

# **Documenting baseline vegetation data for salt marshes in Acadia National Park: Bass Harbor Marsh, Northeast Creek, Thompson Island, and Schoodic Peninsula**

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All ecosystems in Maine will be affected by climate change over the next few decades, and species with narrow ranges, small population sizes, and a distribution determined by low temperatures may be more susceptible to climate change (Sætersdal and Birks 1997; Lesica and McCune 2004; Pauli et al. 2015). In addition, stressors such as sea level rise, caused by melting glaciers and polar ice and thermal expansion of a warming ocean, are predicted to accelerate along the Maine coast (Nielsen and Dudley 2013). Salt marshes, with the highest productivity of any terrestrial or marine system, have limited distribution in Maine, have species distribution controlled by minute differences in salinity, and many do not have adequate upland area directly adjacent for migration of species as sea levels rise (Watson and Byrne 2009, Nielsen and Dudley 2013). The primary objective of this study were to conduct a botanical baseline inventory of the salt marshes of Acadia National Park and document the flora using methods that may be useful for long-term monitoring studies.

## **Study Area**

The salt marshes we studied included all of the salt marshes within Acadia National Park boundaries, as determined by Nielsen and Dudley (2013). Bass Harbor Marsh and Northeast Creek, on Mount Desert Island, were the largest salt marshes studied. We also studied the series of marshes at the northern end of Mount Desert Island in the vicinity of Thompson Island (hereafter referred to as Thompson Island) and also the series of marshes on Schoodic Peninsula.

## **Methods**

The general approach was to conduct an inventory of all species of vascular plants on each salt marsh studied and estimate maximum categorical abundance of each species within 25x25 m grid cells covering the entire marsh on a single visit between late June and July. Field inventory trips were made on the following dates during 2016: Bass Harbor Marsh on 7-8, 11-13 July; Northeast Creek on 14-15 July; Thompson Island on 29 June and 5, 8, and 18 July; and Schoodic Peninsula on 22 June. Identification of all species were made in the field; some taxa requiring further study were only identified to genus so that the surveys would not get slowed down. All nomenclature follows Haines (2011) or more recent nomenclature changes in Haines (2016). We focused our survey efforts strictly within the salt marsh habitat and ignored species in adjacent uplands and adjacent fresh water wetlands during our inventory efforts.

Using GIS software, we built a 25x25 m grid across the salt marsh and into adjacent habitat. The grid was oriented following true compass bearings, with the UTM coordinates (NAD83, Zone 19) of the grid extent being 551700, 4902200; 552900, 4899400 at Bass Harbor Marsh; 553600, 4919300; 556100, 4917900 at Northeast Creek; 550300, 4919500; 551300, 4918800 at Thompson Island; and 574900, 4910400; 575525, 4909800 at Schoodic Peninsula. The grid and grid-cell number shapefiles were uploaded onto a Garmin handheld WAAS corrected GPS using DNRGPS software. In the field, we referred to the GPS unit to determine the bounds of each grid cell. On each trip to the island, we made a list of vascular plants present within each grid cell and estimated the categorical abundance of each. Abundance categories were as follows: common = species with a wide distribution in the grid cell, occurring in large numbers, typically with over 50% cover; occasional = species with a scattered distribution throughout the grid cell, typically with 25-50% cover; uncommon = species not widely distributed and not often encountered in the grid cell, typically with 5-25% cover; and rare = species usually restricted to small areas, specialized habitats, or consisting of 1 or 2 very small "populations" in the grid cell, typically with less than 5% cover.

## Results

**Bass Harbor Marsh.** We documented 59 plant taxa in 513 grid cells on the salt marsh with an average of  $6.94 \pm 0.14$  taxa per grid cell (Table 1). Non-native species made up 7% of all taxa documented from the salt marsh. A total of 11 taxa were documented in 25% or more of all of the grid cells surveyed and these taxa included one non-native taxa (*Agrostis stolonifera*) and ten native taxa (*Anthoxanthum nitens* ssp. *nitens*, *Bolboschoenus maritimus* ssp. *paludosus*, *Festuca rubra*, *Juncus balticus* ssp. *littoralis*, *Juncus gerardii*, *Solidago sempervirens* var. *sempervirens*, *Sporobolus michauxianus*, *Sporobolus pumilus*, *Symphyotrichum* sp., and *Triglochin maritima*).

**Northeast Creek.** We documented 38 plant taxa in 191 grid cells on the salt marsh with an average of  $5.04 \pm 0.21$  taxa per grid cell (Table 2). Non-native species made up 5% of all taxa documented from the salt marsh. A total of nine taxa were documented in 25% or more of all of the grid cells surveyed and these taxa included one non-native taxa (*Agrostis stolonifera*) and eight native taxa (*Bolboschoenus maritimus* ssp. *paludosus*, *Eleocharis* sp., *Festuca rubra*, *Myrica gale*, *Schoenoplectus tabernaemontani*, *Sporobolus michauxianus*, *Triglochin maritima*, and *Vaccinium macrocarpon*).

**Thompson Island.** We documented 54 plant taxa in 227 grid cells on the salt marsh with an average of  $5.64 \pm 0.18$  taxa per grid cell (Table 3). Non-native species made up 7% of all taxa documented from the salt marsh. A total of eight taxa were documented in 25% or more of all of the grid cells surveyed and these taxa included two non-native taxa (*Agrostis stolonifera* and *Suaeda* sp.) and six native taxa (*Juncus gerardii*, *Limonium carolinianum*, *Solidago sempervirens* var. *sempervirens*, *Sporobolus alterniflorus*, *Sporobolus pumilus*, and *Triglochin maritima*).

**Schoodic Peninsula.** We documented 64 plant taxa in 65 grid cells on the salt marsh with an average of  $9.05 \pm 0.47$  taxa per grid cell (Table 4). Non-native species made up 5% of all taxa documented from the salt marsh. A total of 13 taxa were documented in 25% or more of all of the grid cells surveyed and these taxa included no non-native taxa and 13 native taxa (*Argentina egedii* ssp. *groenlandica*, *Atriplex acadiensis*, *Carex paleacea*, *Festuca rubra*, *Juncus balticus* ssp. *littoralis*, *Juncus gerardii*, *Lysimachia maritima*, *Myrica gale*, *Plantago maritima* ssp. *juncooides*, *Salicornia depressa*, *Solidago sempervirens* var. *sempervirens*, *Triglochin maritima*, and *Vaccinium macrocarpon*).

**All Salt Marshes Combined.** We documented 108 plant taxa in 996 grid cells on the salt marsh with an average of  $6.42 \pm 0.10$  taxa per grid cell (Table 5). Non-native species made up 7% of all taxa documented from the salt marsh. A total of 10 taxa were documented in 25% or more of all of the grid cells surveyed and these taxa included one non-native taxa (*Agrostis stolonifera*) and nine native taxa (*Anthoxanthum nitens* ssp. *nitens*, *Bolboschoenus maritimus* ssp. *paludosus*, *Festuca rubra*, *Juncus balticus* ssp. *littoralis*, *Juncus gerardii*, *Solidago sempervirens* var. *sempervirens*, *Sporobolus michauxianus*, *Sporobolus pumilus*, and *Triglochin maritima*).

Table 1. Absolute and relative frequency of occurrence of species within 513 grid cells (each 25x25 m) for all species documented within the salt marsh study area at Bass Harbor Marsh, Acadia National Park, Maine during 2016. Non-native taxa are marked with a \* symbol. Numbers for taxa are absolute frequency (relative frequency); numbers reported for total number species/grid cell are average  $\pm$  s.e..

| Species                                                         | Common     | Occasional | Uncommon   | Rare      | Overall    |
|-----------------------------------------------------------------|------------|------------|------------|-----------|------------|
| <i>Sporobolus pumilus</i>                                       | 197 (0.38) | 99 (0.19)  | 67 (0.13)  | 7 (0.01)  | 370 (0.72) |
| <i>Triglochin maritima</i>                                      | 14 (0.03)  | 79 (0.15)  | 222 (0.43) | 40 (0.08) | 355 (0.69) |
| * <i>Agrostis stolonifera</i>                                   | 38 (0.07)  | 123 (0.24) | 121 (0.24) | 14 (0.03) | 296 (0.58) |
| <i>Solidago sempervirens</i> var. <i>sempervirens</i>           | 9 (0.02)   | 68 (0.13)  | 172 (0.34) | 18 (0.04) | 267 (0.52) |
| <i>Anthoxanthum nitens</i> ssp. <i>nitens</i>                   | 18 (0.04)  | 73 (0.14)  | 100 (0.19) | 56 (0.11) | 247 (0.48) |
| <i>Sporobolus michauxianus</i>                                  | 23 (0.04)  | 102 (0.20) | 106 (0.21) | 4 (0.01)  | 235 (0.46) |
| <i>Juncus balticus</i> ssp. <i>littoralis</i>                   | 37 (0.07)  | 90 (0.18)  | 78 (0.15)  | 6 (0.01)  | 211 (0.41) |
| <i>Juncus gerardii</i>                                          | 18 (0.04)  | 96 (0.19)  | 85 (0.17)  | 3 (0.01)  | 202 (0.39) |
| <i>Festuca rubra</i>                                            | 0          | 13 (0.03)  | 141 (0.27) | 24 (0.05) | 178 (0.35) |
| <i>Bolboschoenus maritimus</i> ssp. <i>paludosus</i>            | 1 (0.002)  | 40 (0.08)  | 90 (0.18)  | 15 (0.03) | 146 (0.28) |
| <i>Symphyotrichum</i> sp.                                       | 16 (0.03)  | 63 (0.12)  | 57 (0.11)  | 0         | 136 (0.27) |
| <i>Calystegia sepium</i>                                        | 2 (0.004)  | 26 (0.05)  | 74 (0.14)  | 4 (0.01)  | 106 (0.21) |
| <i>Argentina egedii</i> ssp. <i>groenlandica</i>                | 0          | 16 (0.03)  | 73 (0.14)  | 11 (0.02) | 100 (0.19) |
| <i>Carex paleacea</i>                                           | 10 (0.02)  | 36 (0.07)  | 44 (0.09)  | 9 (0.02)  | 99 (0.19)  |
| <i>Myrica gale</i>                                              | 5 (0.01)   | 33 (0.06)  | 58 (0.11)  | 3 (0.01)  | 99 (0.19)  |
| <i>Sporobolus alterniflorus</i>                                 | 0          | 32 (0.06)  | 55 (0.11)  | 3 (0.01)  | 90 (0.18)  |
| <i>Plantago maritima</i> ssp. <i>juncoides</i>                  | 0          | 6 (0.01)   | 25 (0.05)  | 13 (0.03) | 44 (0.09)  |
| <i>Vaccinium macrocarpon</i>                                    | 0          | 18 (0.04)  | 13 (0.03)  | 4 (0.01)  | 35 (0.07)  |
| <i>Aronia melanocarpa</i>                                       | 0          | 9 (0.02)   | 20 (0.04)  | 2 (0.004) | 31 (0.06)  |
| <i>Eleocharis</i> sp.                                           | 0          | 7 (0.01)   | 20 (0.04)  | 3 (0.01)  | 30 (0.06)  |
| * <i>Elymus repens</i>                                          | 1 (0.002)  | 4 (0.01)   | 13 (0.03)  | 9 (0.02)  | 27 (0.05)  |
| <i>Rosa</i> sp.                                                 | 0          | 1 (0.002)  | 18 (0.04)  | 8 (0.02)  | 27 (0.05)  |
| <i>Atriplex acadiensis</i>                                      | 0          | 1 (0.002)  | 13 (0.03)  | 9 (0.02)  | 23 (0.04)  |
| <i>Lysimachia maritima</i>                                      | 0          | 2 (0.004)  | 15 (0.03)  | 6 (0.01)  | 23 (0.04)  |
| <i>Spiraea alba</i> var. <i>latifolia</i>                       | 0          | 6 (0.01)   | 16 (0.03)  | 0         | 22 (0.04)  |
| <i>Schoenoplectus tabernaemontani</i>                           | 0          | 4 (0.01)   | 6 (0.01)   | 8 (0.02)  | 18 (0.04)  |
| <i>Carex viridula</i> ssp. <i>viridula</i> var. <i>viridula</i> | 0          | 0          | 13 (0.03)  | 4 (0.01)  | 17 (0.03)  |
| <i>Typha latifolia</i>                                          | 1 (0.002)  | 3 (0.01)   | 5 (0.01)   | 5 (0.01)  | 14 (0.03)  |
| <i>Salicornia depressa</i>                                      | 0          | 0          | 4 (0.01)   | 7 (0.01)  | 11 (0.02)  |
| <i>Calamagrostis canadensis</i>                                 | 0          | 4 (0.01)   | 6 (0.01)   | 0         | 10 (0.02)  |
| <i>Carex hormathodes</i>                                        | 0          | 1 (0.002)  | 4 (0.01)   | 5 (0.01)  | 10 (0.02)  |
| <i>Chamaedaphne calyculata</i>                                  | 0          | 1 (0.002)  | 5 (0.01)   | 2 (0.004) | 8 (0.02)   |
| <i>Doellingeria umbellata</i> var. <i>umbellata</i>             | 0          | 0          | 5 (0.01)   | 2 (0.004) | 7 (0.01)   |
| <i>Elymus trachycaulus</i>                                      | 0          | 0          | 4 (0.01)   | 3 (0.01)  | 7 (0.01)   |
| <i>Achillea millefolium</i> ssp. <i>lanulosa</i>                | 0          | 0          | 4 (0.01)   | 2 (0.004) | 6 (0.01)   |
| <i>Lysimachia terrestris</i>                                    | 0          | 0          | 4 (0.01)   | 1 (0.002) | 5 (0.01)   |
| <i>Carex folliculata</i>                                        | 0          | 0          | 2 (0.004)  | 2 (0.004) | 4 (0.01)   |
| <i>Larix laricina</i>                                           | 0          | 0          | 2 (0.004)  | 2 (0.004) | 4 (0.01)   |
| <i>Iris versicolor</i>                                          | 0          | 0          | 2 (0.004)  | 1 (0.002) | 3 (0.01)   |
| <i>Juncus brevicaudatus</i>                                     | 0          | 0          | 2 (0.004)  | 1 (0.002) | 3 (0.01)   |
| <i>Limonium carolinianum</i>                                    | 0          | 1 (0.002)  | 1 (0.002)  | 1 (0.002) | 3 (0.01)   |
| <i>Moehringia lateriflora</i>                                   | 0          | 0          | 1 (0.002)  | 2 (0.004) | 3 (0.01)   |
| <i>Picea mariana</i>                                            | 0          | 0          | 0          | 3 (0.01)  | 3 (0.01)   |
| <i>Rhododendron groenlandicum</i>                               | 0          | 2 (0.004)  | 1 (0.002)  | 0         | 3 (0.01)   |
| <i>Carex lenticularis</i>                                       | 0          | 1 (0.002)  | 1 (0.002)  | 0         | 2 (0.004)  |
| <i>Carex nigra</i>                                              | 0          | 0          | 2 (0.004)  | 0         | 2 (0.004)  |
| <i>Empetrum nigrum</i>                                          | 0          | 0          | 0          | 2 (0.004) | 2 (0.004)  |
| <i>Galium</i> sp.                                               | 0          | 1 (0.002)  | 0          | 1 (0.002) | 2 (0.004)  |

| Species                                    | Common | Occasional | Uncommon  | Rare      | Overall   |
|--------------------------------------------|--------|------------|-----------|-----------|-----------|
| <i>Hordeum jubatum</i> ssp. <i>jubatum</i> | 0      | 0          | 1 (0.002) | 1 (0.002) | 2 (0.004) |
| <i>Morella caroliniensis</i>               | 0      | 0          | 2 (0.004) | 0         | 2 (0.004) |
| * <i>Phleum pratense</i>                   | 0      | 0          | 1 (0.002) | 1 (0.002) | 2 (0.004) |
| <i>Rumex britannica</i>                    | 0      | 0          | 1 (0.002) | 1 (0.002) | 2 (0.004) |
| <i>Solidago</i> sp.                        | 0      | 1 (0.002)  | 1 (0.002) | 0         | 2 (0.004) |
| <i>Carex brunnescens</i>                   | 0      | 0          | 0         | 1 (0.002) | 1 (0.002) |
| <i>Cuscuta gronovii</i>                    | 0      | 0          | 0         | 1 (0.002) | 1 (0.002) |
| <i>Equisetum arvense</i>                   | 0      | 0          | 0         | 1 (0.002) | 1 (0.002) |
| <i>Scutellaria galericulata</i>            | 0      | 0          | 0         | 1 (0.002) | 1 (0.002) |
| <i>Solidago rugosa</i>                     | 0      | 0          | 1 (0.002) | 0         | 1 (0.002) |
| * <i>Vicia cracca</i> ssp. <i>cracca</i>   | 0      | 0          | 0         | 1 (0.002) | 1 (0.002) |
| Total # of species/grid cell               |        |            |           |           | 6.94±0.14 |

Table 2. Absolute and relative frequency of occurrence of species within 191 grid cells (each 25x25 m) for all species documented within the salt marsh study area at Northeast Creek, Acadia National Park, Maine during 2016. Non-native taxa are marked with a \* symbol. Numbers for taxa are absolute frequency (relative frequency); numbers reported for total number species/grid cell are average  $\pm$  s.e..

| Species                                               | Common    | Occasional | Uncommon  | Rare      | Overall         |
|-------------------------------------------------------|-----------|------------|-----------|-----------|-----------------|
| * <i>Agrostis stolonifera</i>                         | 9 (0.05)  | 53 (0.28)  | 43 (0.23) | 8 (0.04)  | 113 (0.59)      |
| <i>Sporobolus michauxianus</i>                        | 14 (0.07) | 47 (0.25)  | 41 (0.21) | 6 (0.03)  | 108 (0.57)      |
| <i>Bolboschoenus maritimus</i> ssp. <i>paludosus</i>  | 45 (0.24) | 26 (0.14)  | 23 (0.12) | 7 (0.04)  | 101 (0.53)      |
| <i>Myrica gale</i>                                    | 8 (0.04)  | 32 (0.17)  | 43 (0.23) | 14 (0.07) | 97 (0.51)       |
| <i>Vaccinium macrocarpon</i>                          | 8 (0.04)  | 24 (0.13)  | 26 (0.14) | 4 (0.02)  | 62 (0.32)       |
| <i>Eleocharis</i> sp.                                 | 3 (0.02)  | 18 (0.09)  | 28 (0.15) | 8 (0.04)  | 57 (0.30)       |
| <i>Triglochin maritima</i>                            | 2 (0.01)  | 5 (0.03)   | 26 (0.14) | 20 (0.10) | 53 (0.28)       |
| <i>Schoenoplectus tabernaemontani</i>                 | 9 (0.05)  | 15 (0.08)  | 19 (0.10) | 7 (0.04)  | 50 (0.26)       |
| <i>Juncus balticus</i> ssp. <i>littoralis</i>         | 4 (0.02)  | 15 (0.08)  | 21 (0.11) | 8 (0.04)  | 48 (0.25)       |
| <i>Symphytotrichum</i> sp.                            | 6 (0.03)  | 15 (0.08)  | 17 (0.09) | 2 (0.01)  | 40 (0.21)       |
| <i>Carex hormathodes</i>                              | 1 (0.01)  | 2 (0.01)   | 12 (0.06) | 14 (0.07) | 29 (0.15)       |
| <i>Festuca rubra</i>                                  | 0         | 7 (0.04)   | 17 (0.09) | 1 (0.01)  | 25 (0.13)       |
| <i>Poa palustris</i>                                  | 1 (0.01)  | 4 (0.02)   | 11 (0.06) | 5 (0.03)  | 21 (0.11)       |
| <i>Elymus trachycaulus</i>                            | 0         | 4 (0.02)   | 11 (0.06) | 5 (0.03)  | 20 (0.10)       |
| <i>Spiraea alba</i> var. <i>latifolia</i>             | 1 (0.01)  | 0          | 11 (0.06) | 4 (0.02)  | 16 (0.08)       |
| <i>Chamaedaphne calyculata</i>                        | 0         | 2 (0.01)   | 9 (0.05)  | 4 (0.02)  | 15 (0.08)       |
| <i>Anthoxanthum nitens</i> ssp. <i>nitens</i>         | 0         | 4 (0.02)   | 6 (0.03)  | 4 (0.02)  | 14 (0.07)       |
| <i>Calystegia sepium</i>                              | 0         | 0          | 7 (0.04)  | 6 (0.03)  | 13 (0.07)       |
| <i>Sporobolus pumilus</i>                             | 2 (0.01)  | 1 (0.01)   | 7 (0.04)  | 3 (0.02)  | 13 (0.07)       |
| <i>Calamagrostis canadensis</i>                       | 0         | 5 (0.03)   | 5 (0.03)  | 1 (0.01)  | 11 (0.06)       |
| <i>Sporobolus alterniflorus</i>                       | 0         | 0          | 5 (0.03)  | 6 (0.03)  | 11 (0.06)       |
| <i>Typha latifolia</i>                                | 4 (0.02)  | 2 (0.01)   | 2 (0.01)  | 0         | 8 (0.04)        |
| <i>Carex folliculata</i>                              | 0         | 0          | 1 (0.01)  | 5 (0.03)  | 6 (0.03)        |
| <i>Thelypteris palustris</i> var. <i>pubescens</i>    | 0         | 1 (0.01)   | 3 (0.02)  | 0         | 4 (0.02)        |
| <i>Carex paleacea</i>                                 | 0         | 0          | 2 (0.01)  | 1 (0.01)  | 3 (0.02)        |
| <i>Juncus gerardii</i>                                | 0         | 0          | 2 (0.01)  | 1 (0.01)  | 3 (0.02)        |
| <i>Lysimachia terrestris</i>                          | 0         | 1 (0.01)   | 1 (0.01)  | 1 (0.01)  | 3 (0.02)        |
| <i>Atriplex acadiensis</i>                            | 0         | 0          | 1 (0.01)  | 1 (0.01)  | 2 (0.01)        |
| <i>Carex stricta</i>                                  | 0         | 2 (0.01)   | 0         | 0         | 2 (0.01)        |
| <i>Galium</i> sp.                                     | 0         | 0          | 0         | 2 (0.01)  | 2 (0.01)        |
| <i>Iris versicolor</i>                                | 0         | 0          | 0         | 2 (0.01)  | 2 (0.01)        |
| <i>Osmunda regalis</i> var. <i>spectabilis</i>        | 0         | 1 (0.01)   | 1 (0.01)  | 0         | 2 (0.01)        |
| <i>Rosa</i> sp.                                       | 0         | 0          | 0         | 2 (0.01)  | 2 (0.01)        |
| * <i>Typha angustifolia</i>                           | 0         | 0          | 0         | 2 (0.01)  | 2 (0.01)        |
| <i>Juncus brevicaudatus</i>                           | 0         | 0          | 1 (0.01)  | 0         | 1 (0.01)        |
| <i>Rumex britannica</i>                               | 0         | 0          | 1 (0.01)  | 0         | 1 (0.01)        |
| <i>Scutellaria galericulata</i>                       | 0         | 0          | 1 (0.01)  | 0         | 1 (0.01)        |
| <i>Solidago sempervirens</i> var. <i>sempervirens</i> | 0         | 0          | 0         | 1 (0.01)  | 1 (0.01)        |
| Total # of species/grid cell                          |           |            |           |           | 5.04 $\pm$ 0.21 |

Table 3. Absolute and relative frequency of occurrence of species within 227 grid cells (each 25x25 m) for all species documented within the salt marsh study area at Thompson Island, Acadia National Park, Maine during 2016. Non-native taxa are marked with a \* symbol. Numbers for taxa are absolute frequency (relative frequency); numbers reported for total number species/grid cell are average  $\pm$  s.e..

| Species                                                          | Common    | Occasional | Uncommon  | Rare      | Overall    |
|------------------------------------------------------------------|-----------|------------|-----------|-----------|------------|
| <i>Sporobolus pumilus</i>                                        | 45 (0.20) | 36 (0.16)  | 30 (0.13) | 4 (0.02)  | 115 (0.51) |
| <i>Juncus gerardii</i>                                           | 16 (0.07) | 38 (0.17)  | 56 (0.25) | 4 (0.02)  | 114 (0.50) |
| <i>Sporobolus alterniflorus</i>                                  | 29 (0.13) | 29 (0.13)  | 42 (0.19) | 14 (0.06) | 114 (0.50) |
| <i>Solidago sempervirens</i> var. <i>sempervirens</i>            | 11 (0.05) | 33 (0.15)  | 45 (0.20) | 15 (0.07) | 104 (0.46) |
| <i>Limonium carolinianum</i>                                     | 0         | 29 (0.13)  | 52 (0.23) | 11 (0.05) | 92 (0.41)  |
| * <i>Suaeda</i> sp.                                              | 2 (0.01)  | 19 (0.08)  | 44 (0.19) | 13 (0.06) | 78 (0.34)  |
| * <i>Agrostis stolonifera</i>                                    | 7 (0.03)  | 36 (0.16)  | 23 (0.10) | 4 (0.02)  | 70 (0.31)  |
| <i>Triglochin maritima</i>                                       | 6 (0.03)  | 10 (0.04)  | 31 (0.14) | 11 (0.05) | 58 (0.26)  |
| <i>Plantago maritima</i> ssp. <i>juncoides</i>                   | 1 (0.004) | 12 (0.05)  | 30 (0.13) | 12 (0.05) | 55 (0.24)  |
| <i>Atriplex acadensis</i>                                        | 0         | 7 (0.03)   | 21 (0.09) | 23 (0.10) | 51 (0.22)  |
| <i>Festuca rubra</i>                                             | 0         | 7 (0.03)   | 29 (0.13) | 11 (0.05) | 47 (0.21)  |
| <i>Bolboschoenus maritimus</i> ssp. <i>paludosus</i>             | 3 (0.01)  | 14 (0.06)  | 23 (0.10) | 3 (0.01)  | 43 (0.19)  |
| <i>Juncus balticus</i> ssp. <i>littoralis</i>                    | 2 (0.01)  | 18 (0.08)  | 13 (0.06) | 2 (0.01)  | 35 (0.15)  |
| * <i>Elymus repens</i>                                           | 0         | 4 (0.02)   | 17 (0.07) | 7 (0.03)  | 28 (0.12)  |
| <i>Puccinellia pumila</i>                                        | 0         | 2 (0.01)   | 7 (0.03)  | 16 (0.07) | 25 (0.11)  |
| <i>Salicornia depressa</i>                                       | 0         | 1 (0.004)  | 7 (0.03)  | 15 (0.07) | 23 (0.10)  |
| <i>Morella caroliniensis</i>                                     | 0         | 3 (0.01)   | 16 (0.07) | 3 (0.01)  | 22 (0.10)  |
| <i>Vaccinium macrocarpon</i>                                     | 4 (0.02)  | 8 (0.04)   | 5 (0.02)  | 3 (0.01)  | 20 (0.09)  |
| <i>Symphyotrichum</i> sp.                                        | 0         | 7 (0.03)   | 10 (0.04) | 2 (0.01)  | 19 (0.08)  |
| <i>Anthoxanthum nitens</i> ssp. <i>nitens</i>                    | 0         | 3 (0.01)   | 9 (0.04)  | 6 (0.03)  | 18 (0.08)  |
| <i>Myrica gale</i>                                               | 6 (0.03)  | 6 (0.03)   | 6 (0.03)  | 0         | 18 (0.08)  |
| <i>Carex viridula</i> ssp. <i>viridula</i> var. <i>viridula</i>  | 3 (0.01)  | 4 (0.02)   | 1 (0.004) | 4 (0.02)  | 12 (0.05)  |
| <i>Spergularia canadensis</i> ssp. <i>canadensis</i>             | 0         | 1 (0.004)  | 6 (0.03)  | 5 (0.02)  | 12 (0.05)  |
| <i>Argentina egedii</i> ssp. <i>groenlandica</i>                 | 0         | 2 (0.01)   | 5 (0.02)  | 4 (0.02)  | 11 (0.05)  |
| <i>Carex paleacea</i>                                            | 1 (0.004) | 3 (0.01)   | 3 (0.01)  | 2 (0.01)  | 9 (0.04)   |
| <i>Elymus trachycaulus</i>                                       | 0         | 0          | 6 (0.03)  | 2 (0.01)  | 8 (0.04)   |
| <i>Gaylussacia baccata</i>                                       | 0         | 1 (0.004)  | 3 (0.01)  | 3 (0.01)  | 7 (0.03)   |
| <i>Calystegia sepium</i>                                         | 0         | 1 (0.004)  | 3 (0.01)  | 2 (0.01)  | 6 (0.03)   |
| <i>Toxicodendron rydbergii</i>                                   | 0         | 1 (0.004)  | 2 (0.01)  | 3 (0.01)  | 6 (0.03)   |
| <i>Typha latifolia</i>                                           | 1 (0.004) | 3 (0.01)   | 1 (0.004) | 1 (0.004) | 6 (0.03)   |
| <i>Achillea millefolium</i> ssp. <i>lanulosa</i>                 | 0         | 0          | 2 (0.01)  | 3 (0.01)  | 5 (0.02)   |
| <i>Spergularia marina</i>                                        | 0         | 3 (0.01)   | 1 (0.004) | 1 (0.004) | 5 (0.02)   |
| <i>Calamagrostis canadensis</i>                                  | 0         | 0          | 4 (0.02)  | 0         | 4 (0.02)   |
| <i>Lysimachia maritima</i>                                       | 0         | 0          | 2 (0.01)  | 1 (0.004) | 3 (0.01)   |
| <i>Rosa</i> sp.                                                  | 0         | 0          | 2 (0.01)  | 1 (0.004) | 3 (0.01)   |
| <i>Sporobolus michauxianus</i>                                   | 0         | 1 (0.004)  | 0         | 2 (0.01)  | 3 (0.01)   |
| <i>Atriplex</i> sp.                                              | 0         | 0          | 0         | 2 (0.01)  | 2 (0.01)   |
| <i>Carex hormathodes</i>                                         | 0         | 0          | 0         | 2 (0.01)  | 2 (0.01)   |
| <i>Chamaedaphne calyculata</i>                                   | 0         | 1 (0.004)  | 0         | 1 (0.004) | 2 (0.01)   |
| <i>Iris versicolor</i>                                           | 0         | 0          | 1 (0.004) | 1 (0.004) | 2 (0.01)   |
| <i>Larix laricina</i>                                            | 0         | 0          | 1 (0.004) | 1 (0.004) | 2 (0.01)   |
| <i>Picea mariana</i>                                             | 0         | 0          | 2 (0.01)  | 0         | 2 (0.01)   |
| <i>Zostera marina</i>                                            | 0         | 0          | 2 (0.01)  | 0         | 2 (0.01)   |
| <i>Angelica lucida</i>                                           | 0         | 0          | 0         | 1 (0.004) | 1 (0.004)  |
| <i>Atriplex glabriuscula</i>                                     | 0         | 0          | 0         | 1 (0.004) | 1 (0.004)  |
| <i>Cakile edentula</i> ssp. <i>edentula</i> var. <i>edentula</i> | 0         | 0          | 0         | 1 (0.004) | 1 (0.004)  |
| <i>Chenopodium</i> sp.                                           | 0         | 0          | 0         | 1 (0.004) | 1 (0.004)  |
| <i>Elymus virginicus</i>                                         | 0         | 0          | 1 (0.004) | 0         | 1 (0.004)  |

| Species                                             | Common | Occasional | Uncommon  | Rare      | Overall   |
|-----------------------------------------------------|--------|------------|-----------|-----------|-----------|
| <i>Galium</i> sp.                                   | 0      | 0          | 1 (0.004) | 0         | 1 (0.004) |
| <i>Juncus pylaei</i>                                | 0      | 0          | 0         | 1 (0.004) | 1 (0.004) |
| <i>Kalmia angustifolia</i> ssp. <i>angustifolia</i> | 0      | 0          | 0         | 1 (0.004) | 1 (0.004) |
| <i>Leymus mollis</i> ssp. <i>mollis</i>             | 0      | 0          | 0         | 1 (0.004) | 1 (0.004) |
| * <i>Solanum dulcamara</i>                          | 0      | 0          | 0         | 1 (0.004) | 1 (0.004) |
| <i>Spiraea alba</i> var. <i>latifolia</i>           | 0      | 0          | 0         | 1 (0.004) | 1 (0.004) |
| Total # of species/grid cell                        |        |            |           |           | 5.64±0.18 |

Table 4. Absolute and relative frequency of occurrence of species within 65 grid cells (each 25x25 m) for all species documented within the salt marsh study area at Schoodic Peninsula, Acadia National Park, Maine during 2016. Non-native taxa are marked with a \* symbol. Numbers for taxa are absolute frequency (relative frequency); numbers reported for total number species/grid cell are average  $\pm$  s.e..

