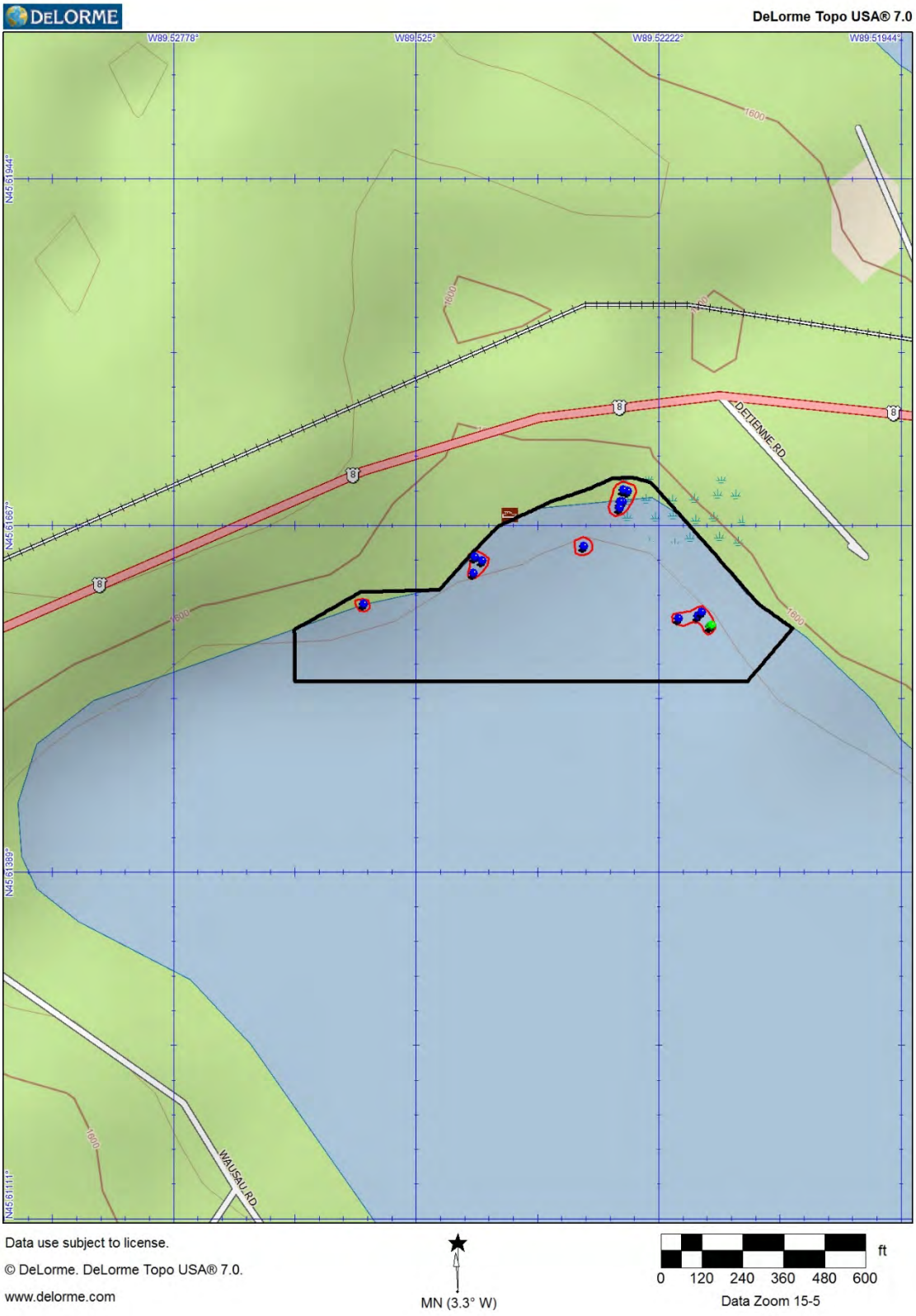
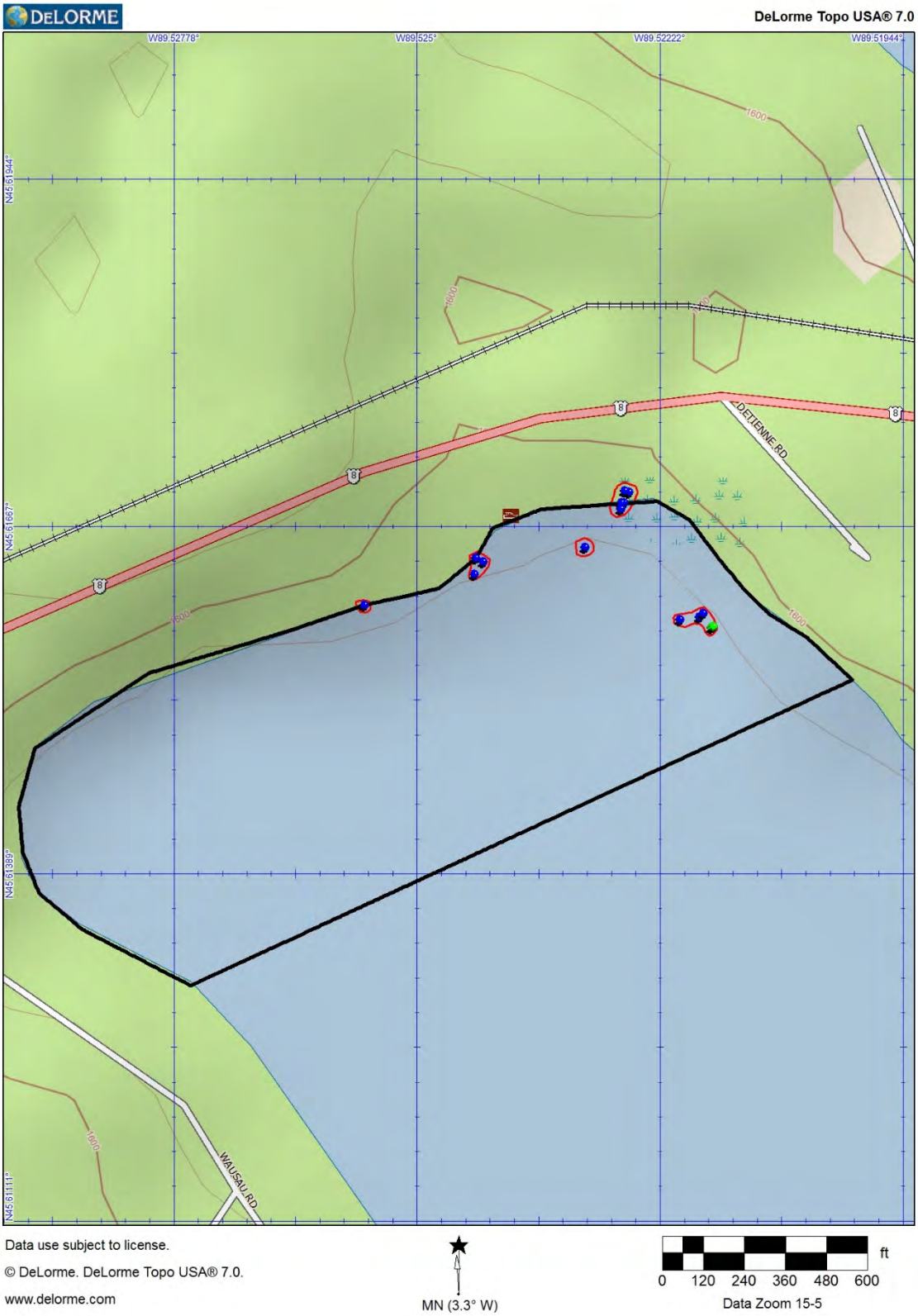
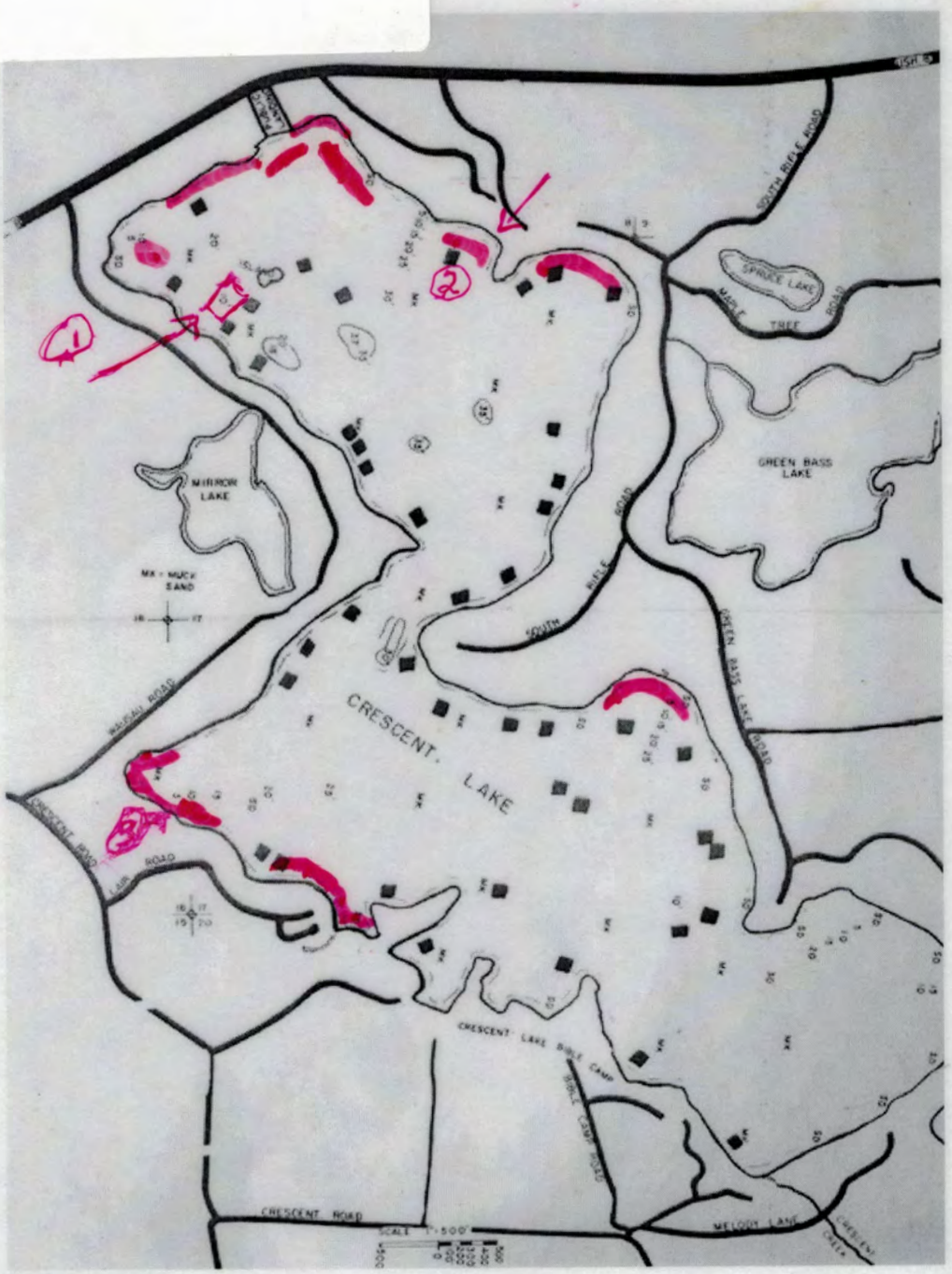


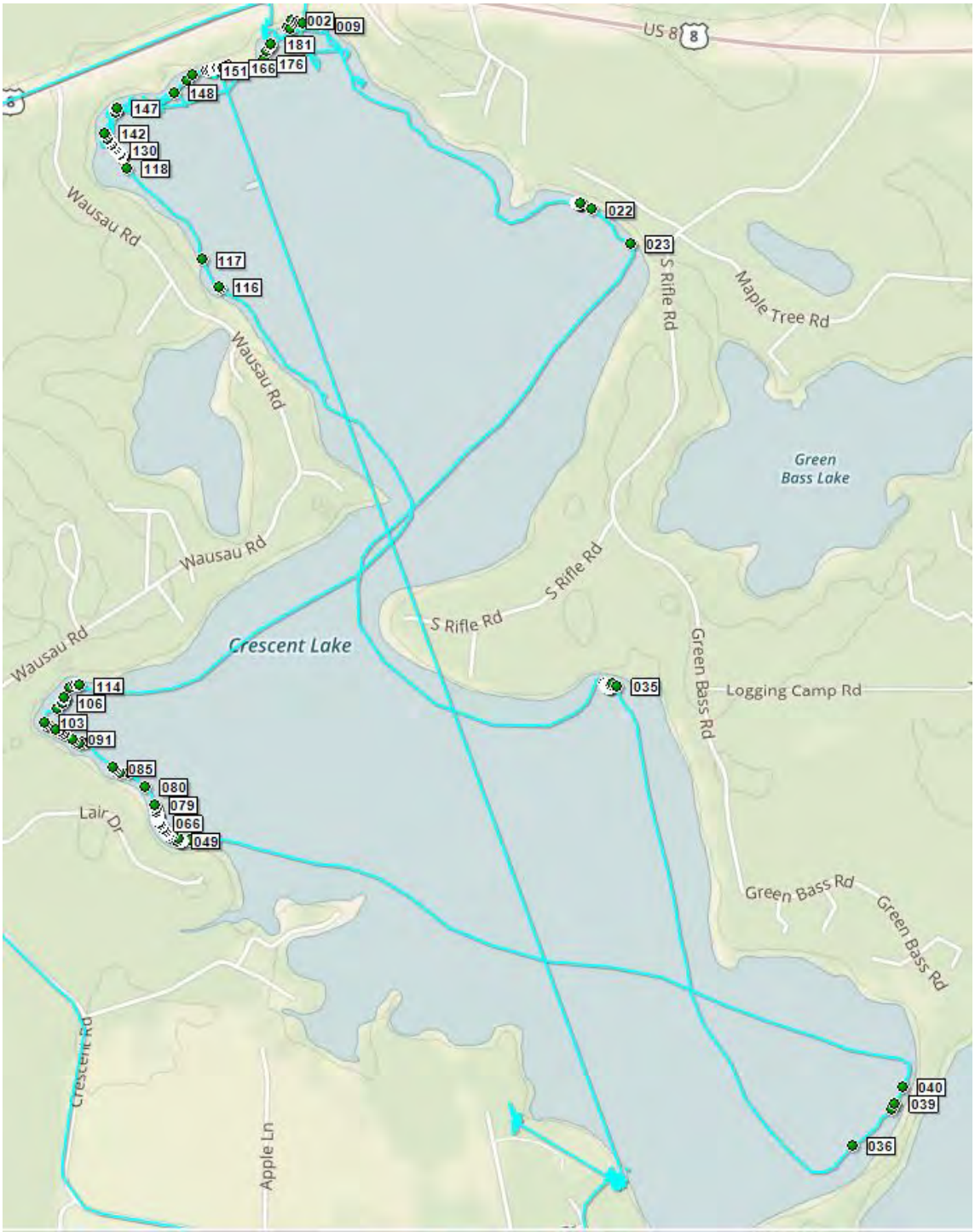
**Figure 5. Crescent Lake Large block (40 acres) 2,4-D treatment**






Crib Locations

# Map 3


002
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049
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039
036
US 8
Wausau Rd
Wausau Rd
Wausau Rd
Wausau Rd
S Rifle Rd
S Rifle Rd
S Rifle Rd
Maple Tree Rd
Green Bass Lake
Crescent Lake
Green Bass Rd
Logging Camp Rd
Green Bass Rd
Green Bass Rd
Lair Dr
Crescent Rd
Apple Ln

## 2017 EWM Harvesting Report

Hand harvesting was done throughout the season by lake resident volunteers and paid contract harvesting by Aquatic Plant Management LLC.

**Volunteer hand harvesting:** periodic harvesting at locations identified by lake resident monitors.

6 to 10 people involved in addition to the lake moitors.

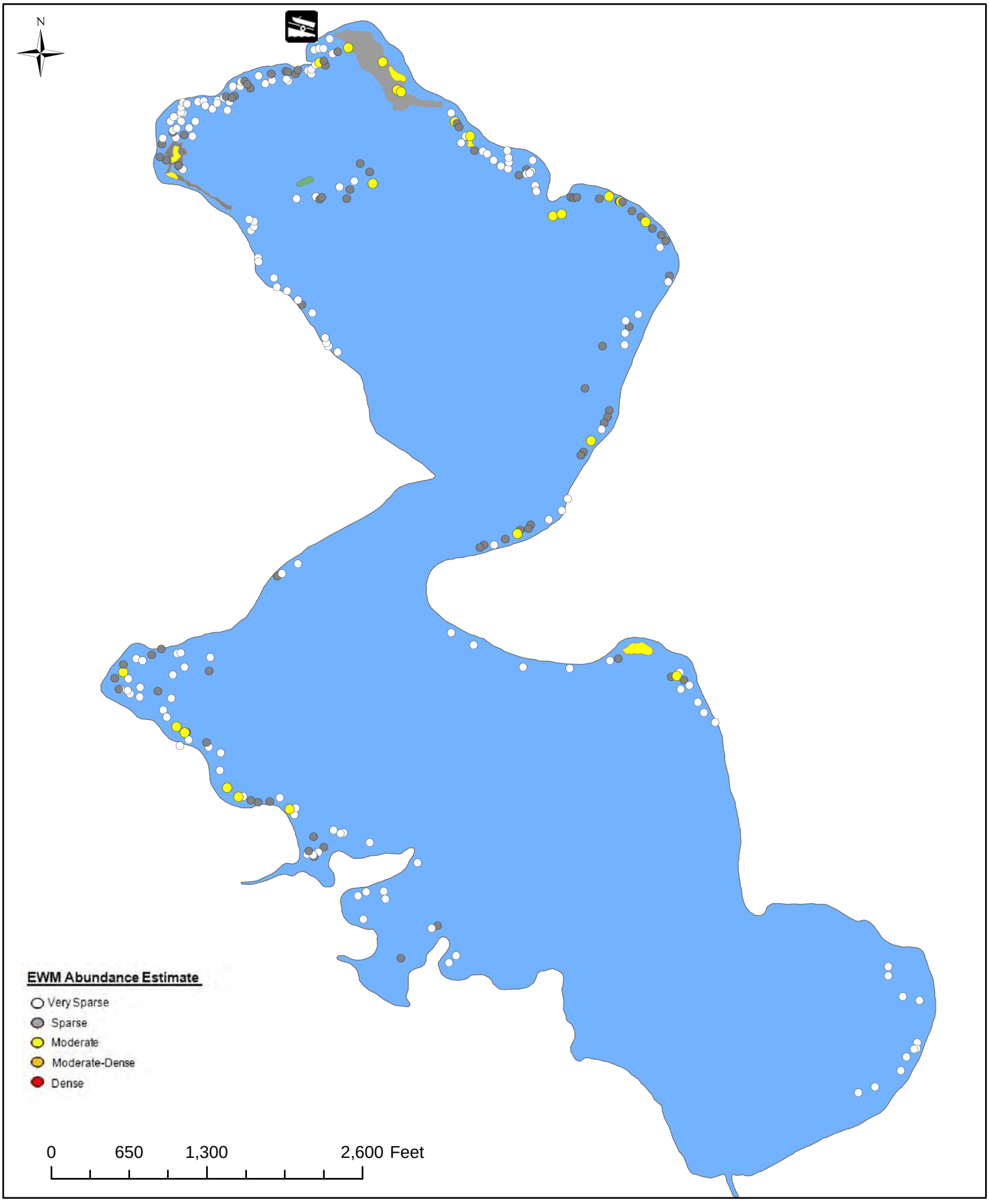
100+ hours on harvesting activities

500 pounds of EWM harvested

**Aquatic Plant Management LLC**: 7/20/17 DASH harvesting, 8/23/17 snorkel harvesting.

48.5 harvesting hours

18.9 cubic feet of EWM harvested




Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 4.26.19, Many Waters, LLC
Survey Date: 9.7.18
Source: WDNR hydro
File: Crescent_MLSS_2018

**Crescent Lake - Oneida Co, WI**
**Mid/Late Season EWM Survey**
**2018**

# EURASIAN WATER MILFOIL (EWM) MANAGEMENT MEETING

# DNR AND CRESCENT LAKE ASSOCIATION

# December 4, 2018

## EURASIAN WATER MILFOIL HISTORY ON CRESCENT LAKE

## LOCATION: ONEIDA COUNTY SIZE: 622 ACRES

## 1970 Crescent Lake Association was formed

**2004 - 2018**

Started to do boat landing boat inspections checking for invasive species. This past year and many formers years we led the county in hours. 2018 we did 30% of the volunteer hours done in Oneida County.