| Species                                                         | Common    | Occasional | Uncommon  | Rare      | Overall   |
|-----------------------------------------------------------------|-----------|------------|-----------|-----------|-----------|
| <i>Triglochin maritima</i>                                      | 4 (0.06)  | 21 (0.32)  | 14 (0.22) | 3 (0.05)  | 42 (0.65) |
| <i>Solidago sempervirens</i> var. <i>sempervirens</i>           | 2 (0.03)  | 13 (0.20)  | 32 (0.35) | 1 (0.02)  | 39 (0.60) |
| <i>Festuca rubra</i>                                            | 3 (0.05)  | 7 (0.11)   | 25 (0.38) | 0         | 35 (0.54) |
| <i>Juncus gerardii</i>                                          | 19 (0.29) | 10 (0.15)  | 1 (0.02)  | 0         | 30 (0.46) |
| <i>Lysimachia maritima</i>                                      | 2 (0.03)  | 7 (0.11)   | 11 (0.17) | 7 (0.11)  | 27 (0.42) |
| <i>Plantago maritima</i> ssp. <i>juncooides</i>                 | 0         | 5 (0.08)   | 11 (0.17) | 8 (0.12)  | 24 (0.37) |
| <i>Salicornia depressa</i>                                      | 0         | 6 (0.09)   | 10 (0.15) | 7 (0.11)  | 23 (0.35) |
| <i>Argentina egedii</i> ssp. <i>groenlandica</i>                | 0         | 1 (0.02)   | 9 (0.14)  | 10 (0.15) | 20 (0.31) |
| <i>Atriplex acadensis</i>                                       | 2 (0.03)  | 9 (0.14)   | 5 (0.08)  | 4 (0.06)  | 20 (0.31) |
| <i>Myrica gale</i>                                              | 4 (0.06)  | 9 (0.14)   | 6 (0.09)  | 1 (0.02)  | 20 (0.31) |
| <i>Carex paleacea</i>                                           | 4 (0.06)  | 9 (0.14)   | 4 (0.06)  | 2 (0.03)  | 19 (0.29) |
| <i>Juncus balticus</i> ssp. <i>littoralis</i>                   | 4 (0.06)  | 7 (0.11)   | 5 (0.08)  | 3 (0.05)  | 19 (0.29) |
| <i>Vaccinium macrocarpon</i>                                    | 1 (0.02)  | 7 (0.11)   | 7 (0.11)  | 1 (0.02)  | 16 (0.25) |
| <i>Limonium carolinianum</i>                                    | 0         | 0          | 6 (0.09)  | 8 (0.12)  | 14 (0.22) |
| * <i>Suaeda</i> sp.                                             | 0         | 4 (0.06)   | 4 (0.06)  | 6 (0.09)  | 14 (0.22) |
| <i>Oclemena nemoralis</i>                                       | 2 (0.03)  | 4 (0.06)   | 5 (0.08)  | 1 (0.02)  | 12 (0.18) |
| <i>Gaylussacia baccata</i>                                      | 0         | 2 (0.03)   | 9 (0.14)  | 0         | 11 (0.17) |
| <i>Thuja occidentalis</i>                                       | 0         | 5 (0.08)   | 5 (0.08)  | 1 (0.02)  | 11 (0.17) |
| <i>Anthoxanthum nitens</i> ssp. <i>nitens</i>                   | 1 (0.02)  | 3 (0.05)   | 6 (0.09)  | 0         | 10 (0.15) |
| <i>Carex viridula</i> ssp. <i>viridula</i> var. <i>viridula</i> | 0         | 1 (0.02)   | 4 (0.06)  | 5 (0.08)  | 10 (0.15) |
| <i>Chamaedaphne calyculata</i>                                  | 0         | 5 (0.08)   | 4 (0.06)  | 1 (0.02)  | 10 (0.15) |
| <i>Sarracenia purpurea</i> ssp. <i>purpurea</i>                 | 0         | 4 (0.06)   | 3 (0.05)  | 3 (0.05)  | 10 (0.15) |
| <i>Rosa</i> sp.                                                 | 0         | 0          | 1 (0.02)  | 8 (0.12)  | 9 (0.14)  |
| <i>Schoenoplectus tabernaemontani</i>                           | 1 (0.02)  | 2 (0.03)   | 3 (0.05)  | 3 (0.05)  | 9 (0.14)  |
| <i>Carex exilis</i>                                             | 1 (0.02)  | 3 (0.05)   | 4 (0.06)  | 0         | 8 (0.12)  |
| <i>Drosera rotundifolia</i>                                     | 0         | 2 (0.03)   | 5 (0.08)  | 1 (0.02)  | 8 (0.12)  |
| * <i>Rosa rugosa</i>                                            | 0         | 0          | 4 (0.06)  | 4 (0.06)  | 8 (0.12)  |
| <i>Spiraea alba</i> var. <i>latifolia</i>                       | 0         | 1 (0.02)   | 6 (0.09)  | 0         | 7 (0.11)  |
| <i>Empetrum nigrum</i>                                          | 0         | 0          | 5 (0.08)  | 1 (0.02)  | 6 (0.09)  |
| <i>Ilex mucronata</i>                                           | 0         | 3 (0.05)   | 3 (0.05)  | 0         | 6 (0.09)  |
| <i>Larix laricina</i>                                           | 0         | 1 (0.02)   | 4 (0.06)  | 1 (0.02)  | 6 (0.09)  |
| <i>Morella caroliniensis</i>                                    | 0         | 1 (0.02)   | 5 (0.08)  | 0         | 6 (0.09)  |
| <i>Calystegia sepium</i>                                        | 0         | 0          | 0         | 5 (0.08)  | 5 (0.08)  |
| <i>Iris versicolor</i>                                          | 0         | 0          | 0         | 5 (0.08)  | 5 (0.08)  |
| <i>Kalmia angustifolia</i> ssp. <i>angustifolia</i>             | 0         | 0          | 4 (0.06)  | 1 (0.02)  | 5 (0.08)  |
| <i>Picea mariana</i>                                            | 0         | 1 (0.02)   | 3 (0.05)  | 1 (0.02)  | 5 (0.08)  |
| <i>Rhododendron groenlandicum</i>                               | 0         | 1 (0.02)   | 4 (0.06)  | 0         | 5 (0.08)  |
| <i>Aronia floribunda</i>                                        | 0         | 0          | 2 (0.03)  | 2 (0.03)  | 4 (0.06)  |
| <i>Drosera intermedia</i>                                       | 0         | 0          | 0         | 4 (0.06)  | 4 (0.06)  |
| <i>Sporobolus</i> sp.                                           | 1 (0.02)  | 1 (0.02)   | 1 (0.02)  | 1 (0.02)  | 4 (0.06)  |
| <i>Acer rubrum</i>                                              | 0         | 0          | 0         | 3 (0.05)  | 3 (0.05)  |
| <i>Carex billingsii</i>                                         | 0         | 0          | 2 (0.03)  | 1 (0.02)  | 3 (0.05)  |
| <i>Eleocharis</i> sp.                                           | 0         | 0          | 2 (0.03)  | 1 (0.02)  | 3 (0.05)  |
| <i>Maianthemum trifolium</i>                                    | 0         | 1 (0.02)   | 2 (0.03)  | 0         | 3 (0.05)  |
| <i>Puccinellia pumila</i>                                       | 0         | 1 (0.02)   | 0         | 2 (0.03)  | 3 (0.05)  |
| * <i>Agrostis stolonifera</i>                                   | 0         | 0          | 0         | 2 (0.03)  | 2 (0.03)  |
| <i>Amelanchier</i> sp.                                          | 0         | 0          | 0         | 2 (0.03)  | 2 (0.03)  |
| <i>Carex mackenziei</i>                                         | 0         | 0          | 0         | 2 (0.03)  | 2 (0.03)  |

| Species                                             | Common | Occasional | Uncommon | Rare     | Overall   |
|-----------------------------------------------------|--------|------------|----------|----------|-----------|
| <i>Elymus trachycaulus</i>                          | 0      | 1 (0.02)   | 1 (0.02) | 0        | 2 (0.03)  |
| <i>Rubus</i> sp.                                    | 0      | 0          | 0        | 2 (0.03) | 2 (0.03)  |
| <i>Vaccinium myrtilloides</i>                       | 0      | 1 (0.02)   | 1 (0.02) | 0        | 2 (0.03)  |
| <i>Vaccinium oxycoccos</i>                          | 0      | 0          | 0        | 2 (0.03) | 2 (0.03)  |
| <i>Viburnum nudum</i> var. <i>cassinoides</i>       | 0      | 0          | 0        | 2 (0.03) | 2 (0.03)  |
| <i>Calopogon tuberosus</i> var. <i>tuberosus</i>    | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| <i>Carex brunnescens</i>                            | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| <i>Carex scoparia</i>                               | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| <i>Carex trisperma</i>                              | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| <i>Doellingeria umbellata</i> var. <i>umbellata</i> | 0      | 0          | 1 (0.02) | 0        | 1 (0.02)  |
| <i>Ilex verticillata</i>                            | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| <i>Lathyrus japonicus</i> var. <i>maritimus</i>     | 0      | 1 (0.02)   | 0        | 0        | 1 (0.02)  |
| <i>Leymus mollis</i> ssp. <i>mollis</i>             | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| <i>Ligusticum scoticum</i> ssp. <i>scoticum</i>     | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| <i>Pogonia ophioglossoides</i>                      | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| <i>Vaccinium vitis-idaea</i> ssp. <i>minus</i>      | 0      | 0          | 0        | 1 (0.02) | 1 (0.02)  |
| Total # of species/grid cell                        |        |            |          |          | 9.05±0.47 |

Table 5. Overall absolute and relative frequency of occurrence of species within 996 grid cells (each 25x25 m) for all species documented within the salt marsh study areas (Thompson Island, Bass Harbor Marsh, Northeast Creek, and Schoodic Peninsula) at Acadia National Park, Maine during 2016. Non-native taxa are marked with a \* symbol. Numbers for taxa are absolute frequency (relative frequency); numbers reported for total number species/grid cell are average  $\pm$  s.e..

| Species                                                         | Common     | Occasional | Uncommon   | Rare      | Overall    |
|-----------------------------------------------------------------|------------|------------|------------|-----------|------------|
| <i>Triglochin maritima</i>                                      | 26 (0.03)  | 115 (0.12) | 293 (0.29) | 74 (0.07) | 508 (0.51) |
| <i>Sporobolus pumilus</i>                                       | 244 (0.24) | 136 (0.14) | 104 (0.10) | 14 (0.01) | 498 (0.50) |
| * <i>Agrostis stolonifera</i>                                   | 54 (0.05)  | 212 (0.21) | 187 (0.19) | 28 (0.03) | 481 (0.48) |
| <i>Solidago sempervirens</i> var. <i>sempervirens</i>           | 22 (0.02)  | 114 (0.11) | 240 (0.24) | 35 (0.04) | 411 (0.41) |
| <i>Juncus gerardii</i>                                          | 53 (0.05)  | 144 (0.14) | 144 (0.14) | 8 (0.01)  | 349 (0.35) |
| <i>Sporobolus michauxianus</i>                                  | 37 (0.04)  | 150 (0.15) | 147 (0.15) | 12 (0.01) | 346 (0.35) |
| <i>Juncus balticus</i> ssp. <i>littoralis</i>                   | 47 (0.05)  | 130 (0.13) | 117 (0.12) | 19 (0.02) | 313 (0.31) |
| <i>Bolboschoenus maritimus</i> ssp. <i>paludosus</i>            | 49 (0.05)  | 80 (0.08)  | 136 (0.14) | 25 (0.03) | 290 (0.29) |
| <i>Anthoxanthum nitens</i> ssp. <i>nitens</i>                   | 19 (0.02)  | 83 (0.08)  | 121 (0.12) | 66 (0.07) | 289 (0.29) |
| <i>Festuca rubra</i>                                            | 3 (0.003)  | 34 (0.03)  | 212 (0.21) | 36 (0.04) | 285 (0.29) |
| <i>Myrica gale</i>                                              | 23 (0.02)  | 80 (0.08)  | 113 (0.11) | 18 (0.02) | 234 (0.23) |
| <i>Sporobolus alterniflorus</i>                                 | 29 (0.03)  | 61 (0.06)  | 102 (0.10) | 23 (0.02) | 215 (0.22) |
| <i>Symphyotrichum</i> sp.                                       | 22 (0.02)  | 85 (0.09)  | 84 (0.08)  | 4 (0.004) | 195 (0.20) |
| <i>Vaccinium macrocarpon</i>                                    | 13 (0.01)  | 57 (0.06)  | 51 (0.05)  | 12 (0.01) | 133 (0.13) |
| <i>Argentina egedii</i> ssp. <i>groenlandica</i>                | 0          | 19 (0.02)  | 87 (0.09)  | 25 (0.03) | 131 (0.13) |
| <i>Calystegia sepium</i>                                        | 2 (0.002)  | 27 (0.03)  | 84 (0.08)  | 17 (0.02) | 130 (0.13) |
| <i>Carex paleacea</i>                                           | 15 (0.02)  | 48 (0.05)  | 53 (0.05)  | 14 (0.01) | 130 (0.13) |
| <i>Plantago maritima</i> ssp. <i>juncooides</i>                 | 1 (0.001)  | 23 (0.02)  | 66 (0.07)  | 33 (0.03) | 123 (0.12) |
| <i>Limonium carolinianum</i>                                    | 0          | 30 (0.03)  | 59 (0.06)  | 20 (0.02) | 109 (0.11) |
| <i>Atriplex acadiensis</i>                                      | 2 (0.002)  | 17 (0.02)  | 40 (0.04)  | 37 (0.04) | 96 (0.10)  |
| * <i>Suaeda</i> sp.                                             | 2 (0.002)  | 23 (0.02)  | 48 (0.05)  | 19 (0.02) | 92 (0.09)  |
| <i>Eleocharis</i> sp.                                           | 3 (0.003)  | 25 (0.03)  | 50 (0.05)  | 12 (0.01) | 90 (0.09)  |
| <i>Schoenoplectus tabernaemontani</i>                           | 10 (0.01)  | 21 (0.02)  | 28 (0.03)  | 18 (0.02) | 77 (0.08)  |
| <i>Salicornia depressa</i>                                      | 0          | 7 (0.01)   | 21 (0.02)  | 29 (0.03) | 57 (0.06)  |
| * <i>Elymus repens</i>                                          | 1 (0.001)  | 8 (0.01)   | 30 (0.03)  | 16 (0.02) | 55 (0.06)  |
| <i>Lysimachia maritima</i>                                      | 2 (0.002)  | 9 (0.01)   | 28 (0.03)  | 14 (0.01) | 53 (0.05)  |
| <i>Spiraea alba</i> var. <i>latifolia</i>                       | 1 (0.001)  | 7 (0.01)   | 33 (0.03)  | 5 (0.01)  | 46 (0.05)  |
| <i>Carex hormathodes</i>                                        | 1 (0.001)  | 3 (0.003)  | 16 (0.02)  | 21 (0.02) | 41 (0.04)  |
| <i>Rosa</i> sp.                                                 | 0          | 1 (0.001)  | 21 (0.02)  | 19 (0.02) | 41 (0.04)  |
| <i>Carex viridula</i> ssp. <i>viridula</i> var. <i>viridula</i> | 3 (0.003)  | 5 (0.01)   | 18 (0.02)  | 13 (0.01) | 39 (0.04)  |
| <i>Elymus trachycaulus</i>                                      | 0          | 53 (0.003) | 22 (0.02)  | 10 (0.01) | 37 (0.04)  |
| <i>Chamaedaphne calyculata</i>                                  | 0          | 9 (0.01)   | 18 (0.02)  | 8 (0.01)  | 35 (0.04)  |
| <i>Aronia melanocarpa</i>                                       | 0          | 9 (0.01)   | 20 (0.02)  | 2 (0.002) | 31 (0.03)  |
| <i>Morella caroliniensis</i>                                    | 0          | 4 (0.004)  | 23 (0.02)  | 3 (0.003) | 30 (0.03)  |
| <i>Puccinellia pumila</i>                                       | 0          | 3 (0.003)  | 7 (0.01)   | 18 (0.02) | 28 (0.03)  |
| <i>Typha latifolia</i>                                          | 6 (0.01)   | 8 (0.01)   | 8 (0.01)   | 6 (0.01)  | 28 (0.03)  |
| <i>Calamagrostis canadensis</i>                                 | 0          | 9 (0.01)   | 15 (0.02)  | 1 (0.001) | 25 (0.03)  |
| <i>Poa palustris</i>                                            | 1 (0.001)  | 4 (0.004)  | 11 (0.01)  | 5 (0.01)  | 21 (0.02)  |
| <i>Gaylussacia baccata</i>                                      | 0          | 3 (0.003)  | 12 (0.01)  | 3 (0.003) | 18 (0.02)  |
| <i>Iris versicolor</i>                                          | 0          | 0          | 3 (0.003)  | 9 (0.01)  | 12 (0.01)  |
| <i>Larix laricina</i>                                           | 0          | 1 (0.001)  | 7 (0.01)   | 4 (0.004) | 12 (0.01)  |
| <i>Oclemena nemoralis</i>                                       | 2 (0.002)  | 4 (0.004)  | 5 (0.01)   | 1 (0.001) | 12 (0.01)  |
| <i>Spergularia canadensis</i> ssp. <i>canadensis</i>            | 0          | 1 (0.001)  | 6 (0.01)   | 5 (0.01)  | 12 (0.01)  |
| <i>Achillea millefolium</i> ssp. <i>lanulosa</i>                | 0          | 0          | 6 (0.01)   | 5 (0.01)  | 11 (0.01)  |
| <i>Thuja occidentalis</i>                                       | 0          | 5 (0.01)   | 5 (0.01)   | 1 (0.001) | 11 (0.01)  |
| <i>Carex folliculata</i>                                        | 0          | 0          | 3 (0.003)  | 7 (0.01)  | 10 (0.01)  |
| <i>Picea mariana</i>                                            | 0          | 1 (0.001)  | 5 (0.01)   | 4 (0.004) | 10 (0.01)  |

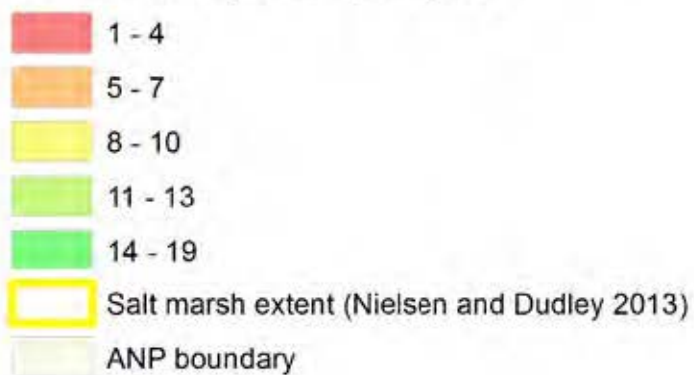
| Species                                                          | Common    | Occasional | Uncommon  | Rare      | Overall   |
|------------------------------------------------------------------|-----------|------------|-----------|-----------|-----------|
| <i>Sarracenia purpurea</i> ssp. <i>purpurea</i>                  | 0         | 4 (0.004)  | 3 (0.003) | 3 (0.003) | 10 (0.01) |
| <i>Carex exilis</i>                                              | 1 (0.001) | 3 (0.003)  | 4 (0.004) | 0         | 8 (0.01)  |
| <i>Doellingeria umbellata</i> var. <i>umbellata</i>              | 0         | 0          | 6 (0.01)  | 2 (0.002) | 8 (0.01)  |
| <i>Drosera rotundifolia</i>                                      | 0         | 2 (0.002)  | 5 (0.01)  | 1 (0.001) | 8 (0.01)  |
| <i>Empetrum nigrum</i>                                           | 0         | 0          | 5 (0.01)  | 3 (0.003) | 8 (0.01)  |
| <i>Lysimachia terrestris</i>                                     | 0         | 1 (0.001)  | 5 (0.01)  | 2 (0.002) | 8 (0.01)  |
| <i>Rhododendron groenlandicum</i>                                | 0         | 3 (0.003)  | 5 (0.01)  | 0         | 8 (0.01)  |
| * <i>Rosa rugosa</i>                                             | 0         | 0          | 4 (0.004) | 4 (0.004) | 8 (0.01)  |
| <i>Ilex mucronata</i>                                            | 0         | 3 (0.003)  | 3 (0.003) | 0         | 6 (0.01)  |
| <i>Kalmia angustifolia</i> ssp. <i>angustifolia</i>              | 0         | 0          | 4 (0.004) | 2 (0.002) | 6 (0.01)  |
| <i>Toxicodendron rydbergii</i>                                   | 0         | 1 (0.001)  | 2 (0.002) | 3 (0.003) | 6 (0.01)  |
| <i>Galium</i> sp.                                                | 0         | 1 (0.001)  | 1 (0.001) | 3 (0.003) | 5 (0.01)  |
| <i>Spergularia marina</i>                                        | 0         | 3 (0.003)  | 1 (0.001) | 1 (0.001) | 5 (0.01)  |
| <i>Aronia floribunda</i>                                         | 0         | 0          | 2 (0.002) | 2 (0.002) | 4 (0.004) |
| <i>Drosera intermedia</i>                                        | 0         | 0          | 0         | 4 (0.004) | 4 (0.004) |
| <i>Juncus brevicaudatus</i>                                      | 0         | 0          | 3 (0.003) | 1 (0.001) | 4 (0.004) |
| <i>Sporobolus</i> sp.                                            | 1 (0.001) | 1 (0.001)  | 1 (0.001) | 1 (0.001) | 4 (0.004) |
| <i>Thelypteris palustris</i> var. <i>pubescens</i>               | 0         | 1 (0.001)  | 3 (0.003) | 0         | 4 (0.004) |
| <i>Acer rubrum</i>                                               | 0         | 0          | 0         | 3 (0.003) | 3 (0.003) |
| <i>Carex billingsii</i>                                          | 0         | 0          | 2 (0.002) | 1 (0.001) | 3 (0.003) |
| <i>Maianthemum trifolium</i>                                     | 0         | 1 (0.001)  | 2 (0.002) | 0         | 3 (0.003) |
| <i>Moehringia lateriflora</i>                                    | 0         | 0          | 1 (0.001) | 2 (0.002) | 3 (0.003) |
| <i>Rumex britannica</i>                                          | 0         | 0          | 2 (0.002) | 1 (0.001) | 3 (0.003) |
| <i>Amelanchier</i> sp.                                           | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Atriplex</i> sp.                                              | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Carex brunnescens</i>                                         | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Carex lenticularis</i>                                        | 0         | 1 (0.001)  | 1 (0.001) | 0         | 2 (0.002) |
| <i>Carex mackenziei</i>                                          | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Carex nigra</i>                                               | 0         | 0          | 2 (0.002) | 0         | 2 (0.002) |
| <i>Carex stricta</i>                                             | 0         | 2 (0.002)  | 0         | 0         | 2 (0.002) |
| <i>Hordeum jubatum</i> ssp. <i>jubatum</i>                       | 0         | 0          | 1 (0.001) | 1 (0.001) | 2 (0.002) |
| <i>Leymus mollis</i> ssp. <i>mollis</i>                          | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Osmunda regalis</i> var. <i>spectabilis</i>                   | 0         | 1 (0.001)  | 1 (0.001) | 0         | 2 (0.002) |
| * <i>Phleum pratense</i>                                         | 0         | 0          | 1 (0.001) | 1 (0.001) | 2 (0.002) |
| <i>Rubus</i> sp.                                                 | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Scutellaria galericulata</i>                                  | 0         | 0          | 1 (0.001) | 1 (0.001) | 2 (0.002) |
| <i>Solidago</i> sp.                                              | 0         | 1 (0.001)  | 1 (0.001) | 0         | 2 (0.002) |
| * <i>Typha angustifolia</i>                                      | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Vaccinium myrtilloides</i>                                    | 0         | 1 (0.001)  | 1 (0.001) | 0         | 2 (0.002) |
| <i>Vaccinium oxycoccos</i>                                       | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Viburnum nudum</i> var. <i>cassinoides</i>                    | 0         | 0          | 0         | 2 (0.002) | 2 (0.002) |
| <i>Zostera marina</i>                                            | 0         | 0          | 2 (0.002) | 0         | 2 (0.002) |
| <i>Angelica lucida</i>                                           | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Atriplex glabriuscula</i>                                     | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Cakile edentula</i> ssp. <i>edentula</i> var. <i>edentula</i> | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Calopogon tuberosus</i> var. <i>tuberosus</i>                 | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Carex scoparia</i>                                            | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Carex trisperma</i>                                           | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Chenopodium</i> sp.                                           | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Cuscuta gronovii</i>                                          | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Elymus virginicus</i>                                         | 0         | 0          | 1 (0.001) | 0         | 1 (0.001) |
| <i>Equisetum arvense</i>                                         | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Ilex verticillata</i>                                         | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Juncus pylaei</i>                                             | 0         | 0          | 0         | 1 (0.001) | 1 (0.001) |

| Species                                         | Common | Occasional | Uncommon  | Rare      | Overall   |
|-------------------------------------------------|--------|------------|-----------|-----------|-----------|
| <i>Lathyrus japonicus</i> var. <i>maritimus</i> | 0      | 1 (0.001)  | 0         | 0         | 1 (0.001) |
| <i>Ligusticum scoticum</i> ssp. <i>scoticum</i> | 0      | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Pogonia ophioglossoides</i>                  | 0      | 0          | 0         | 1 (0.001) | 1 (0.001) |
| * <i>Solanum dulcamara</i>                      | 0      | 0          | 0         | 1 (0.001) | 1 (0.001) |
| <i>Solidago rugosa</i>                          | 0      | 0          | 1 (0.001) | 0         | 1 (0.001) |
| <i>Vaccinium vitis-idaea</i> ssp. <i>minus</i>  | 0      | 0          | 0         | 1 (0.001) | 1 (0.001) |
| * <i>Vicia cracca</i> ssp. <i>cracca</i>        | 0      | 0          | 0         | 1 (0.001) | 1 (0.001) |
| Total # of species/grid cell                    |        |            |           |           | 6.42±0.10 |

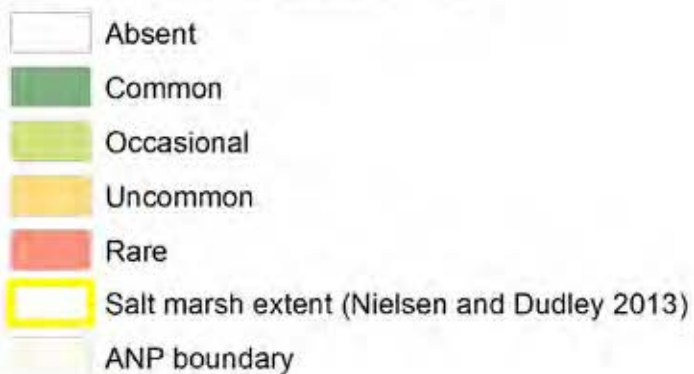
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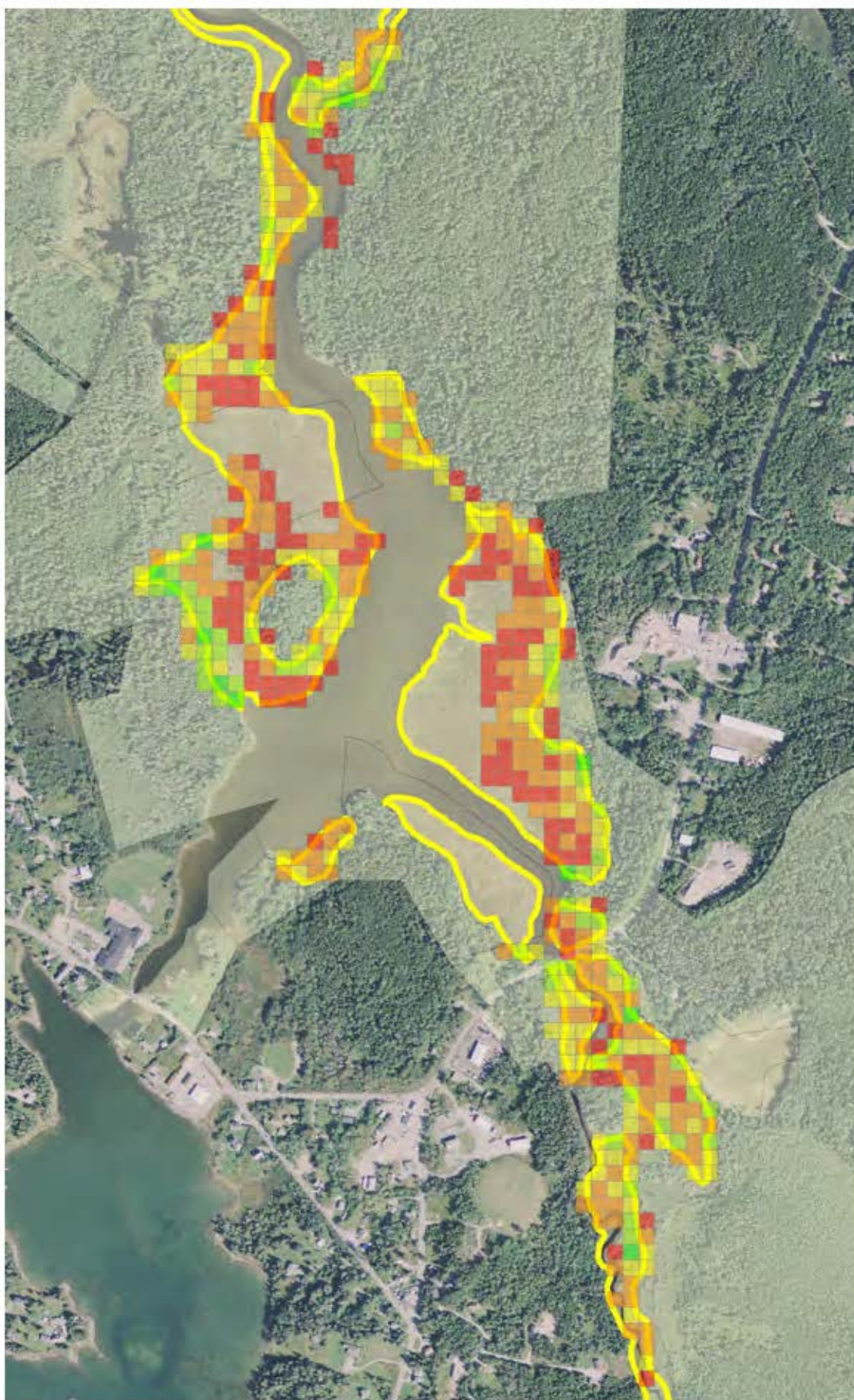
### Number of species per plot