Also, did lake monitoring by volunteers twice annually by tossing rakes every 100 feet and identifying every plant brought to the surface. Have maintained the results and educated lake residents. About one thousand hours of time spent doing this.

Applied for and received Clean Boats Clear Waters DNR Grant. 2004 – present. 4598 hours of boat inspection time 2004 - 20014

**2007**

Crescent Lake Management Plan completed

**2008**

Crescent Lake Management Plan revised

**2009**

Crescent Lake Management Plan revised

**2015**

July: EWM discovered by UW Stevens Point near boat landing. Crescent Lake Association (CLA) contacts Rhinelander DNR staff for guidance and proposes a course of action. CLA proposes to cover EWM site with a benthic barrier (fabric, impervious barrier, placed on the bottom of the lake covering the EWM). Rhinelander DNR staff does not approve this course of action. CLA states it is concerned that EWM will expand throughout the lake if immediate action not taken.

Hand pulling/harvesting began with the assistance of Oneida County Land and Water Conservation Office.

539 volunteer hours of boat inspections in 2015

CLA applied for and received $20,000 Early Detection and Response Grant (AUG 1, 2015) to (JUNE 30, 2018) to assist with managing spread of EWM. Hired consulting firm to survey Crescent Lake and assist with developing plan of action.

$2,293.00 to Onterra for consulting services. (see map 1)

**2016 Year two of Early Detection and Response Grant**

Visible expansion of EWM.

Early and late season lake survey completed by outside contractor. (see map 2)

Increase volunteer hand pulling/harvesting activities.

Lake resident volunteer hand harvesting of EWM totaled 37 hours, pounds total harvested for year not available.

Contracted with outside contractor to assist with hand harvesting of EWM. Used grant funding to cover cost. Total hand harvesting and DASH harvesting of EWM by outside contractor 8.5 cubic feet, 24.13 hours on the water.

360+ volunteer hours of shore monitoring looking for EWM.

675 volunteer hours of boat inspections in 2016.

Discussed herbicide application at Crescent Lake Association meeting. DR. Larry Benning and John Sirek, experts in EWM herbicide treatment, presented at an association meeting. Received overwhelming support by members in attendance.

Submitted DNR application and permit to do herbicide treatment of EWM. ($195.00) Permit denied.

Met with Rhinelander DNR staff to discuss use of herbicides to manage/control spread of EWM. Told by DNR staff an application for herbicide application would not be approved.

$5,080.00 to Onterra and Aquatic Plant Management

**2017**

Visible rapid expansion of EWM. (See map 3)

Increase hand harvesting activities.

Lake resident volunteer hand harvesting of EWM totaled 64 hours, pounds total harvested for year not available.

Contracted with outside contractor to assist with hand harvesting of EWM. Used grant funding to cover cost of

Applied for application to use Diver Assisted Suction Harvesting boat (DASH boat) for more efficient harvesting of EWM. $300.00 Permit approved.

Contracted with outside contractor to assist with hand harvesting and DASH boat harvesting of EWM. Used grant funding to cover cost. Total hand harvesting and DASH harvesting of EWM by outside contractor 19 cubic feet, 49 hours on the water.$3,892.25

Met with Rhinelander DNR staff to discuss use of herbicides to manage/control spread of EWM. Told by DNR staff an application for herbicide application would not be approved.

Discussed with Madison based DNR staff the use of herbicides to manage/control spread of EWM. Got verbal approval herbicide application for the fall of 2017. CLA decided not to go forward with herbicide application because the EWM growing cycle was over and desired control impact would not be realized.

417 volunteer hours of shore monitoring looking for EWM.

640 volunteer hours of boat inspections in 2017

**Were told that we had to submit another LAKE MANAGEMENT grant in order to qualify for additional AIS GRANT……**

Applied for and received $37,000 Lake Management Grant to assist with managing spread of EWM.

Applied for and received a second $20,000.00 Early Detection and Response Grant to assist with managing spread of EWM.

**2018**

SIGNIFICANT RAPID EXPANSION OF EWM. (see map 4)

Increase hand harvesting activities.

Lake resident volunteer hand harvesting of EWM totaled 451 hours with 3095 pounds of EWM harvested.

Applied for application ($300.00) to use Diver Assisted Suction Harvesting boat (DASH boat) for more efficient harvesting of EWM. THE CONTRACTOR COULD NOT DO DASH BOAT HARVESTING.UNTIL LATE SUMMER BECAUSE OF THE DNR FAILURE TO APPROVE THE APPLICATION IN A TIMELY MANNER.

Contracted with outside contractor to assist with hand harvesting and DASH boat harvesting of EWM. $6,099.20 Used grant funding to cover cost. Total hand harvesting and DASH harvesting of EWM by outside contractor 81.0 cubic feet, 21 hours on the water.

Met with Rhinelander DNR staff to discuss use of herbicides to manage/control spread of EWM. Told by DNR staff an application for herbicide application for Crescent Lake would not be approved. DNR did approve herbicide treatment in lakes in Northern Wisconsin.

Lake residents build Diver Assisted Suction Harvesting Boat. Used grant funds AND ASSOCIATION FUNDS to cover expenses. $8,978.11 DASH boat completed in Sept.

305 volunteer hours of shore monitoring looking for EWM.

569 volunteer hours of boat inspection time in 2018

Many Waters has indicated that our bill for 2018 to address EWM only will come to $5800.00

This brings the amount of funds in 2018 expended for EWM alone to **$21,177.31**

**TOTAL COST IN GRANT AND ASSOCIATION FUNDS SINCE JULY 13, 2015**

**$32,937.56**

Lake residents are becoming more and more frustrated with DNR's lack of concern regarding the spread of EWM in Crescent Lake. We do all the work and the DNR provides roadblocks to effective EWM management. (see map 4)

DNR staff contacted do not provide any creative means of addressing EWM issue on Crescent Lake.

**2019** ????

**WHAT IS THE DNR'S PLAN TO ADDRESS EURASIAN WATER MILFOIL IN CRESCENT LAKE?**

**EWM Harvesting Activities**

**2016**

- **Volunteer, 37 hours na pounds**
- **360 volunteer hours shore monitoring looking for EWM**
- **Commercial, 24 hours**
- **Commercial, 8.5 cu ft EWM**
- **Commercial, .35 cu ft per hour**

**2017**

- **Volunteer, 64 hours na pounds**
- **417 volunteer hours shore monitoring looking for EWM**
- **Commercial 49 hours**
- **Commercial, 19 cu ft EWM**
- **Commercial, .39 cu ft per hour**

**2018**

- **451 hours, volunteer 3095 pounds**

- **305 volunteer hours shore monitoring looking for EWM**
- **Commercial 21 hours**
- **Commercial, 81 cu ft EWM**
- **Commercial, 3.86 cu ft per hou**

## COMMERCIAL HARVEST 2016 THROUGH 2018

- **3.51 CUBIC FOOT PER HOUR HARVEST INCREASE.**
- **11-FOLD INCREASE IN 3 YEARS.**
- **OVER 1000% INCREASE IN EWM IN 3 YEARS!!**

We do not regret doing the job of education for lake residents and all lake users. We will continue to do CB/CW activities and work with the DNR and OCL&W office. We are eager for the results of the Lake Management Grant that we have been given. We want to move beyond the tasks of AIS and embrace shore improvement, littoral zone protection, and the fish and wildlife enhancement, and watershed preservation missions; but we can't do these things while watching the lake change from a full recreation lake to a choked mass of weed material that prevents use by anglers, and family recreation enthusiasts.

# EWM STATUS FOR CRESCENT LAKE

**As of 7/31/2019**

## The following represents updates on status of EWM expansion and management activities for specific areas of Crescent Lake.

On 7/31 Dick Lower and Terry Goldbach circled the entire lake to review the status of EWM on Crescent Lake. The following was prepared by Terry.

There are now very few shoreline areas where there is no or very limited EWM. Expansion and density have increased faster than anticipated.

See attached for specific areas:

A1. Wausau Bay: significant expansion, growth, and density since last year. Expansion occurring in the entire bay. DASH will not be effective in long run.

A2. Shallow water areas have significant expansion and surface mating. Hope to use Crescent Lake DASH boat here. DASH will not be effective in long run.

B. Lower/LaPorte/Hitchcock bay: significant expansion, growth, and density since last year. Homeowners in the area were not swimming in this area because of density and area expansion. Crescent Lake DASH boat used to open-up an area for swimming. DASH will not be effective in long run. DASH used last year with no positive impact for this year.

C. New area. Roughly 200' X 400'. Some high density within this area. Major skiing and boating area.

D. High density area by island. 200' X 200'. Put markers out around entire area. Very busy boat traffic area. Using Crescent Lake volunteer diving team. Critical area because of location. Straight out from boat landing. Just south of 2019 ProcellaCOR treatment area. Hope it does not compromise ProcellaCOR treatment. DASH will not be effective in long run.

E. Area just south of ProcellaCOR treatment area. Showing signs of expansion.

F. High density area. 200' X 500'. Homeowners in the area are not swimming in this area because of density and area expansion. Using Crescent Lake volunteer diving team.

G. Large, high density area. Expanding faster than anticipated. Very busy boat traffic area. DASH will not be effective in long run.

H. Expansion and density increase over last year. Very busy boat traffic area.

I. Expansion and density increase over last year.

J. Radke Bay: Expansion and density increase over last year. Expanding faster than anticipated. High concentration of Northern Milfoil. EWM density within Northern Milfoil expanding faster than anticipated. Areas of EWM matting and increasing in density. EWM and northern milfoil found 400 to 500 feet from shorn. Popular area for boat traffic.

K. We are now seeing some EWM plants in this area. Using hand pulling at-this-time. We feel this area is being compromised by area J.

L. EWM spreading through the entire bay.

M. Showing signs of spreading and increasing in density.

N. Was treated with ProcellaCOR herbicide in June 2019. Results very positive. EWM is gone.

General observation:  volunteer hand pullers who have been doing hand pulling for 3 years are finding EWM regularly now in 10 to 14 feet of water.  As Dick and I toured the lake we found EWM in less than 12 inches of water depth out to 10 plus feet of water depth.  We found locations where the EWM didn't start until the depth was 4 plus feet.

## EWM Management Considerations For 2020

### 2019 ProcellaCOR herbicide application on north shore area of the lake was very effective.

Areas A 1, A 2, B, C, D, F: 2020 Herbicide Treatment (ProcellaCOR). Would depend upon cost and permit approval.

Areas G, H: 2020 Herbicide Treatment (ProcellaCOR). Would depend upon cost and permit approval. Very active boating areas by property owners.  Is a concern that this area could infect areas to the south.

Area J: expansion and density increase more than anticipated.  This area has the potential to infect entire far southern area of lake.  Management challenge because of native northern milfoil density.  Hard to do hand pulling because of density of all plants. Use DASH boat for 2020 where feasible and do evaluation for 2021 management considerations.  Herbicide Treatment (ProcellaCOR) may be the only successful method for management.  This bay is rather shallow and could be a major problem for EWM expansion and density issues.

Area K: now finding EWM expansion to this area.  Use hand harvesting.  Concern is this area has been compromised by area J.

Wisconsin Department of Natural Resources
Surface Water Grants Program
Aquatic Invasive Species
Grant # AEPP55318.2

# Crescent Lake AIS Prevention & Control Project

Crescent Lake – Oneida County, WI

2019 Reporting



Submitted To:
Wisconsin Department of Natural Resources
Attention: Scott Van Egeren – Lakes Biologist
8770 Hwy J, Woodruff, WI 54568
Phone: 715.471-0007
Scott.vanegeren@wi.gov

And

Crescent Lake Association
6714 Melody Lane
Rhinelander, WI 54501

Submitted By:

Many Waters, LLC
2527 Lake Ottawa Road
Iron River, MI, 49935
906.284.2198

Contact: Bill Artwich; billartwich@gmail.com
Barb Gajewski; skih2o@hotmail.com

**PROJECT OVERVIEW**

Crescent Lake, Oneida County, is a 616-acre deep lowland lake with a mean depth of 17 feet and a maximum depth of 32 feet. Crescent Lake, assessed in 2020, is below impairment thresholds for phosphorous and chlorophyll *a*, with a general water quality condition ranking of excellent. Located within the Woodboro Watershed, land cover consists of forests (55%), wetlands (13%), barrens (12%) and other uses (20%). Overall, this watershed ranks high for nonpoint pollutant issues affecting lakes and low for nonpoint pollutant issues affecting streams and groundwater. The most recent calculated floristic quality index for Crescent Lake is 36.76 (2019). Invasive species known to occur on Crescent Lake include Eurasian watermilfoil (EWM), purple loosestrife, rusty crayfish, and yellow iris.[1]

Located just west of Rhinelander, WI (the largest city in Oneida County), Crescent Lake is easily accessed by locals and visitors alike. A WDNR boat launch located at the north end of the lake supports 10 vehicle-trailers, a vaulted toilet, and a picnic area with grills. Crescent Lake has approximately 240-property owner including one camp and resort.

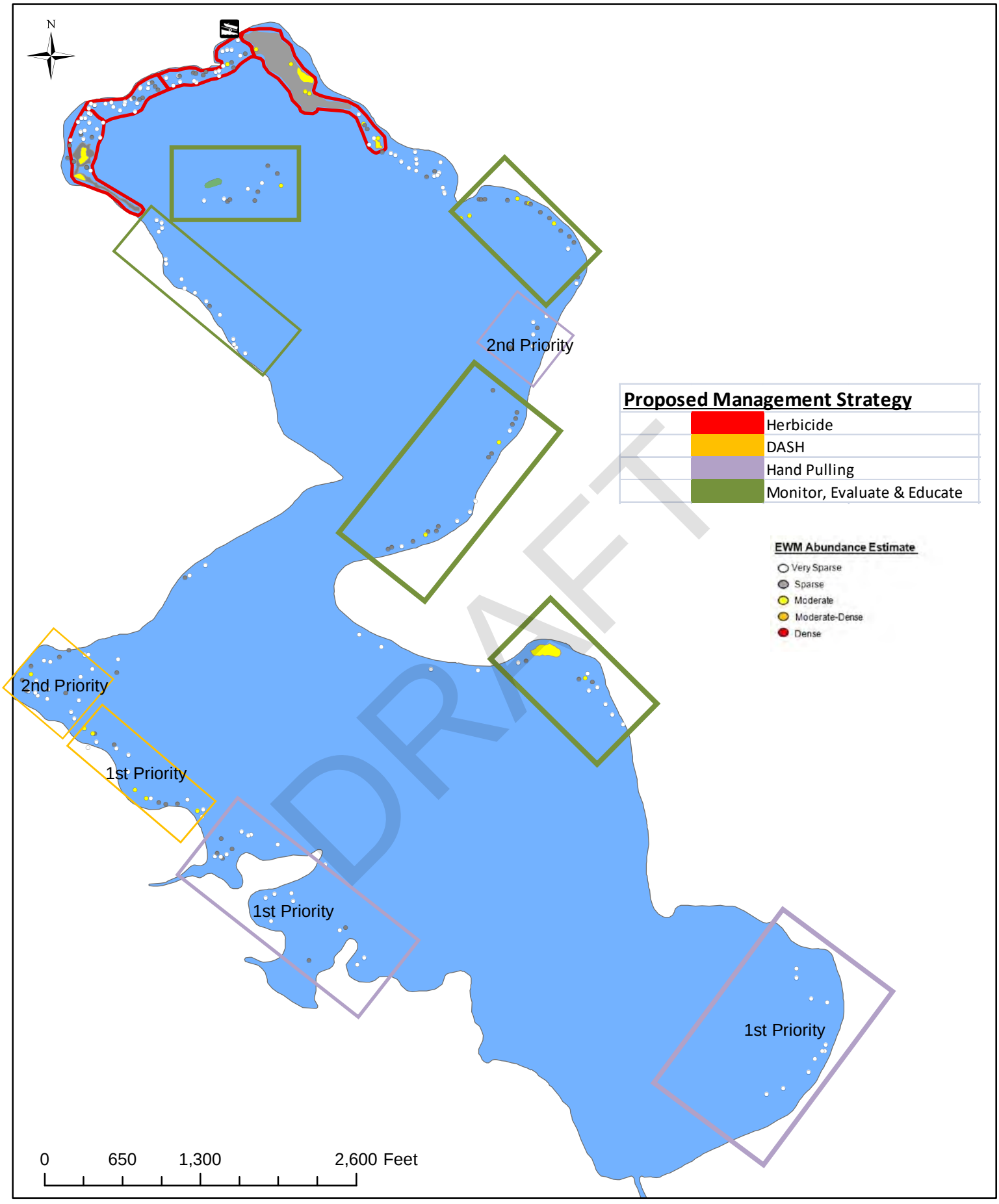

[1] WDNR Accessed 3/2020

This report is a summary 2019 activities completed under the Crescent Lake WDNR Surface Water Grant #AEPP55318.2 including (1) seasonal aquatic invasive species monitoring, (2) Eurasian watermilfoil (EWM) management, (3) post management evaluations, (4) status of the CLA's investigation into limno curtain feasibility and (5) project highlights.

**EWM MANAGEMENT**

In March 2019, a joint meeting between the AIS Response Team and the Lake Planning Project Steering Committee discussed 2019 EWM management on Crescent Lake. Additional attendees include representatives from the WDNR and Many Waters. Meeting attendants reviewed maps of the most recent aquatic plant data for Crescent Lake. Maps focused on species identified in research that have the highest potential for non-target impacts with herbicide use. Maps also showed high species richness regions of the lake. This information helped shaped herbicide discussions by understanding potential risks with herbicide use, but also identified species rich regions of the lake, where management may take a protective approach. Attendants worked through several exercises to create management strategies for 2019 and beyond, including identifying high use areas, high diversity/protective areas, areas to continue monitoring and an education strategy. From this list, taking the rationale for management, attendants specifically identified priority sites and the type of management for 2019 including herbicides, DASH, hand pulling (without DASH), monitor and evaluate coupled with educational efforts.

Regions identified for proposed herbicide use in 2019 includes the stretch of shoreline along the north end of the lake, where EWM is causing recreational use issues and pathways to spread are more likely due to the boat landing access at this end of the lake. DASH sites would focus on the second highest priority sites for management along the region of "Wausau Bay" and to the south. Hand pulling would prioritize high value aquatic plant sites, where native plant richness is high and the population of EWM is quite low. Priority hand pulling sites identified include the Crescent Lake Bible Camp bay and the adjacent bay to the northwest, and the southeastern end of the lake near the portage to Emma Lake. The remaining sites on the lake will be monitored throughout the 2019 season. Depending on seasonal EWM growth, sites may be added to the hand pulling or DASH list in 2019, or become priority sites for 2020.




Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 4.27.19 Many Waters, LLC
Source: WDNR hydro, EWM-Many Waters
File: Crescent_2019_Strategy

**Crescent Lake - Oneida Co, WI**
**EWM Management Strategy**
**2019**

Herbicide Management and Evaluation

Herbicide management included targeting 15.2 acres at the northern end of the lake with ProcellaCOR™ (active ingredient florpyrauxifen-benzyl). ProcellaCOR™ is a relatively recent registered aquatic herbicide in Wisconsin designed for milfoil control. It is a new class of auxin mimics, different from 2, 4-D and triclopyr, with promise of shorter concentration exposure times[2]. One difference with ProcellaCOR™ treatments versus more traditionally used herbicides is calculating the dosing or the amount of chemical used. Typically, target applications are use the concentration of the active ingredient (a.i.), for example parts per billion or milligrams per liter. SePRO, the maker of ProcellaCOR™, uses a prescriptive dosing unit or PDU rather than a target concentration. The thought is that PDUs are easier and more accurate for the applicator to work with, rather than calculating target concentrations of active ingredients. The WDNR calculated the proposed ProcellaCOR™ at 3 PDUs on 15.2 acres to be 5.63 ppb florpyrauxifen-benzyl (a.i.).

Being ProcellaCOR™ it is relatively new; little field trial data in the State is available. Additional monitoring collected information on efficacy, selectivity to native plants, and herbicide concentrations. This included pre-treatment Sub PI monitoring, post-treatment Sub-PI monitoring (year of treatment and one year post treatment), qualitative EWM abundance/distribution mapping and herbicide concentration sampling. Volunteers collected herbicide concentration water samples, Many Waters collected pre treatment Sub PI data and post treatment qualitative EWM abundance/distribution mapping, and the WDNR collected post treatment Sub PI plant data.

Since the determination to treat occurred after the 2018 field season, native plant data year prior to treatment was not available. Therefore, delayed treatment windows, which in Northern Wisconsin are relatively early to protect native plants[3], allowed enough native plant growth to collect pre-treatment data. The thought with early season treatments is to target EWM when it is small and most "vulnerable" and presumed that most native plants species are still dormant. This strategy seeks to reduce impacts to native plants; however, early season treatments may overlap with spawning periods for some fish species. Recent research does suggest that some herbicides commonly used in aquatic plant management may affect the development of fish eggs and embryos (Dehnert, 2019). Comments provided by resource managers in the WDNR herbicide application permit mentioned delayed timing might minimize exposure to eggs and larval fish of walleye and musky.

Many Waters completed pre treatment Sub PI plant monitoring on June 17th 2019, using WDNR standardized treatment evaluation methods. Sampling included collecting plant data within the treatment area and additional plant data from sites within the southern basin, which served as a comparison or control for the treatment. Presence of EWM and species rich regions were the two site factors used to develop the comparison site locations. Treatment occurred on June 26th 2019. Volunteers collected water samples from within and adjacent to the treatment area at 3, 6, 9, 12, 24 and 48 hours after treatment. The WDNR completed the post management Sub PI monitoring on August 21st 2019.

[2] More information on herbicide concentration exposure relationships can be found in the first paragraph under Management Considerations-Herbicide Use in this report (pg 12).
[3] Aquatic Plant Management Strategy, Northern Region WDNR, Summer - 2007.

Concentration monitoring detected Porcellacor™ between 2.3-5.2 ppb within the treatment area and <1 ppb adjacent to the treatment area three hours after treatment. Thereafter, most sampling detected very low herbicide concentrations (<1 ppb) in and adjacent to the treatment area, with a few exceptions. One sites within the treatment area had detectable concentrations (>1 ppb) at 9 and 12 hours after treatment. In addition, one location outside of the treatment area had detectable concentrations (florpyrauxifen-benzyl >1 ppb) at six hours after treatment. Detection at a sampling site outside of the treatment area may suggest movement or dissipation of the herbicide off site, however, to the extent that the herbicide may have dissipated is unclear. This data will be useful for the WNDR to build a larger data set, however, general conclusions are limited given most sites show very low herbicide concentrations (<1 ppb). Furthermore, it is not evident from the SePRO FastTEST laboratory reports the relationship between the prescribed PDU and the concentrations expressed as parts per billion. Therefore, it is challenging to correlate target application rates with laboratory reporting.

Sub PI vegetation monitoring detected a substantial reduction of EWM within the treatment area. No statistically significant negative impacts to native plants within the treatment area were evident. Variable leaf pondweed, flat stem pondweed and water celery showed a statistically valid increase within the treatment area, with similar trends seen in the control sites. Meaning the increase of native plants seen within the treatment may not be the result of management. If this were the case, it would be less likely to see similar trends for these species in the non-treated sites. Variable leaf pondweed and water celery may be late season growers and underrepresented in the pre-management Sub PI survey due to timing.

**Figure 1:** Pre and post treatment Sub-PI EWM Results. Black dots indicate sample location, red dots indicate EWM sampled, "x" is a visual identification, but not found on the rake sample.

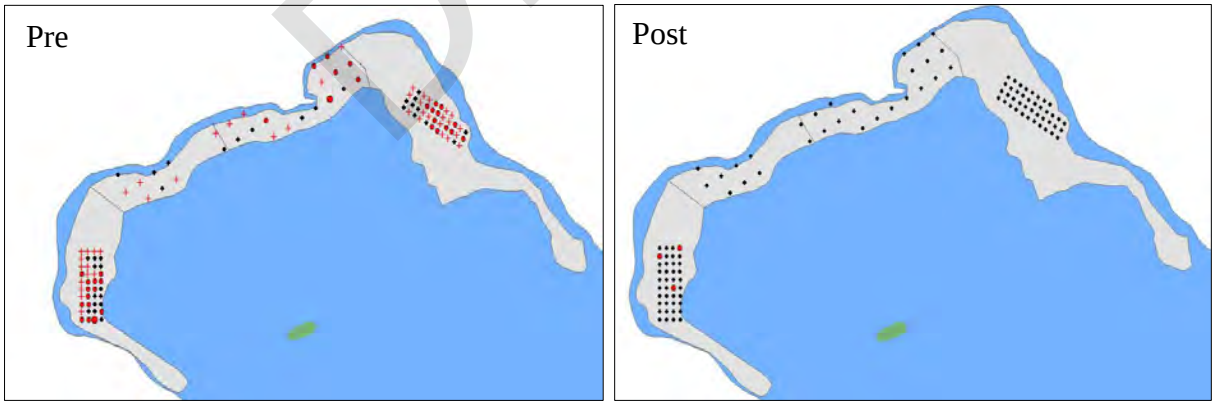


**Figure 2:** Sub PI plant monitoring results. Frequency of occurrence pre and post treatment within the treatment area - Crescent Lake. * statistical valid change

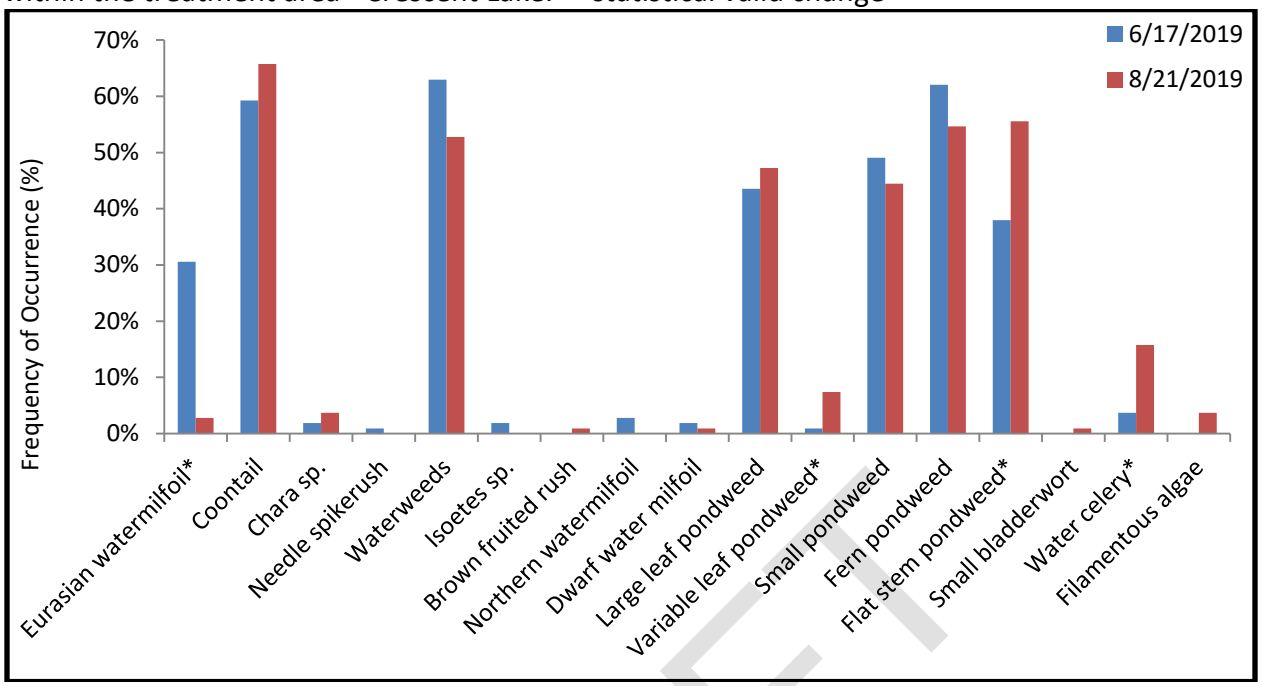
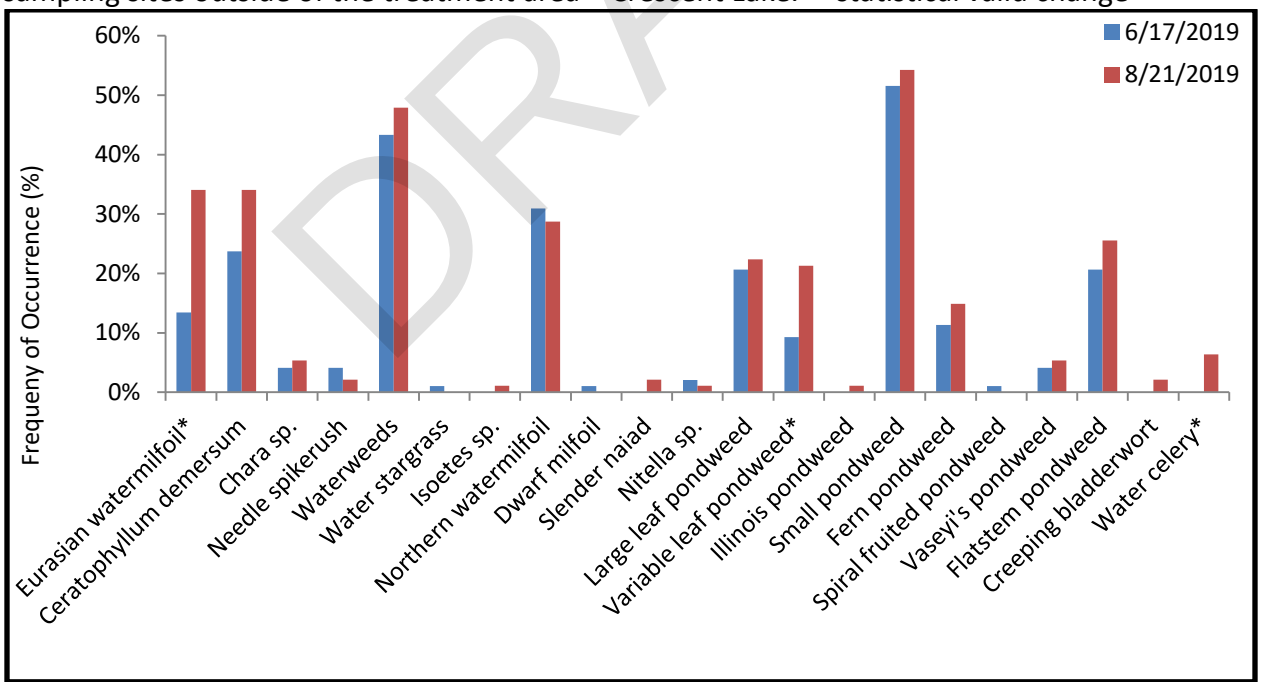



**Figure 3:** Sub PI plant monitoring results. Frequency of occurrence pre and post treatment, sampling sites outside of the treatment area – Crescent Lake. * statistical valid change



Hand Removal and DASH

EWM hand removal used a combination of diving and DASH lead by lake volunteers. As mentioned above, proposed priority hand removal sites included the Bible Camp bay and the adjacent bay to the west, and the southeast corner of the lake near the portage to Lake Emma. DASH first priority sites included the stretch of shoreline just southeast of Wausau Bay, with Wausau Bay being a second priority site. Volunteers reported 213 dive hours removing a total of 3,857 pounds (wet weight) of EWM and 11 days of DASH efforts removing 4,080 pounds (wet weight) of EWM. Comparing the June survey results to the September survey results, no detectable change in abundance or distribution of EWM within the first priority sites for diving or DASH was observed. Three of the twenty-seven dive trips reported targeted the first priority regions, whereas approximately four of the eleven DASH days reported worked in the first priority region. No detectable change was observed in the second priority for hand pulling or DASH regions. DASH and hand pulling efforts successfully removed all EWM documented within the vicinity of the island.

**AIS SEASONAL MONITORING**

Aquatic invasive species (AIS) monitoring targets Eurasian watermilfoil but includes other aquatic and wetland invasive plant species. The first survey, timed during the first half of the growing season, reconfirms previous EWM locations to refine management strategies and monitors for EWM, mainly in shallow waters. The second survey, timed to capture EWM plants at or near their greatest annual growth potential occurs during the second half of the growing season and includes deeper waters and off shore locations where vegetation grows.

Monitoring efforts are qualitative in nature, meaning information collected describes the condition or population of the target AIS rather than relying on measured or quantitatively collected and calculated values. Smaller sites are geo-referenced with a GPS point and extent is determined by visually estimating coverage in foot-circumference. This is an observed estimate of exact extent, not footprint. On average, these sites are less than a 0.10 of an acre in size. Larger sites, typically greater than a 0.10 of an acre in size, are circumnavigated and extent in acres is calculated and represented on a map with a polygon. Mid/late season monitoring point based mapping estimated 17 acres of EWM, whereas polygon based mapping delineated 4.1 acres of EWM, for a total of 21.1 acres.


Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 12.7.2019 Many Waters, LLC
Survey Date: 9.16.19
Source: WDNR hydro, EWM-Many Waters
File: Crescent_MLSS_2019

**Crescent Lake - Oneida Co, WI**
**Mid/Late Season EWM Survey**
**2019**

**Figure 4:** Change in EWM point based acreage from 2018-2019, Crescent Lake. Note: This is a visual estimate of exact extent, not total footprint.

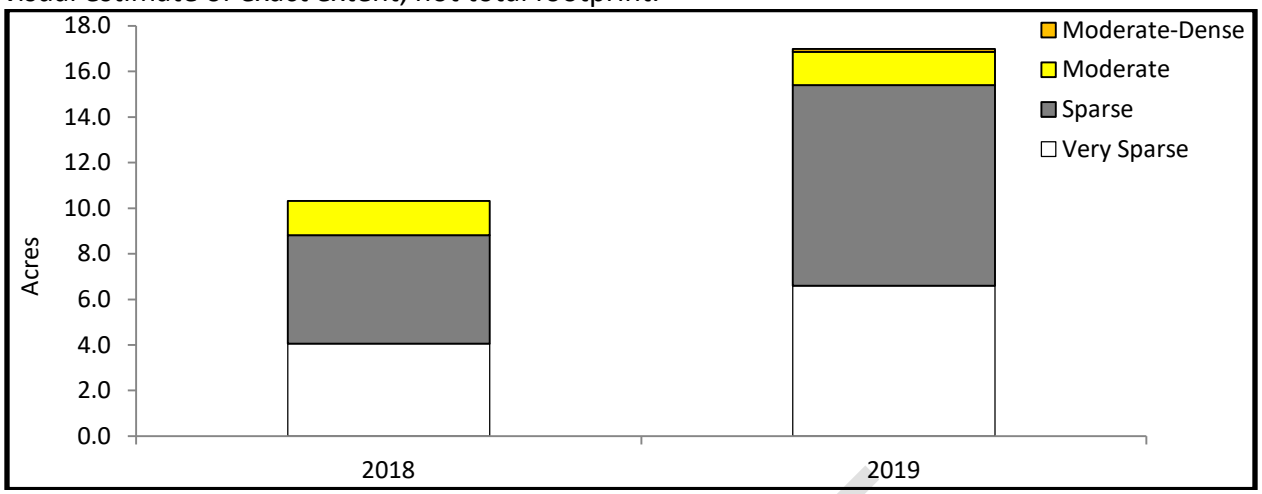



**Figure 5:** Change in EWM polygon (>.10 acre) mapped acreage from 2018-2019, Crescent Lake.

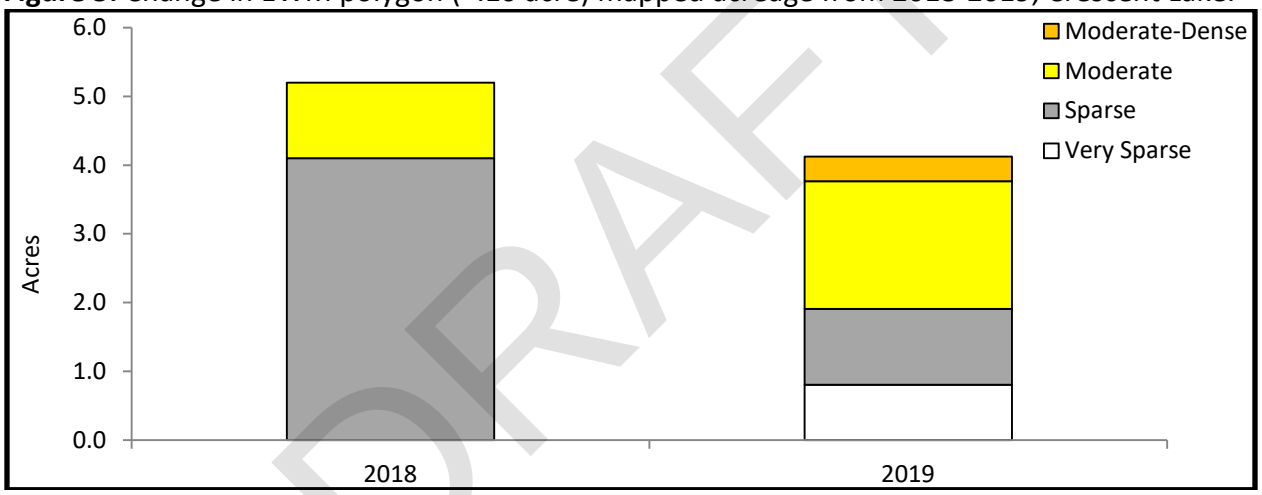





**Figure 6:** Change in EWM acreage (polygon and point data combined) from 2018-2019, Crescent Lake.

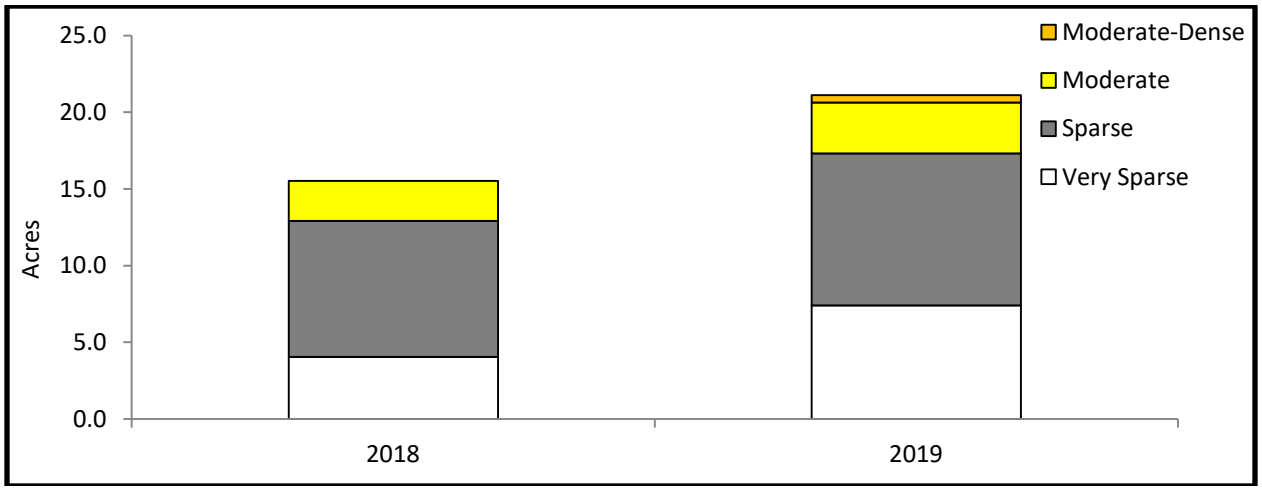


**Table 1:** Change in EWM acreage (polygon and point data) from 2018-2019, Crescent Lake.

| | Points | | Polygons | |
|---|---|---|---|---|
| **Abundance Estimate** | **2018** | **2019** | **2018** | **2019** |
| Very Sparse | 4.1 | 6.6 | 0.0 | 0.8 |
| Sparse | 4.8 | 8.8 | 4.1 | 1.1 |
| Moderate | 1.5 | 1.5 | 1.1 | 1.9 |
| Moderate-Dense | 0.0 | 0.1 | 0.0 | 0.4 |
| Dense | 0.0 | 0.0 | 0.0 | 0.0 |
| TOTAL | **10.3** | **17.0** | **5.2** | **4.1** |

**DISCUSSION**

Eurasian watermilfoil can potentially alter native aquatic plant ecosystems and cause recreational use and impairment issues. Conversely, not all lakes may experience high populations of EWM, particularly in Northern Wisconsin (Nault, 2016). Recent WDNR research suggests that across the State of Wisconsin, many lakes do not reach lake-wide high densities, as previously once thought. Nonetheless, it is important to recognize that aquatic ecosystems are dynamic and a lake may have a "low" lake-wide population of EWM, but still cause site-specific recreational impairment issues. Annual variation does occur and further research is needed to understand how lake ecology and climate may play a role in EWM population variability.