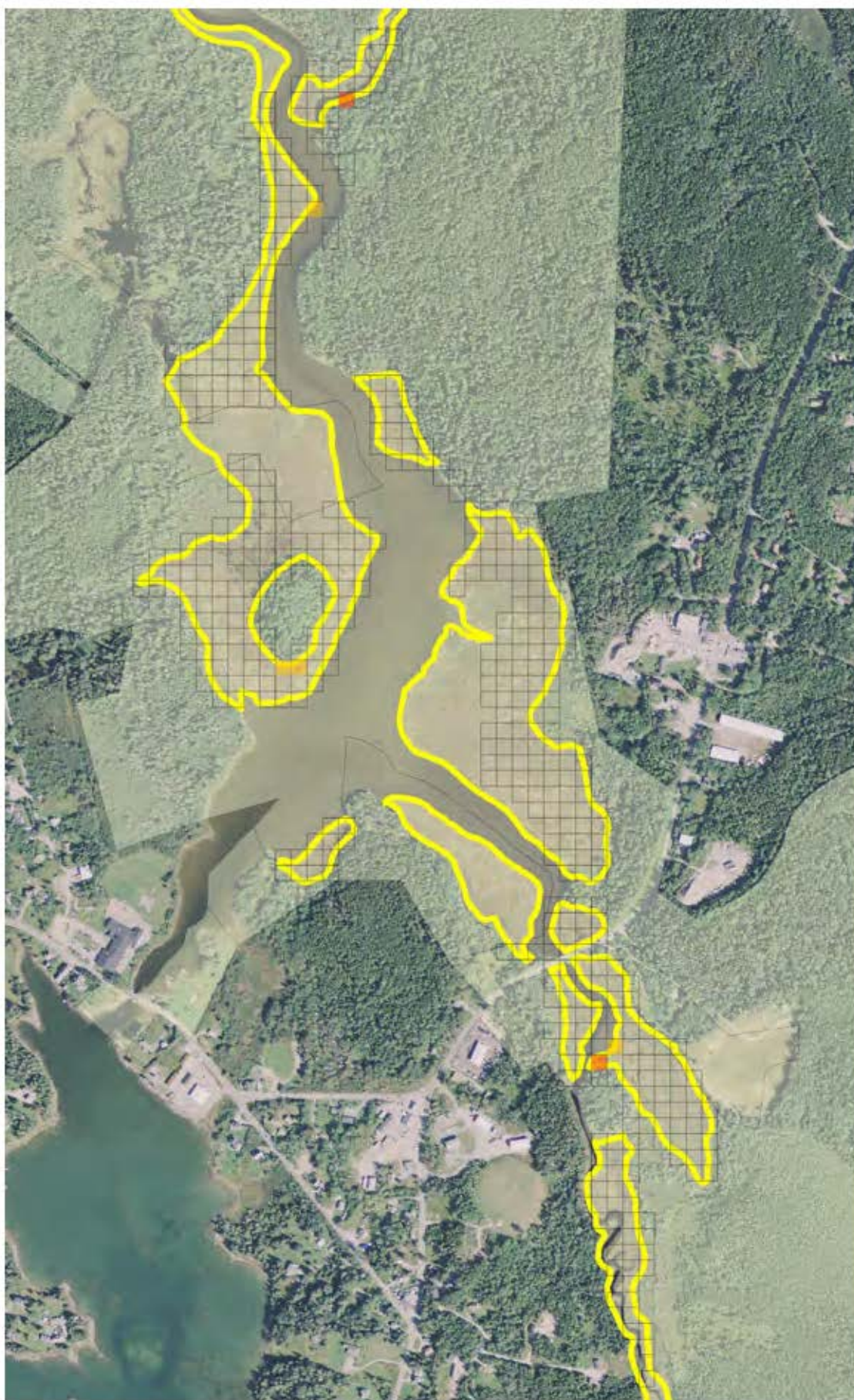
### Species Abundance Codes



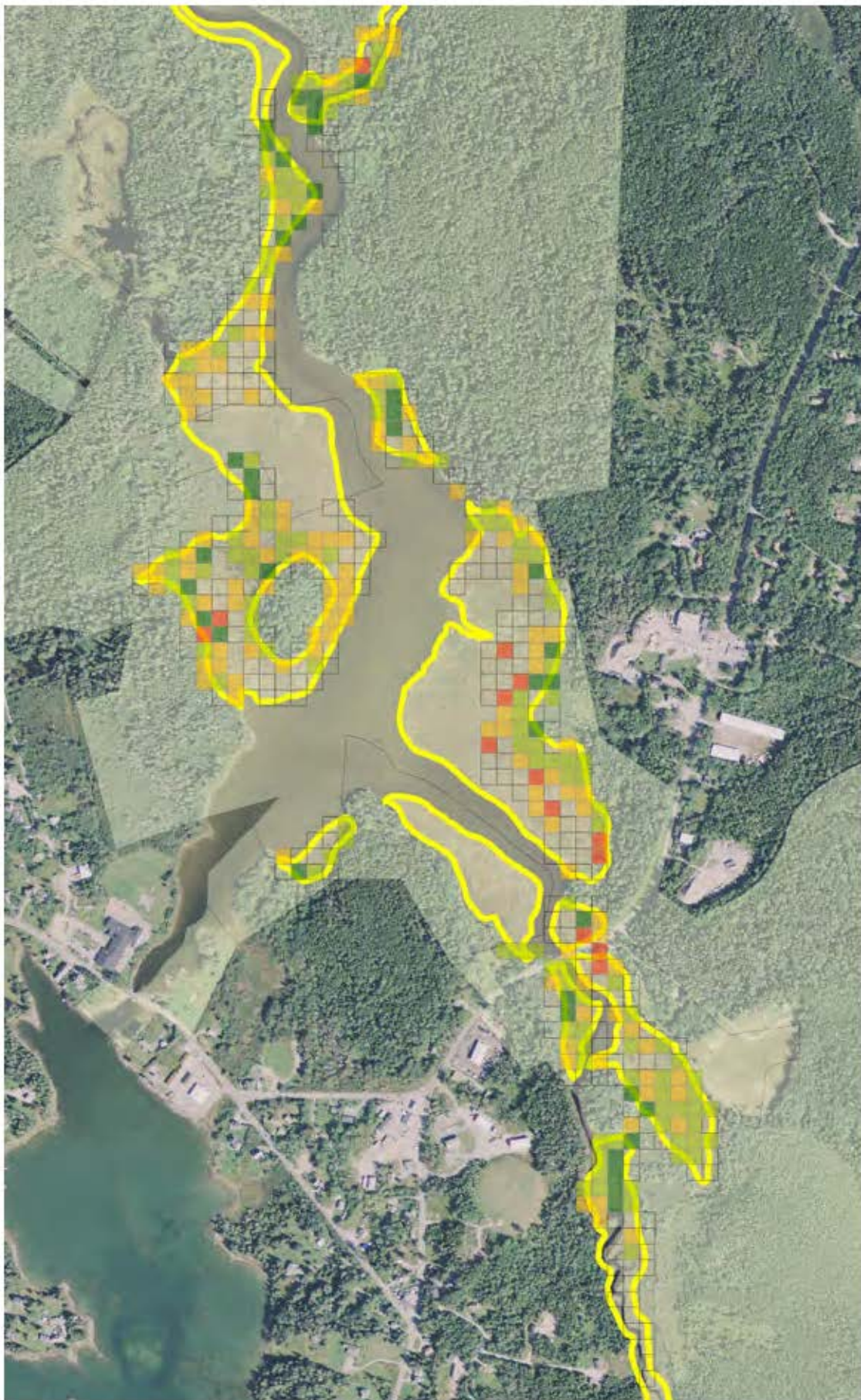
Appendix 1. Plant distribution maps for the salt marsh area at Bass Harbor Marsh



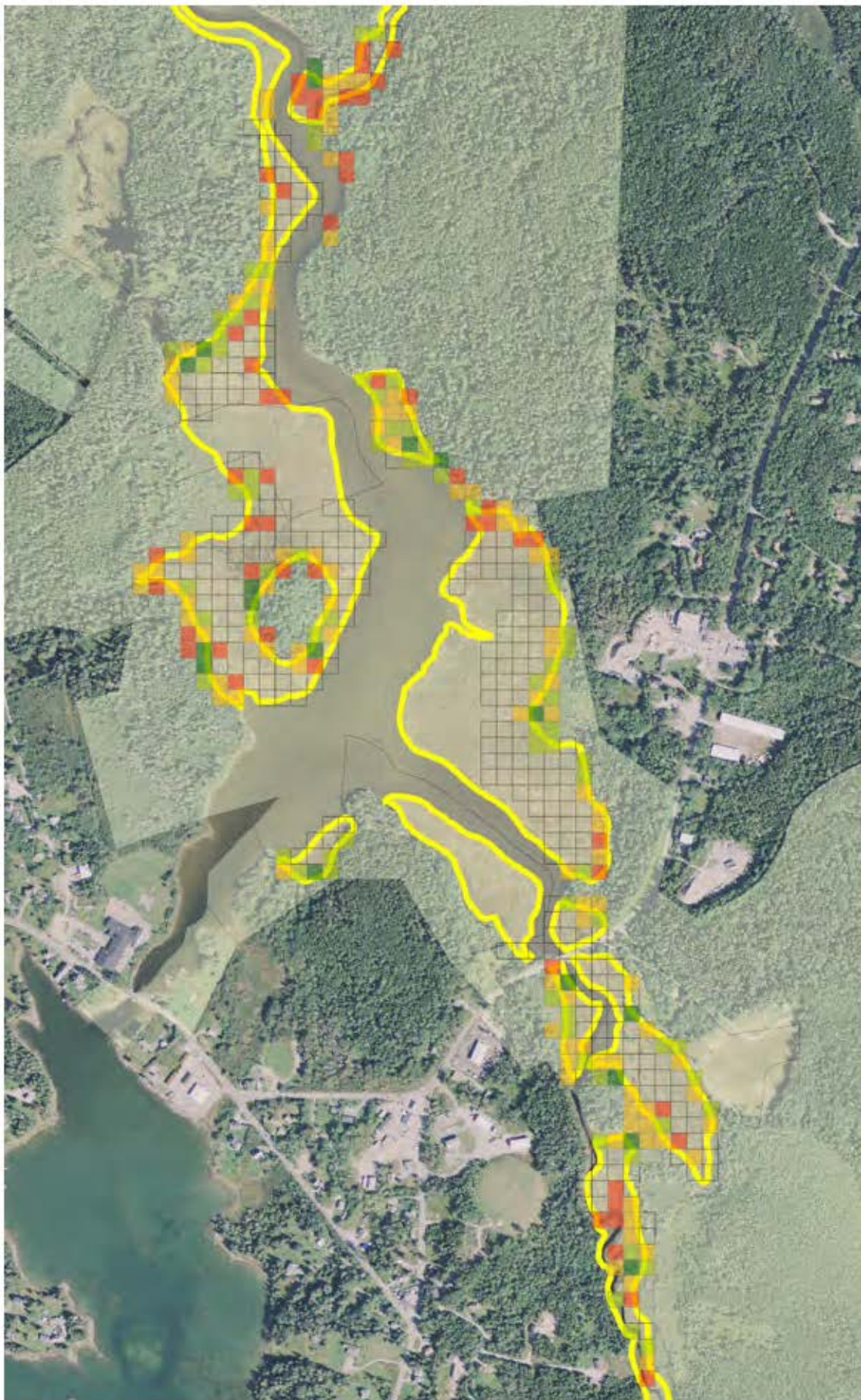
Number of species per grid cell



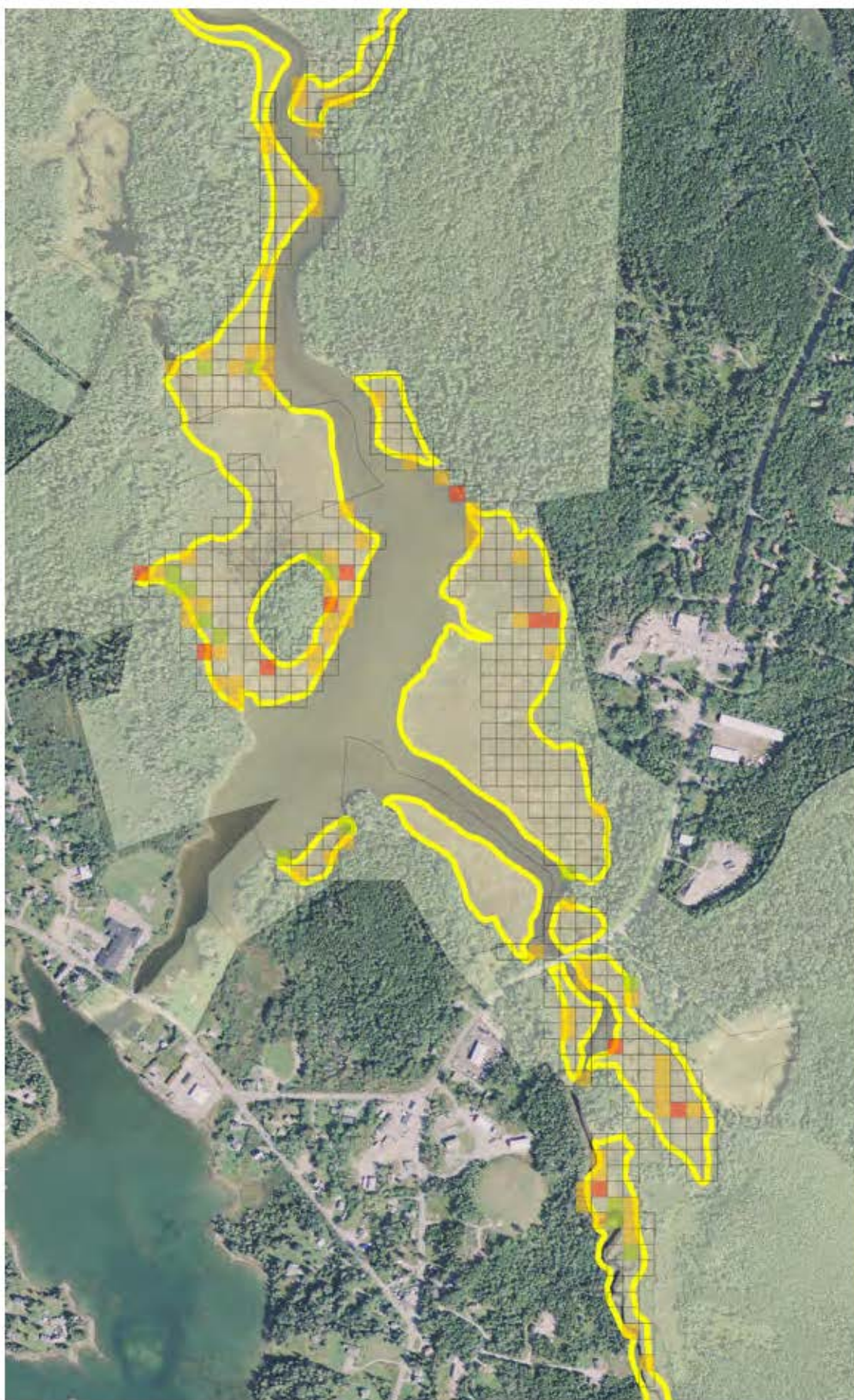
*Achillea millefolium* ssp. *lanulosa*



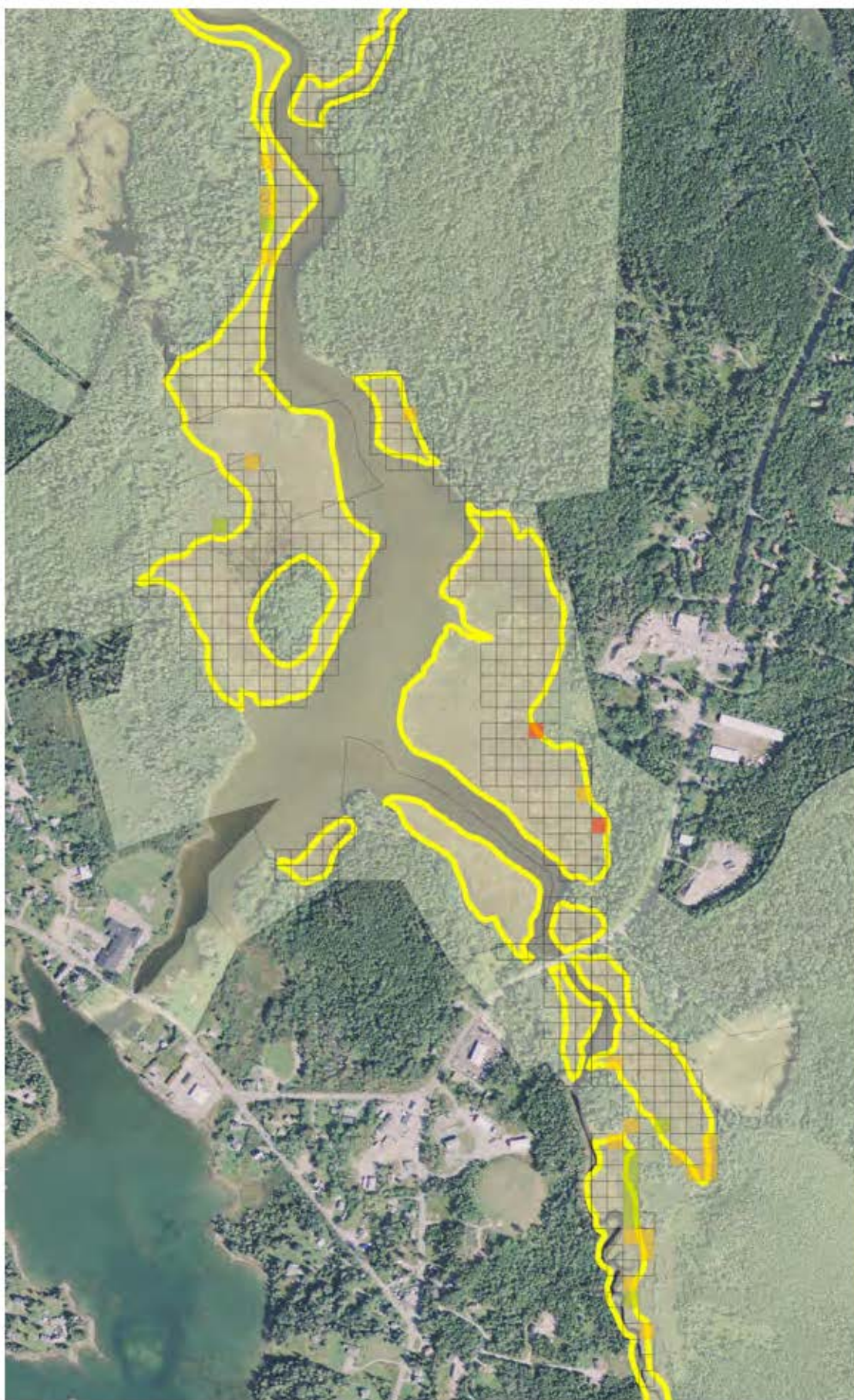
*Agrostis stolonifera*



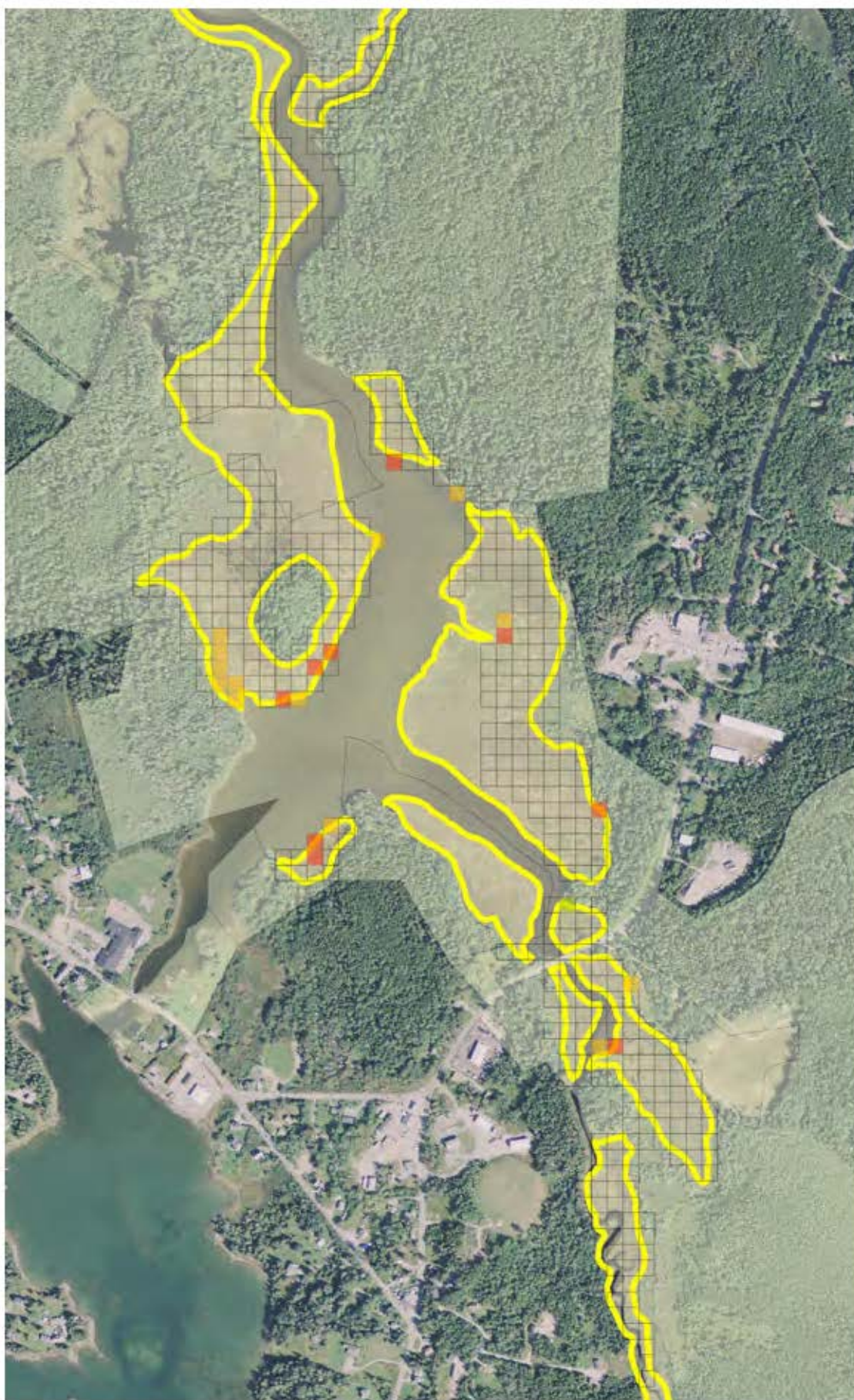
*Anthoxanthum nitens* ssp. *nitens*



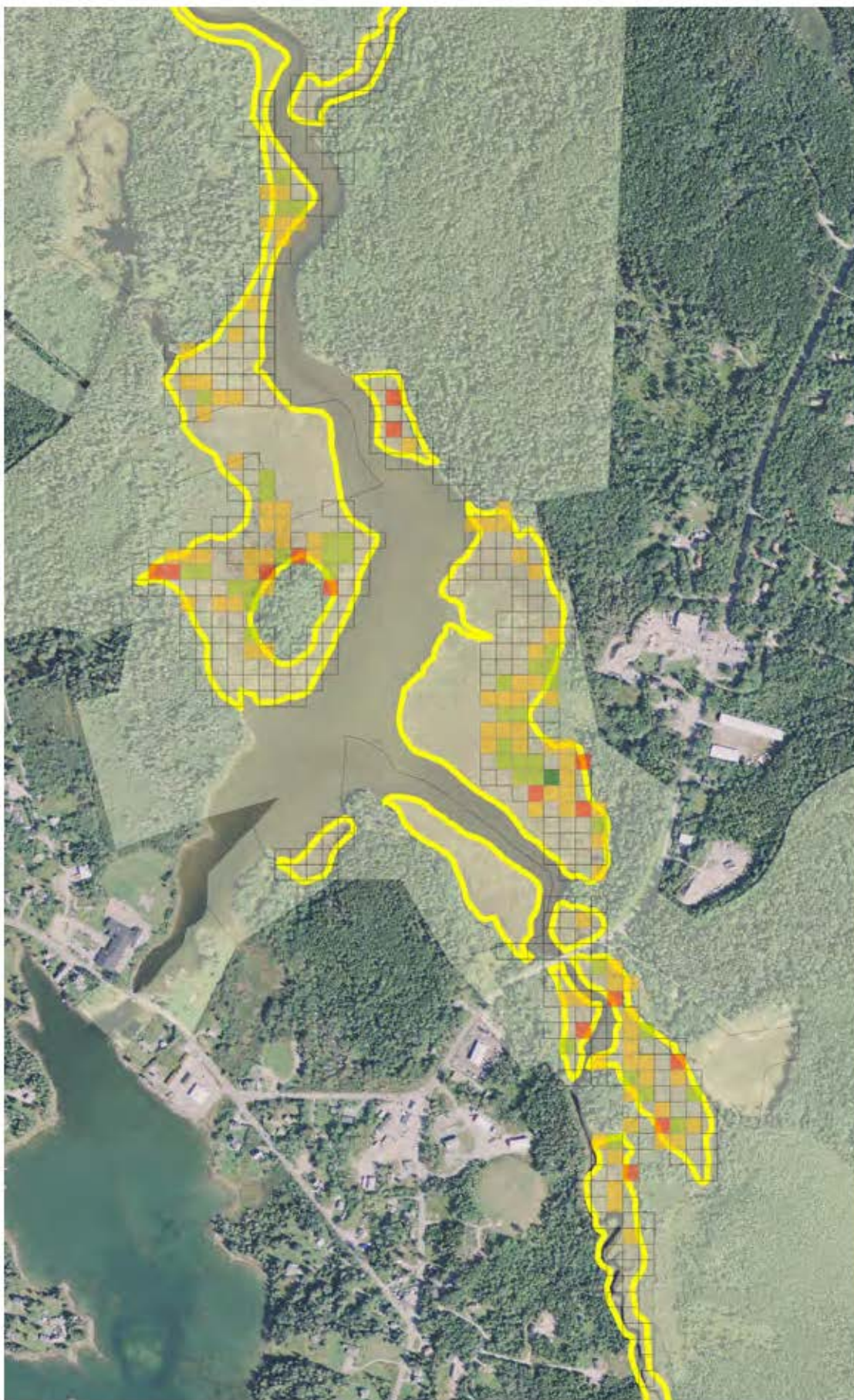
*Argentina egedii* ssp. *groenlandica*



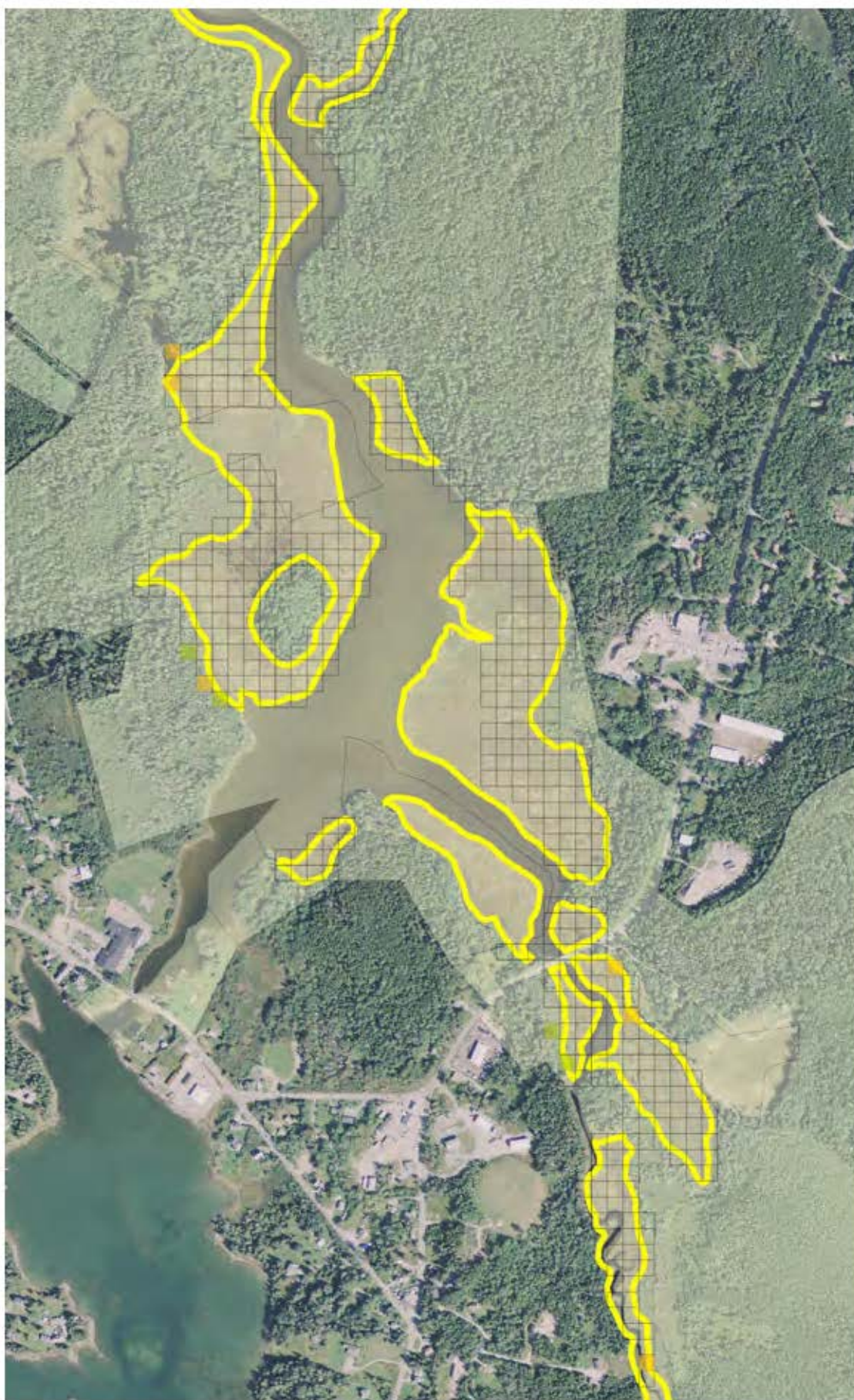
*Aronia melanocarpa*



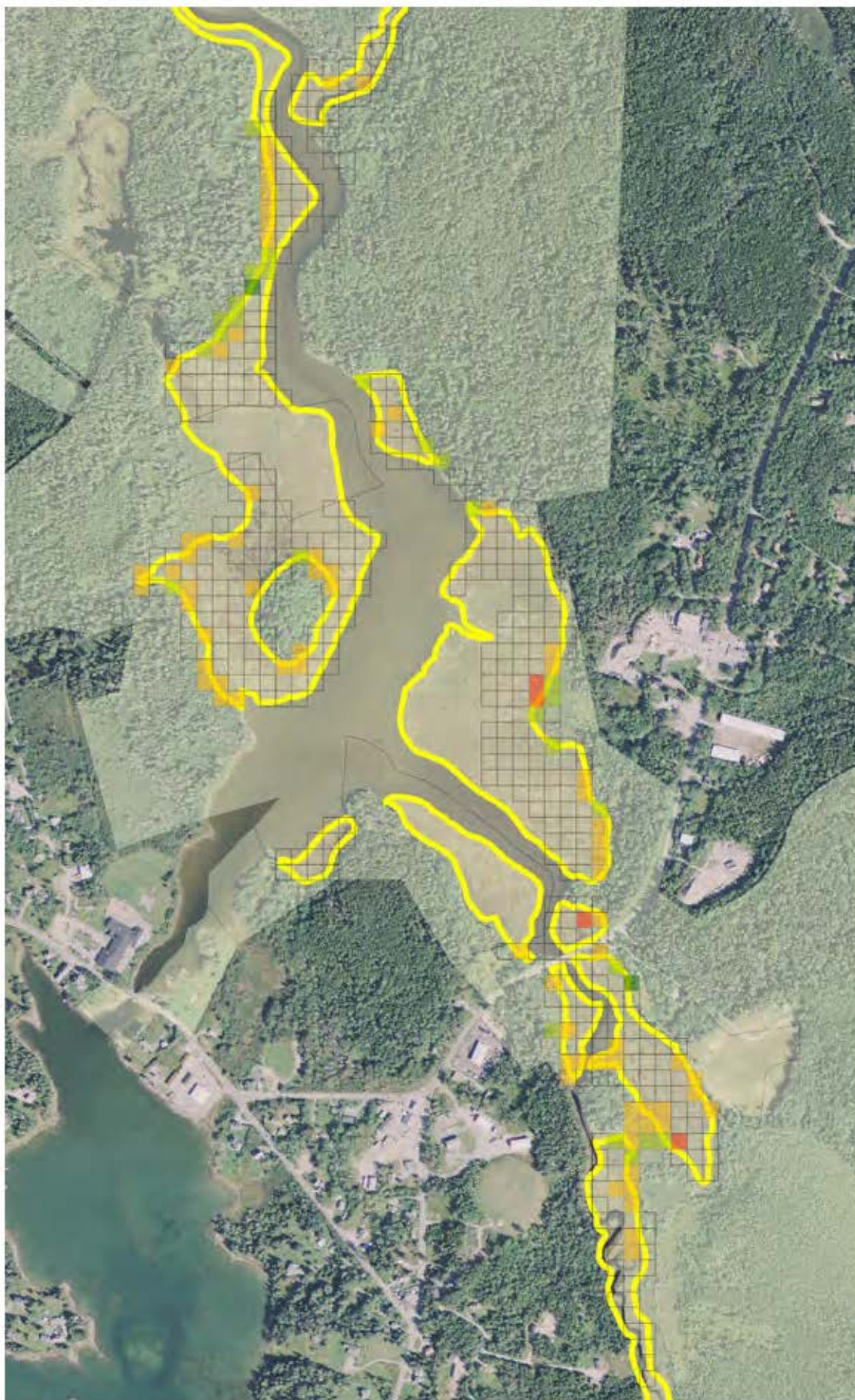
*Atriplex acadiensis*



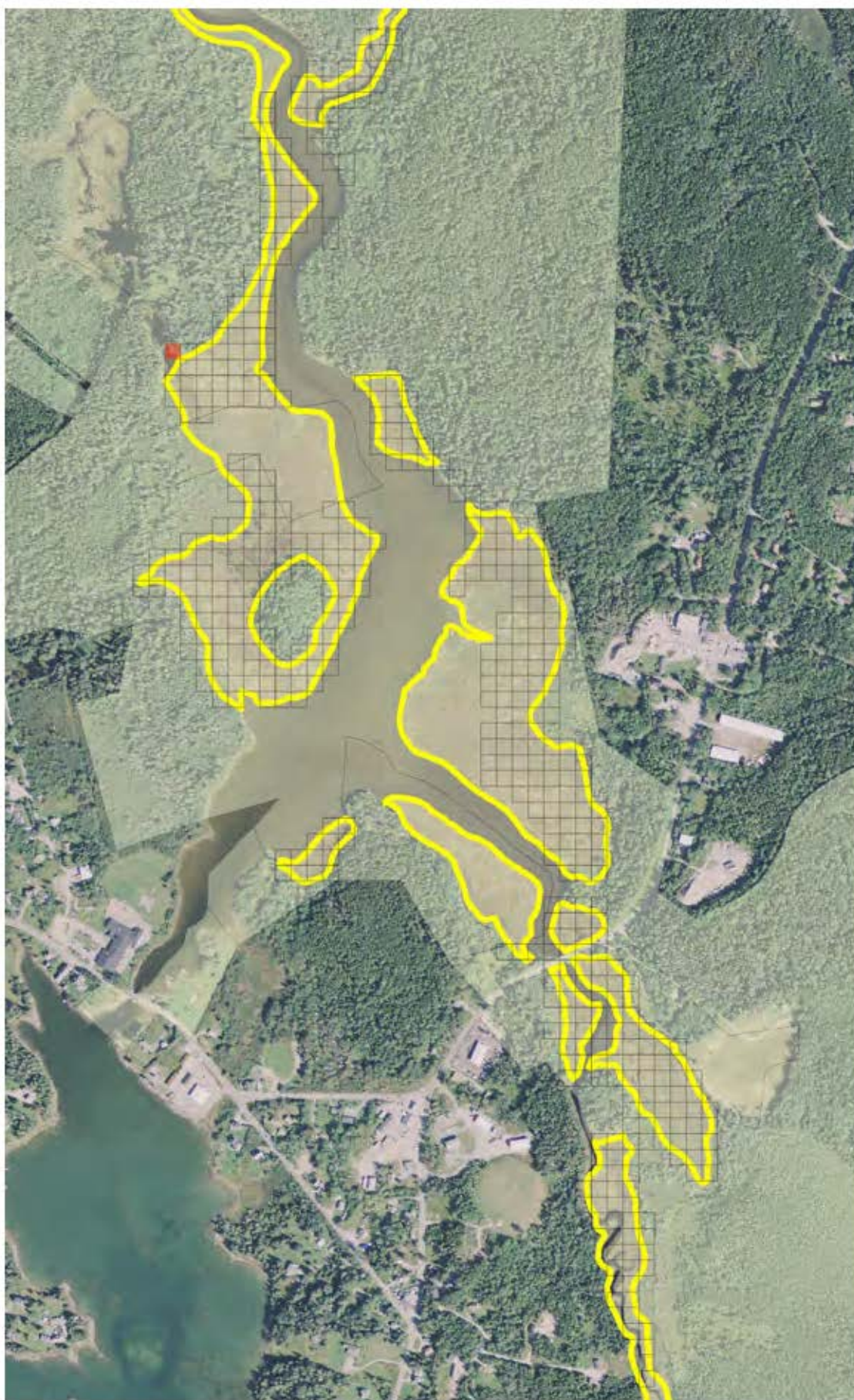
*Bolboschoenus maritimus* ssp. *paludosus*