Since 2012, the CLA has taken a very active volunteer approach to AIS monitoring, management, and prevention. During this time, the CLA received and executed several WDNR grant projects to educate, prevent, and monitor for AIS. Recently, the construction of a DASH boat has allowed the CLA to expand efforts to manage EWM. While these accomplishments demonstrate devotion by lake volunteers to protect CLA from all AIS, EWM on Crescent Lake is increasing. The footprint (distribution) and the abundance in certain regions of the lake are beyond volunteer diving capacity. Even coupled with professional level efforts, the resources using a diving and DASH management approach would be substantive and realistically cost prohibitive to lower the lake-wide population of EWM, if that is the goal. Furthermore, even with the preliminary positive results of incorporating herbicide management, the total acreage of EWM in Crescent Lake grew from 2018 to 2019. It will be important for the CLA to define short and long-term EWM management goals and objectives. For example, a long-term management goal may be to work towards reducing nutrients from the surrounding landscape from entering the lake. This may potentially limiting nutrients to fuel excessive plant and algae growth.

The 2020 proposed management approach includes the continued use of volunteer divers for hand pulling and DASH, coupled with an herbicide application at several regions, mainly within the southern half of the lake. More information on the development of this approach to date is in the supplemental information at the end of this report. Volunteer efforts should focus on manageable sites, where notable progress in the reduction and distribution of EWM is achievable. For example, DASH efforts may target small, isolated colonies of EWM, where

abundance may be too much for divers alone to handle, but manageable for volunteer DASH efforts. A good example of a site where success can be achieved using DASH is the site off the islands. It will be important to continue to monitor this region and expect follow up hand removal in 2020 and beyond to maintain this site at the current low population.

Part of this project sought to understand the feasibility of using limno curtains as a management tool for small-scale herbicide use on Crescent Lake. Specifically, the intent of this activity is to investigate and potentially develop a site-specific cost-benefit analysis on the applicability of limno-curtains during small-scale herbicide management. This activity would include reviewing existing information regarding site-specific needs, pros, cons, general considerations, and cost estimates for purchase (or rental or hire). This may include observation of limno-curtain installment projects or a site visit to existing installations. The primary deliverable under this activity is to summarize all the information learned and share with the CLA board and Association members. The status of activity is unknown at the time of this report.

**MANAGEMENT CONSIDERATIONS – HERBICIDE USE**

Herbicide effectiveness is the results of two primary factors: concentration of the herbicide applied and exposure of that plant to the herbicide. This concentration-exposure relationship, explored in laboratory research, provides specific concentration-exposure times necessary for adequate plant control. For example, plants would need to be in contact with 2, 4-D applied at 2pmm (ae) for about 24 hours to achieve adequate control (Green & Westerdahl, 1990). In a laboratory scenario, the movement of the herbicide off the target treatment area is controlled, whereas in a lake setting controlling for this movement or dissipation is much more challenging. Factors affecting this movement in lakes include the treatment area relative to the lake area, wind, currents, and water depth.

In small scale or spot treatments, where the treatment area is relatively small compared to the total lake area, herbicide exposure time may be limited. In these cases, it is common to use higher concentration of product to “off-set” low predicted exposure times. Even in these treatment scenarios (using high concentrations of herbicide), rarely is target concentration achieved, suggesting rapid dissipation of the herbicide off site (Nault et al., 2015). In the above example, laboratory results suggest that 2, 4-D applied at a target concentration of 2ppm (ae) would need 24 hours of contact time to achieve control. In field concentration monitoring during treatments by the WDNR found that the target concentration is not achieved and only a small fraction of the applied herbicide was detected by 24 hours. Since Porcellacor™ is relatively new, laboratory concentration-exposure relationships are probably developed, however, field data to show the ability to provide more than one season of EWM control is still being collected.

Another consideration in the application of herbicides is the occurrence of hybrid watermilfoil—typically the invasive Eurasian watermilfoil hybridizing with one of the native watermilfoils and producing seedling hybrids. Recent research supports some hybrids being less sensitive to the herbicide 2, 4-D and tolerant to fluridone (LaRue et al, 2012, Parks et al, 2016). Furthermore, not all hybrids may respond equally, meaning certain hybrid clones may

have various responses to treatment (LaRue et al, 2012). Rotating the mode of action of the herbicide may reduce the potential of resistance issues. Laboratory analysis confirmed pure strain Eurasian watermilfoil, and no hybrids (WDNR, 2018).[4] This does not mean hybrids may not exist on Crescent Lake, just samples collected and analyzed are not hybrid watermilfoil.

Repetitive herbicide treatments that result in non-lethal killing of the target plant species may result in that target species to develop resistance or a reduced sensitivity to that herbicide. (EPA-DRAFT, 2016). Furthermore, these repetitive annual treatments may shift aquatic plant communities from diverse stable communities to low diversity more disturbance tolerant systems. Recent research by the WDNR looking at degradation patterns of commonly used herbicides are finding that on lakes with previous 2, 4-D use, microbial degradation of the herbicide occurs quicker than on lakes that do not have that history of herbicide use. This may suggest that microbial activity on lakes with historical 2, 4-D use have adapted to breakdown 2, 4-D more efficiently than lakes without historical 2, 4-D use. Though most work by the WDNR has been on 2, 4-D, these patterns may apply for other herbicide use. The judicial use of herbicides should include practices that decrease risk of resistance including minimizing frequent or consecutive applications of herbicides with similar mechanism of action and apply integrated pest management.



[4] https://dnrx.wisconsin.gov/swims/viewStationResults.do?id=1545965 (Accessed 3/2020)

Environmental Protection Agency (USEPA). 2016. Draft Herbicide Resistance PRN 2016-XX for Public Comment – May 2016.U.S.

Dehnert, Gavin. 2019. Effects of Low, Subchronic Exposure of Commercial 2, 4-D formulations on early life Stages of Native Wisconsin Game Fish Species. Presented at the UWEX Lakes Convention, Stevens Point, WI. (Accessed 6/2019).

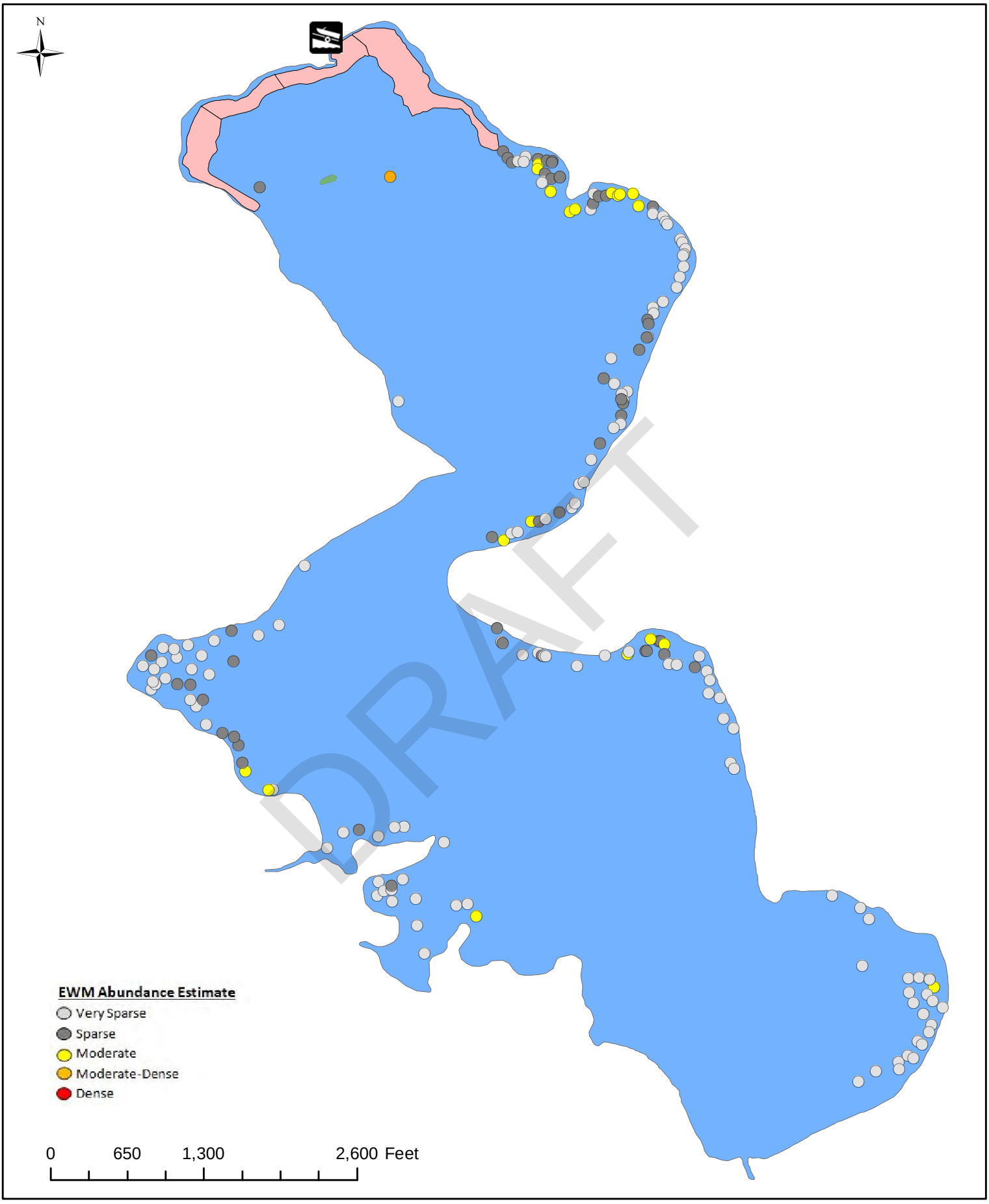
Green, W.R. and Westerdahl, H.E. 1990. Response of Eurasian watermilfoil to 2, 4-D Concentrations and Exposure Times. Journal of Aquatic Plant Management, 28: 27-32.

LaRue E.A., Zuellig, M.P., Netherland, M.D., Heilman, M.A., & Thum, R.A. 2012. Hybrid watermilfoil lineages are more invasive and less sensitive to a commonly used herbicide than their exotic parent (Eurasian watermilfoil). Evolutionary Applications, 6:462-471.

Nault, M. 2016. The science behind the "so-called" super weed. Wisconsin Natural Resources 2016: 10-12.

Nault, M., Knight, S., Van Egeren, S. Heath, E. Skogerboe, J., Barton, M. and Provost, S. 2015. Control of Invasive Aquatic Plants on a Small Scale. Lakeline, pgs 35-39. North American Lake Management Society.

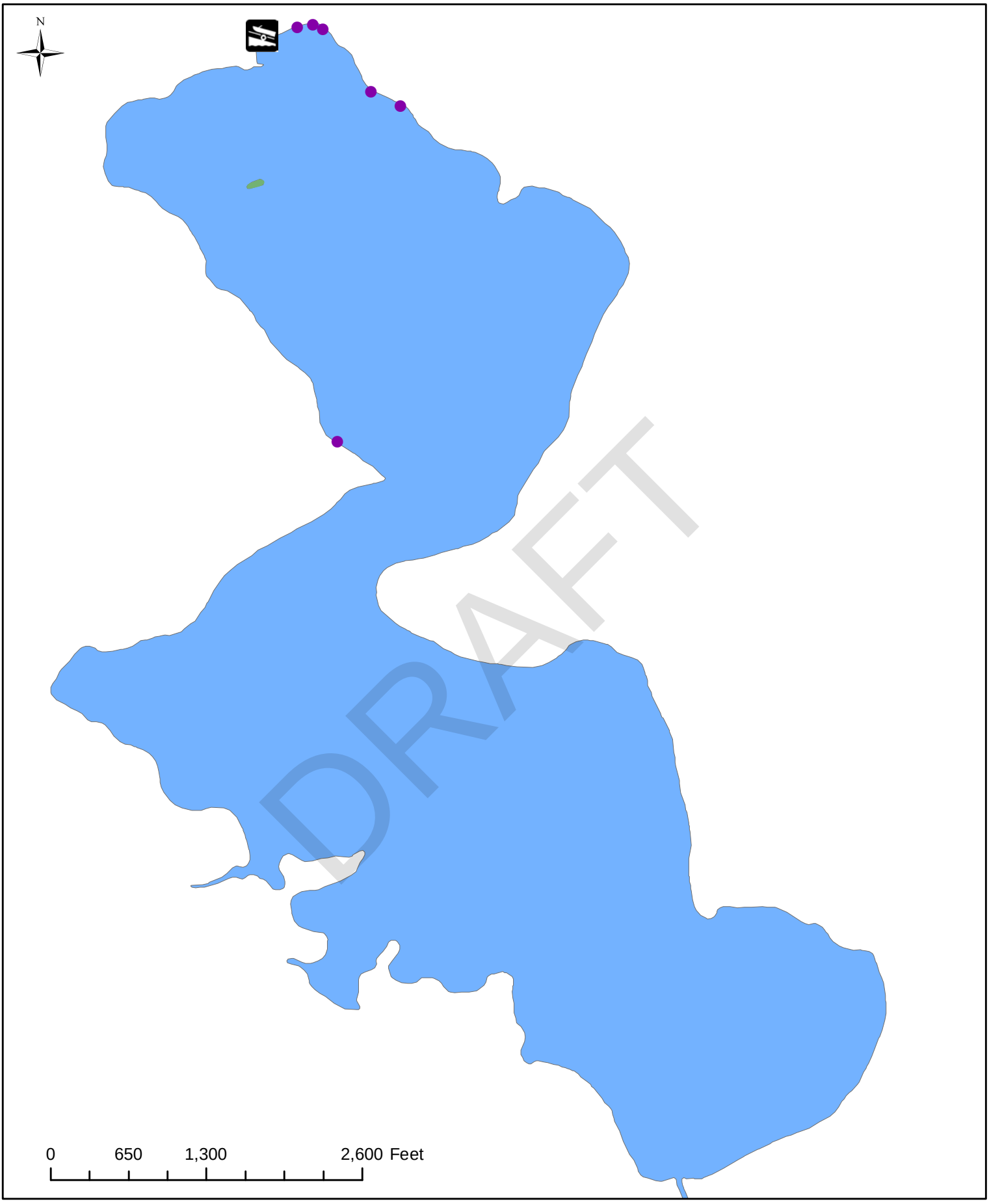
Parks, S.R., McNair, J.N., Hausler, P., Tyning P. and Thum, R.A. 2016. Divergent responses of cryptic invasive watermilfoil to treatment with axing herbicides in a large Michigan lake, Lake and Reservoir Management, 32:4, 366372, DOI: 10.1080/10402381.2016.1212955.




Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 3.13.20, Many Waters, LLC
Survey Date: 6.17.2019
Source: WDNR hydro, EWM-Many Waters
File: Crescent_MLSS_2019

2019 Treatment Boundary

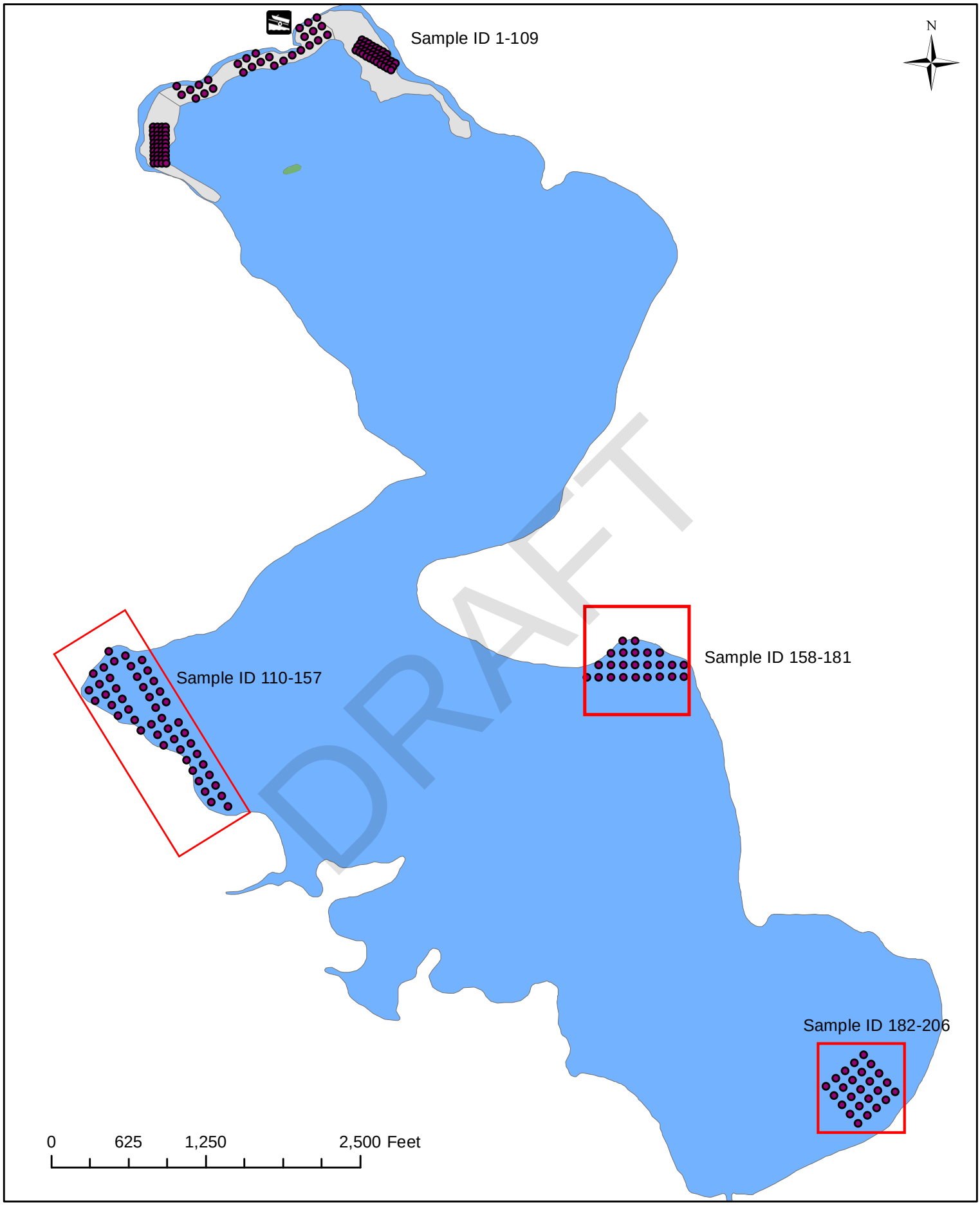
**Crescent Lake - Oneida Co, WI**
**Early Season EWM Survey**
**2019**




Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 12.7.2019 Many Waters, LLC
Survey Date: 9.16.19
Source: WDNR hydro, Purple loosestrife-Many Waters
File: Crescent_MLSS_2019