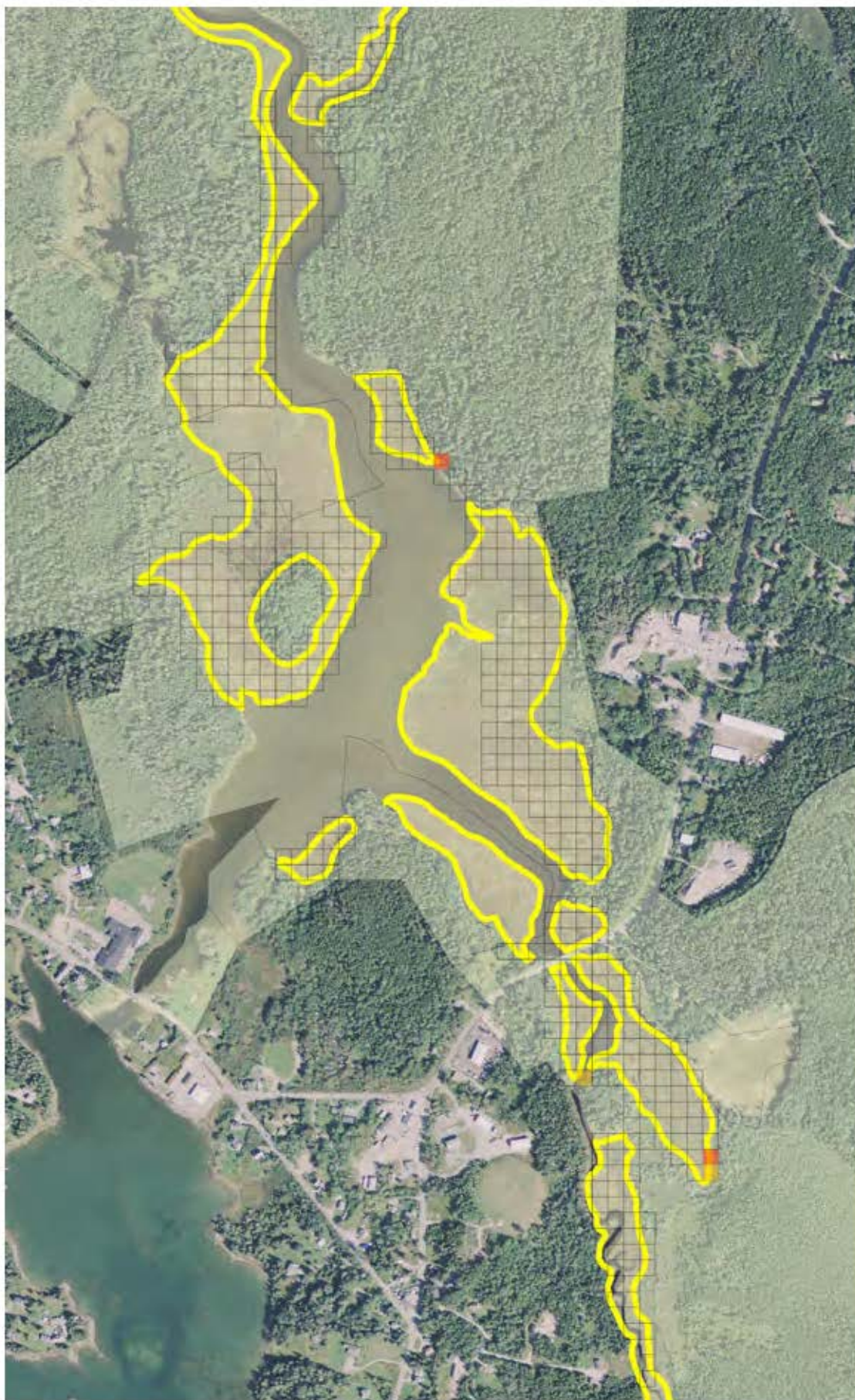
*Calamagrostis canadensis*



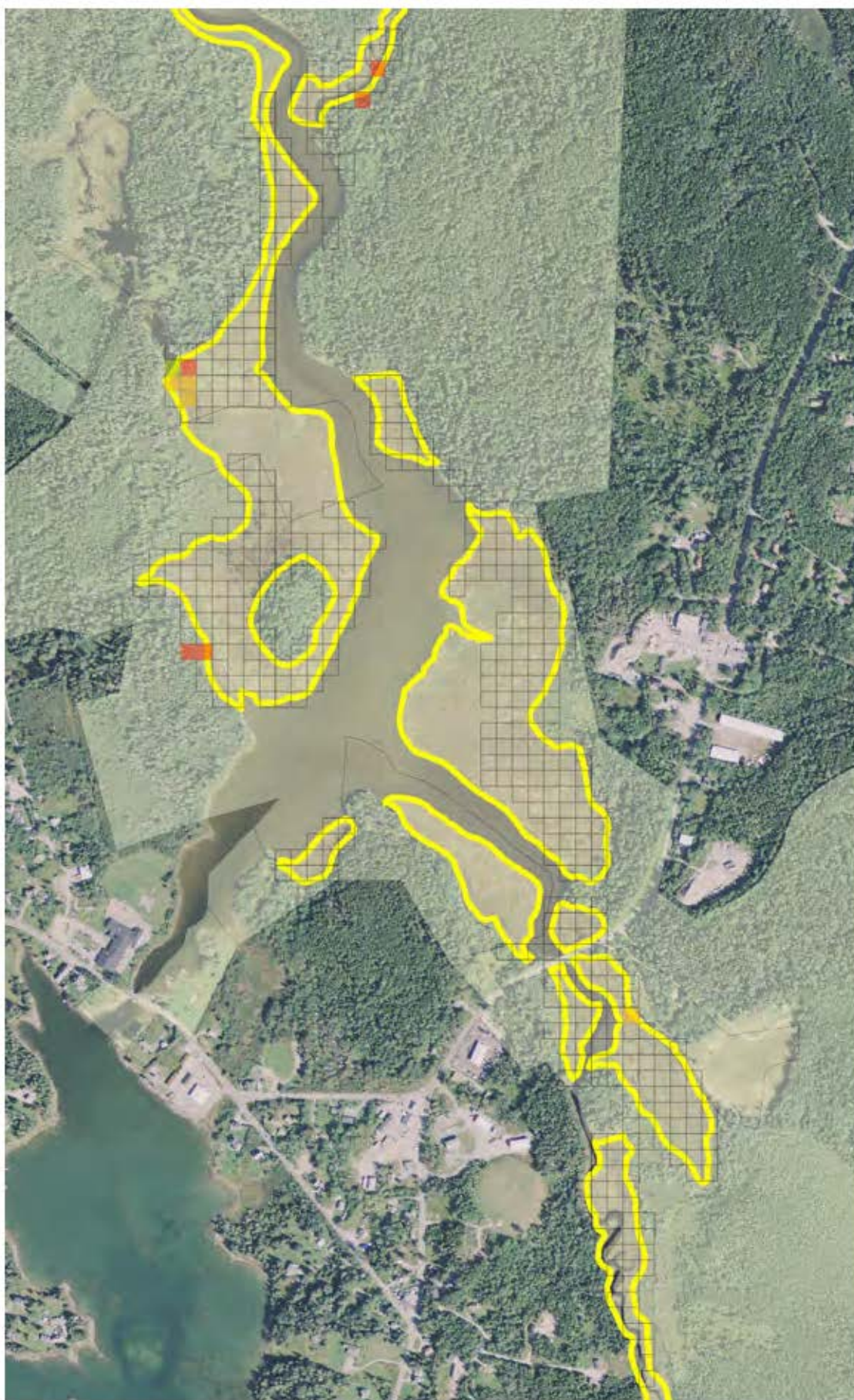
*Calystegia sepium*



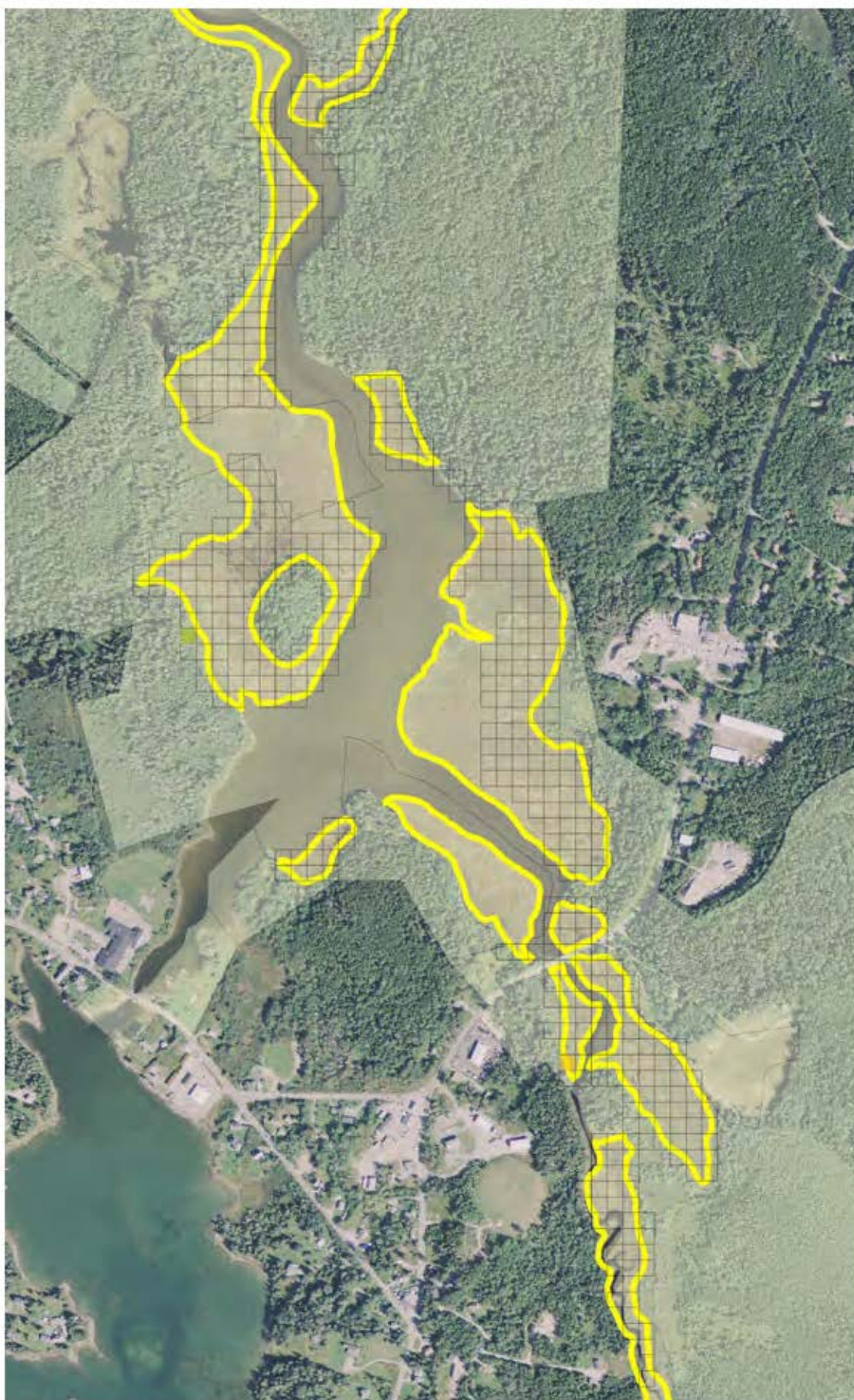
*Carex brunnescens*



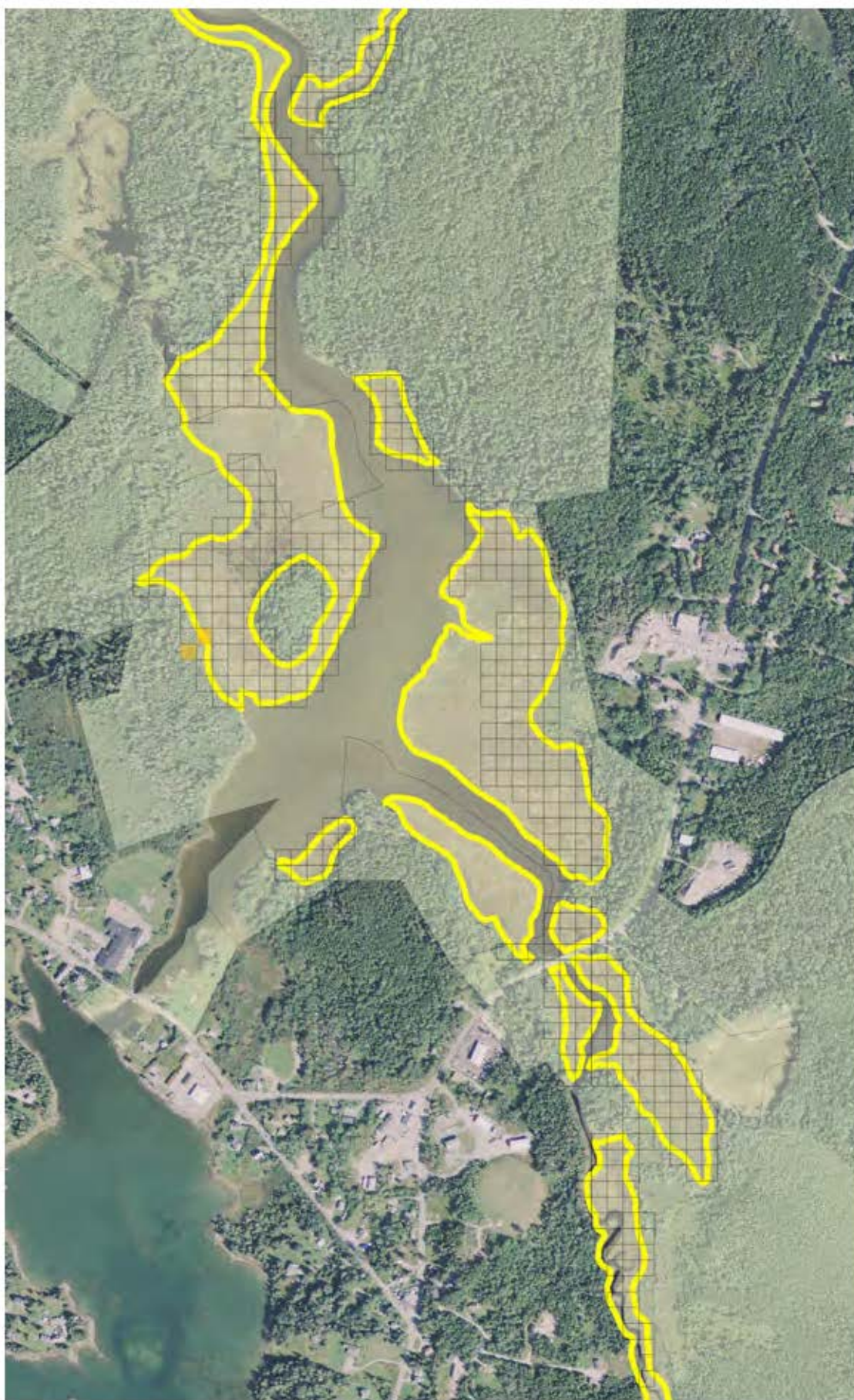
*Carex folliculata*



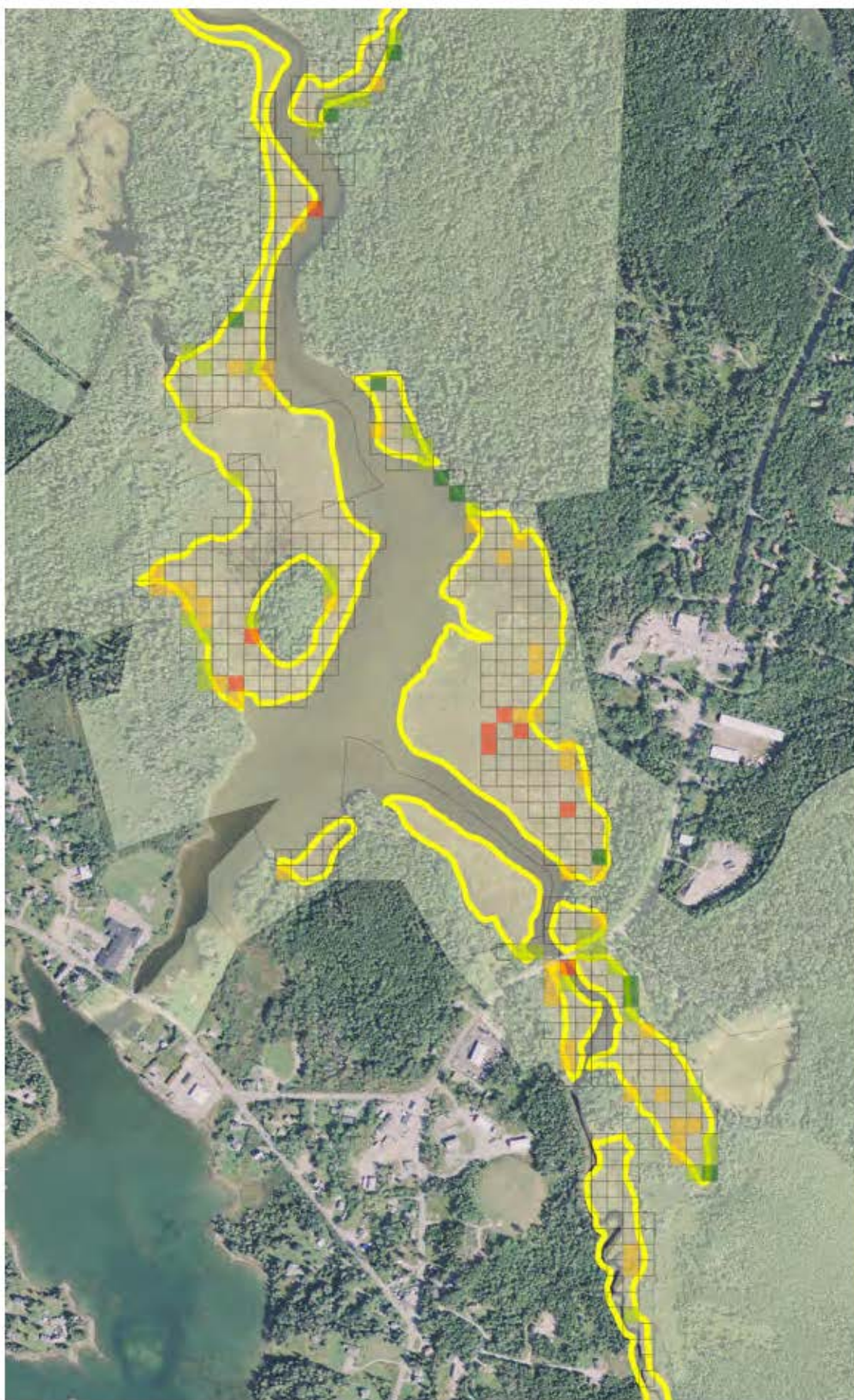
*Carex hormathodes*



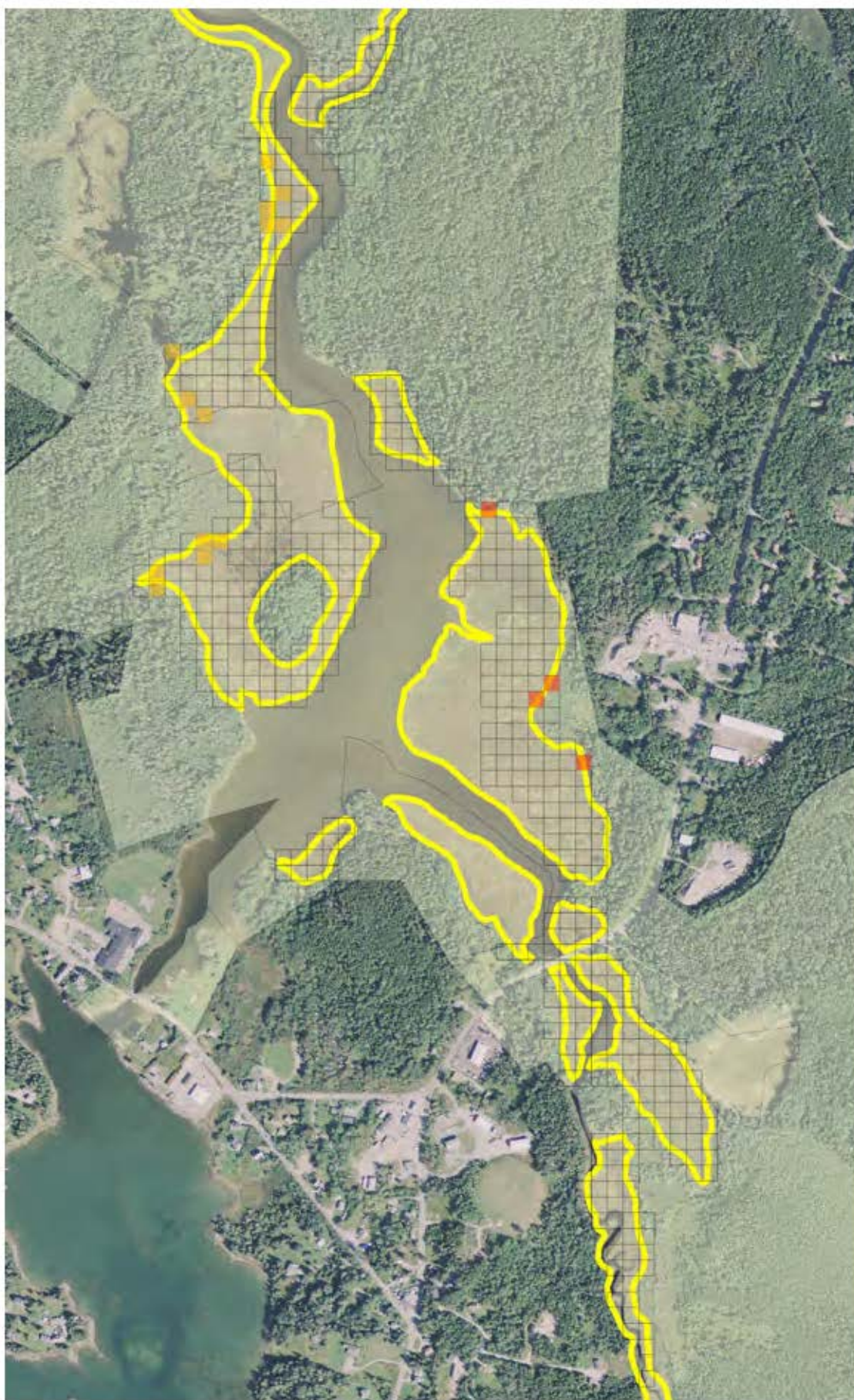
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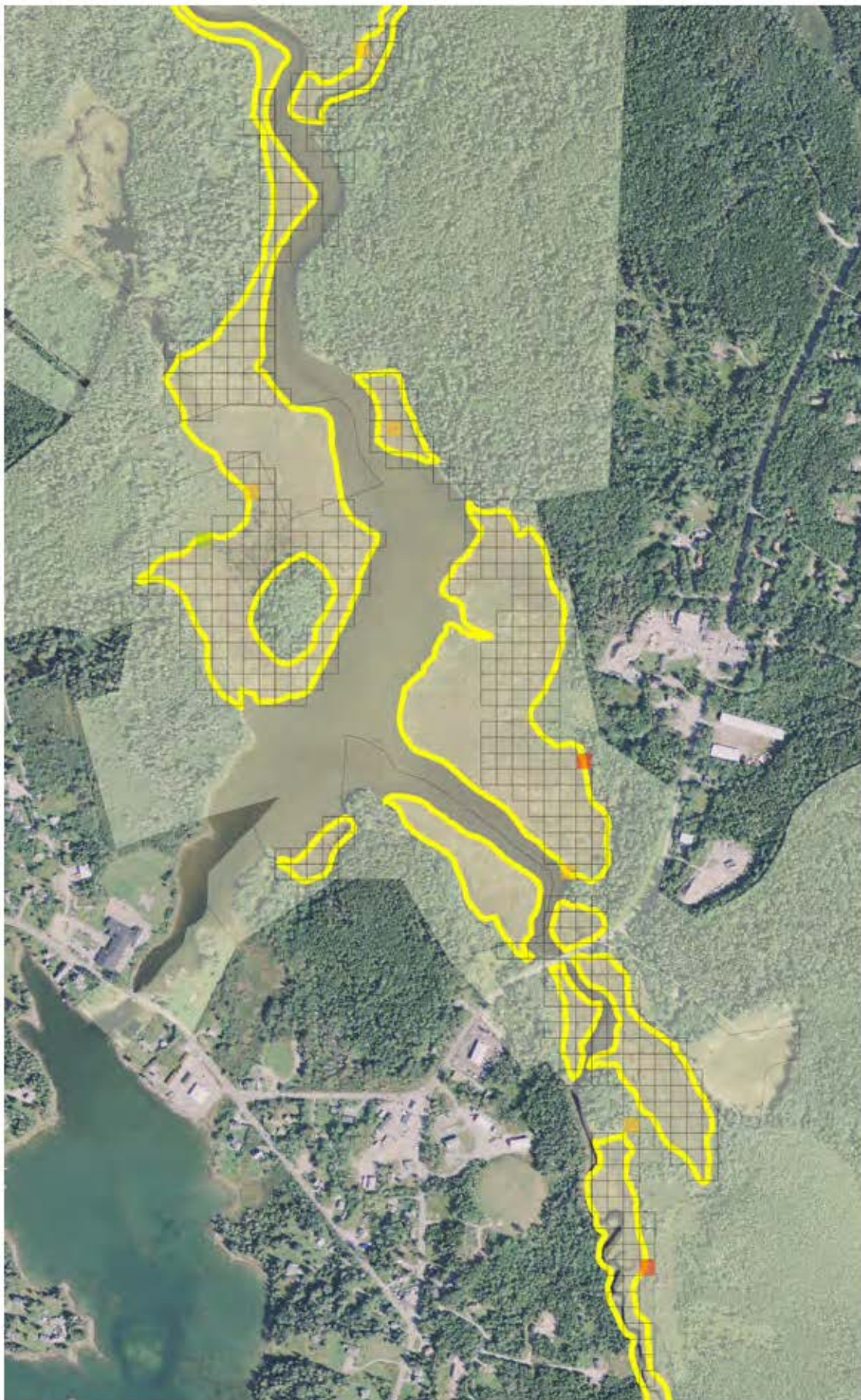
*Carex nigra*



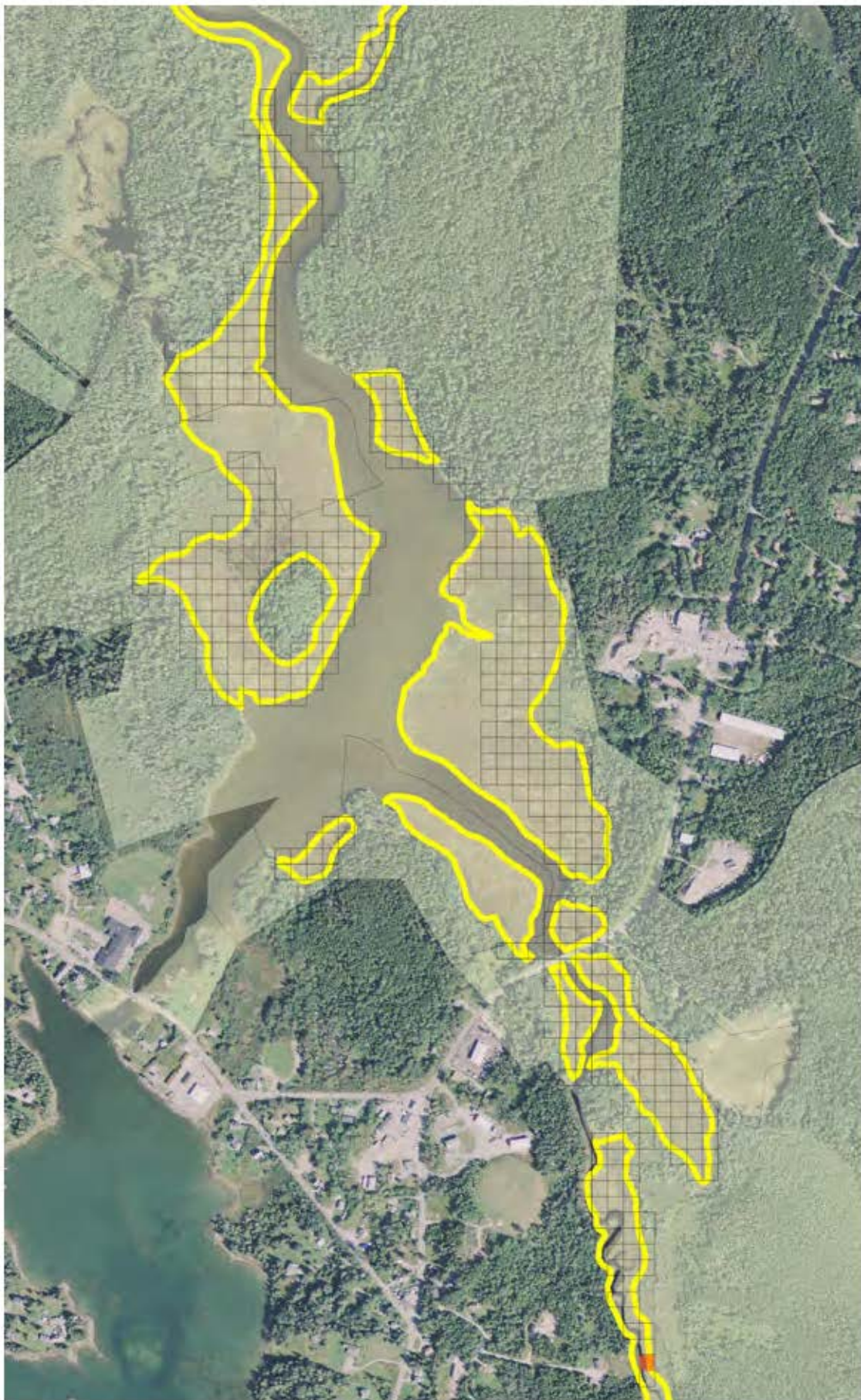
*Carex paleacea*



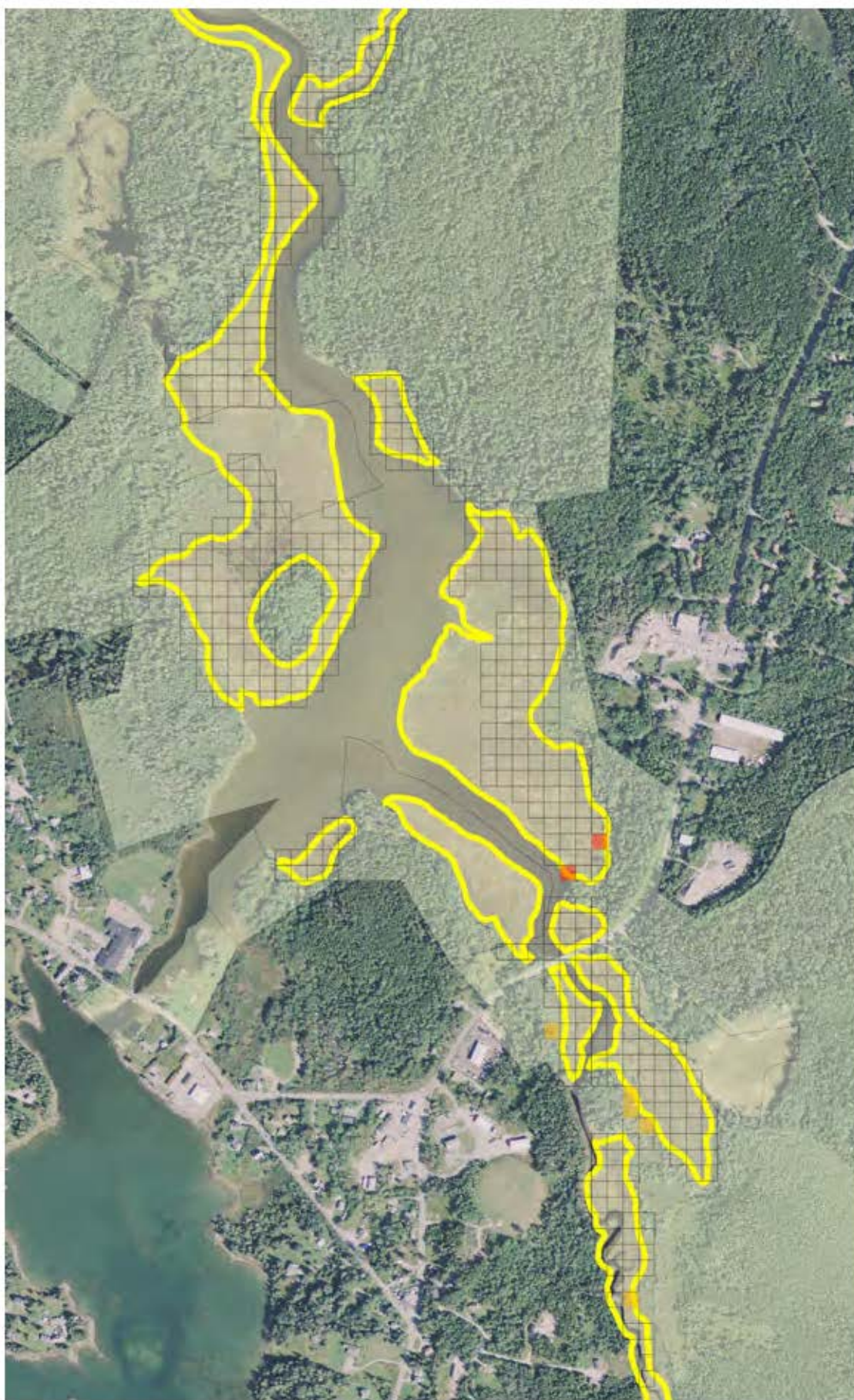
*Carex viridula* ssp. *viridula* var. *viridula*