**Purple looestrife**

**Crescent Lake - Oneida Co, WI**
**Purple loosestrife**
**2019**

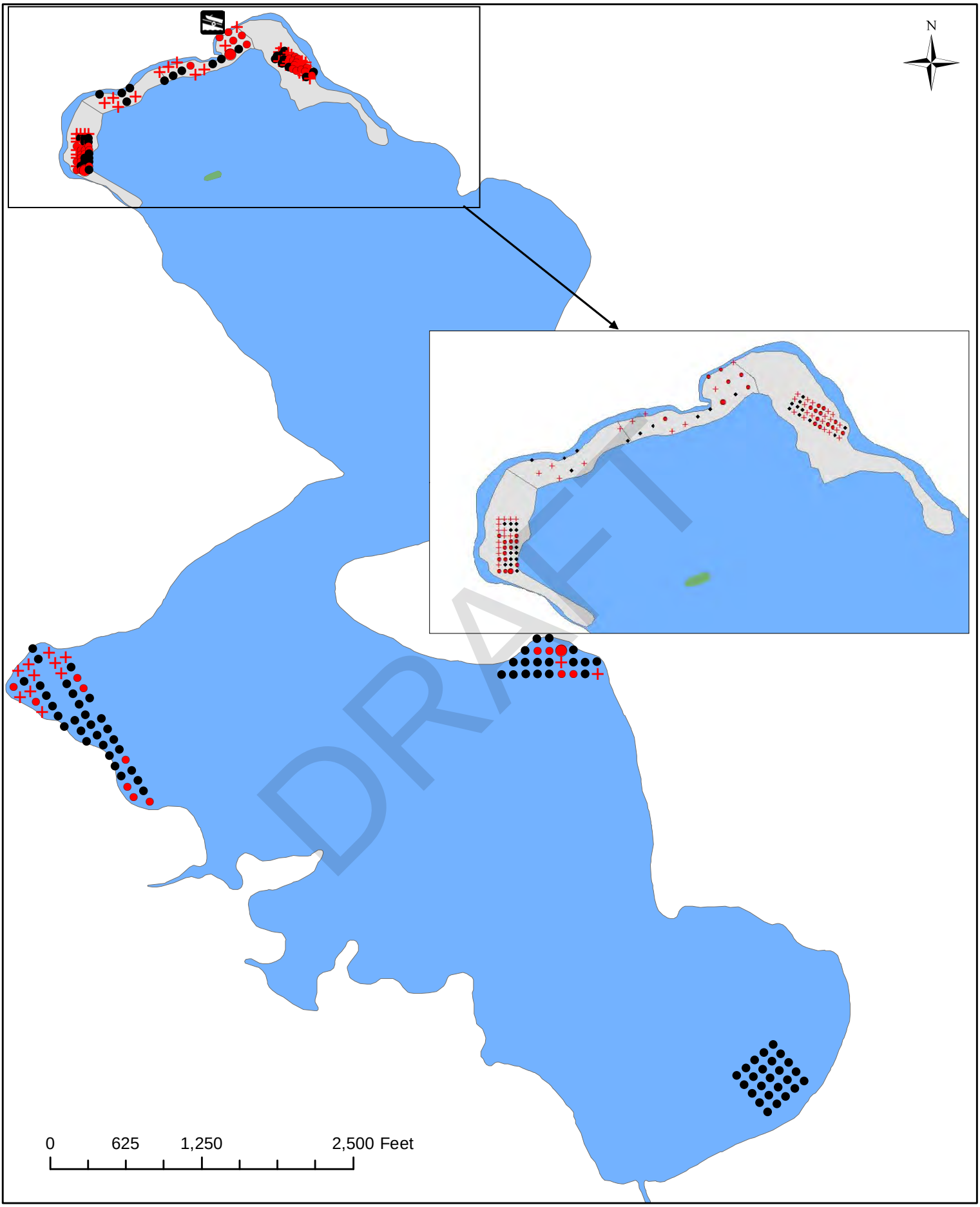



Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 3.12.20Many Waters, LLC
Survey Date: 8.17.2019
Source: WDNR hydro, SubPI-WDNR
File: Crescent_SubPITreatmentMonitoring2019

2019 Treatment Boundary

Non-Treatment Control Sampling

**Crescent Lake - Oneida Co, WI**
**Treatment Evaluation Sub PI Locations 2019**

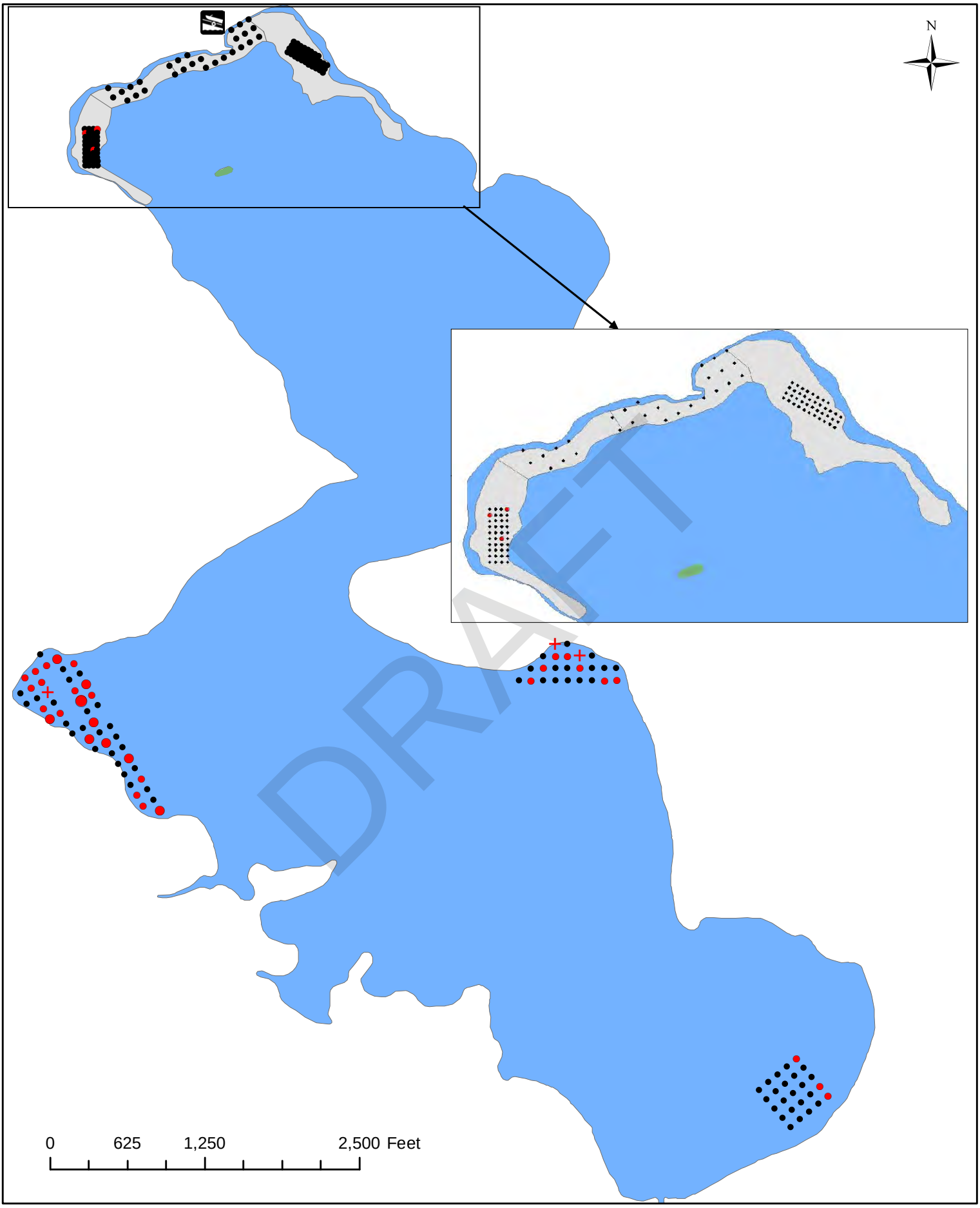



Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 3.12.20Many Waters, LLC
Survey Date: 6.17.2019
Source: WDNR hydro, SubPI-Many Waters
File: Crescent_SubPITreatmentMonitoring2019

Rake fullness -1
Rake fullness-2
Rake fullness-3
Visually Observed
Sampling Site

2019 Treatment Boundary

**Crescent Lake - Oneida Co, WI**
**Pre-Treatment EWM Sub PI Locations**
**2019**




Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 3.12.20Many Waters, LLC
Survey Date: 8.17.2019
Source: WDNR hydro, SubPI-WDNR
File: Crescent_SubPITreatmentMonitoring2019

Rake fullness -1
Rake fullness-2
Rake fullness-3
Visually Observed
Sampling Site

2019 Treatment Boundary

**Crescent Lake - Oneida Co, WI**
**Post-Treatment EWM Sub PI Locations**
**2019**

# EWM REMOVAL REPORT 2019

## DASH boat report summer 2019

| Name. | Hours. | Days |
|---|---|---|
| Darrel Mack | 43. | 12 |
| Rob Schindelholz | 16.5 | 5 |
| Jim Schindelholz | 13. | 4 |
| Terry Goldbach | 9.5 | 3 |
| John Dusenberry | 9 | 3 |
| Steve Mayberry | 9 | 3 |
| O. Mayberry | 9 | 3 |
| Harvey Wolff | 4.5 | 2 |
| Robin Wolff | 3 | 1 |
| Jill Peterson | 3 | 1 |
| Larry Peterson | 3 | 1 |
| | 122.5 | 12 |
| | Pounds of EWM | 4,080 |

Other workers. Dale Bendickson, Bill Fish, Dale Kinney, Jim Gehrke*

| Expenses. | | |
|---|---|---|
| | DASH parts | $274.41 |
| | Caps for venturi | $ 29.90 |
| | DASH, anchor & rope | $118.02 |
| | Gas. | $ 42.20 |
| | Winterizing supplies | $. 8.00 |
| | | $472.53 |

## HAND PULLING report summer 2019

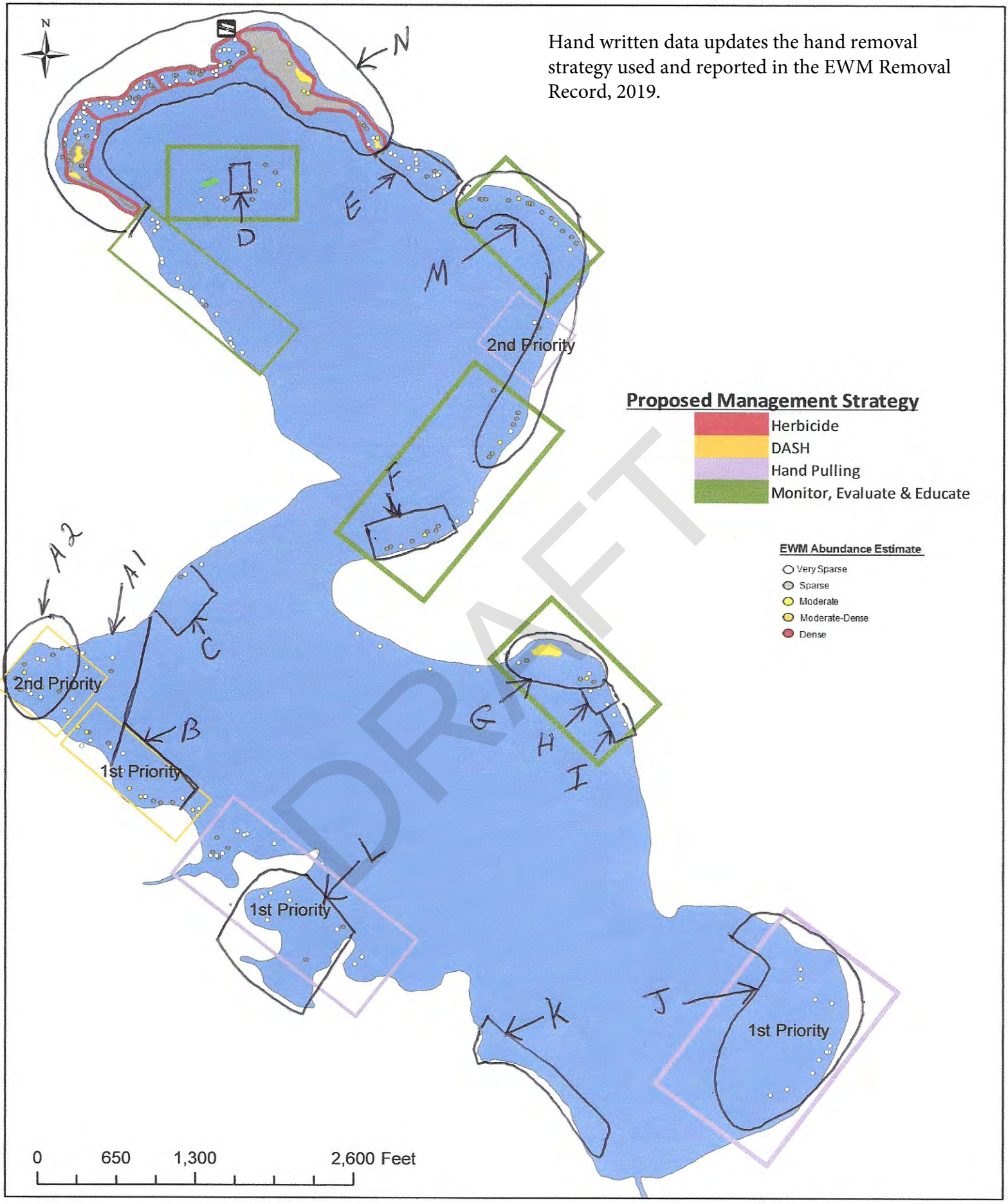
| Oren Hermel | Hours | Days | |
|---|---|---|---|
| | 106.5 | 24 | |
| Cindy Hermel | 104 | 23 | |
| Mark Puyleart | 2.5 | | |
| | 213 HRS | 3,857 LBS. | $000.00 |

| Invasive Weed Removal LLC. | 1 day. | ??? lbs | $910.00 |
|---|---|---|---|

$1,382.53

*There are hundreds of other hours that will be coming In soon.

Submitted by Jim Gehrke
AIS chairman
Crescent Lake Assn.




Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 4.27.19 Many Waters, LLC
Source: WDNR hydro, EWM-Many Waters
File: Crescent_2019_Strategy

**Crescent Lake - Oneida Co, WI**
**EWM Management Strategy**
**2019**

# EWM Removal Record
# 2019
# Oren & Cindy Hermel/Marc Puyleart

| | | | |
|---|---|---|---|
| 6-27-19 | Oren 4 hrs<br>Cindy 4 hrs | 101 lbs | Section J on EWM Management Map<br>(3-6') Snorkel/Pontoon |
| 6-28-19<br>(Trip 1) | Oren 1.5 hrs<br>Cindy 1.5 hrs | 30 lbs | Section K<br>(5-8') Snorkel/Pontoon |
| 6-28-19<br>(Trip 2) | Oren 2 hrs<br>Cindy 2 hrs | 46 lbs | Section K (9-15') Snorkel/Pontoon |
| 6-29-19<br>(Trip 1) | Oren 3 hrs<br>Cindy 3 hrs | 106 lbs | LaPorte/Hitchcock: Section B<br>(4-15') Tank/Pontoon |
| 6-29-19<br>(Trip 2) | Oren 3 hrs<br>Cindy 3 hrs | 95 lbs | LaPorte/Hitchcock: Section B<br>(34-15') Tank/Pontoon |
| 6-30-19 | Oren 4.5 hrs<br>Cindy 4.5 hrs | 103 lbs | LaPorte/Hitchcock: Section B<br>(4-10') Tank/Pontoon |
| 7-02-19 | Oren 3 hrs<br>Cindy 3 hrs | 107 lbs | LaPorte/Hitchcock: Section B<br>(4-15') Tank/Pontoon |
| 7-03-19 | Oren 4 hrs<br>Cindy 4 hrs | 175 lbs | NE of Island: Tank/Pontoon<br>(5-12') |
| 7-10-19 | Oren 5.5 hrs<br>Cindy 5.5 hrs | 227 lbs | Section B<br>(4-15') Tank/Pontoon |
| 7-11-19 | Oren 3.5 hrs<br>Cindy 3.5 hrs | 89 lbs | Section J (3-7') Snorkel/Pontoon &<br>kayak |
| 7-18-19 | Oren 5.5 hrs<br>Cindy 5.5 hrs | 106 lbs | NE of Island (5-10')<br>Tank/Pontoon |

| | | | |
|---|---|---|---|
| 7-19-19 | Oren 5 hrs<br>Cindy 5 hrs | 168 lbs | Section M (4-12')<br>Tank/Pontoon |
| 7-21-19 | Oren 4 hrs<br>Cindy 4 hrs | 133 lbs | Sections M & K (4-12')<br>Tank/Pontoon &<br>Snorkel/Pontoon |
| 7-22-19 | Oren 3 hrs<br>Cindy 3 hrs | 78 lbs | Section M (4-12')<br>Tank/Pontoon |
| 7-23-19 | Oren 4 hrs<br>Cindy 4 hrs | 147 lbs | Section F (7-15')<br>Tank/Pontoon |
| 7-25-19 | Oren 5.5 hrs<br>Cindy 5.5 hrs | 218 lbs | Section F (6-14') Tank/Pontoon |
| 7-28-19 | Oren 5 hrs<br>Cindy 5 hrs | 203 lbs | Section F (6-14') Tank/Pontoon |
| 7-31-19 | Oren 4.5 hrs<br>Cindy 4.5 hrs | 198 lbs | Section F (6-14') Tank/Pontoon |
| 8-1-19 | Oren 5 hrs<br>Cindy 5 hrs | 175 lbs | Section F (4-12') Tank/Pontoon |
| 8-12-19 | Oren 4 hrs<br>Cindy 4 hrs | 142 lbs | (Same as above) |
| 8-14-19 | Oren 5 hrs<br>Cindy 5 hrs | 219 lbs | (Same as above) |
| 8-15-19<br>(Trip 1) | Oren 4.5 hrs<br>Cindy 4.5 hrs | 201 lbs | (Same as above) |
| (Trip 2) | Oren 2.5 hrs<br>Cindy 2.5 hrs | 162 lbs | Section J (2-6') Snorkel |
| 8-17-19 | Oren 2.5 hrs<br>Marc 2.5 hrs | 90 lbs | Section L (5-12') Snorkel/Pontoon |

| | | | |
|---|---|---|---|
| 8-19-19 | Oren 4 hrs<br>Cindy 4 hrs | 188 lbs | Section F (2-10') Tank/Pontoon |
| 8-20-19 | Oren 4.5 hrs<br>Cindy 4.5 hrs | 201 lbs | Section F (4-14') Tank/Pontoon |
| 8-24-19 | Oren 4 hrs<br>Cindy 4 hrs | 149 lbs | Section F (3-12')<br>Scuba/Pontoon |

***Totals to date: Hours: Oren 106.5***
***Cindy 104***
***Marc 2.5***
***Total (213)***

***Pounds of EWM removed: 3,857***

# Crescent Lake, Oneida County (WBIC 1564200)
# Herbicide Concentration Monitoring Sample Plan, 2019
# Scott Van Egeren

**Crescent Lake is 616 acres, and has a mean depth of 17 ft and a maximum depth of 32 ft. The lake is classified as a mesotrophic, deep, lowland drainage lake. The north basin of Crescent Lake is approximately 226 acres. ProcellaCor (active ingredient florpyrauxifen-benzyl) is proposed to be applied to milfoil beds that combined cover 15.2 acres (Figure 1). The proposed target application concentration is 5.63 ppb florpyrauxifen-benzyl (a.i.) within the treatment areas.**

**The data collected is intended to provide information on how long the herbicide remains in the water and in contact with plants and at what concentration. This is known as herbicide concentration exposure time (CET) and is a measurement that is used by researchers and lake managers to understand the amount of herbicide and exposure time needed to kill plants. This information will be used in conjunction with aquatic plant survey data collected both before and after the herbicide treatment to complete the treatment evaluation. The evaluation will help to understand to what extent different plant species are impacted at the actual herbicide CET.**