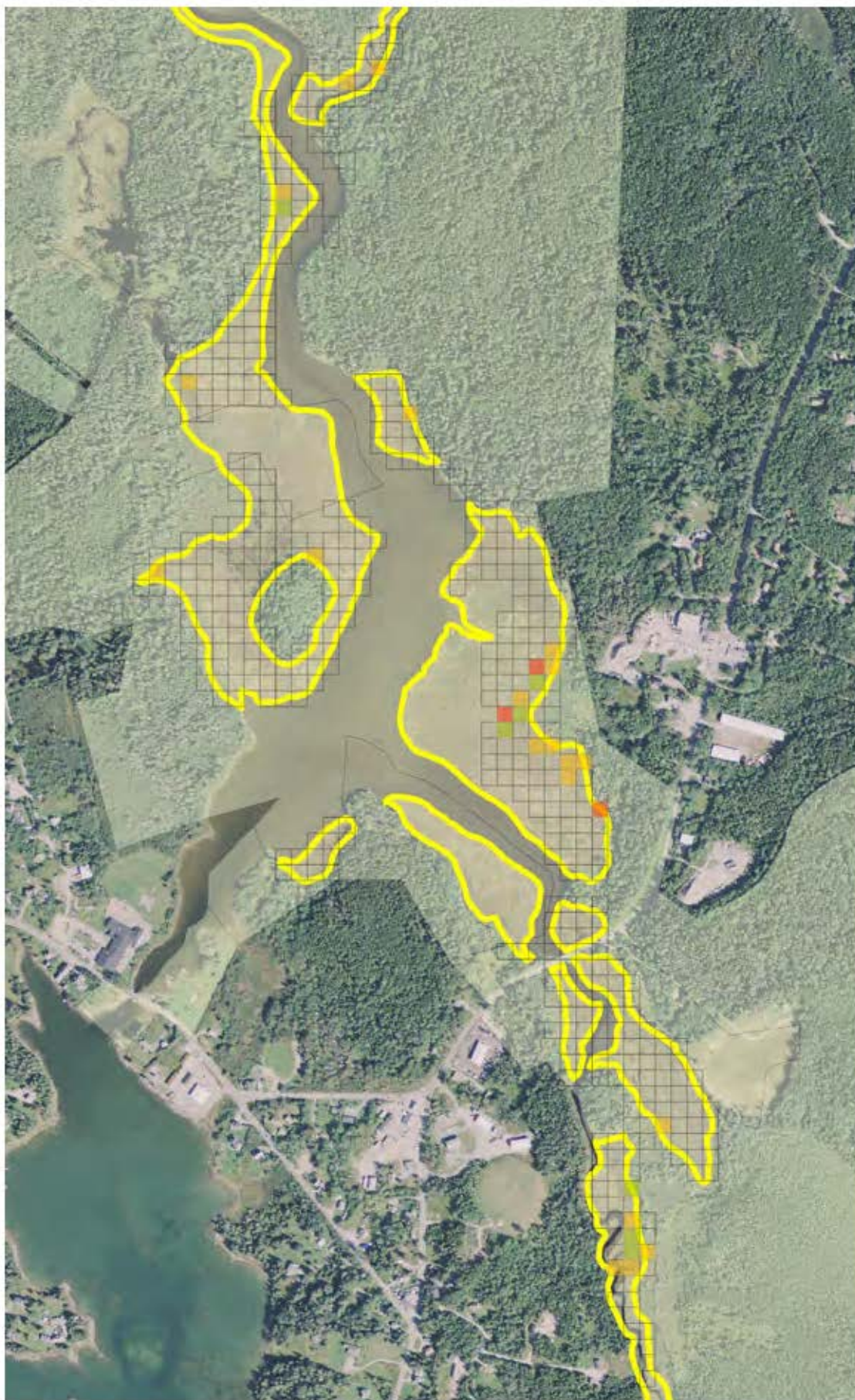
*Chamaedaphne calyculata*



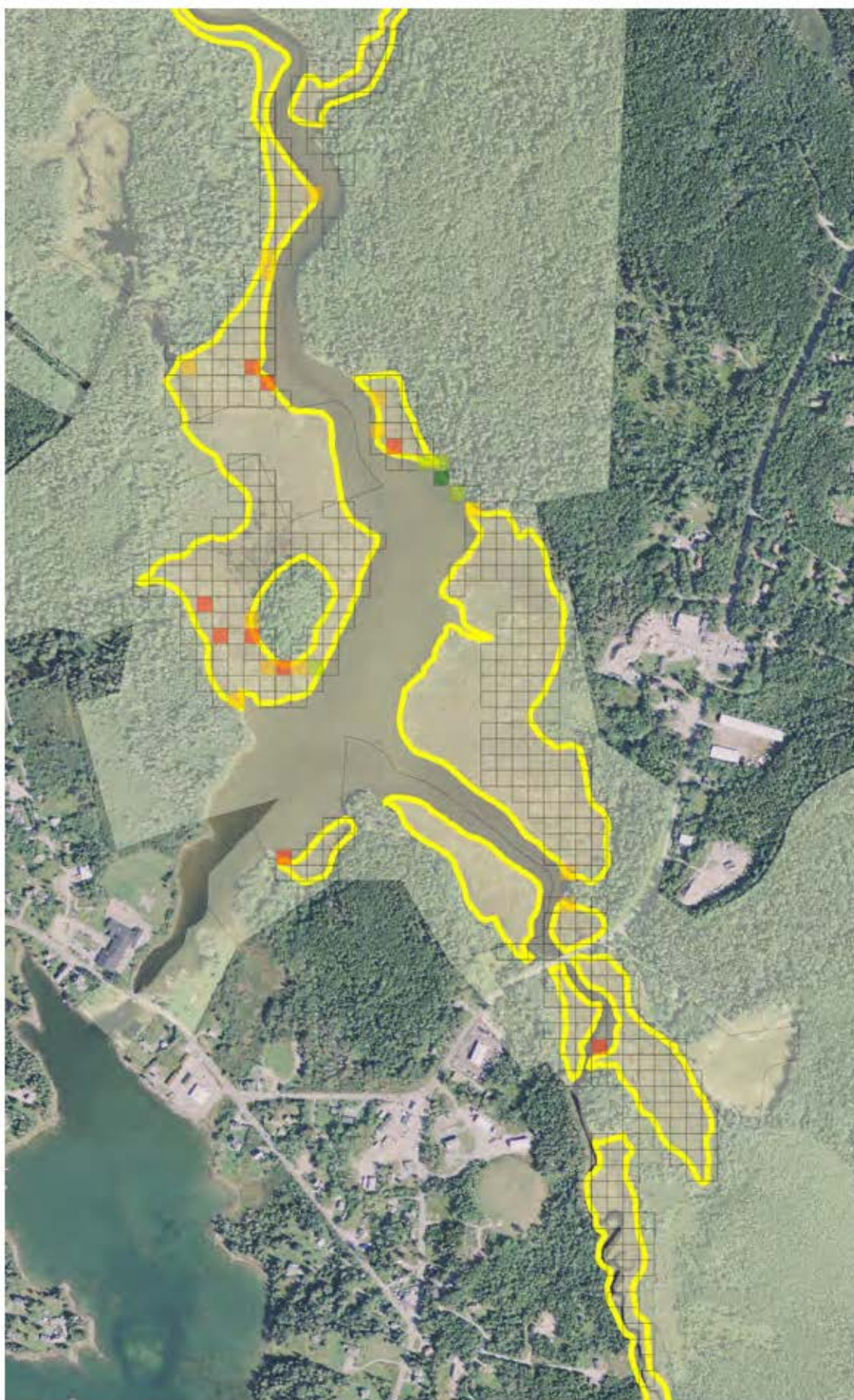
*Cuscuta gronovii*



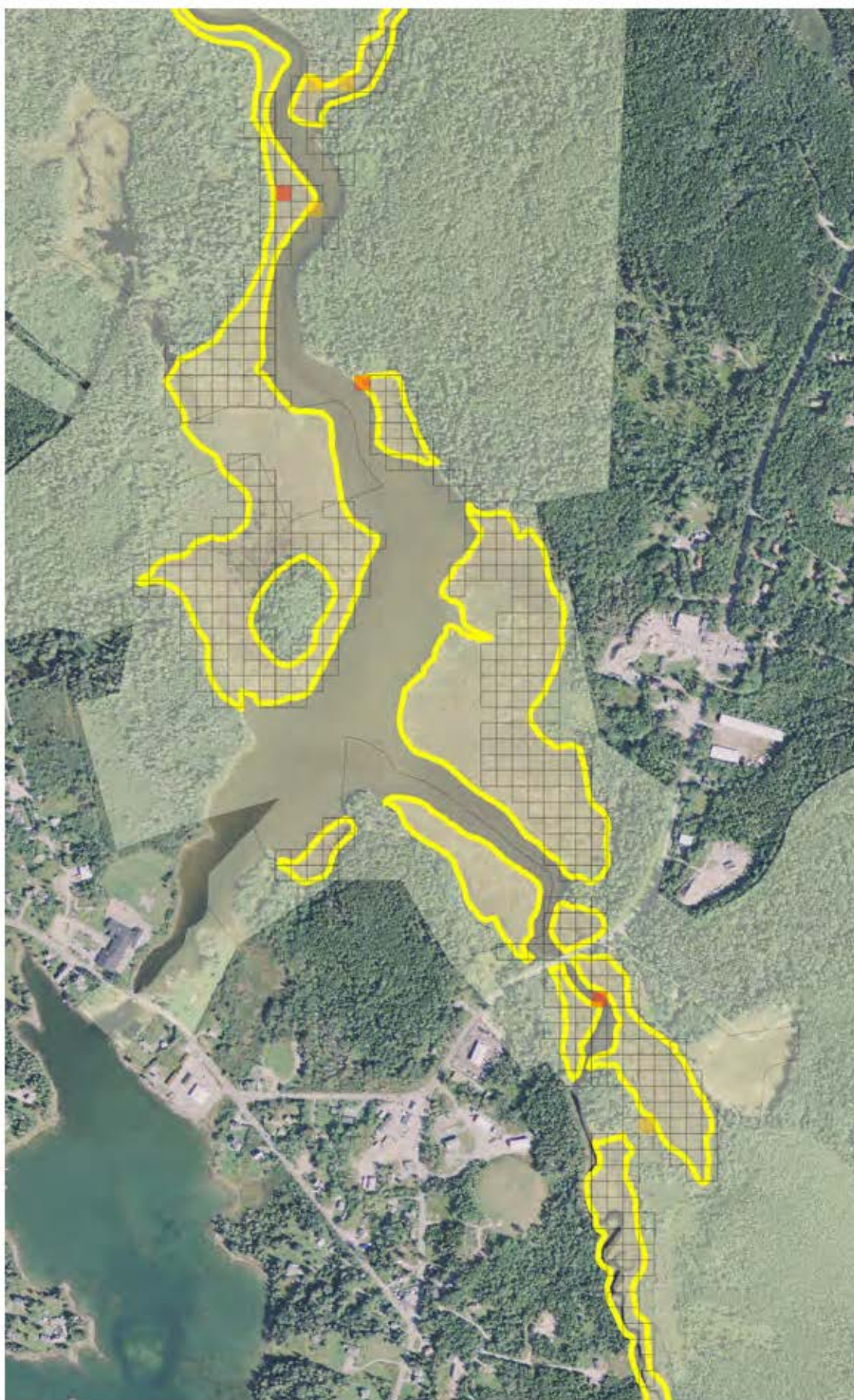
*Doellingeria umbellata* var. *umbellata*



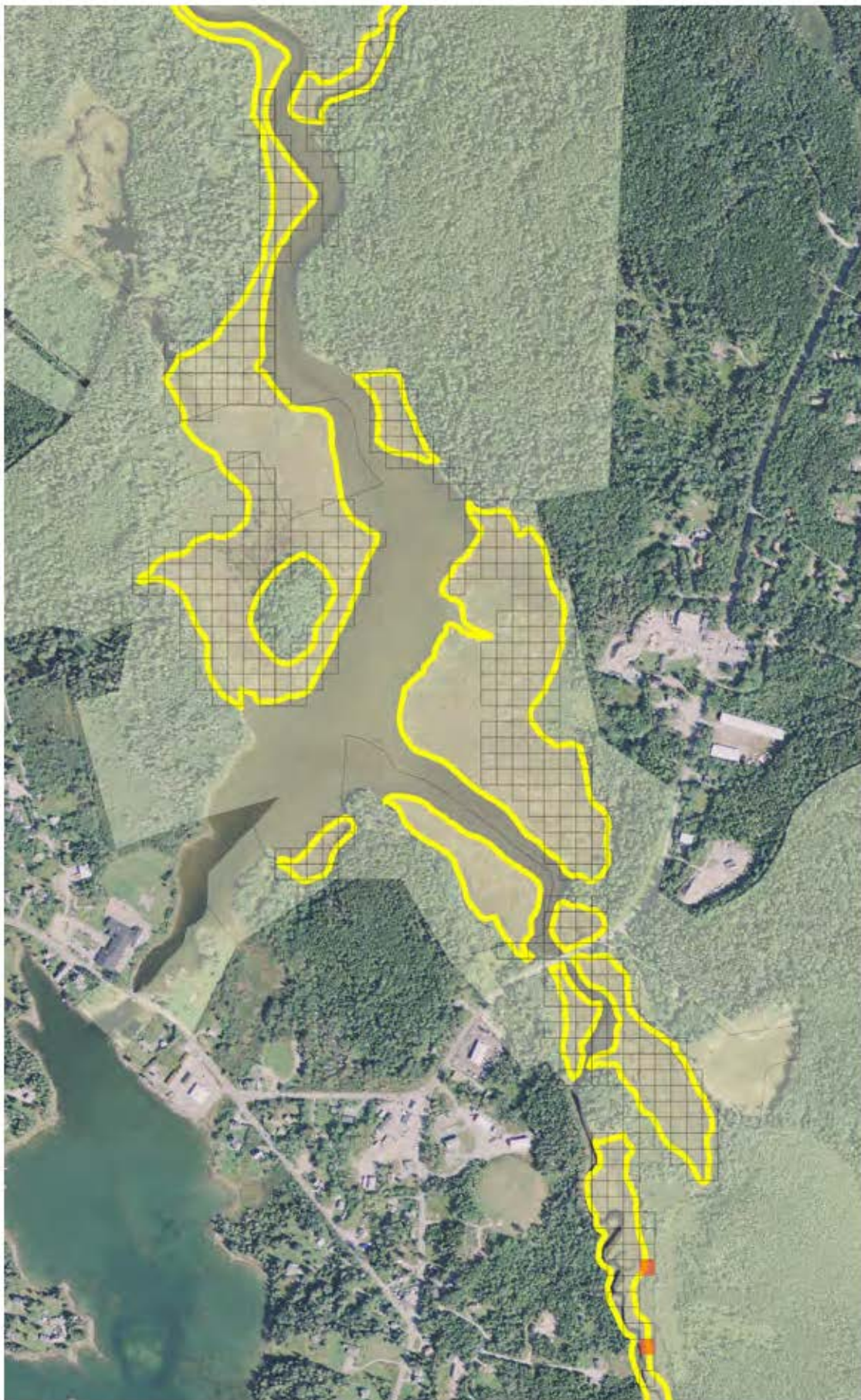
*Eleocharis* sp.



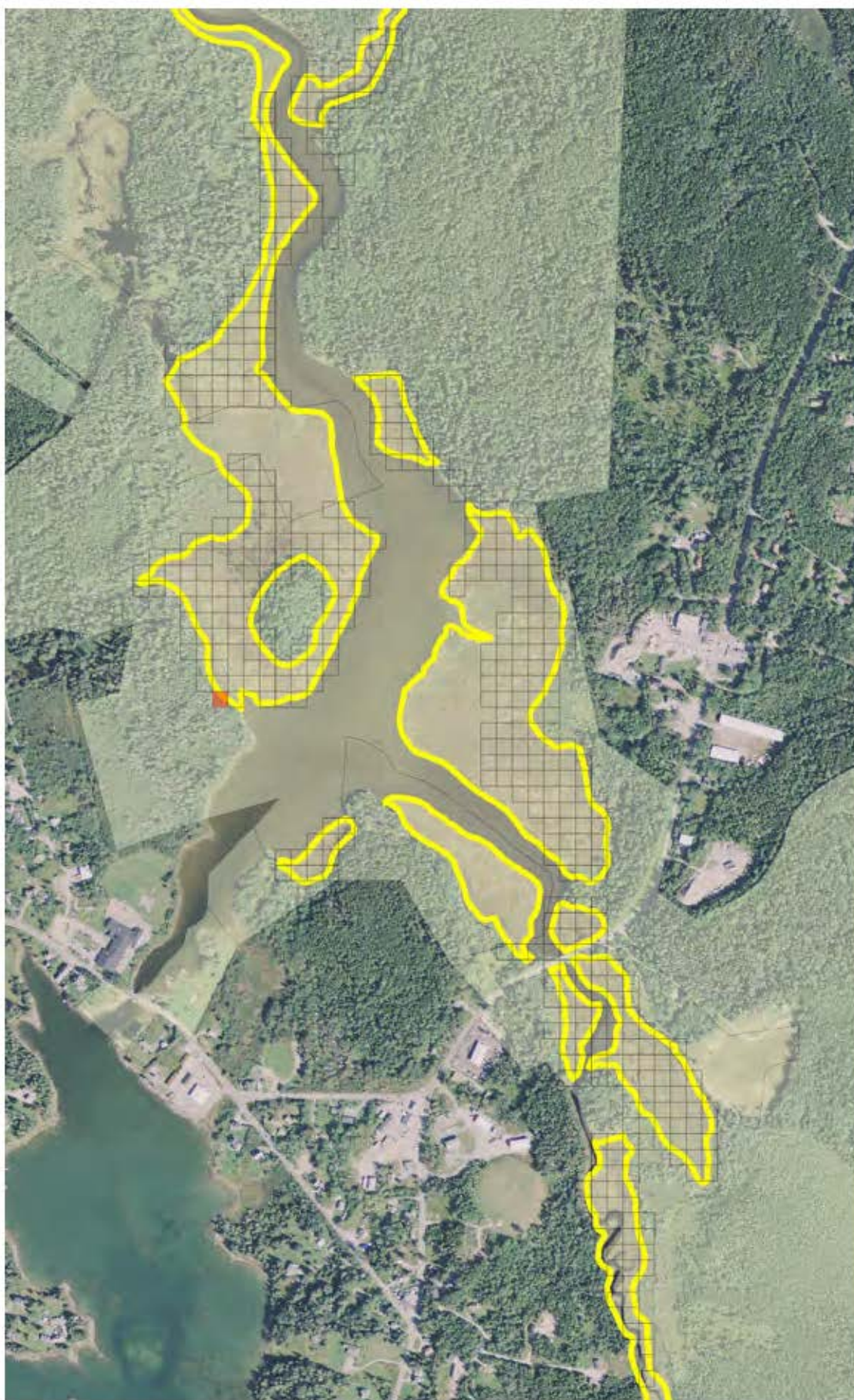
*Elymus repens*



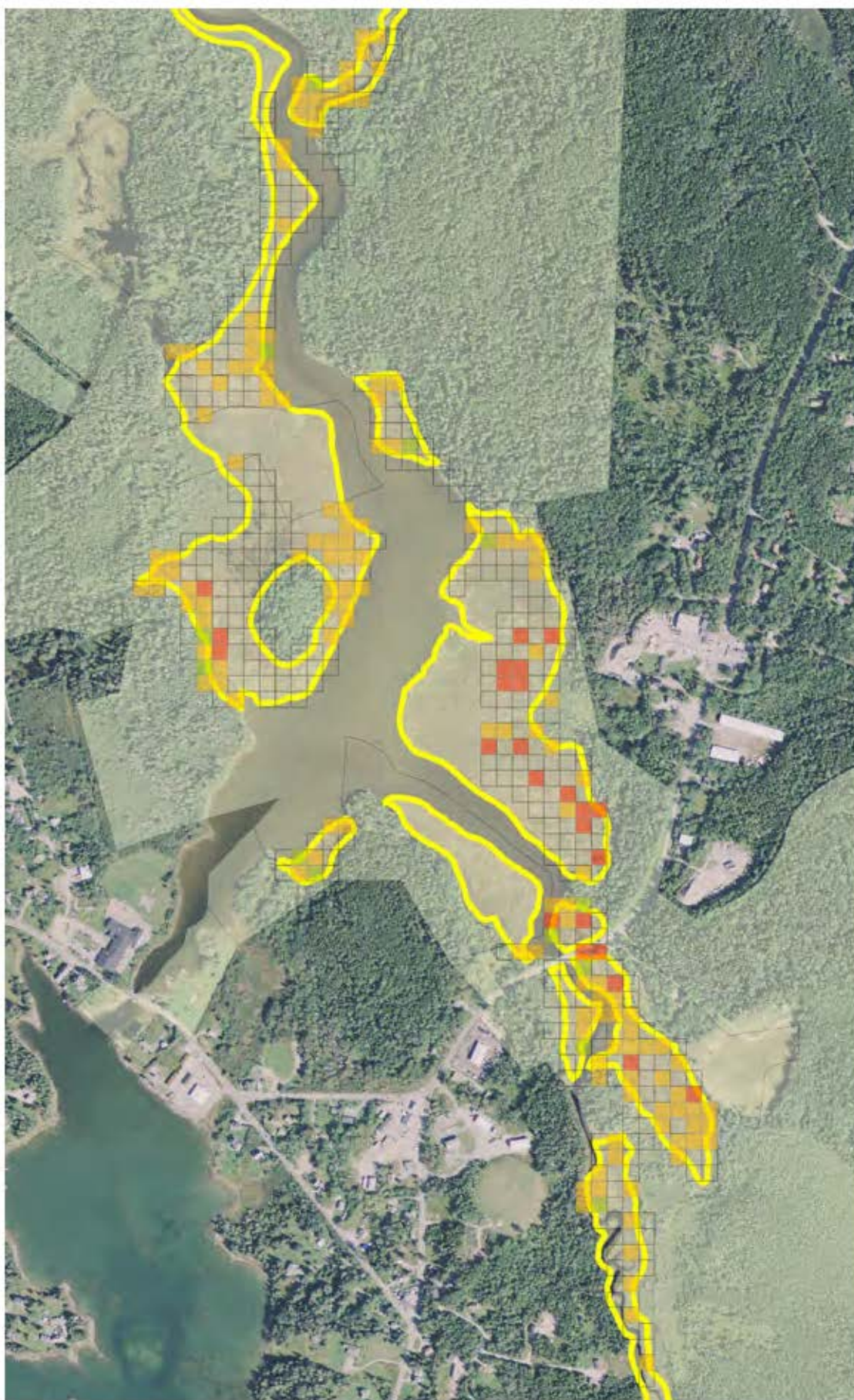
*Elymus trachycaulus*



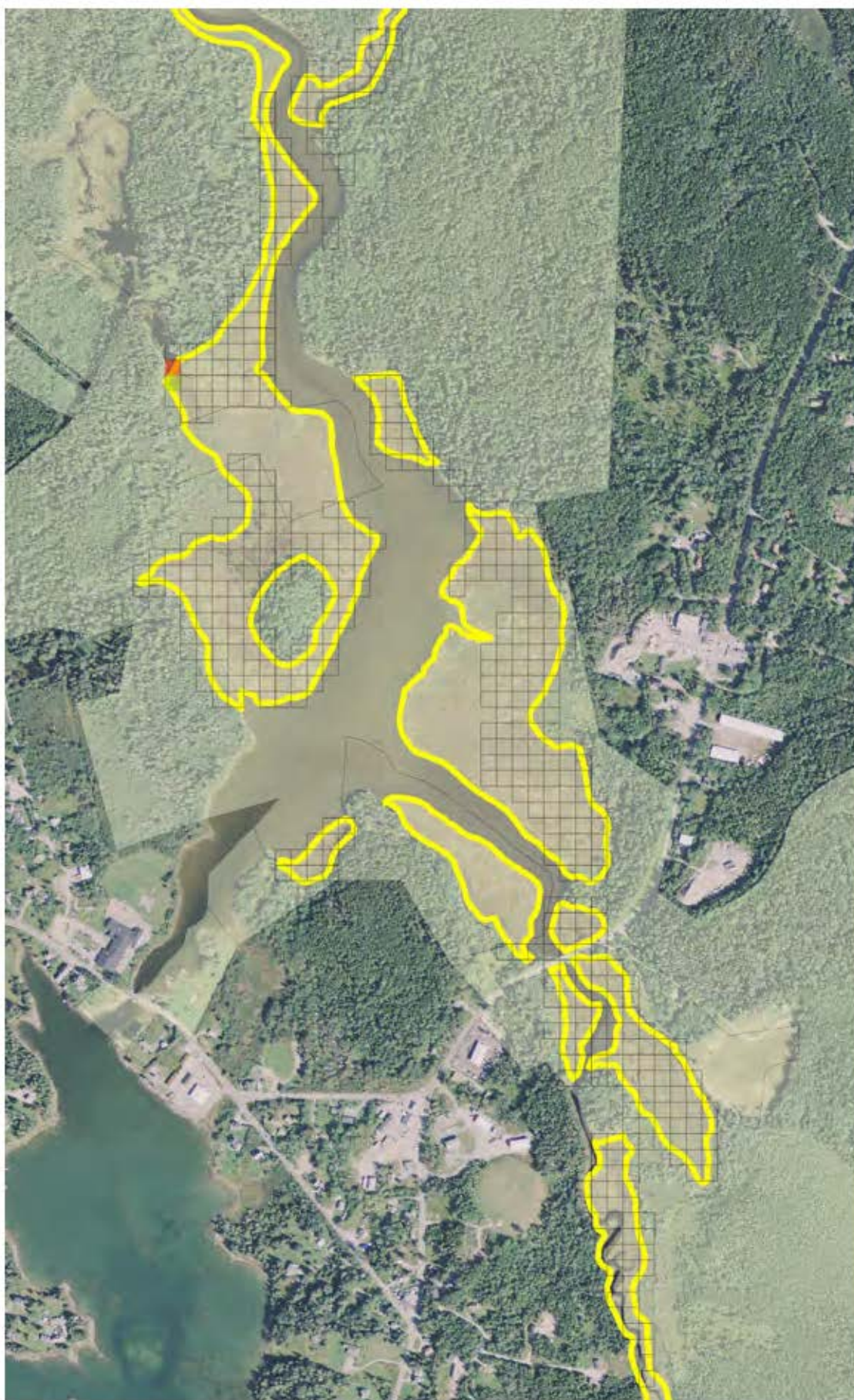
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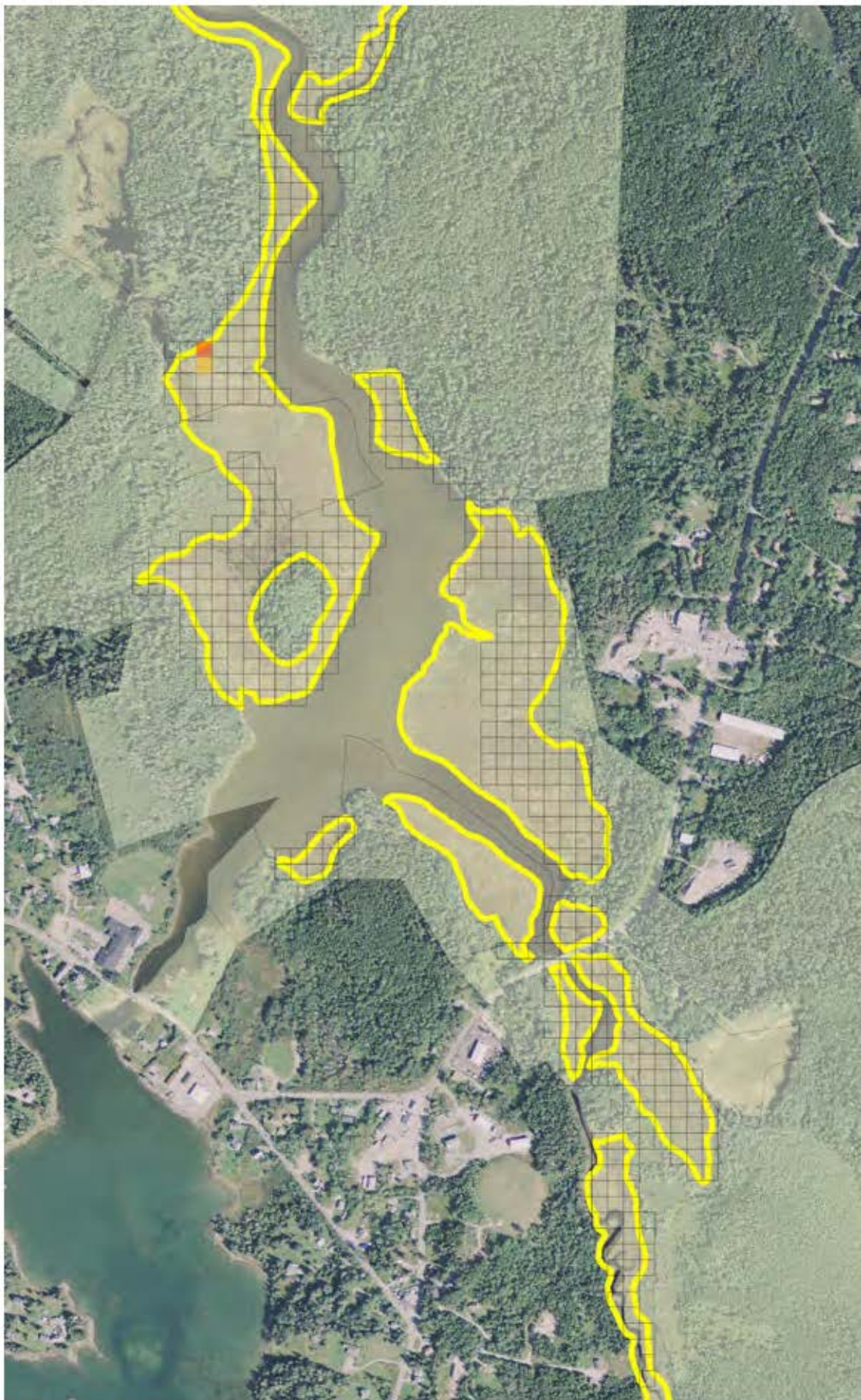
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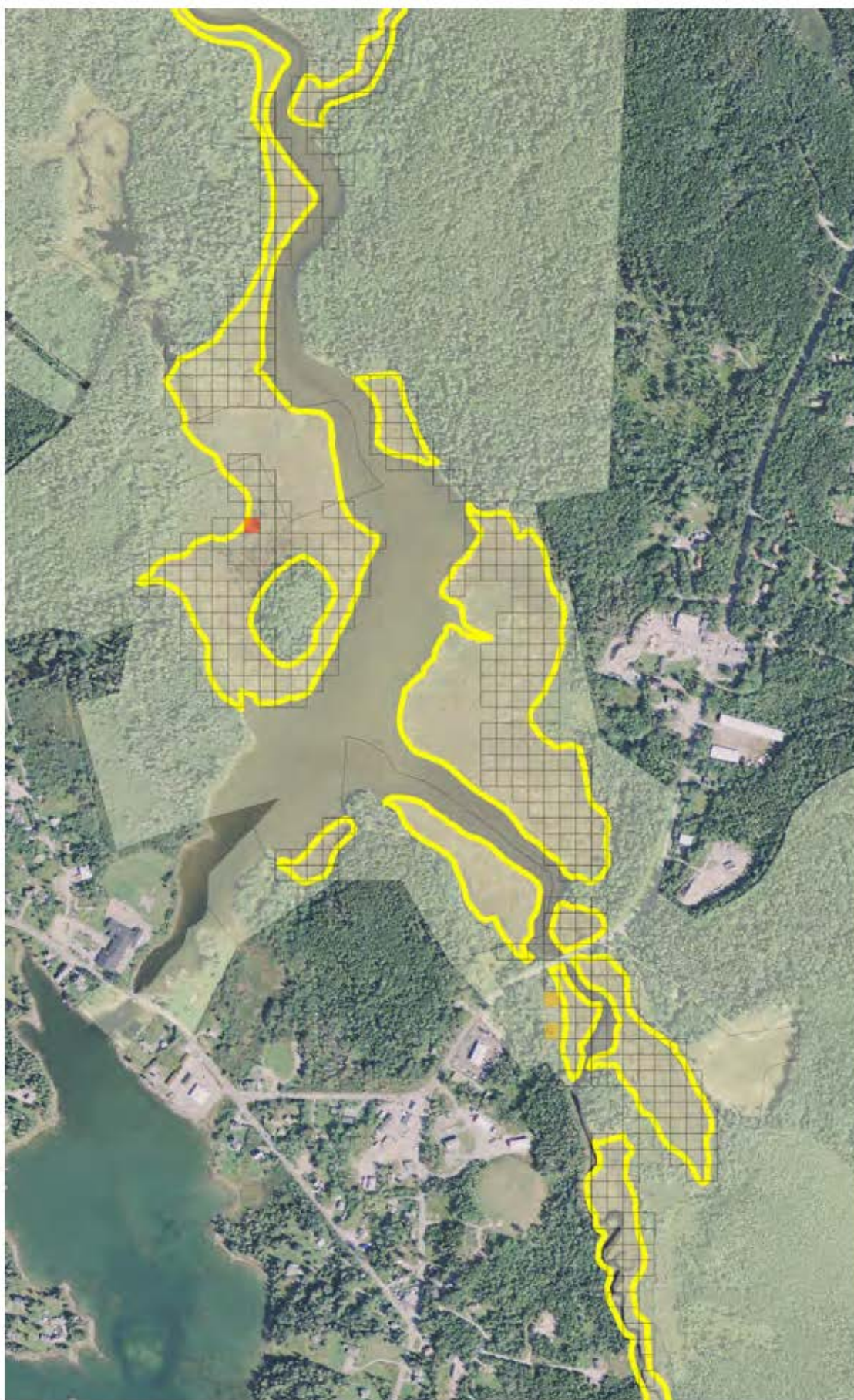
*Festuca rubra*



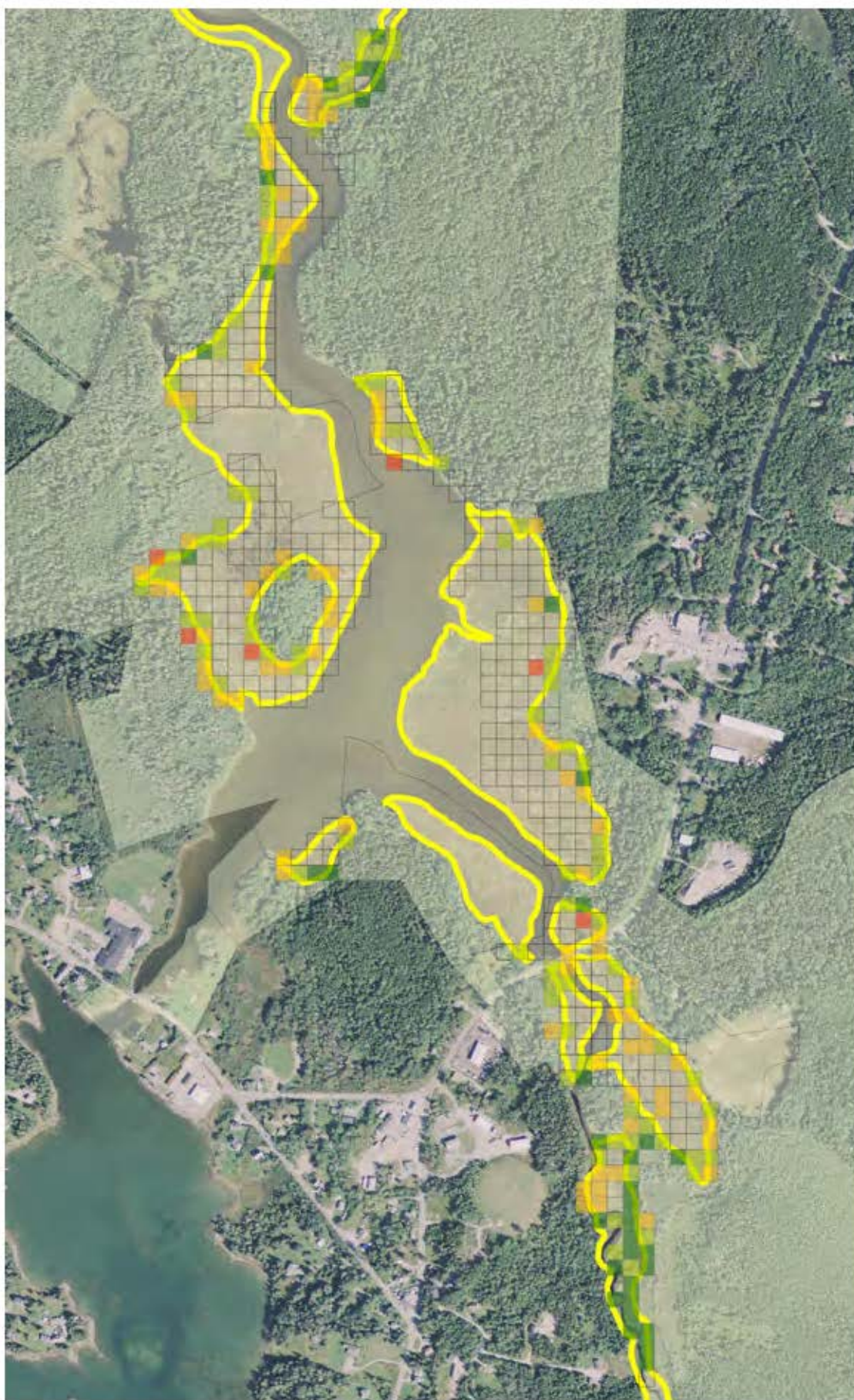
*Galium* sp.