**Water samples will be collected at sites and times listed below to monitor herbicide concentration following treatment. A map of the herbicide sample site locations is attached (Figure 2) and the coordinates are provided (Figure 3). Data are in decimal degrees and the datum is WGS84.**

| Crescent Lake Herbicide Sample Sites | |
|---|---|
| Site | Sample Depth |
| Crescent1 | Integrated (0-6 ft) |
| Crescent2 | Integrated (0-6 ft) |
| Crescent3 | Integrated (0-6 ft) |
| Crescent4 | Integrated (0-6 ft) |
| Crescent5 | Integrated (0-6 ft) |
| Crescent6 | Integrated (0-6 ft) |

**Samples will need to be collected at different time intervals throughout the project and are listed below.**

| Crescent Lake Herbicide Sample Intervals | | |
|---|---|---|
| **Interval** | **Samples/interval** | **Total Samples** |
| **3 HAT** | **6** | **6** |
| **6 HAT** | **6** | **12** |
| **9 HAT** | **6** | **18** |
| **12 HAT** | **6** | **24** |
| **24 HAT** | **6** | **30** |
| **48 HAT** | **6** | **36** |

**HAT denotes hours after treatment**

- **Water samples will be collected using an integrated water sampler. DNR can provide one if necessary. Water is collected by pushing the pipe straight down to within 1 ft of the bottom or as far as it will go in deep water. The pipe is brought to the surface and emptied into a bucket using a screw driver to push open the check valve.**

- **A GPS should be used to navigate to each site. Samples should be collected at each site at each interval listed above. If you cannot collect a sample at the interval listed above please collect the sample as soon as reasonably possible. Sample bottles and labels will be provided. If you need a GPS please let us know.**

- **SePro Corporation will provide a sampling kit which will include bottles, labels, chain of custody forms, acid, a shipping cooler, and sample handling instructions.**
- **DNR will provide a data sheet to collect additional information while on site.**

**DNR Sample Data Sheet: DNR will provide an example data sheet for use when collecting water samples. <u>It is important to use a separate data sheet for each time interval that you monitor.</u>**

**The DNR will need to provide the following information for the sample data sheet which can be reprinted by the sampling volunteer for each sample interval (Figure 6):**

- **WBIC**
- **Test Request**
- **Sample site number**
- **Station ID**
- **Sample Depth**

**The sampling volunteers will need to provide the following on a new data sheet for each sample date:**

- **Sampling Date**
- **Sampling Time**
- **Water Temperature: If water temperature is measured in F, then it should be converted to C using the table included on the data sheet. We suggest printing out the conversion table and bringing it in the field if your thermometer only reads in Fahrenheit.**
- **Wind Direction and Speed**

**Figure 3. Crescent Bay 2019 Herbicide Sample Site Coordinates**

| North | West | Sample Site |
|---|---|---|
| 45.61601 | -89.522125 | Crescent1 |
| 45.615784 | -89.526375 | Crescent2 |
| 45.61439 | -89.52891 | Crescent3 |
| 45.614025 | -89.52714 | Crescent4 |
| 45.61502 | -89.525475 | Crescent5 |
| 45.61531 | -89.523 | Crescent6 |

**Figure 1. Crescent Lake 2019 Treatment Areas**

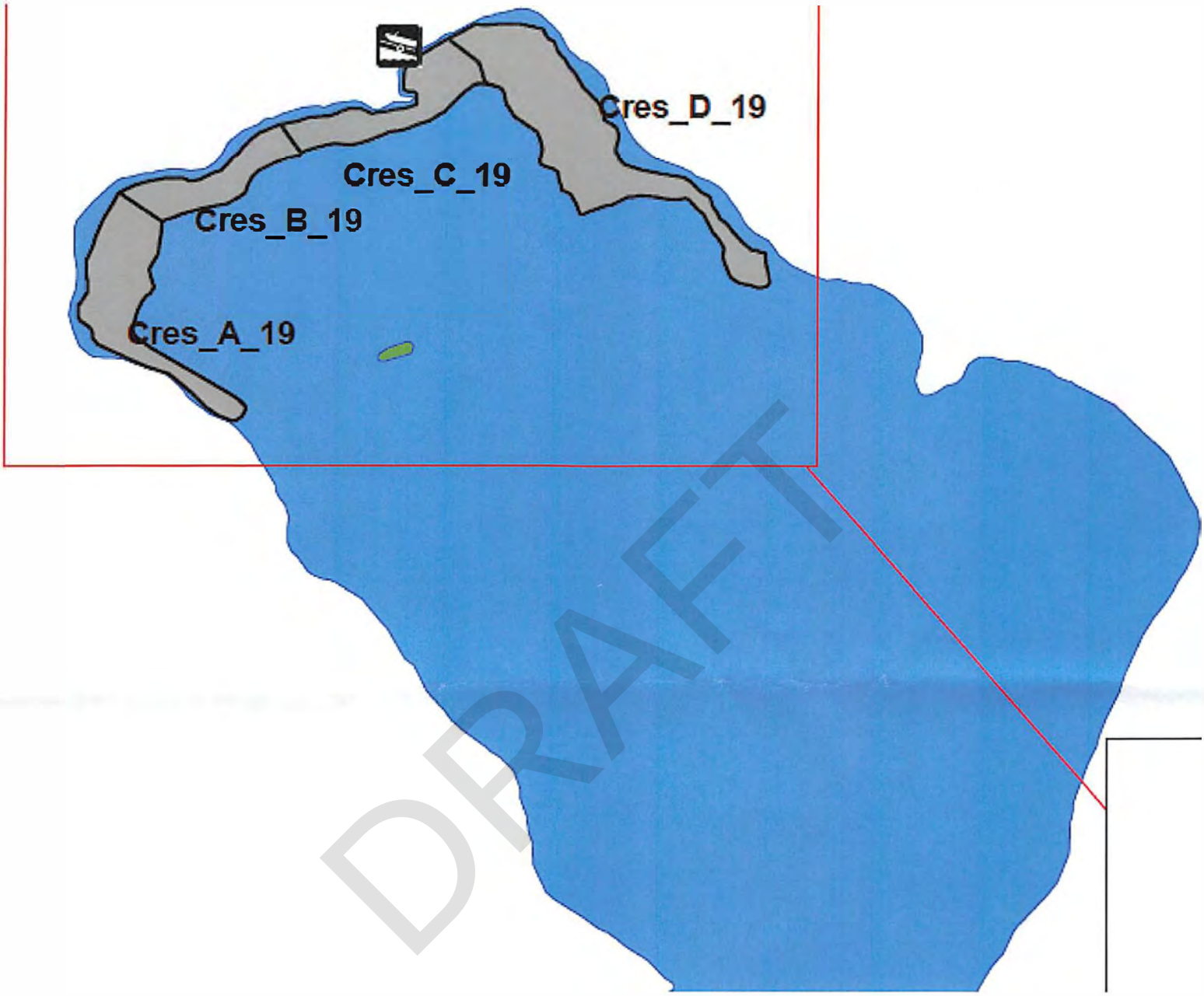
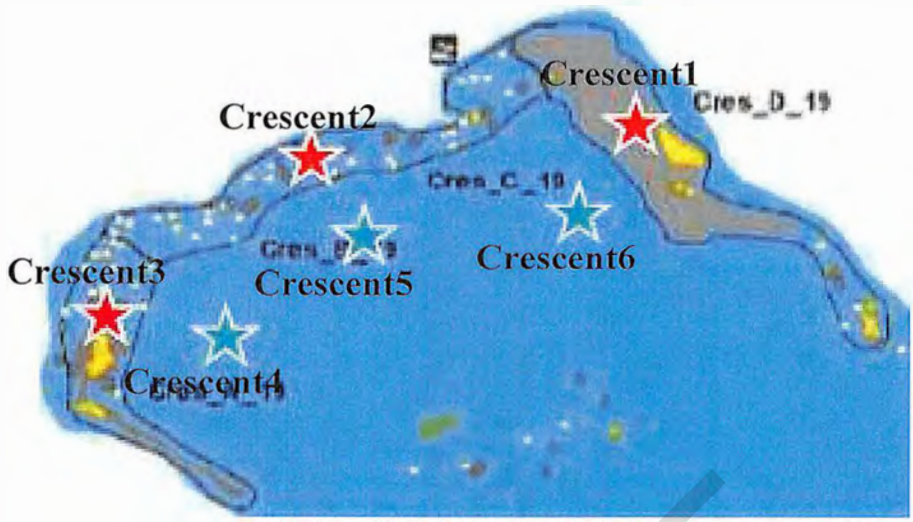


**Figure 2. Crescent Lake Herbicide Concentration Monitoring Sites**



# Crescent Lake, Oneida County — Herbicide Data Sheet, 2019

| | |
|---|---|
| **Account number:** | |
| **DNR User ID: VANEGS** | |

| | |
|---|---|
| **Sample Matrix:** | Surface Water (SU) |
| **Project:** | HerbicideMonitoring |

| | |
|---|---|
| **WBIC:** | **1564200** |

| | |
|---|---|
| **Collector Name:** | Terry Goldbach |
| **Phone Number:** | 715-490-0569 |

| | |
|---|---|
| **Test Requested:** | **Florpyrauxifen-benzyl** |
| **Sample Interval:** | 48 HAT |

| Site | Station ID | Sample Depth | Date | Time (24:00) | Water Temp in C | Wind Direction and Speed |
|---|---|---|---|---|---|---|
| Crescent1 | 10052646 | 0-6 | 6/28 | 7:33 | 22.8 | 4.4 SE |
| Crescent2 | 10052647 | ↓ | ↓ | 7:47 | ↓ | 1.1 SE |
| Crescent3 | 10052648 | ↓ | ↓ | 7:55 | ↓ | 2.5 E |
| Crescent4 | 10052649 | ↓ | ↓ | 8:05 | ↓ | 2.7 SE |
| Crescent5 | 10052651 | ↓ | ↓ | 8:13 | ↓ | 4.4 E |
| Crescent6 | 10052652 | ↓ | ↓ | 8:21 | ↓ | 3.5 S |

# Crescent Lake, Oneida County — Herbicide Data Sheet, 2019

| | |
|---|---|
| Account number: | |
| DNR User ID: VANEGS | |

| | |
|---|---|
| Sample Matrix: | Surface Water (SU) |
| Project: | HerbicideMonitoring |

| | |
|---|---|
| WBIC: | 1564200 |

| | |
|---|---|
| Collector Name: | Terry Goldbach |
| Phone Number: | 715-490-0569 |

| | |
|---|---|
| Test Requested: | Florpyrauxifen-benzyl |
| Sample Interval: | 24 HAT |

| Site | Station ID | Sample Depth | Date | Time (24:00) | Water Temp in C | Wind Direction and Speed |
|---|---|---|---|---|---|---|
| Crescent1 | 10052646 | 0-1' | 6-27 | 7:00 | 22.2 | 2.4 S |
| Crescent2 | 10052647 | ↓ | ↓ | 7:11 | ↓ | 2.2 S |
| Crescent3 | 10052648 | ↓ | ↓ | 7:20 | ↓ | 2.2 S |
| Crescent4 | 10052649 | ↓ | ↓ | 7:28 | ↓ | 1.9 SE |
| Crescent5 | 10052651 | ↓ | ↓ | 7:36 | ↓ | 4.0 E |
| Crescent6 | 10052652 | ↓ | ↓ | 7:50 | ↓ | 3.3 E |

# Crescent Lake, Oneida County — Herbicide Data Sheet, 2019

| | |
|---|---|
| Account number: | |
| DNR User ID: VANEGS | |

| | |
|---|---|
| Sample Matrix: | Surface Water (SU) |
| Project: | HerbicideMonitoring |

| | |
|---|---|
| WBIC: | 1564200 |

| | |
|---|---|
| Collector Name: | Terry Goldbach |
| Phone Number: | 715-490-0569 |

| | |
|---|---|
| Test Requested: | Florpyrauxifen-benzyl |
| Sample Interval: | 12 HAT |

| Site | Station ID | Sample Depth | Date | Time (24:00) | Water Temp in C | Wind Direction and Speed |
|---|---|---|---|---|---|---|
| Crescent1 | 10052646 | 0-6 | 6/26 | 18:50 | 21.7 | 4.0 W |
| Crescent2 | 10052647 | " | " | 19:08 | " | 3.3 W |
| Crescent3 | 10052648 | " | " | 19:17 | " | 1.5 W |
| Crescent4 | 10052649 | " | " | 19:26 | " | 0.0 W |
| Crescent5 | 10052651 | " | " | 19:39 | " | 4.2 W |
| Crescent6 | 10052652 | " | " | 19:48 | " | 3.5 W |

# Crescent Lake, Oneida County — Herbicide Data Sheet, 2019

| | |
|---|---|
| Account number: | |
| DNR User ID: VANEGS | |

| | |
|---|---|
| Sample Matrix: | Surface Water (SU) |
| Project: | HerbicideMonitoring |

| | |
|---|---|
| WBIC: | 1564200 |

| | |
|---|---|
| Collector Name: | Terry Gotlibeck |
| Phone Number: | 715-490-0569 |

| | |
|---|---|
| Test Requested: | Florpyrauxifen-benzyl |
| Sample Interval: | 9 HAT |

| Site | Station ID | Sample Depth | Date | Time (24:00) | Water Temp in C | Wind Direction and Speed |
|---|---|---|---|---|---|---|
| Crescent1 | 10052646 | 0-6 | 6/26 | 16:10 | 21.7 | 6.0 W |
| Crescent2 | 10052647 | " | 6/26 | 16:23 | | 6.9 W |
| Crescent3 | 10052648 | " | 6/26 | 16:36 | | 2.6 W |
| Crescent4 | 10052649 | " | 6/26 | 16:45 | | 2.4 W |
| Crescent5 | 10052651 | " | 6/26 | 16:56 | | 6.2 W |
| Crescent6 | 10052652 | " | 6/26 | 17:06 | | 6.4W |

# Crescent Lake, Oneida County — Herbicide Data Sheet, 2019

| | |
|---|---|
| Account number: | |
| DNR User ID: VANEGS | |

| | |
|---|---|
| Sample Matrix: | Surface Water (SU) |
| Project: | HerbicideMonitoring |

| | |
|---|---|
| WBIC: | 1564200 |

| | |
|---|---|
| Collector Name: | Terry Goldbach |
| Phone Number: | 715-490-0569 |

| | |
|---|---|
| Test Requested: | Florpyrauxifen-benzyl |

Sample Interval: 6 ~~HAT~~

| Site | Station ID | Sample Depth | Date | Time (24:00) | Water Temp in C | Wind Direction and Speed |
|---|---|---|---|---|---|---|
| Crescent1 | 10052646 | 0-6 | 6/26 | 13:00 | 21.7 | 6.0 W |
| Crescent2 | 10052647 | ↓ | ↓ | 13:14 | ↓ | 6.3 W |
| Crescent3 | 10052648 | ↓ | ↓ | 13:30 | ↓ | 5.3 W |
| Crescent4 | 10052649 | ↓ | ↓ | 13:43 | ↓ | 7.1 W |
| Crescent5 | 10052651 | ↓ | ↓ | 13:51 | ↓ | 9.4 W |
| Crescent6 | 10052652 | ↓ | ↓ | 13:58 | ↓ | 7.3 W |

# Crescent Lake, Oneida County — Herbicide Data Sheet, 2019

| | |
|---|---|
| **Account number:** | |
| **DNR User ID: VANEGS** | |

| | |
|---|---|
| **Sample Matrix:** | Surface Water (SU) |
| **Project:** | HerbicideMonitoring |

| | |
|---|---|
| **WBIC:** | 1564200 |

| | |
|---|---|
| **Collector Name:** | Terry Goldbach |
| **Phone Number:** | 715-490-0569 |

| | |
|---|---|
| **Test Requested:** | Florpyrauxifen-benzyl |
| **Sample Interval:** | 3 HAT |

| Site | Station ID | Sample Depth | Date | Time (24:00) | Water Temp in C | Wind Direction and Speed |
|---|---|---|---|---|---|---|
| Crescent1 | 10052646 | 0-6 | 6-26 | ~~10:06~~ 10:16 | 21.1 | 4.7 W |
| Crescent2 | 10052647 | ↓ | ↓ | 10:26 | ↓ | 4.7 W |
| Crescent3 | 10052648 | ↓ | ↓ | 10:36 | ↓ | 5.7 W |
| Crescent4 | 10052649 | ↓ | ↓ | 10:45 | ↓ | 10.3 W |
| Crescent5 | 10052651 | ↓ | ↓ | 10:54 | ↓ | 6.7 W |
| Crescent6 | 10052652 | ↓ | ↓ | 11:04 | ↓ | 9.8 W |

The brown 60mL bottle is a baseline water sample from a non-treated area for lab use.

## Figure 4. Example of a State Lab of Hygiene Sample Data Sheet

| Crescent Lake, Oneida County | | | | Herbicide Data Sheet, 2019 | | |
|---|---|---|---|---|---|---|
| Account number: | | | | Sample Matrix: | Surface Water (SU) | |
| DNR User ID: VANEGS | | | | Project: | HerbicideMonitoring | |
| WBIC: | 1564200 | | | Collector Name: | | |
| | | | | Phone Number: | | |
| Test Requested: | Florpyrauxifen-benzyl | | | | | |
| Sample Interval: | | | | | | |
| Site | Station ID | Sample Depth | Date | Time (24:00) | Water Temp in C | Wind Direction and Speed |
| Crescent1 | 10052646 | | | | | |
| Crescent2 | 10052647 | | | | | |
| Crescent3 | 10052648 | | | | | |
| Crescent4 | 10052649 | | | | | |
| Crescent5 | 10052651 | | | | | |
| Crescent6 | 10052652 | | | | | |



Convert Fahrenheit to Celsius

$T(°C) = (T(°F) - 32) \times 5/9$

| Degree F | Degree C | Degree F | Degree C | Degree F | Degree C | Degree F | Degree C |
|---|---|---|---|---|---|---|---|
| 50 | 10.0 | 60 | 15.6 | 70 | 21.1 | 80 | 26.7 |
| 51 | 10.6 | 61 | 16.1 | 71 | 21.7 | 81 | 27.2 |
| 52 | 11.1 | 62 | 16.7 | 72 | 22.2 | 82 | 27.8 |
| 53 | 11.7 | 63 | 17.2 | 73 | 22.8 | 83 | 28.3 |
| 54 | 12.2 | 64 | 17.8 | 74 | 23.3 | 84 | 28.9 |
| 55 | 12.8 | 65 | 18.3 | 75 | 23.9 | 85 | 29.4 |
| 56 | 13.3 | 66 | 18.9 | 76 | 24.4 | | |
| 57 | 13.9 | 67 | 19.4 | 77 | 25.0 | | |
| 58 | 14.4 | 68 | 20.0 | 78 | 25.6 | | |
| 59 | 15.0 | 69 | 20.6 | 79 | 26.1 | | |

SRTC

SePRO Research & Technology Campus

SePRO

# FasTEST® Monitoring

## Chain of Custody

Company Name:* Wisconsin Department of Natural Resources  Contact Person:* Scott VanEgeren

Billing Address:* 107 Sutliff Ave, Rhinelander, WI 54501

Telephone:* 715-471-0007  E-mail Address:* scott.vanegeren@wi.gov

*Required fields

Project/Reference Name: Crescent Lake Procella Cor Treatment

SePRO Aquatic Specialist Name: Michael Hiatt

Sampler: Terry Goldbach

Number of samples to be analyzed: 36

Will water from treatment site be used for irrigation or potable purposes? If so, please describe: No

Check Payment Method: X PO Number_____ ☐ VISA ☐ MasterCard Card No._____ CCV Code:_____ Expiration Date:_____

☐ Check here if you would like us to keep this credit card information on file for future lab analysis orders.

(To establish a secure credit card file for future billing, please contact the SePRO Accounting Department at 317-580-8291).

See attached monitoring plan for maps and locations.