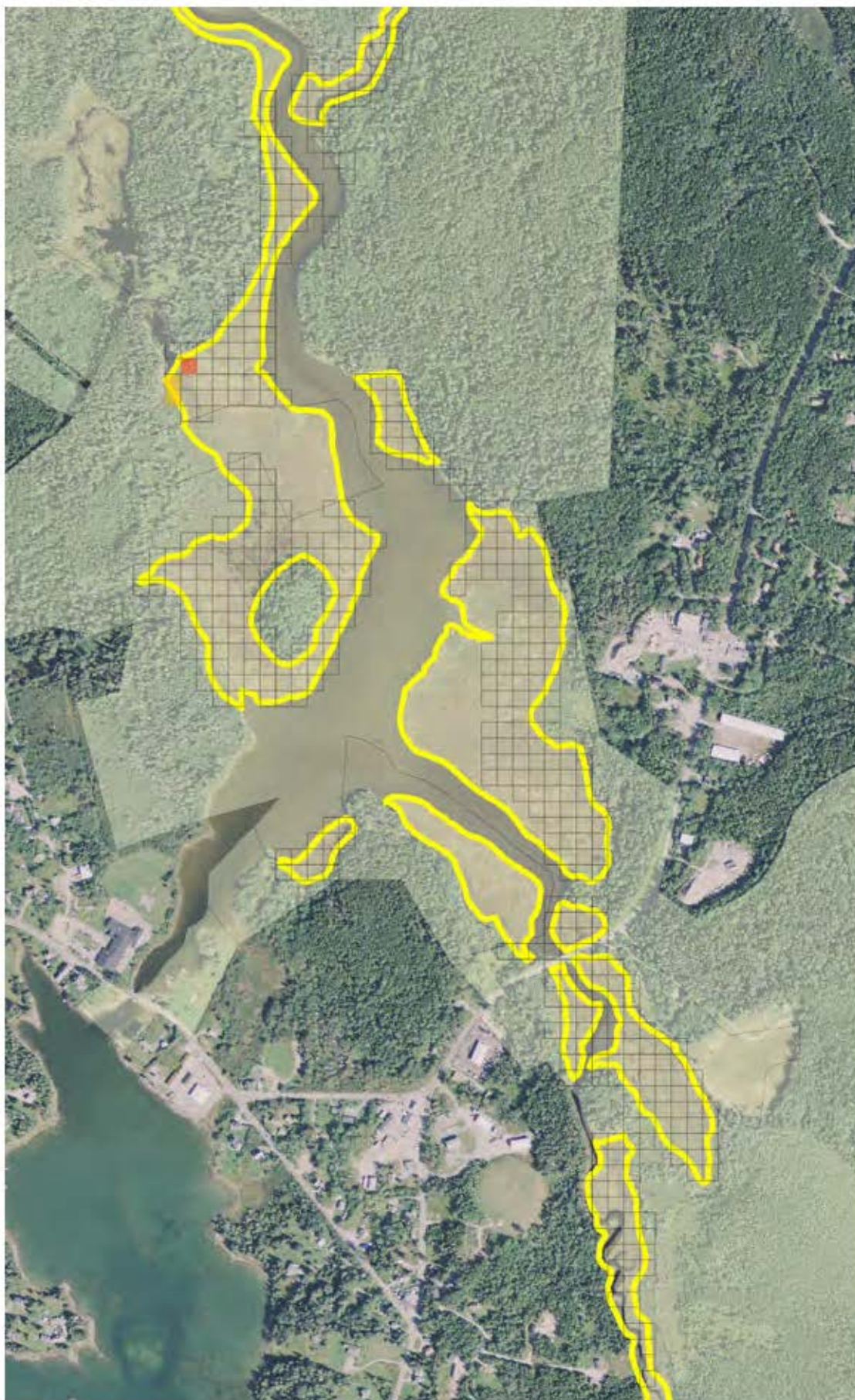
*Hordeum jubatum* ssp. *jubatum*



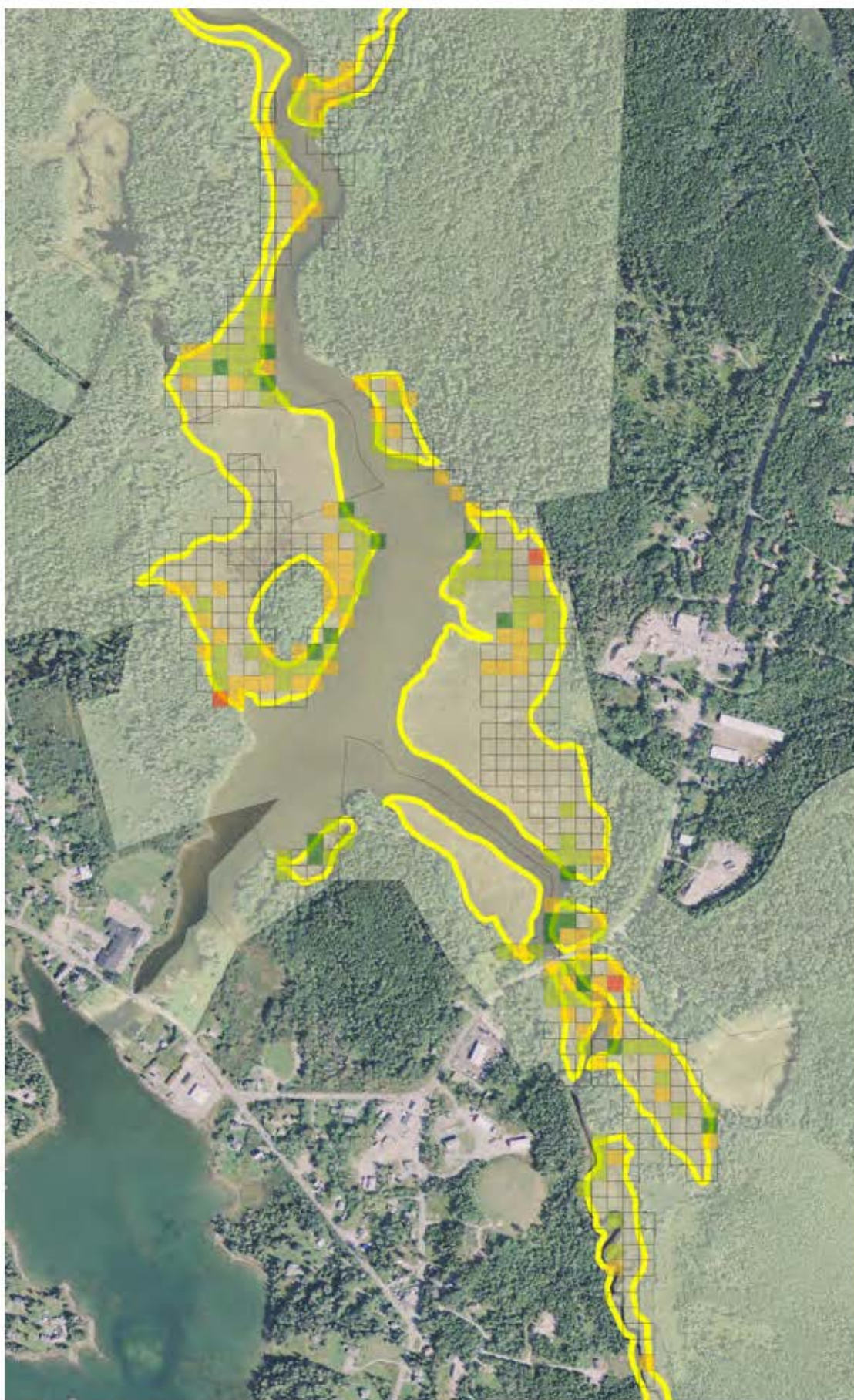
*Iris versicolor*



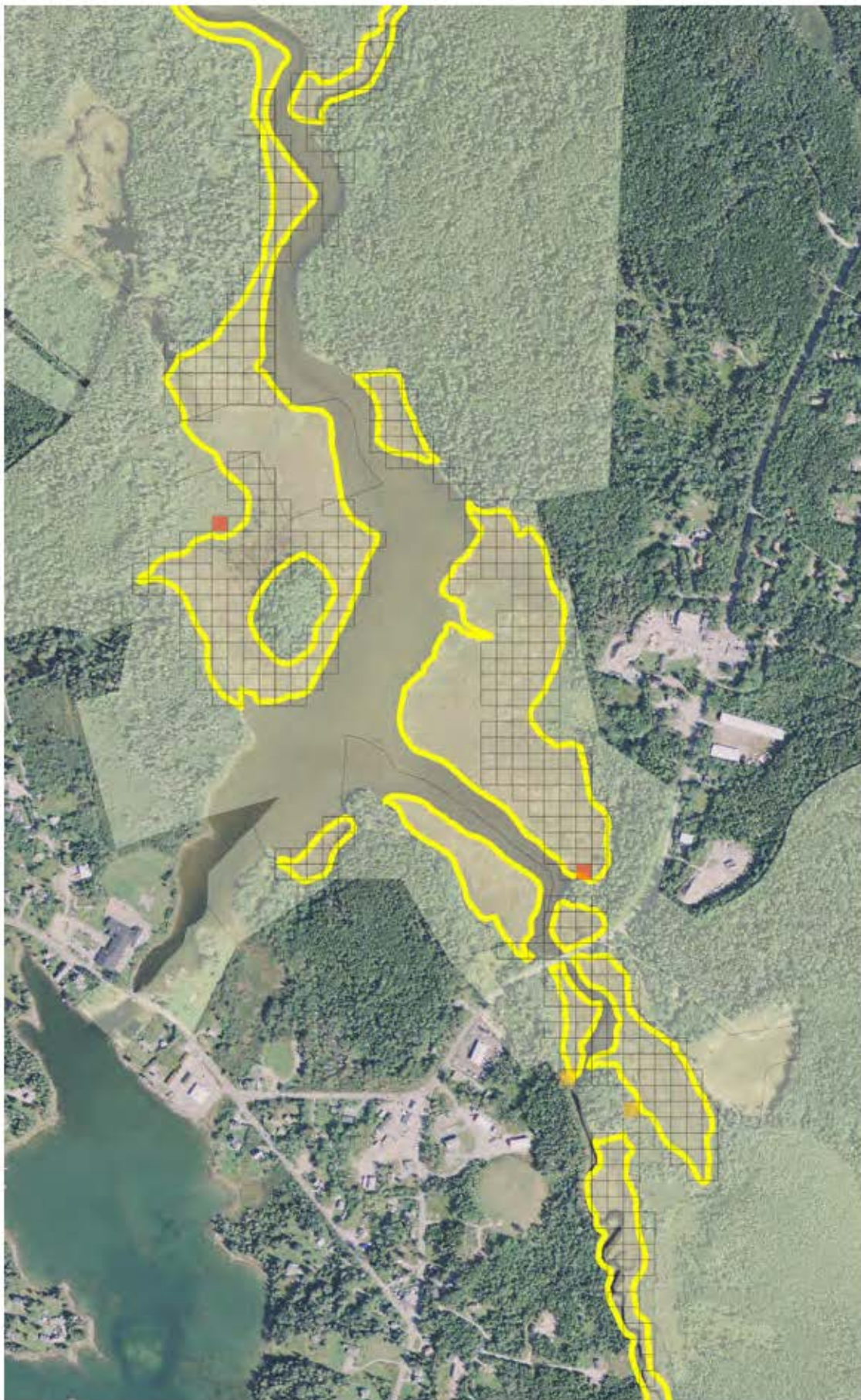
*Juncus balticus* ssp. *littoralis*



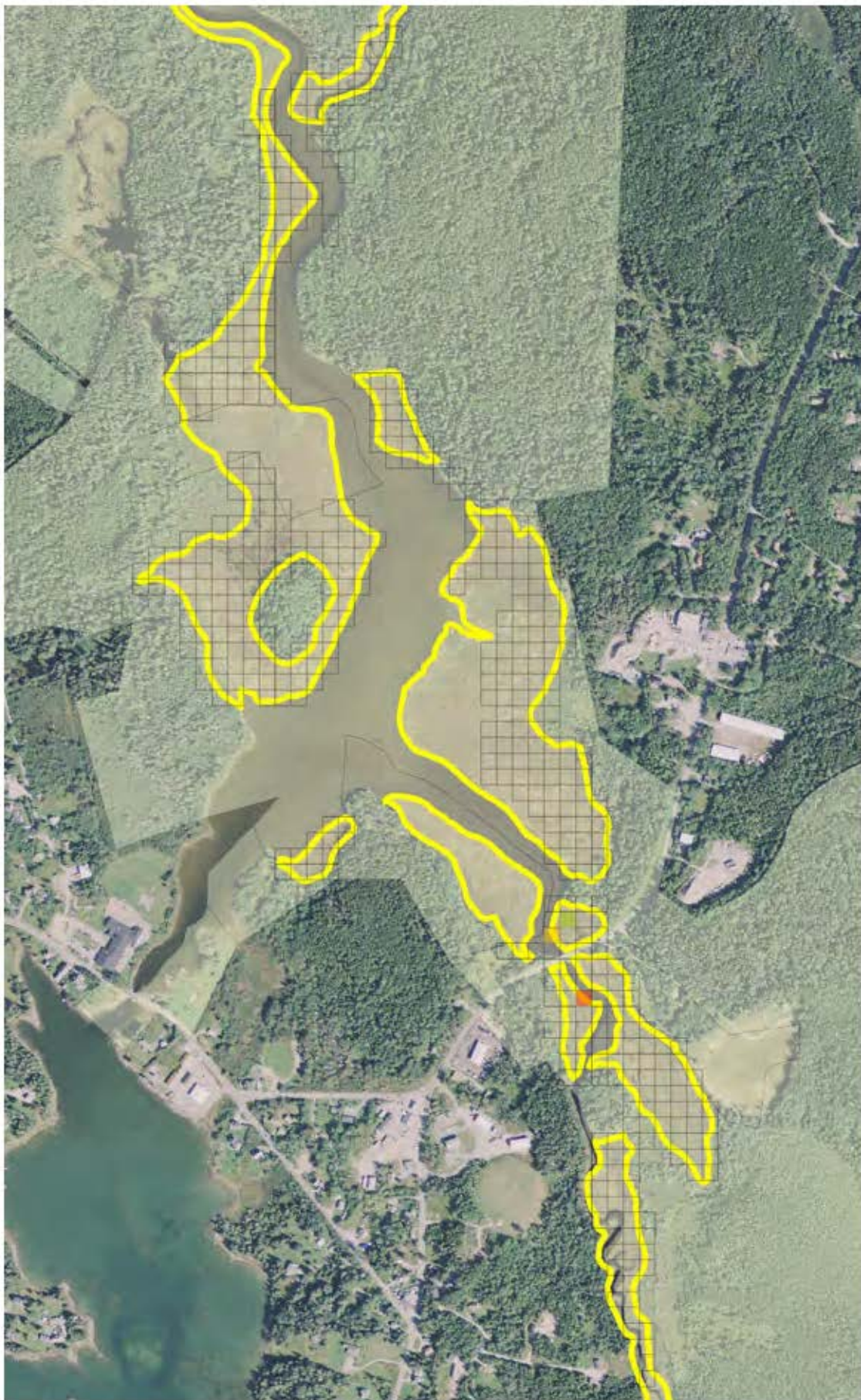
*Juncus brevicaudatus*



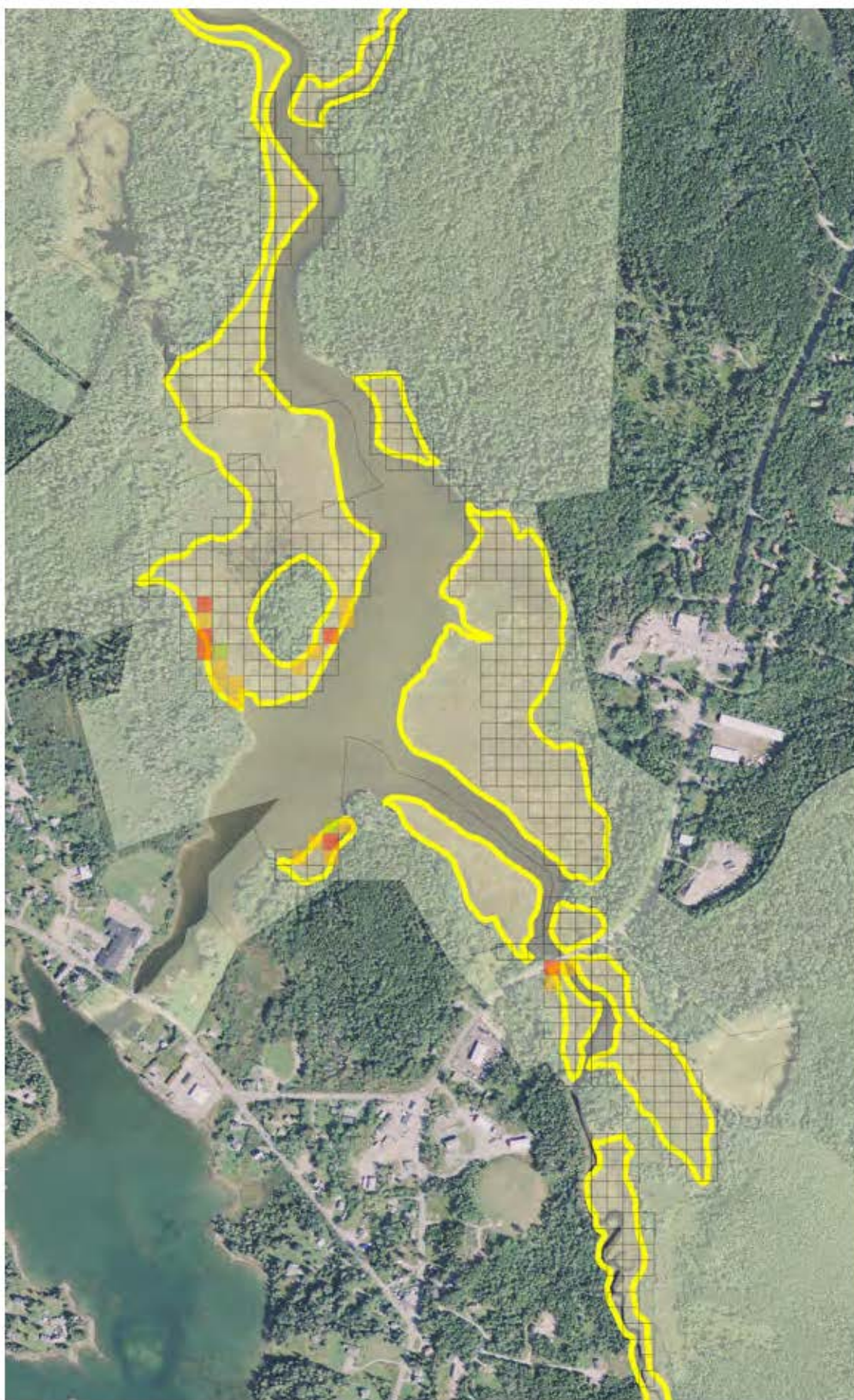
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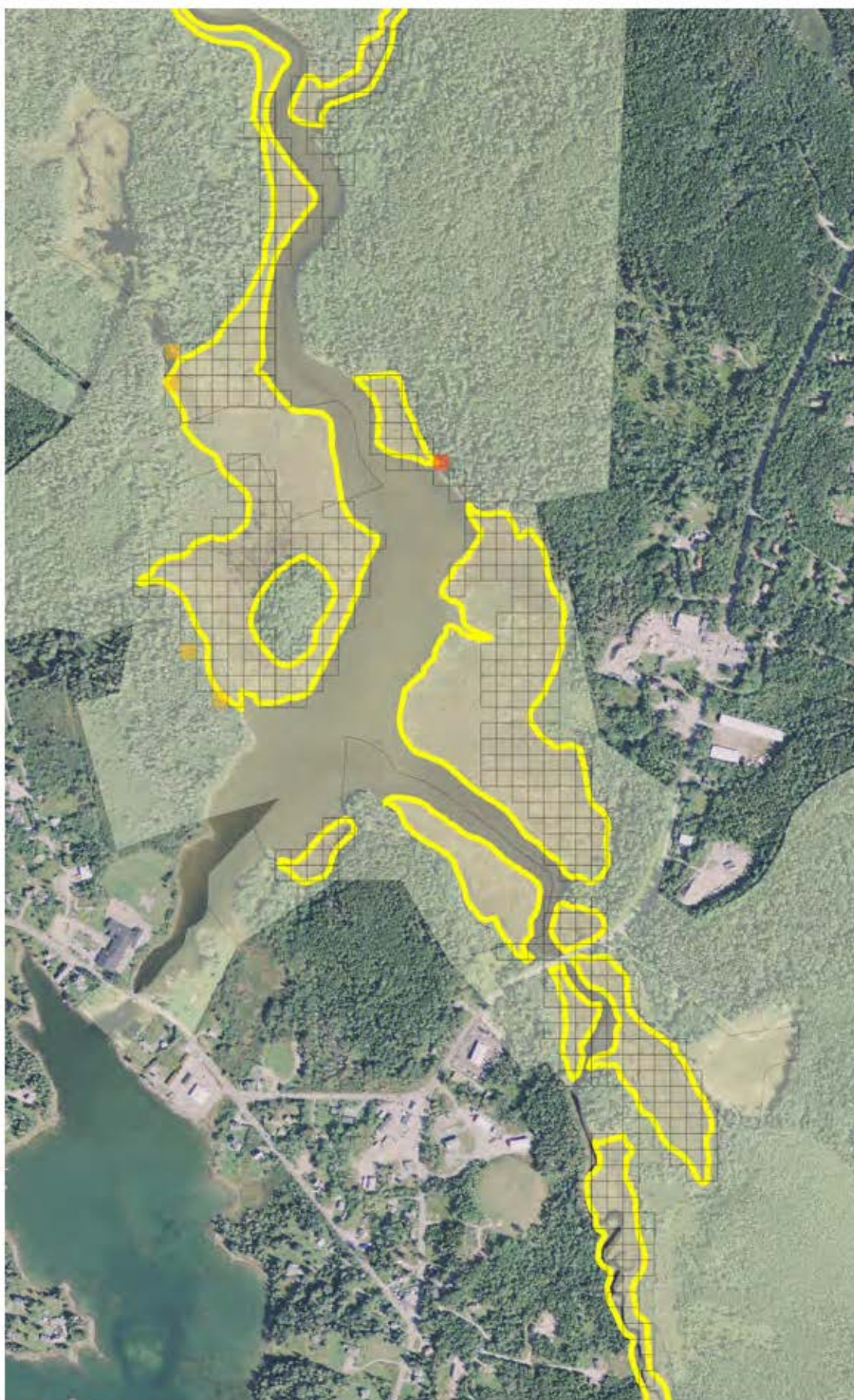
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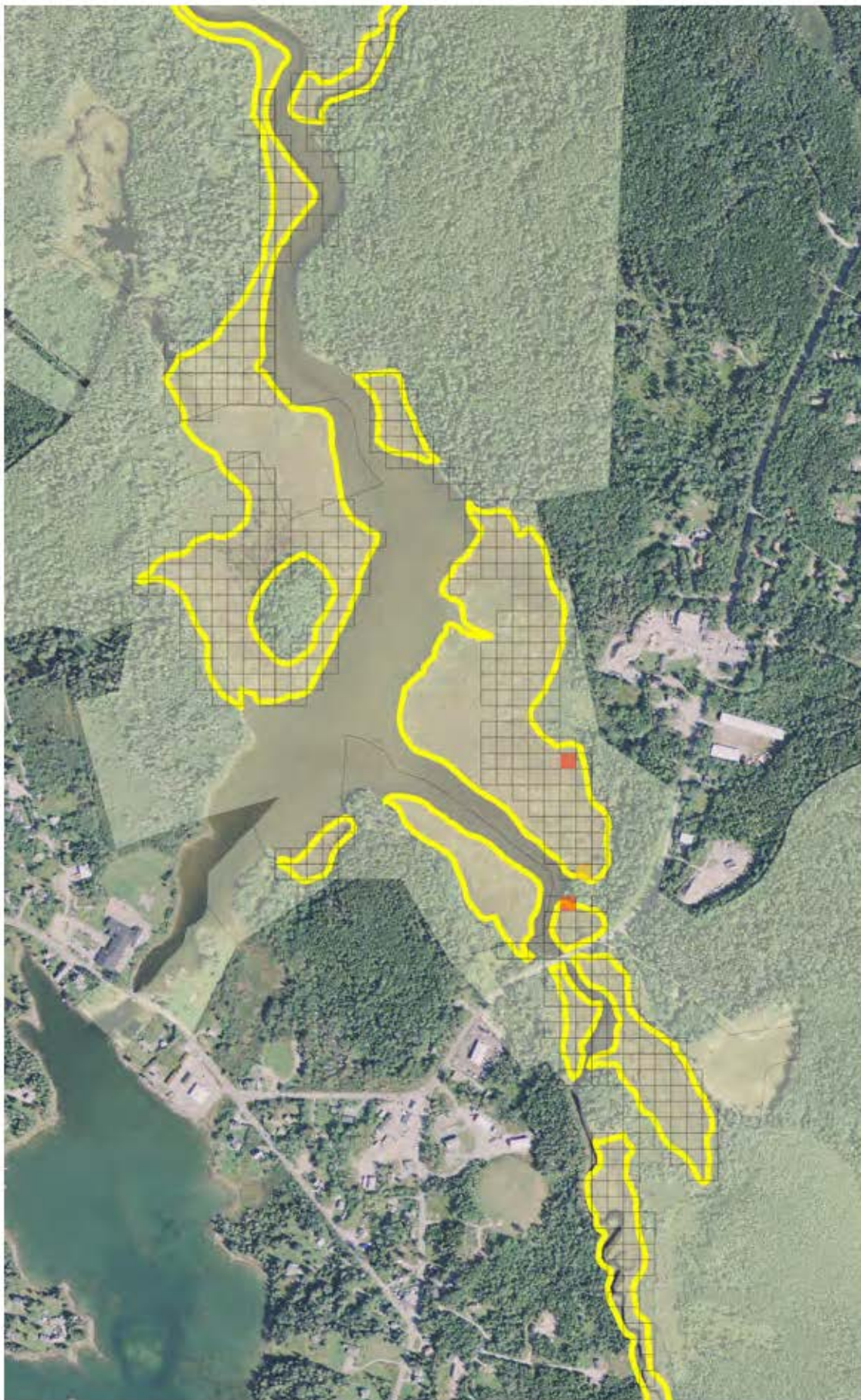
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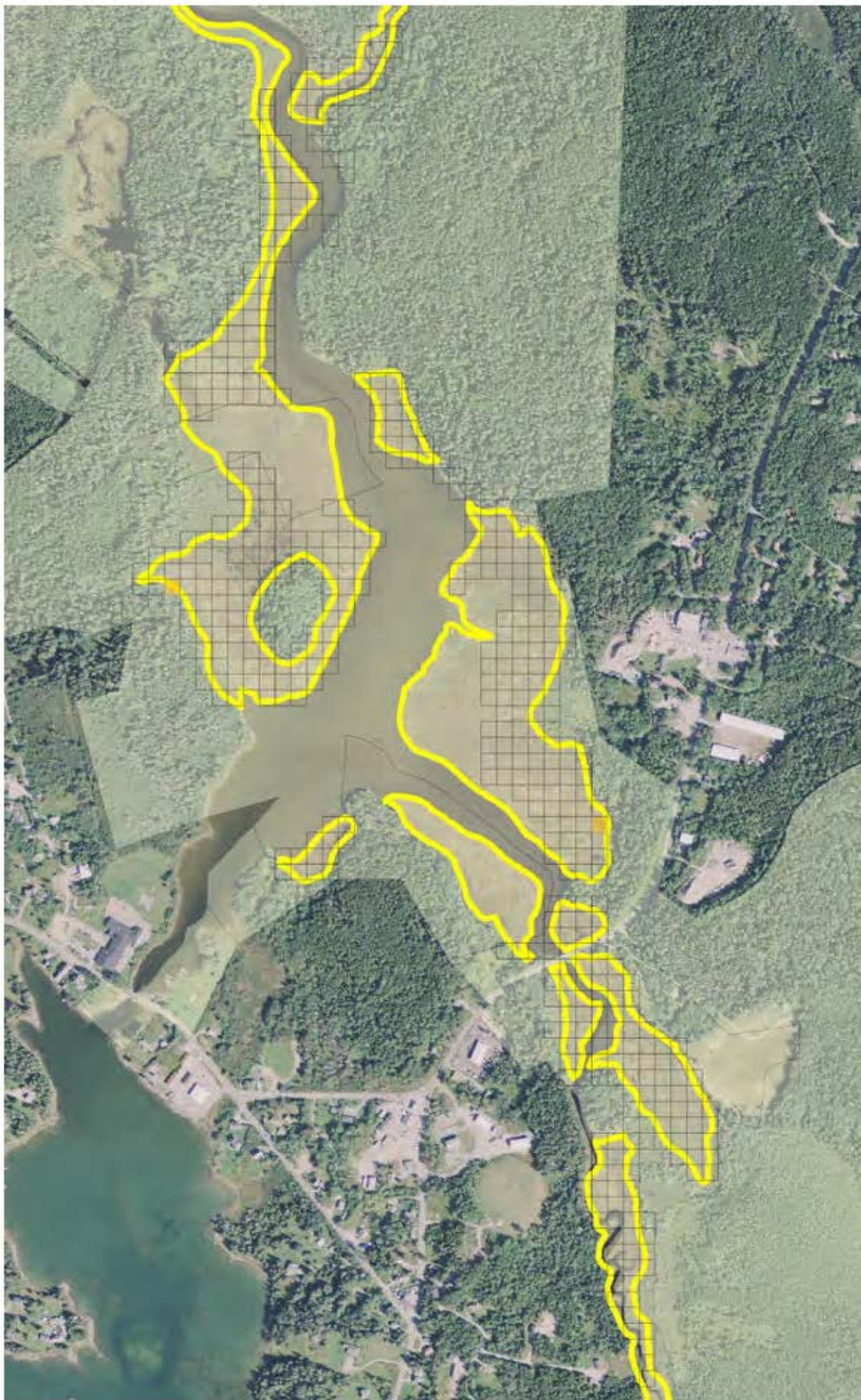
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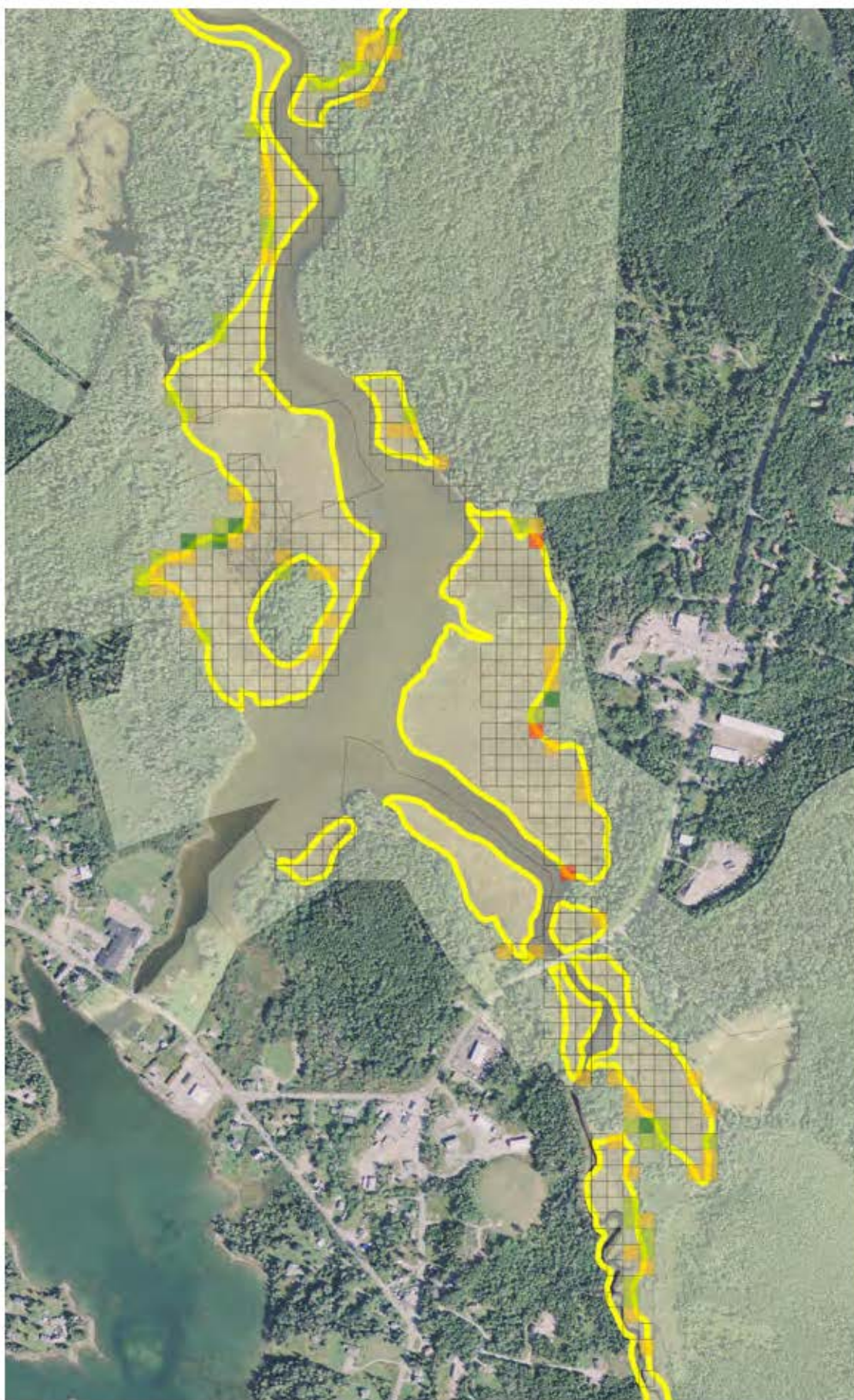
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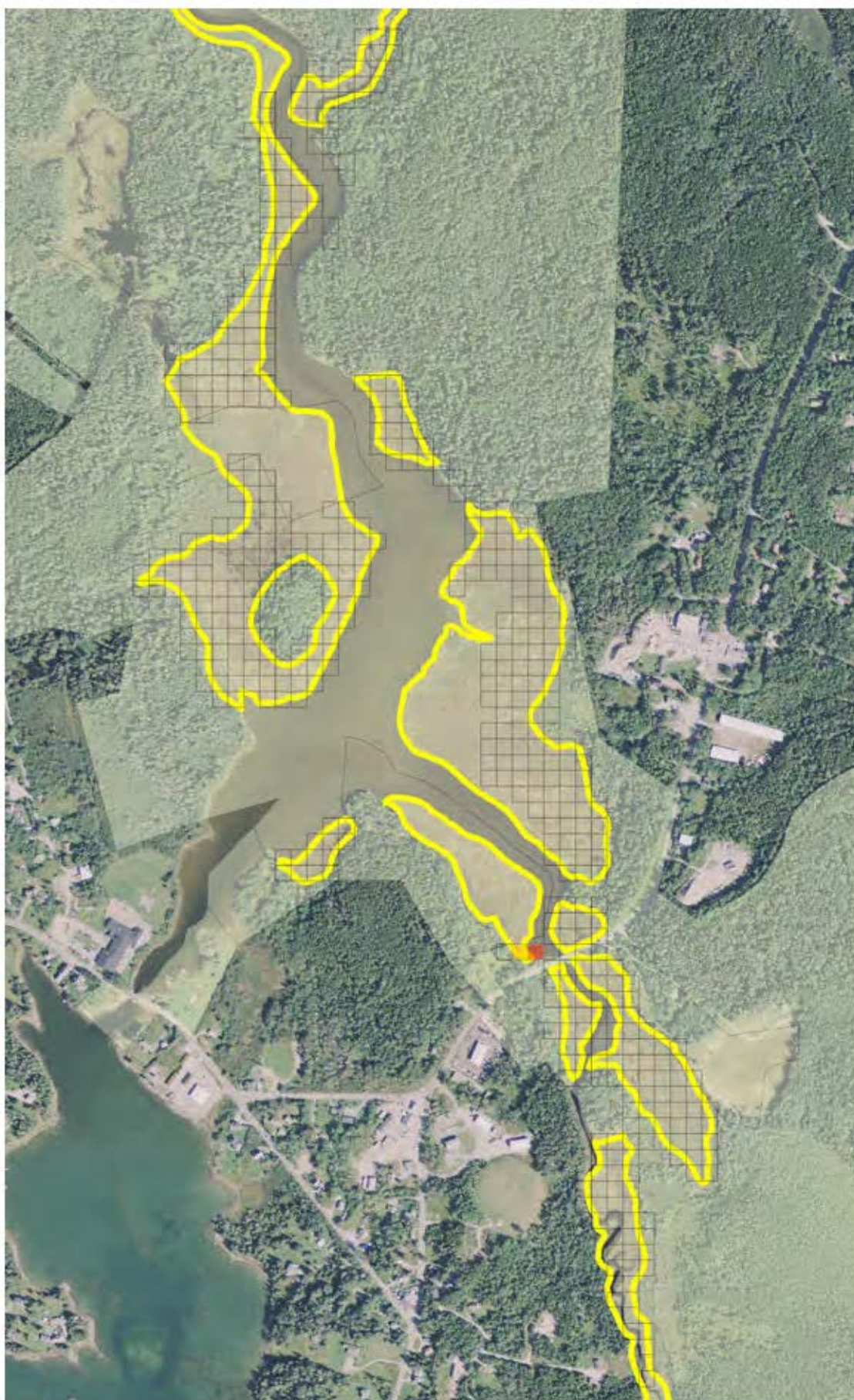
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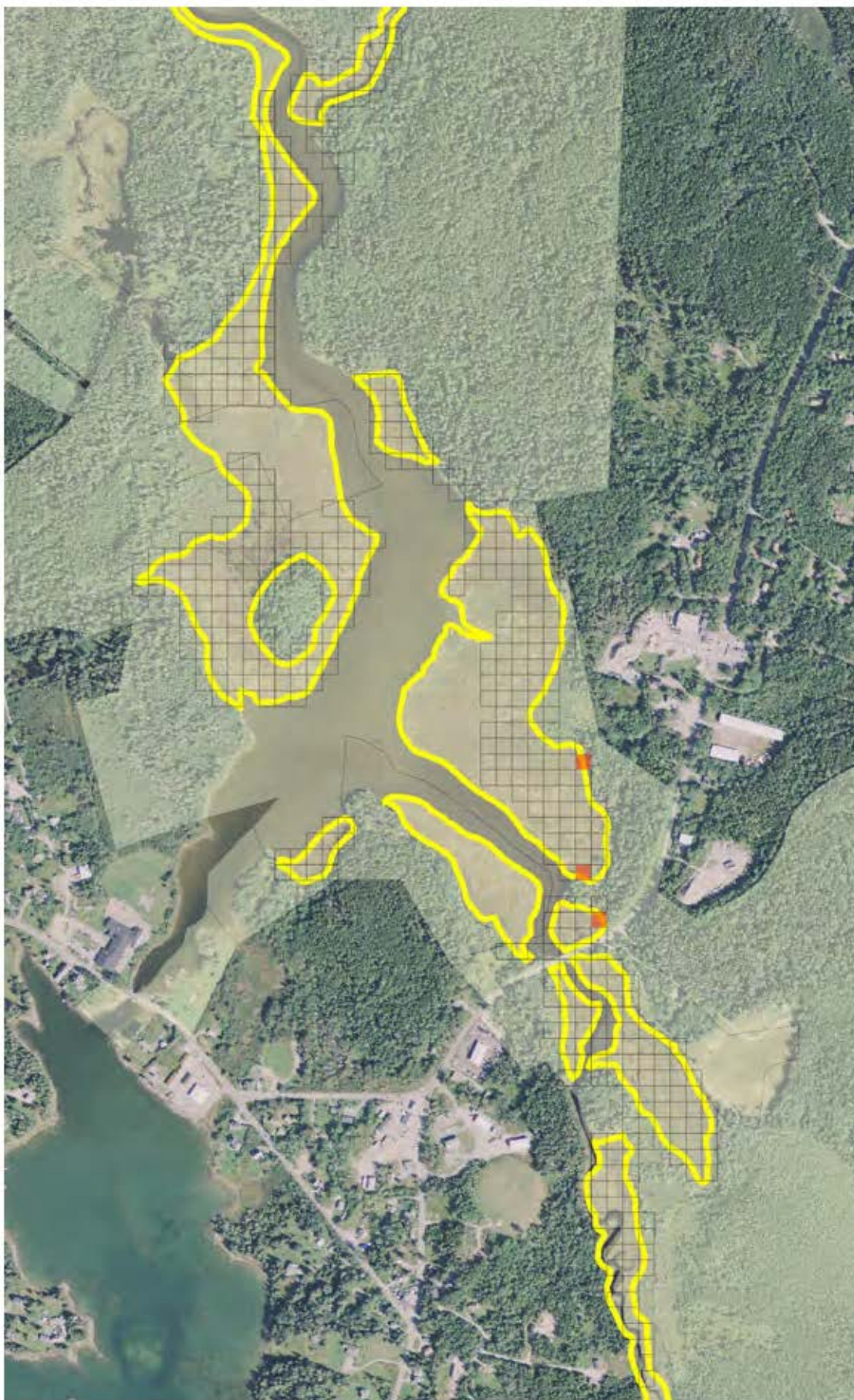
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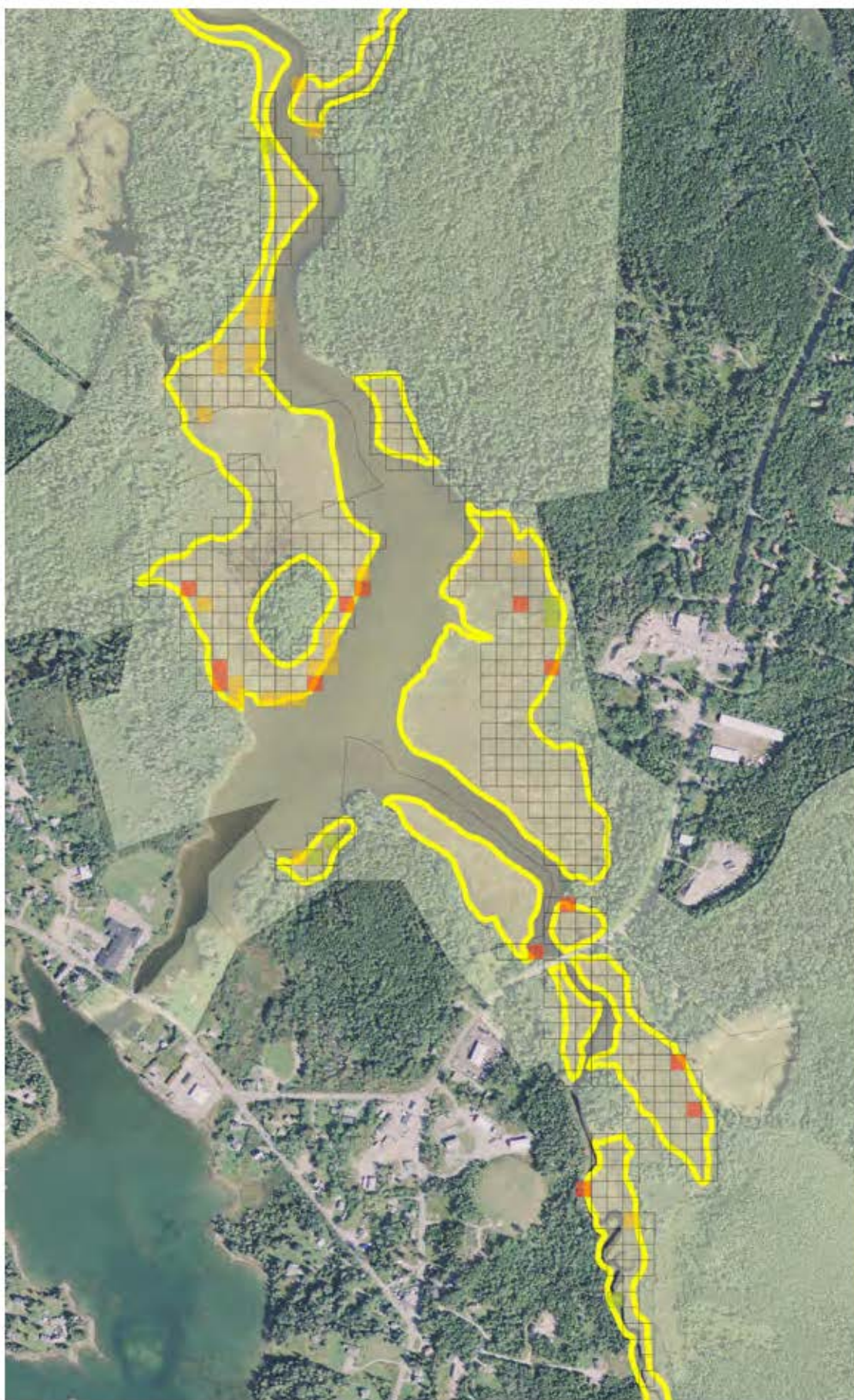
*Myrica gale*