Draw a map of water body or enclose a copy of a prepared map identifying the following:

- Sample locations by Sample Numbers as listed on the *other side of this form.*
- Treatment area, if not the whole lake.
- Irrigation or potable water intake locations

Field Notes: Please run the samples from the earliest collected (3 HAT) to the latest (48 HAT). Stop analyzing when two sampling intervals in a row show non-detect at all sites. The brown unlabeled Nalgene bottle is a ~~baseline water~~ sample from well outside the treatment area.

Direct all inquiries about your sampling and FasTEST results to your SePRO Aquatic Specialist.

Ship samples to:
SePRO SRTC
16013 Watson Seed Farm Road
Whitakers, NC 27891-9114
E-mail: srtclab@sepro.com
Tel: (252) 437-3282

COC5425 SRX6536

SRTC SePRO Research & Technology Campus

SePRO

# FasTEST® Monitoring

## Chain of Custody

Water Body Name: Crescent Lake  Water Body Size (acres): 616  State: Wisconsin

Depth Average and Depth Collected (feet): 2-10 and 0-6 feet collected  Target Plant Species: EWM

**Formulations Applied** (Place an "X" in the boxes of analysis desired)  One form for each water body and formulation

Sonar® (fluridone) ☐ A.S. ☐ PR ☐ Q ☐ SRP ☐ One ☐ Genesis  Renovate® (triclopyr) ☐ 3 ☐ OTF  Renovate® MAX G (triclopyr & 2,4-d) ☐  Sculpin® G (2,4-d) ☐

Galleon® (penoxsulam) ☐  Nautique® (copper) ☐  Komeen® (copper) ☐  SeClear® (copper) ☐  K-Tea® (copper) ☐  Captain® (copper) ☐  Captain® XTR (copper) ☐

Habitat® (imazapyr) ☐  Clearcast® (imazamox) ☐  Oasis® (topramezone) ☐  Stingray® (carfentrazone-ethyl & chloropropionic acid†) ☐  ProcellaCor ✓ Florpyrauxifen-benzyl

| Client Sample Site I.D. (Required field) | Date(s) Treated | Date Sample Collected (Required field) | Application Rate(s) | Treated Area (In Acres) | Sample Location – Identify sites on map (GPS coordinates preferred) | Lab Use Only - Notes 3HR | 6HR |
|---|---|---|---|---|---|---|---|
| 1. CR1 | 6/26/19 | 6/26, 6/27 & 6/28 | 3 PPM | 15.2 | 45.61601, -89.522125 | 166655 | 166661 |
| 2. CR2 | | | | | 45.615784, -89.526375 | 166656 | 166662 |
| 3. CR3 | | | | | 45.61439, -89.52891 | 166657 | 166663 |
| 4. CR4 | Not Treated | | | | 45.614025, -89.52714 | 166658 | 166664 |
| 5. CR5 | | | | | 45.61502, -89.525475 | 166659 | 166665 |
| 6. CR6 | | | | | 45.61631, -89.523 | 166660 | 166666 |
| 7. | | | | | 48 - 166685 | 9HR - 166667 | 12HR 166673 24-166679 |
| 8. | | | | | 166686 | 166668 | 166674 166680 |
| 9. | | | | | 166687 | 166669 | 166675 166681 |
| 10. | | | | | 166688 | 166670 | 166676 166682 |
| 11. | | | | | 166689 | 166671 | 166677 166683 |
| 12. | | | | | 166690 | 166672 | 166678 166684 |

*FasTEST results will be reported 48 hours from receipt of samples by laboratory. Inaccurate or incomplete information on this form may delay analysis and reporting. † This laboratory is not accredited for these tests: Stingray.*

Shipped by: Scott VanEgeren  Date/Time: 7/1/19 1000 AM

To be filled out by laboratory

Received by: _____  Date/Time: _____

SePRO Research & Technology Campus

FasTEST*

**16013 Watson Seed Farm Road, Whitakers, NC 27891**

# Chain of Custody: COC5425 **LABORATORY REPORT**

**Customer Company** **Customer Contact**

| | |
|---|---|
| Company Name Wisconsin Dept. of Natural Resources | Contact Person: Scott Van Egeren |
| Address: 107 Sutliff Ave Rhinelander WI 54501 | E-mail Address: scott.vanegeren@wi.gov |
| | Phone: 715-471-0007 |

**Waterbody Information**

| | |
|---|---|
| Waterbody: | Crescent Lake - WI |
| Waterbody size: | 616 |
| Depth Average: | 10 |



| Sample ID | Sample Location | Test | Method | Results | Sampling Date / Time |
|---|---|---|---|---|---|
| CTM16655-1 | CR1 3HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | 2.3 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | 3.6 | |
| CTM16656-1 | CR2 3HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | 5.2 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16657-1 | CR3 3HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | 4.3 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16658-1 | CR4 3HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16659-1 | CR5 3HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16660-1 | CR6 3HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16661-1 | CR1 6HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | 1.1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16662-1 | CR2 6HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16663-1 | CR3 6HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |

| | | | | | |
|---|---|---|---|---|---|
| CTM16664-1 | CR4 6HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16665-1 | CR5 6HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16666-1 | CR6 6HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | 1.2 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16667-1 | CR1 9HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | 2.2 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16668-1 | CR2 9HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16669-1 | CR3 9HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16670-1 | CR4 9HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16671-1 | CR5 9HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16672-1 | CR6 9HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16673-1 | CR1 12HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | 2.4 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16674-1 | CR2 12HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16675-1 | CR3 12HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16676-1 | CR4 12HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16677-1 | CR5 12HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16678-1 | CR6 12HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/26/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16679-1 | CR1 24HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/27/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16680-1 | CR2 24HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/27/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | 1.2 | |
| CTM16681-1 | CR3 24HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/27/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16682-1 | CR4 24HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/27/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16683-1 | CR5 24HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/27/2019 |

| | | | | | |
|---|---|---|---|---|---|
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16684-1 | CR6 24HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/27/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16685-1 | CR1 48HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/28/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16686-1 | CR2 48HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/28/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16687-1 | CR3 48HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/28/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16688-1 | CR4 48HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/28/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16689-1 | CR5 48HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/28/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |
| CTM16690-1 | CR6 48HR | ProcellaCOR/florpyrauxifen-benzyl (ug/L) | FAST 16 | <1 | 06/28/2019 |
| | | ProcellaCOR acid/florpyrauxifen (ug/L) | FAST 16 | <1 | |

ANALYSIS STATEMENTS:
SAMPLE RECEIPT /HOLDING TIMES: All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.
PRESERVATION: Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted
in the report.
QA/QC CRITERIA: All analyses met method criteria, except as noted in the report with data qualifiers.
COMMENTS: No significant observations were made unless noted in the report.
MEASUREMENT UNCERTAINTY: Uncertainty of measurement has been determined and is available upon request.



**Laboratory Information**
Date / Time Received: 07/02/19 11:00 AM
Date Results Sent: Tuesday, July 30, 2019



*This entire report was reviewed and approved for release.*

*Reviewed By: Laboratory Supervisor*

**2020 ProcellaCOR DNR Treatment Description**

**Area #1 11.75 acres**

Wausau Bay: would do the entire bay. EWM has continued to expand. There were issues with people not swimming, kayaking, and general boating in the area. New property owner said if they had known about the EWM being as dense as it was, they would not have bought the house. DASH and hand harvesting unsuccessful in alleviating issues.

**Area #2 3.45 acres**

This area also was very dense. 2018 and 2019 have been a challenge. Have used DASH and hand harvesting with unacceptable results. People didn't swim and boat in this area; told grandchildren no swimming; could not fish off their docks; residents would not take their boats out and drive through the EWM not wanting to chop it up; and neighbors would not visit neighbors because they did not want to drive through the EWM and chop it up. EWM out over 100 feet from shore. Has been a problem now for 3 years.

**Area #3 2.70 acres**

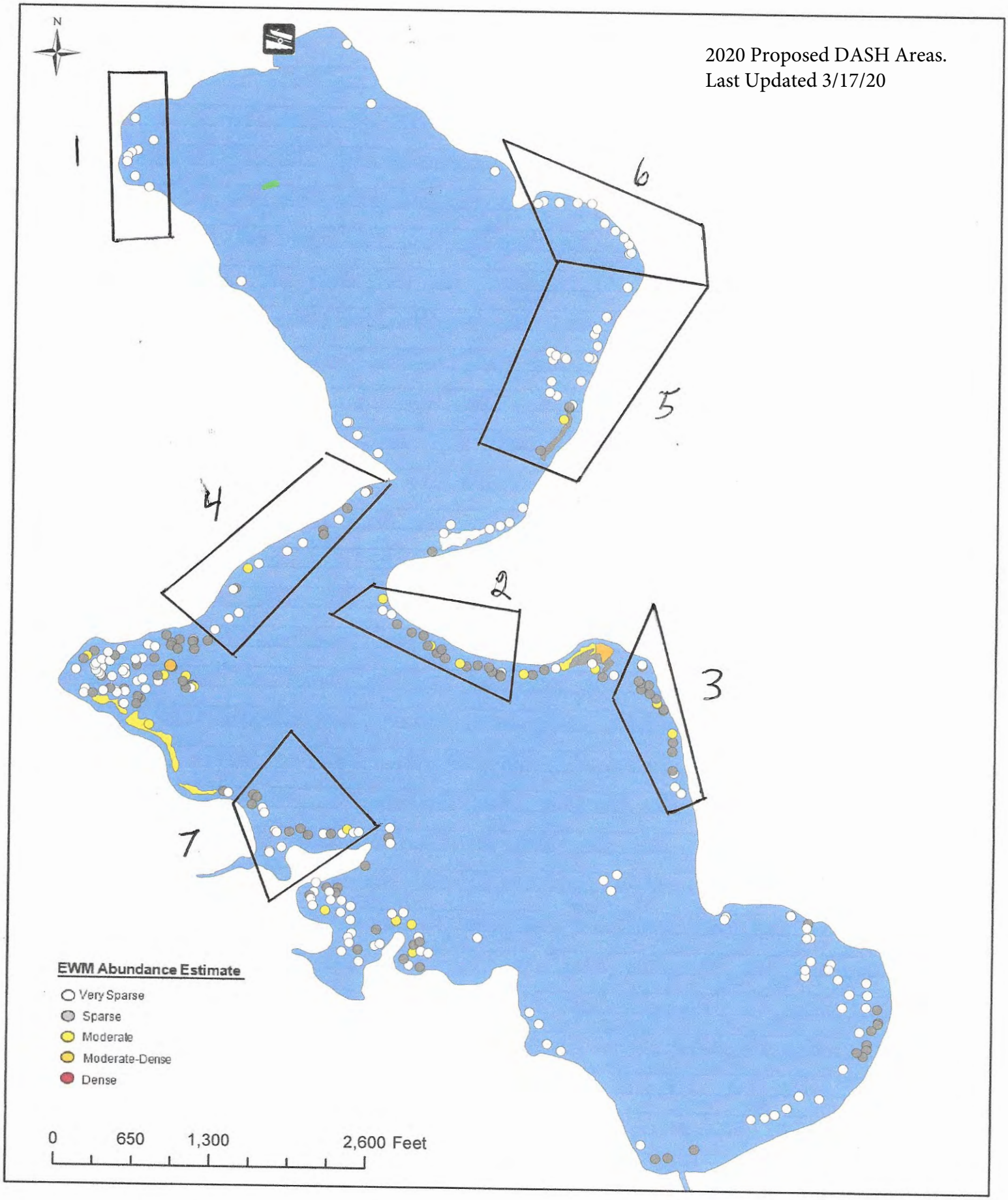
May have been the worst area on the lake. Swimming and boating issues here also. Residents would not take their boats out and drive through the EWM not wanting to chop it up; and neighbors would not visit neighbors because they did not want to drive through the EWM and chop it up. Tried using both DASH and hand harvesting however so dense we moved to other areas. Because of location and density in this area it has the potential to adversely impact the southern lobe of the lake.

**Area #4 1.63 acres**

This is the area we refer to as the hump by Wausau Bay. Major lake touring lane for the pontoons and skiers. There is a shallow hump with a drop off on its edge. It is a continuance of the shallow Wausau Bay. If we don't treat this area it will compromise the treatment in Wausau Bay Area 1 and Area 2.

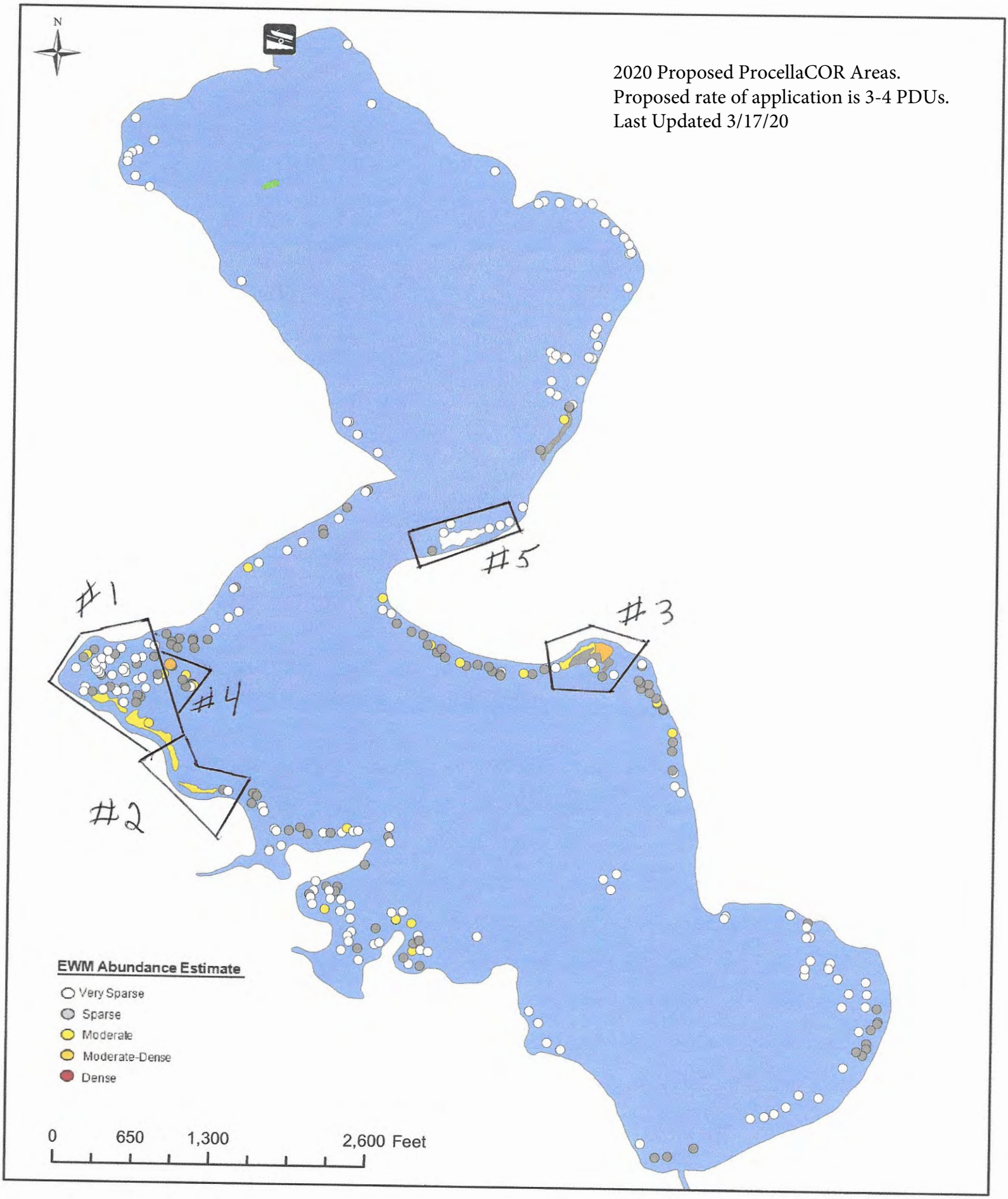
**Area #5 2.65 acres**

Another swimming and boating issue area. Another area where residents would not take their boats out and drive through the EWM not wanting to chop it up; and neighbors would not visit neighbors because they did not want to drive through the EWM and chop it up. Is in a bad spot for EWM to send plants around the corner. Heavy traffic in that area.



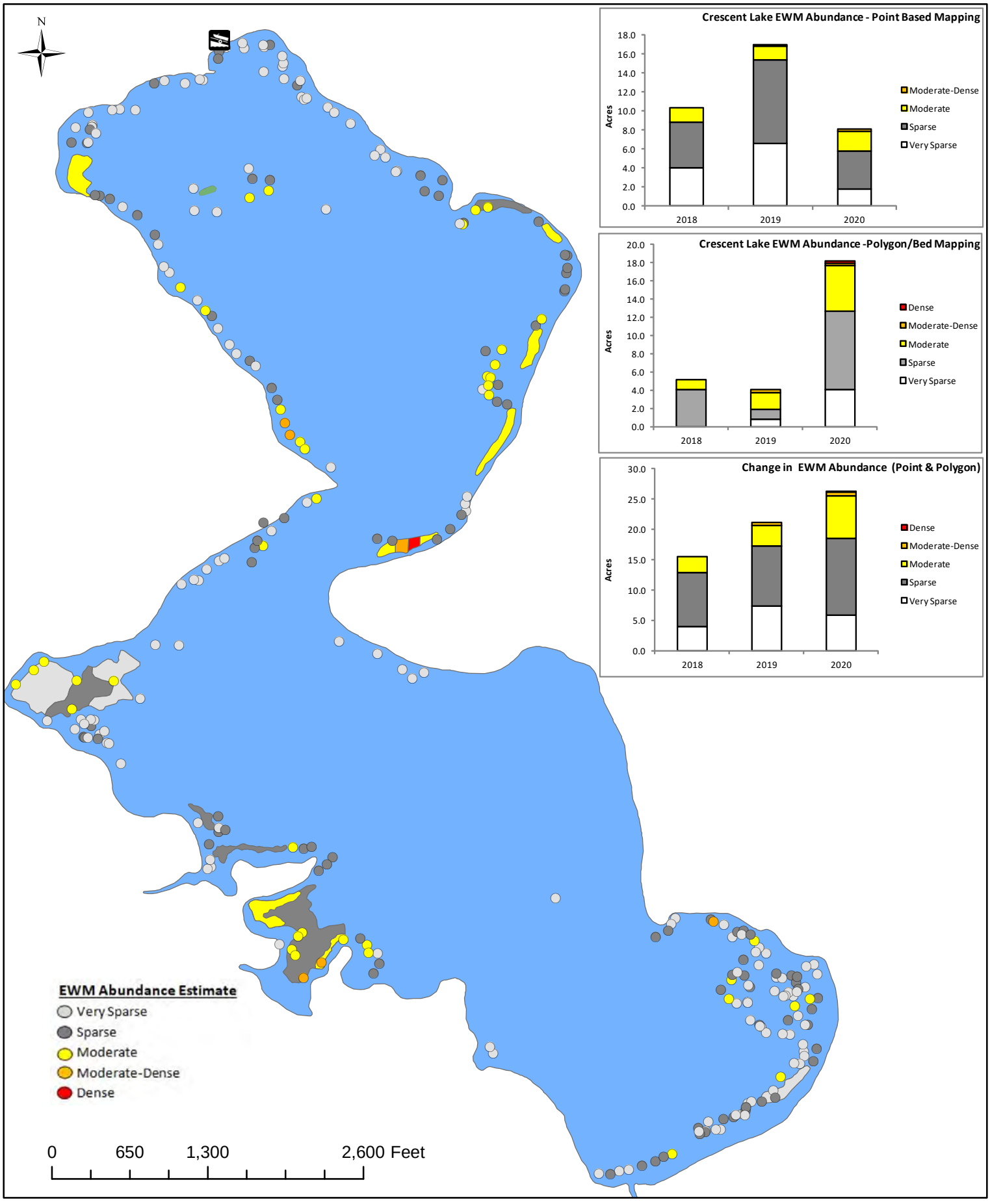

Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 12.7.2019 Many Waters, LLC
Survey Date: 9.16.19
Source: WDNR hydro
File: Crescent_MLSS_2019

**Crescent Lake - Oneida Co, WI**
**Mid/Late Season EWM Survey**
**2019**
**DRAFT**



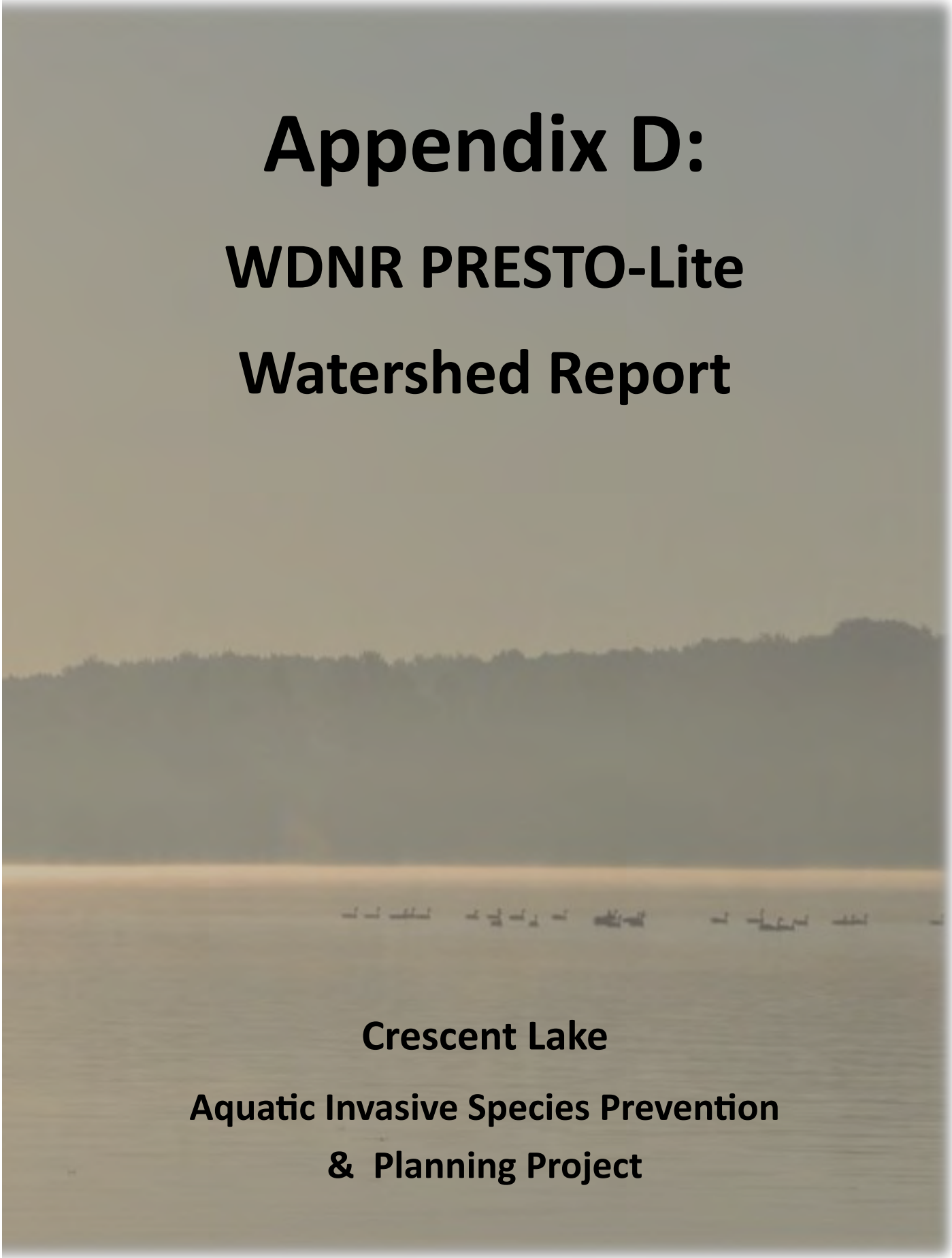

Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: 12.7.2019 Many Waters, LLC
Survey Date: 9.16.19
Source: WDNR hydro
File: Crescent_MLSS_2019

**Crescent Lake - Oneida Co, WI**
**Mid/Late Season EWM Survey**
**2019**
**DRAFT**




Lake: Crescent Lake, Oneida County, MI
Map Date & Creator: Updated 10.12.2020, Many Waters, LLC
Survey Date: 9.18.2020
Source: WDNR hydro, EWM-Many Waters
File: Crescent_MLSS_2020

# Crescent Lake - Oneida Co, WI
# Mid/Late Season EWM Survey
# 2020



# Appendix D:

## WDNR PRESTO-Lite

## Watershed Report

**Crescent Lake**

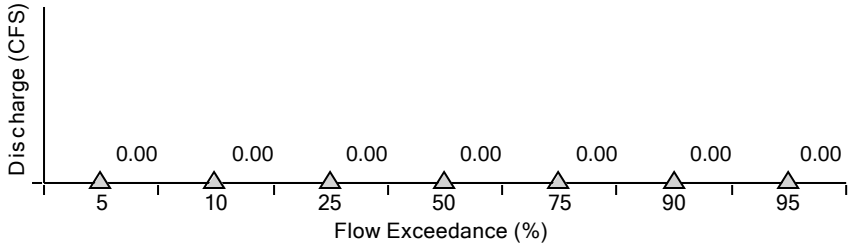
**Aquatic Invasive Species Prevention**

**& Planning Project**

# PRESTO-Lite Watershed Delineation Report

| |
|---|
| Reach ID: 600018010 |
| Watershed Name: Cresent Creek-Wisconsin River |
| Waterbody Name: Crescent Lake |
| HUC08: Upper Wisconsin |
| Watershed Area: 9.02 mi² |
| Average Annual Precipitation: 31.42in |

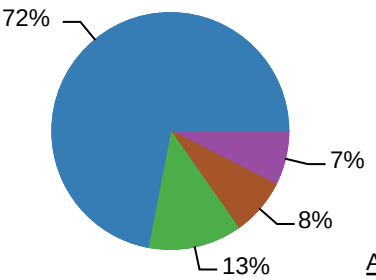
## Stream Flow




## Tributary Stream Type

| Type | Length |
|---|---|
| Coldwater | 0 ft |
| Cool-Cold Headwater | 0 ft |
| Cool-Cold Mainstem | 0 ft |
| Cold Headwater | 0 ft |
| Cold Mainstem | 0 ft |
| Large River | 0 ft |
| Macroinvertebrates | 0 ft |
| Warm Headwater | 0 ft |
| Warm Mainstem | 0 ft |

## Landcover




| Type | Area |
|---|---|
| Forest | 4.96 mi² |
| Wetland | 0.88 mi² |
| Urban | 0.54 mi² |
| Agriculture | 0.52 mi² |
| Barren | 0.1 mi² |
| Grassland | 0.09 mi² |

## PRESTO Phosphorus Load Estimate

| | |
|---|---|
| Avg. Annual Nonpoint Phosphorous Load (80% Confidence Interval) | 84 (43 - 167) lbs |
| Number of Facilities (Individual Facility Information below) | 0 |
| Avg. Annual Point-source Phosphorous Load (2010 - 2012 total of all facilities) | 0lbs |
| Most Likely Point : Nonpoint Phosphorous Ratio | 0% : 100% |
| Low Estimate Point : Nonpoint Phosphorous Ratio (Adaptive Management) | 0% : 100% |

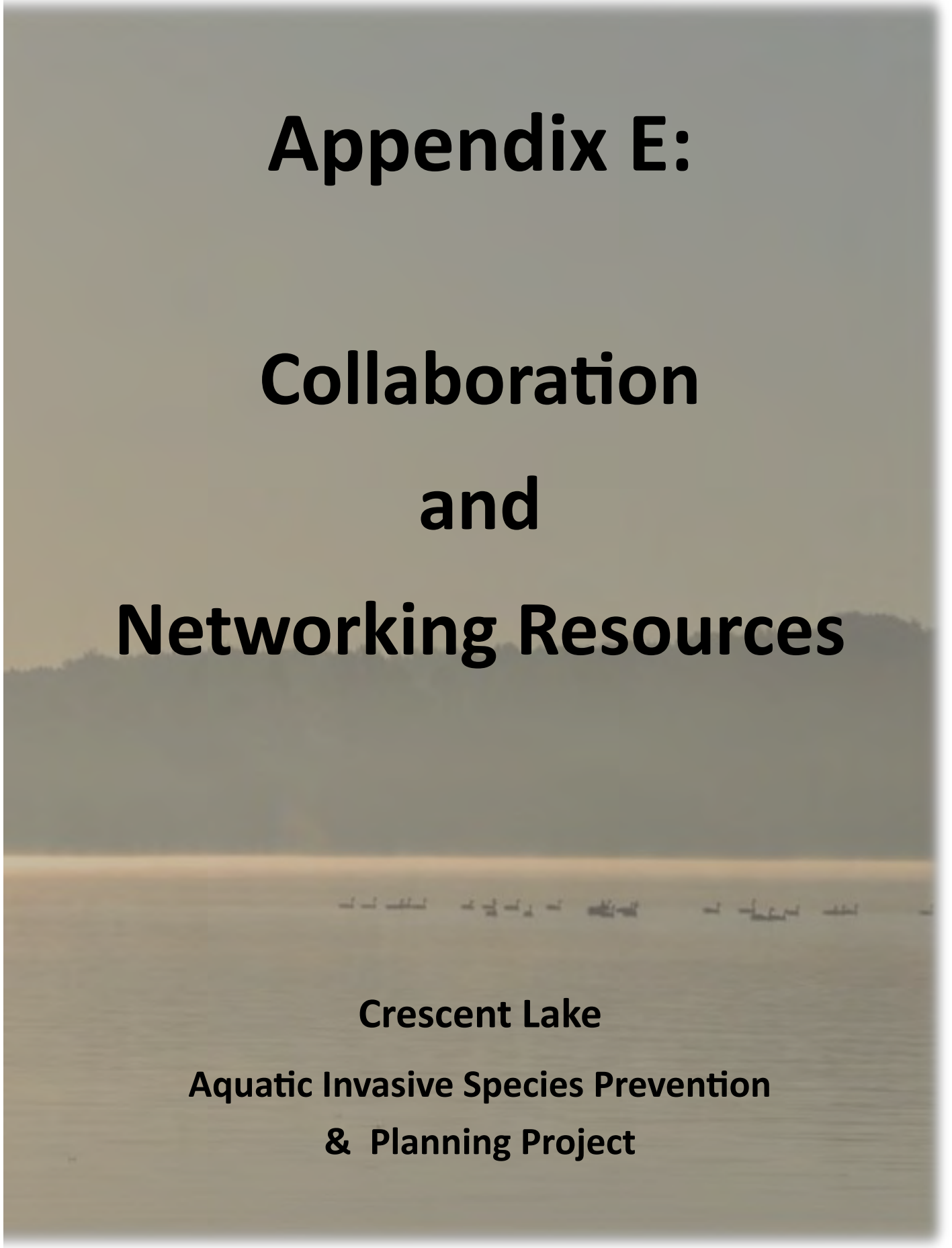
## Adaptive Management Results

Facilities Discharging to the Cresent Creek-Wisconsin River Watershed:

| Facility Name | Permit # | Outfall # | Waste Type | Receiving Water | Avg. Phosphorus Load (lbs.) (2010 - 2012) |
|---|---|---|---|---|---|
| No Facilities Found | - | - | - | - | - |

## Watershed Analysis Limitations

- This analysis relies on pre-defined catchments from the Wisconsin Hydrography Data-Plus and may not delineate from the exact location required. When assessing phosphorus loads for specific facility in support of efforts such as adaptive management, care should be taken to ensure that additional downstream point sources do not exist. For adaptive management information related to specific facilities please reference the PRESTO website http://dnr.wi.gov/topic/surfacewater/presto.html
- Delineation of watersheds is based on a topographic assessment and therefore do not account for modified drainage networks such as stormwater sewer systems and ditched agriculture.
- If a watershed requires delineation from an exact location the user may use the desktop version of PRESTO that requires ESRI ArcGIS. The PRESTO tool and default datasets can be downloaded at http://dnr.wi.gov/topic/surfacewater/presto.html
- Data sources for this report originate from the WDNR's Wisconsin Hydrography Data-Plus value-added dataset and the point and non-point source loading information including in the WDNR's PRESTO model.
- If you have questions about the report generated from the PRESTO-Lite application please contact: DNRWATERQUALITYMODELING@wisconsin.gov



# Appendix E:

# Collaboration and Networking Resources

**Crescent Lake**

**Aquatic Invasive Species Prevention & Planning Project**

Crescent Lake Networking & Collaboration List

Clean Boats Clean Waters:

Erin McFarlane
Statewide CBCW Educator Extension Lakes
University of Wisconsin-Stevens Point
College of Natural Resources
715-346-4978
erin.mcfarriane@uwsp.edu

***Aquatic Plant Management in Wisconsin*** (Guidebook)
Information to assist in developing an effective plan to manage plants in Wisconsin Lakes.

Download at www.uwsp.edu

Stephanie Boismenue
AIS Coordinator
Oneida County Land & Water Conservation Department
CBCW Inspector Training
Boat Landing Signage
Healthy Lakes Grant Program

Healthy Lakes

Dan Butkus
dan.butkus@yahoo.com
Squash Lake Association
Healthy Lakes Shoreline Restoration

Hanson's Garden Village
2660 CTH-G
Rhinelander, WI 54501
715-365-2929
Selection of plants conducive to creating an effective buffer.

Lake District

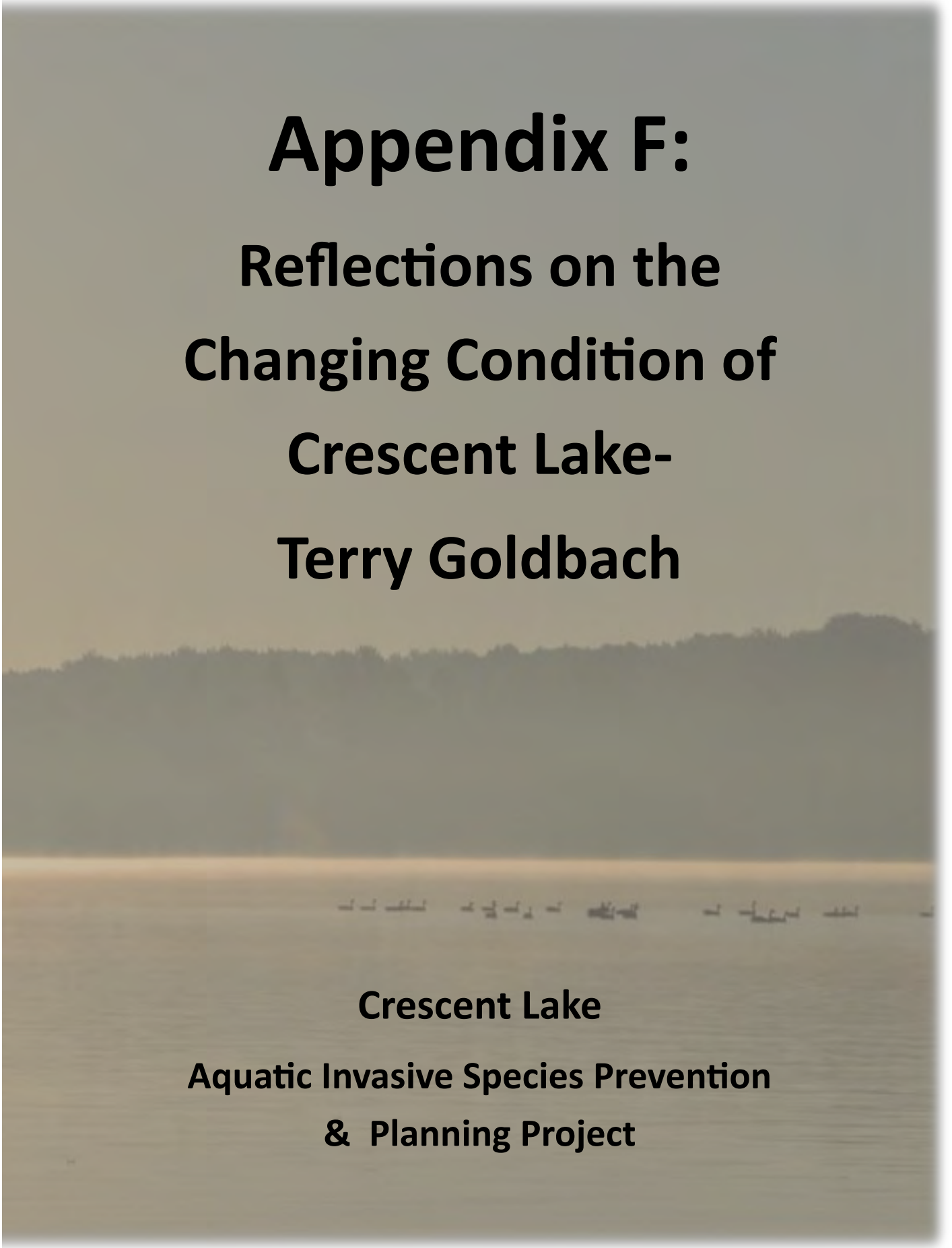
Dan Butkus
dan.butkus@yahoo.com
How to create a Lake District

Grant Guidance

Jill Sunderland
WDNR Environmental Grants Specialist
Jill.Sunderland@wisconsin.gov
Crescent Lake Association's assigned contact

AIS/EWM

Sally Merwin
8229 Brinkland Circle
Minocqua, WI 54548
715-356-1149
Lake Minocqua Association
AIS Task Force & Permit Applicant



# Appendix F:

## Reflections on the Changing Condition of Crescent Lake-

## Terry Goldbach

**Crescent Lake**

**Aquatic Invasive Species Prevention**

**& Planning Project**

## AS YOU READ THIS DOCUMENT

As you read this document there are some things you need to keep in mind. In the 2007, revised 2008 and 2009 Management Plan for Crescent Lake there was no Eurasian Water Milfoil (EWM, an invasive non-native aquatic plant) or native Northern Milfoil in Crescent Lake. Northern Milfoil was initially discovered by lake volunteers doing an aquatic plant raking survey in 2014, and in 2015 EWM was discovered by UW Stevens Point. The 2007, revised 2008 and 2009, Management Plan for Crescent Lake does mention there were rusty crayfish, also an invasive, in the lake. According to DNR records the rusty crayfish had been present in the lake since the 1970's. There is also a comment by lake residents in the 2007, revised 2008 and 2009 Management Plan regarding less dense stands of aquatic vegetation as in past years which may be a result of the rusty crayfish population in the lake. Between 2010 and prior to the discovery of milfoil in 2014 and 2015 the rusty crayfish population disappeared and remains absent to this day.

The lakes environment is not a fixed environment. Each year, even within each season of a given year, the lake changes and evolves. The lakes environment on the north end is also slightly different than the lakes environment on the south end. The amount of rain and snow, sunshine and clouds, water temperature, air temperature, volume of ice, volume of boat traffic, type of boat traffic, water chemistry, water clarity, strength of and location of springs within the lake, etc. all impacts the lakes eco system and how the lake maybe used or is used. The bottom surface of the lake; sand, muck, gravel, rock, or combinations of these also affects what happens in specific locations regarding aquatic plant growth. The fact that the trees on the shore are more mature and taller also impacts the lakes ecology. There are more leaves and pine needles entering the lake today than 40 years ago.

In addition, where one property owner finds a nuisance, another may not find an issue. Fishing maybe poor for one property owner, another feels fishing is fine, and another property owner may not care about fishing. Plant surveys also have varied results from year to year and is affected by all of the above. In fact, plant surveys done in May (start of growth cycle) or September (plant death cycle) will be different than a plant survey done in the last two weeks in July (plant peak growth cycle). Where aquatic plants are found one year maybe different in future years. Density and volume of plants will change from year to year and even within one season. Some property owners may not be considered good stewards of the lake and other property owners maybe the opposite. There are over 250 property owners on Crescent Lake, and they all are here for different reasons and have their own unique relationship with the lake, e.g. relaxation, skiing, boating, swimming, fishing; some will be here a long time and others a short time. Whether a short or long-term property owner the common thread that ties us together is the enjoyment of being here on Crescent Lake.