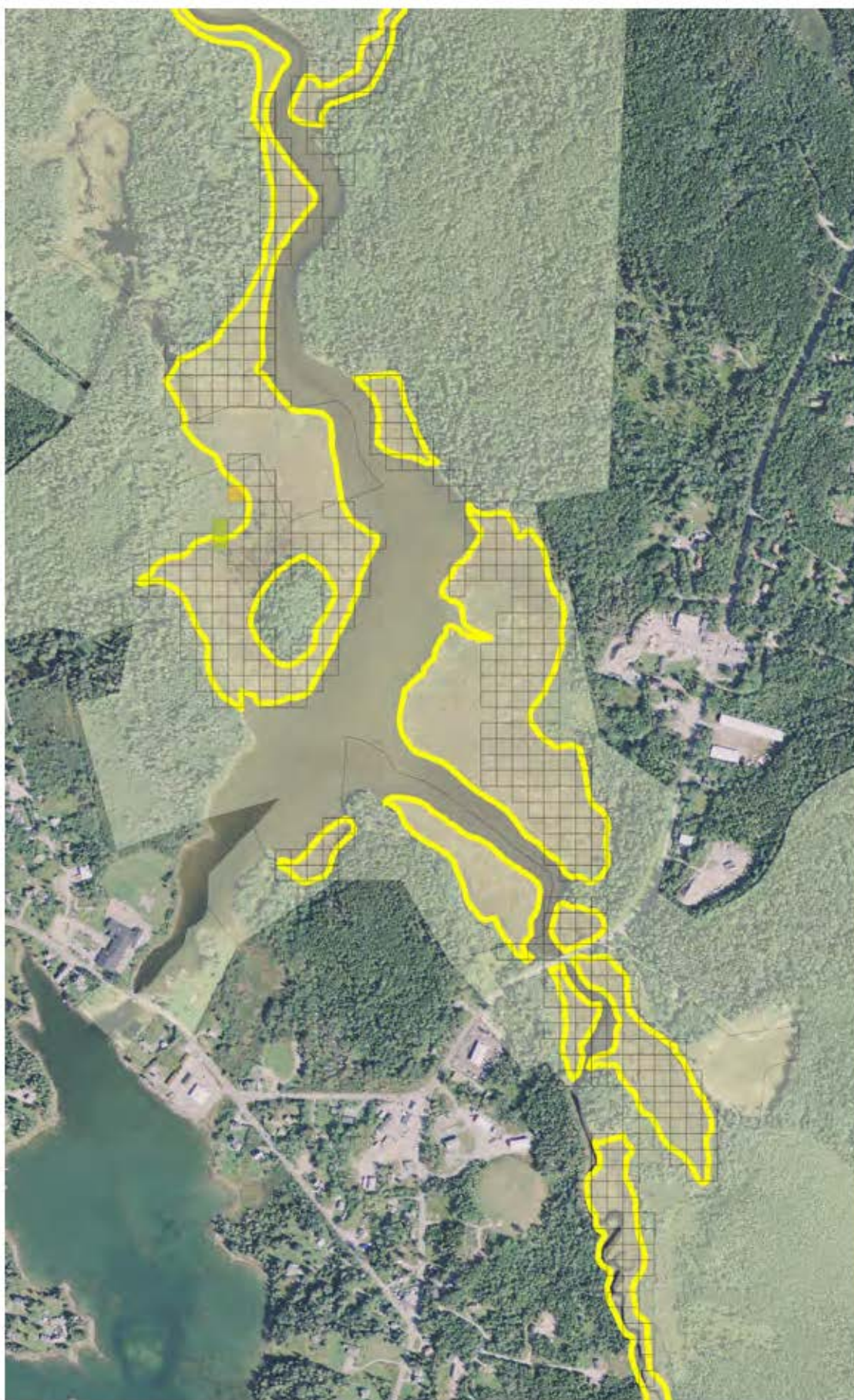
*Phleum pratense*



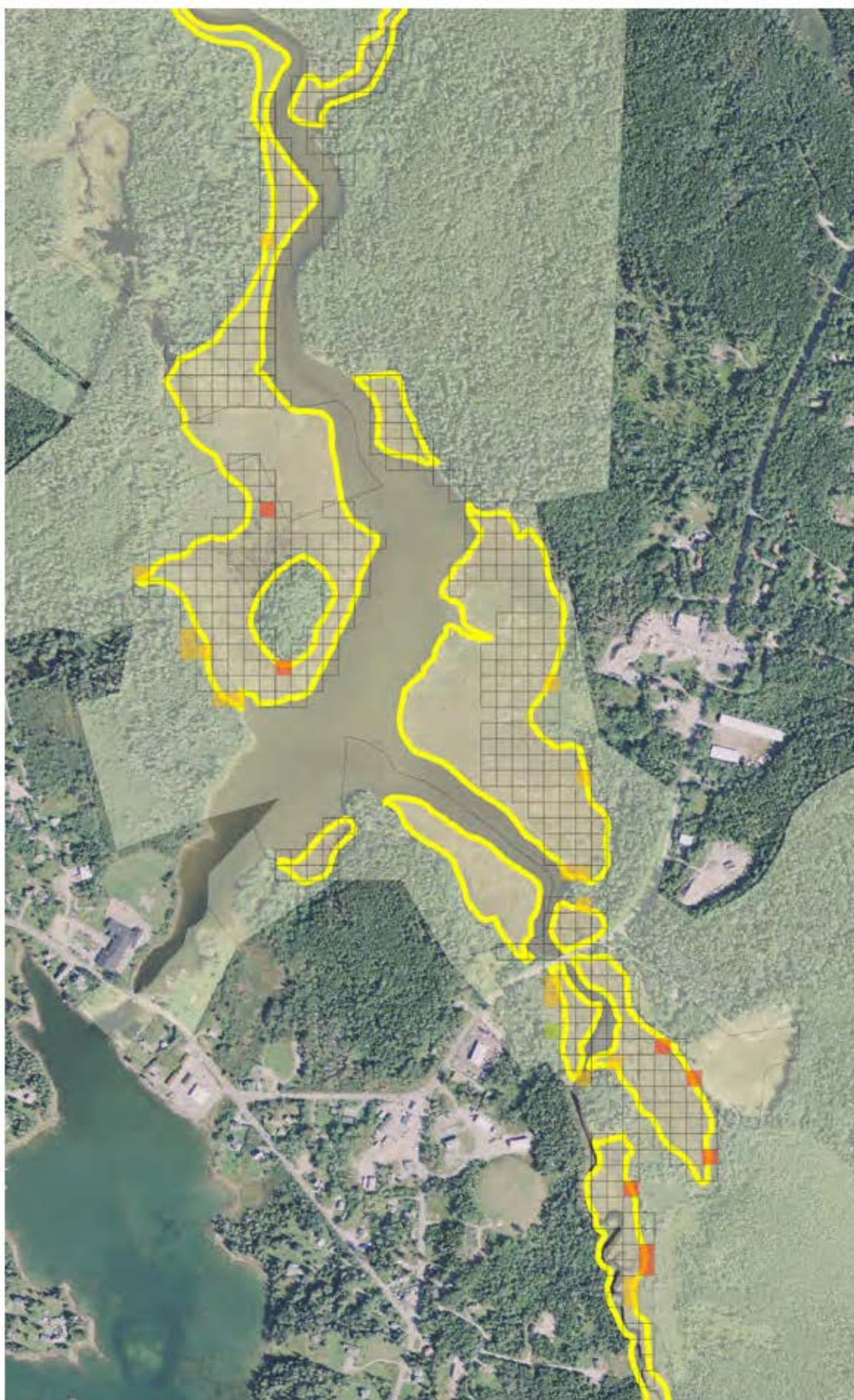
*Picea mariana*



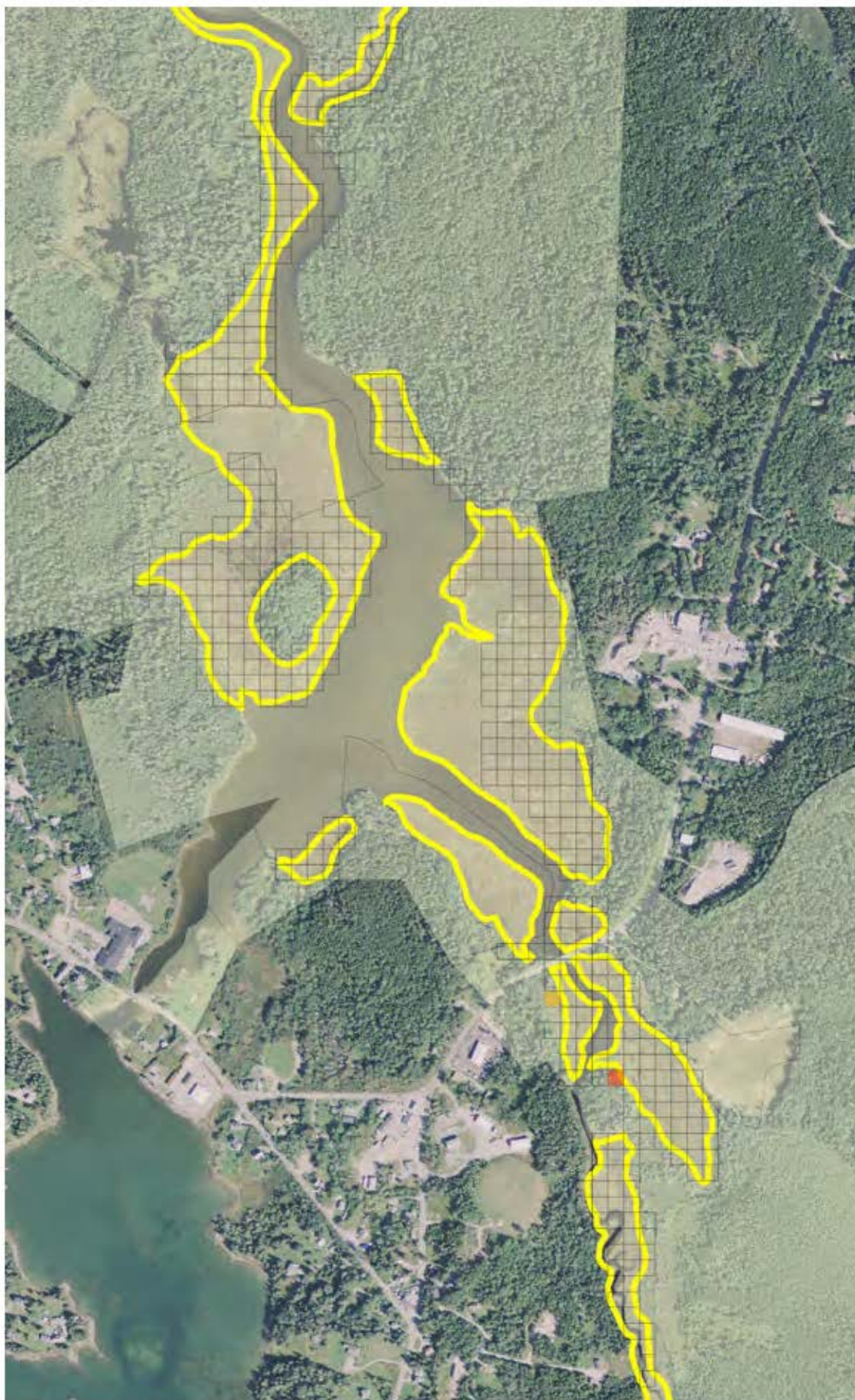
*Plantago maritima* ssp. *juncooides*



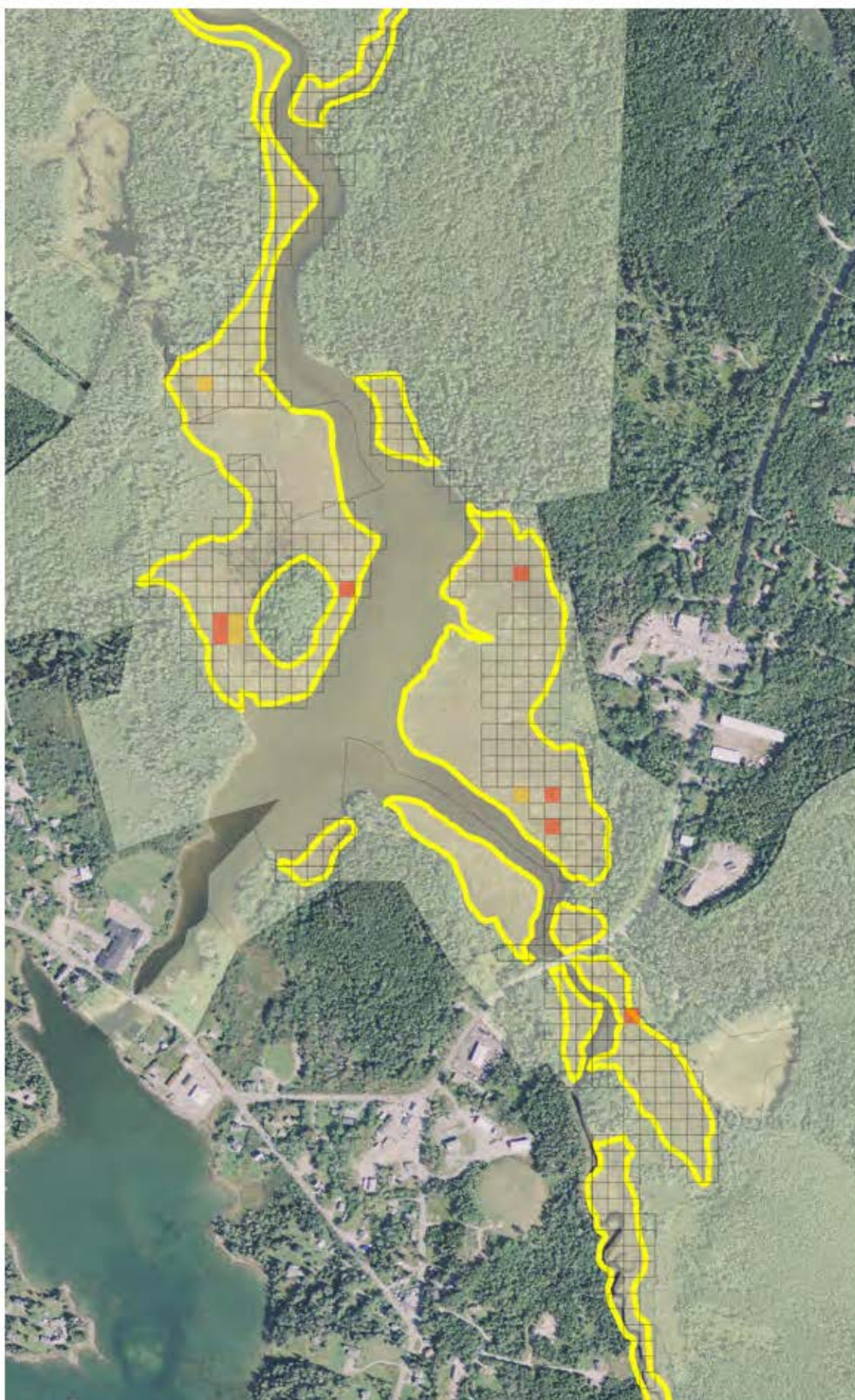
*Rhododendron groenlandicum*



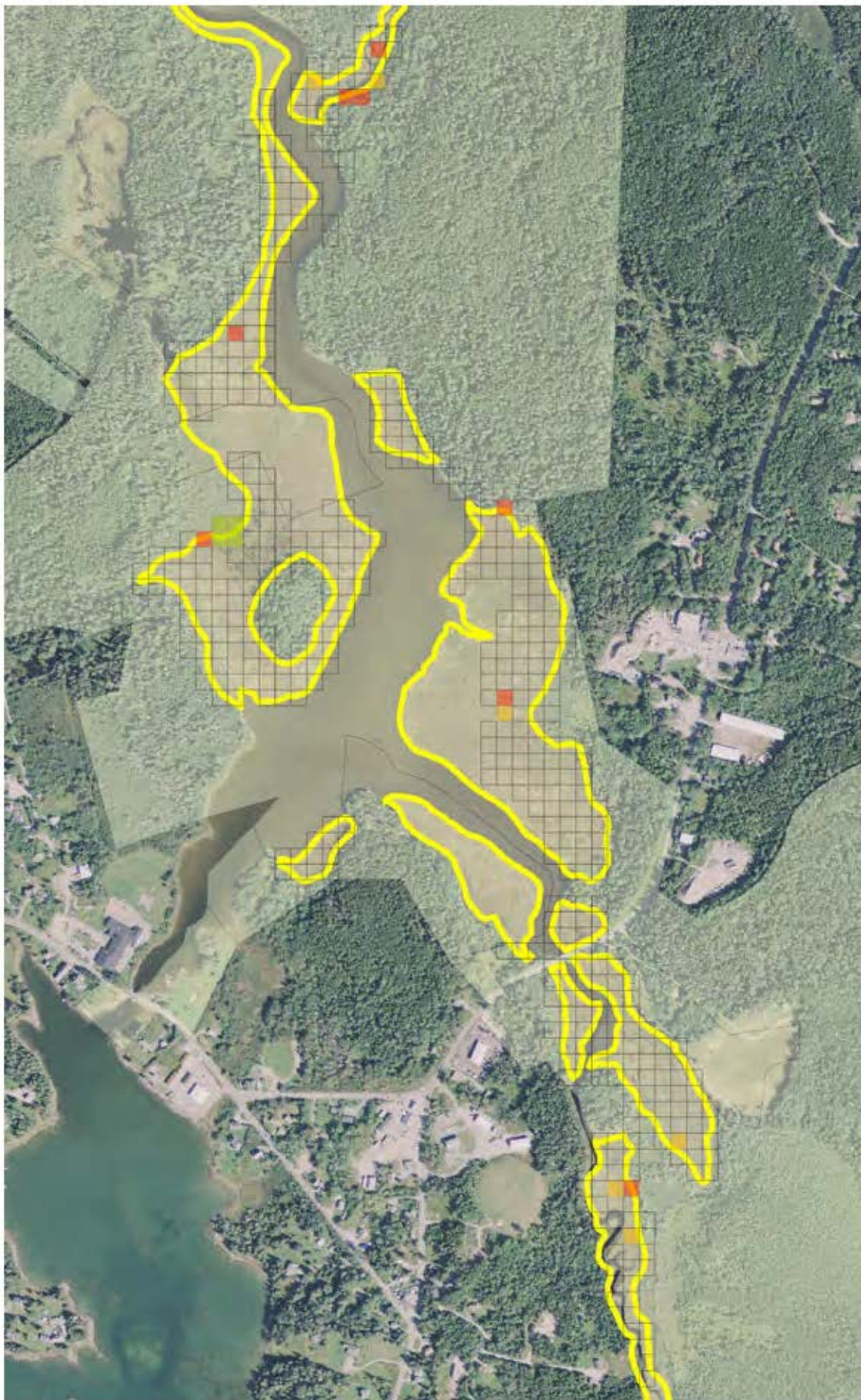
*Rosa* sp.



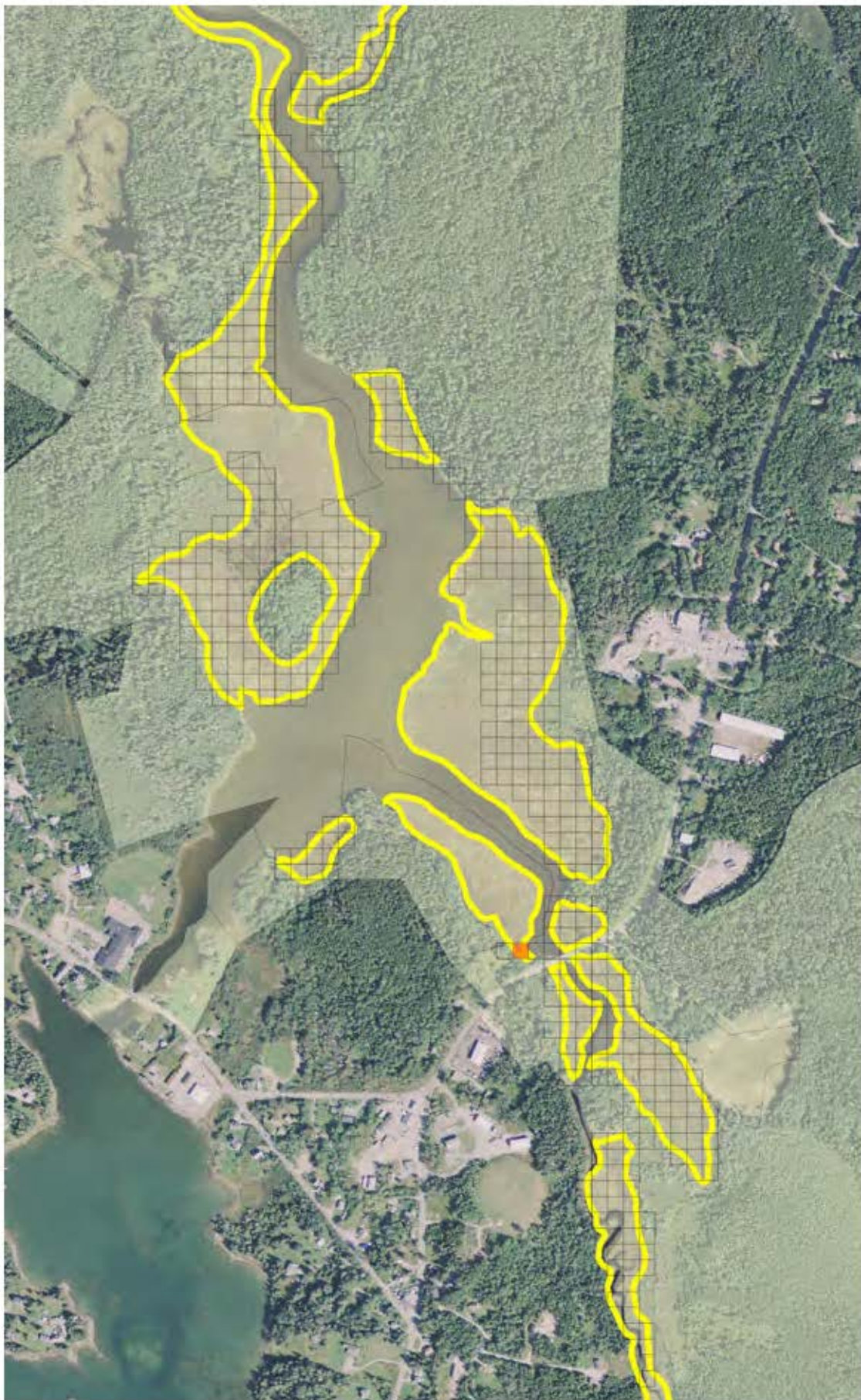
*Rumex britannica*



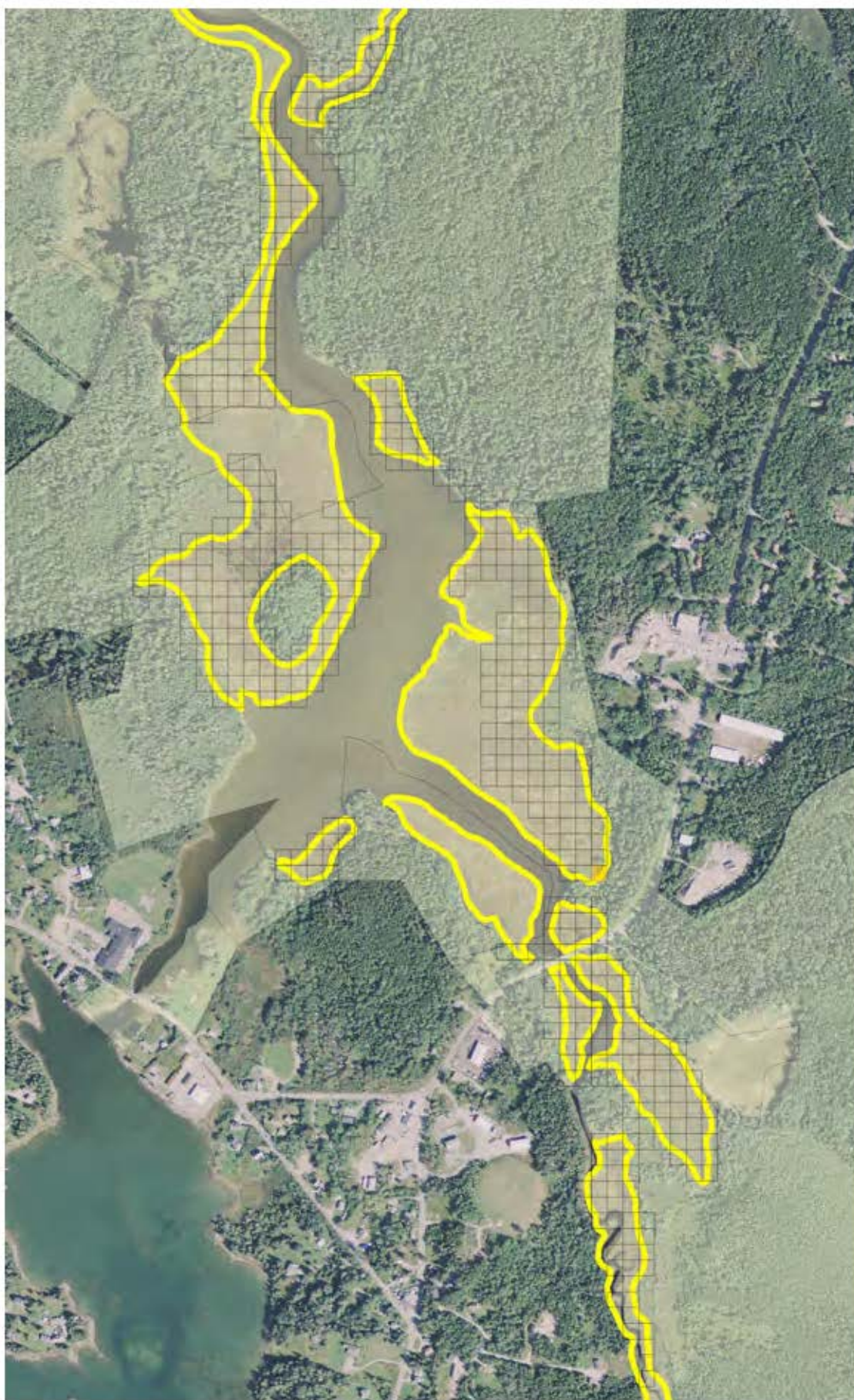
*Salicornia depressa*



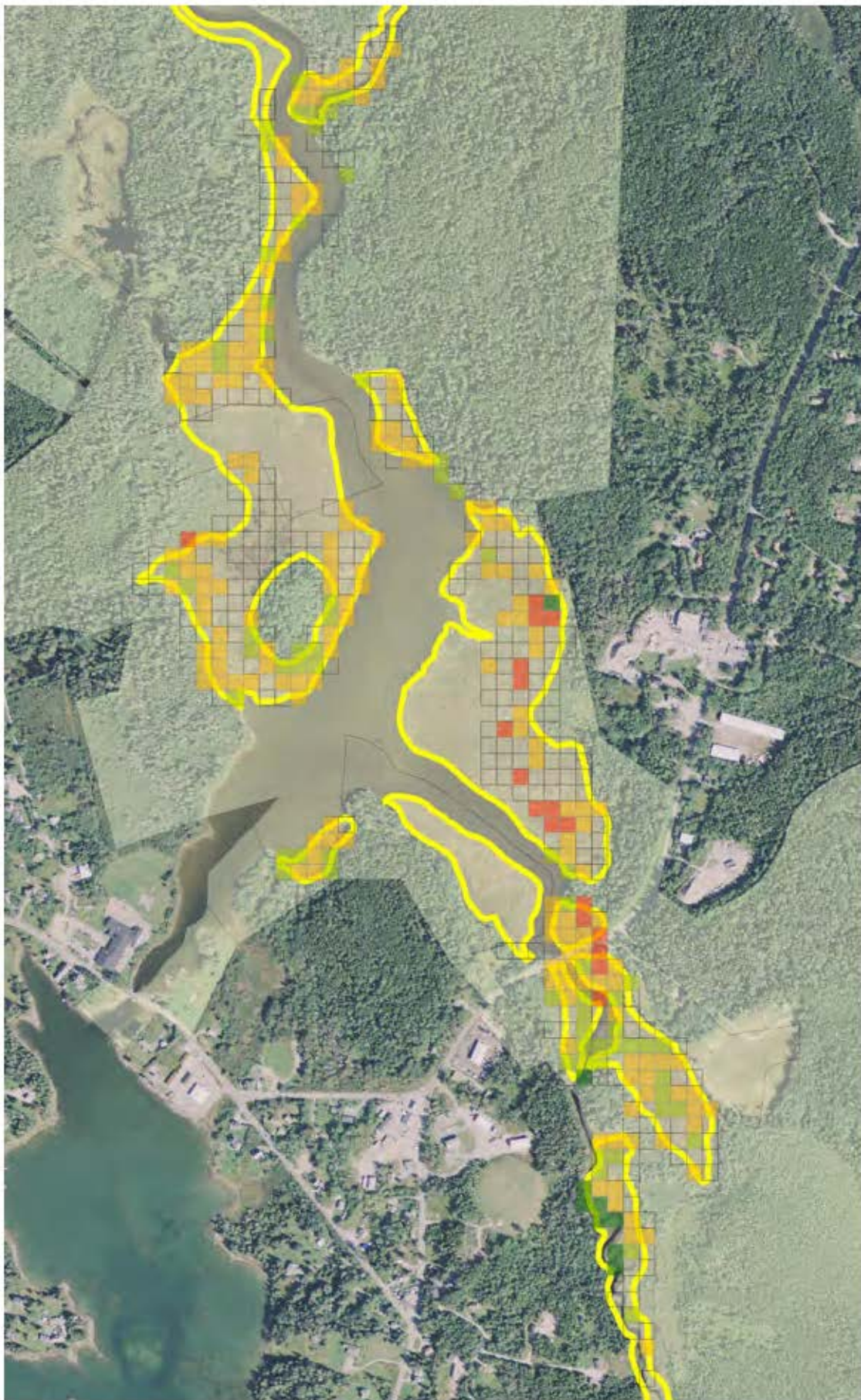
*Schoenoplectus tabernaemontani*



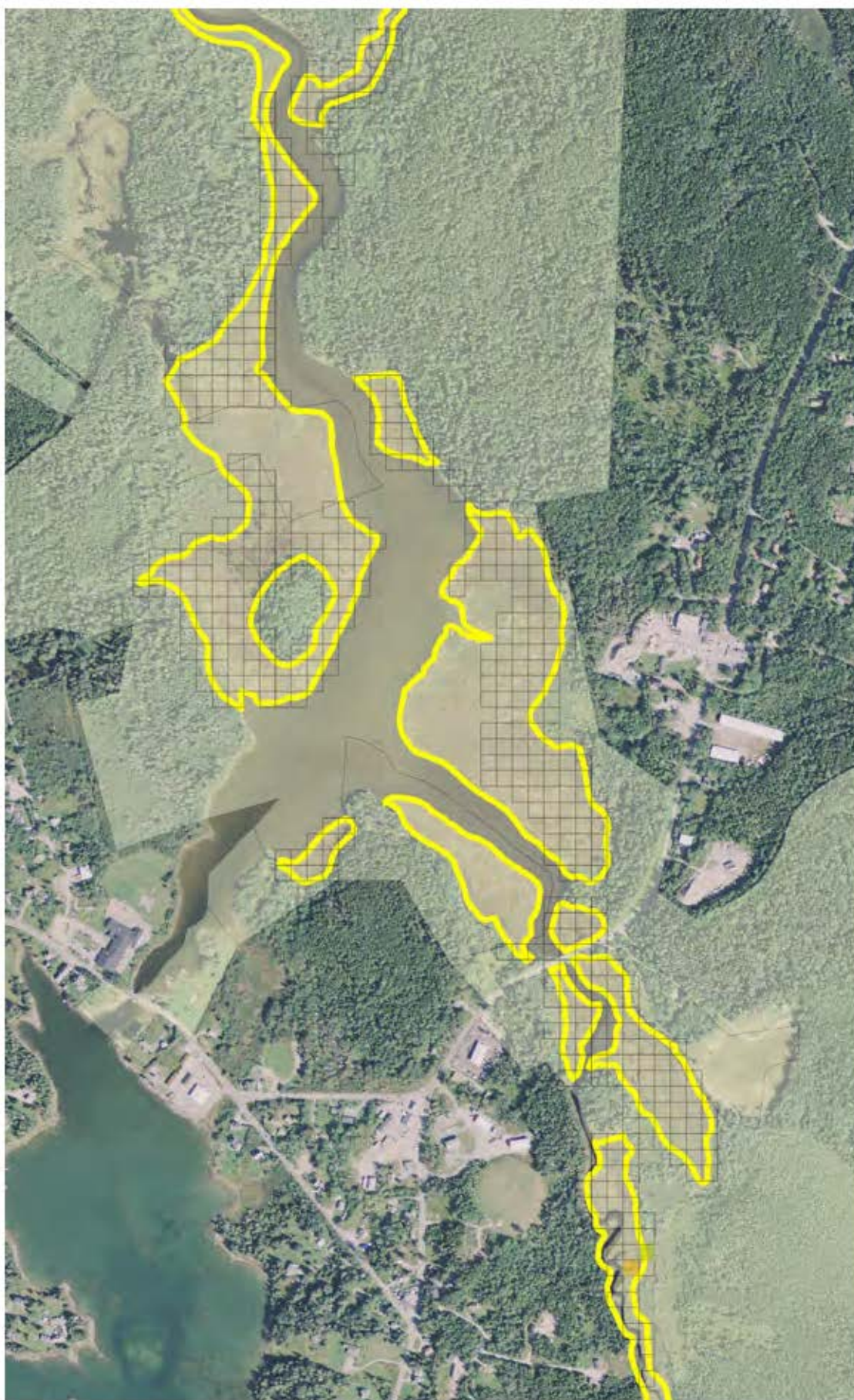
*Scutellaria galericulata*



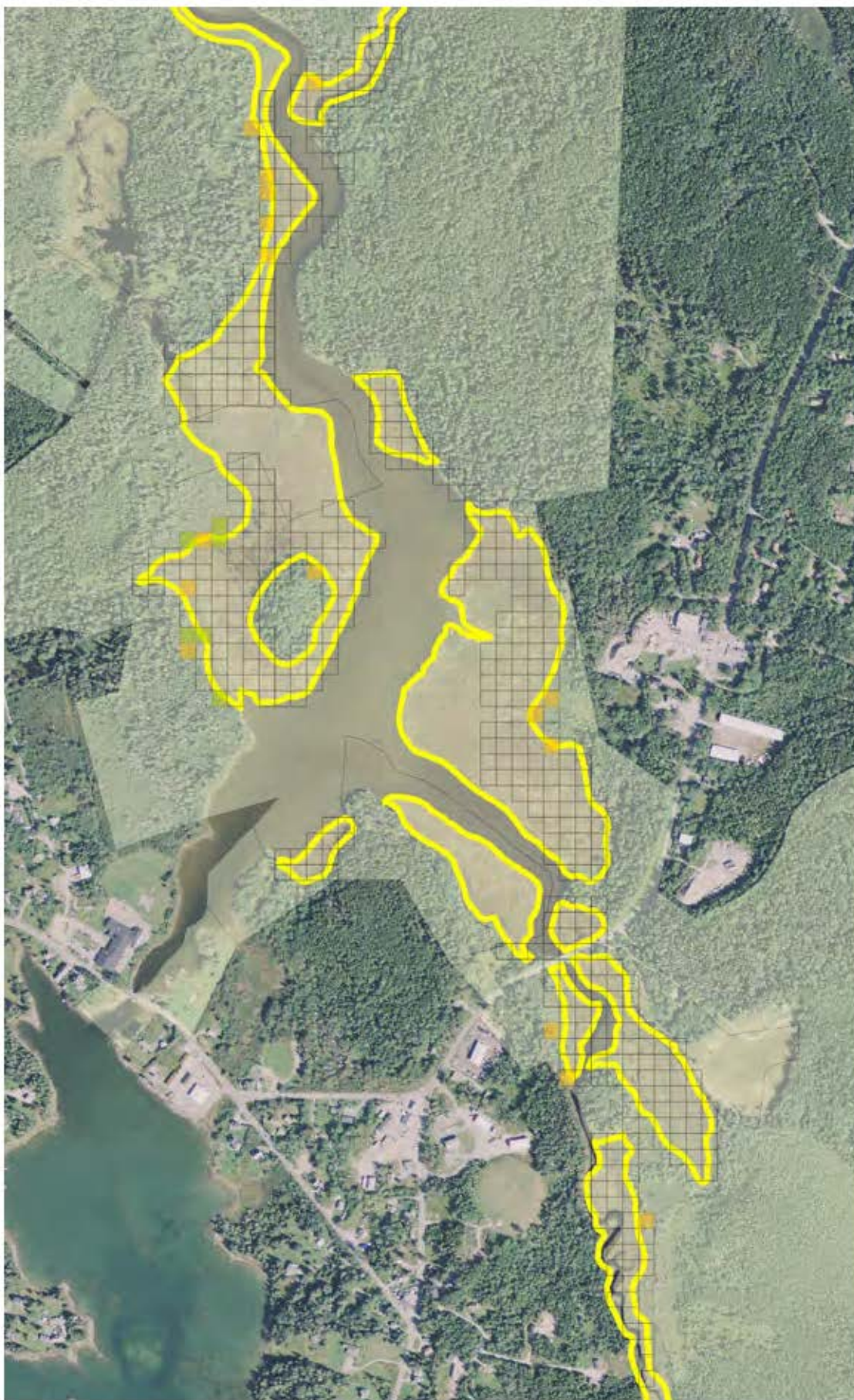
*Solidago rugosa*



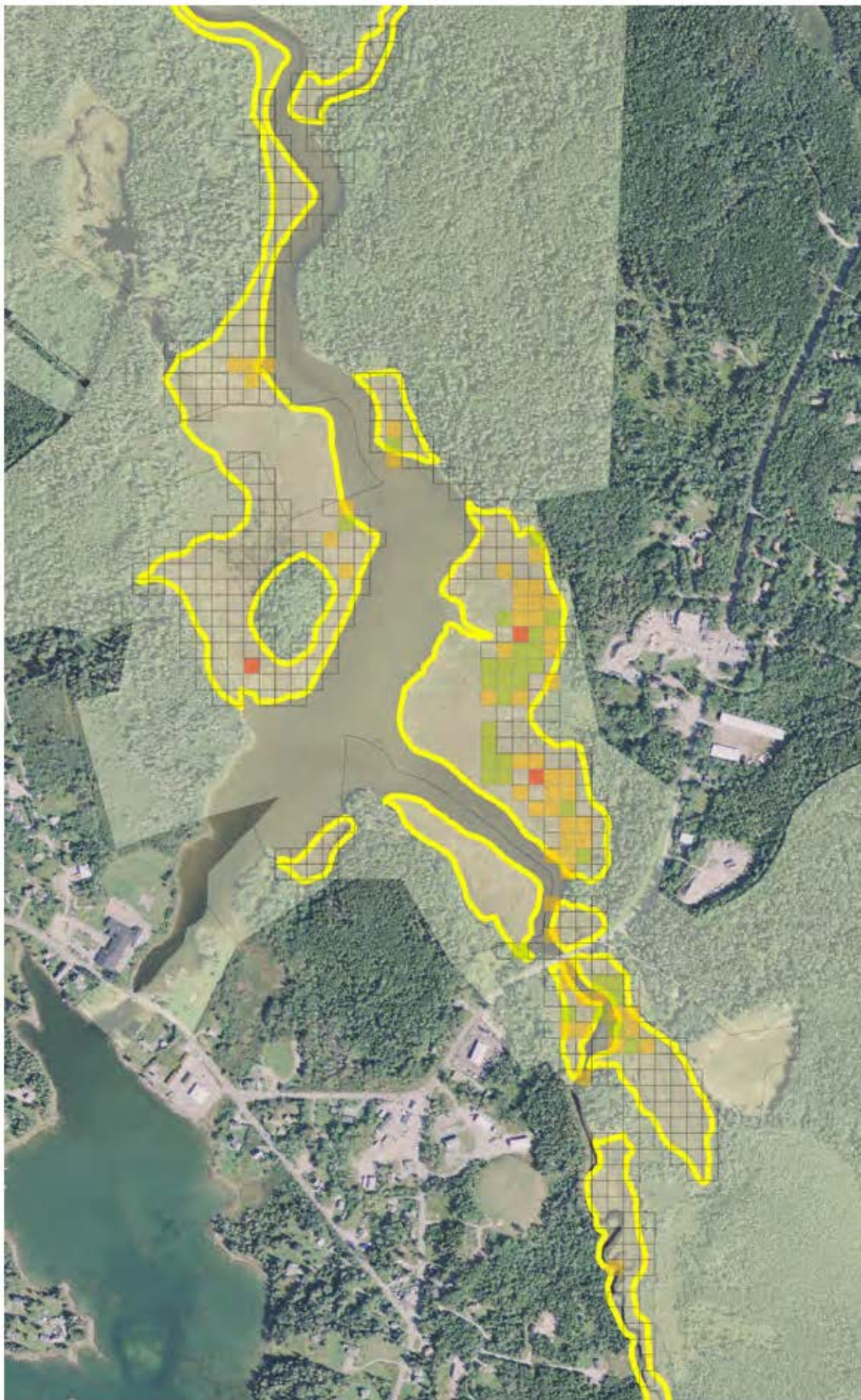
*Solidago sempervirens* var. *sempervirens*



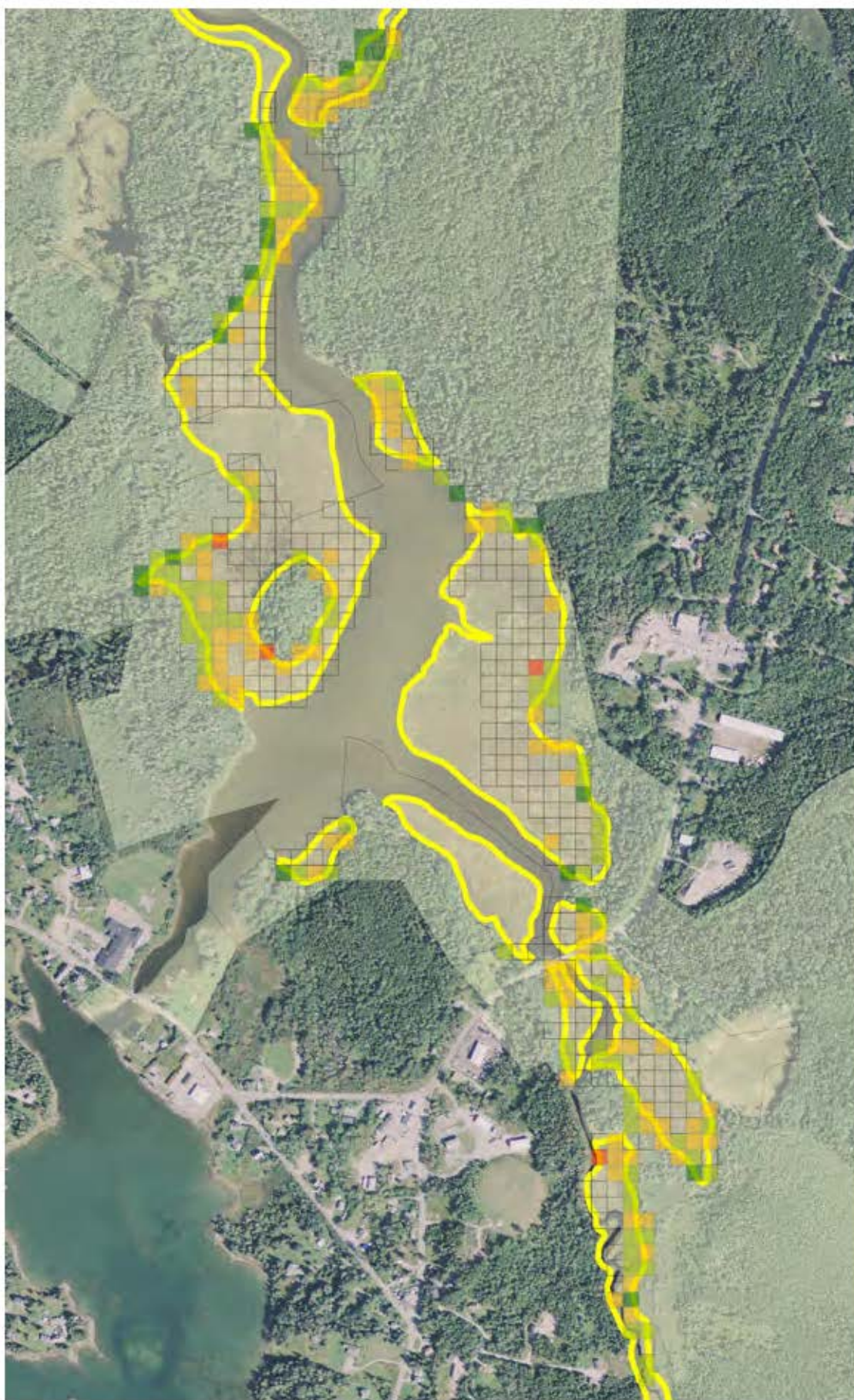
*Solidago* sp.



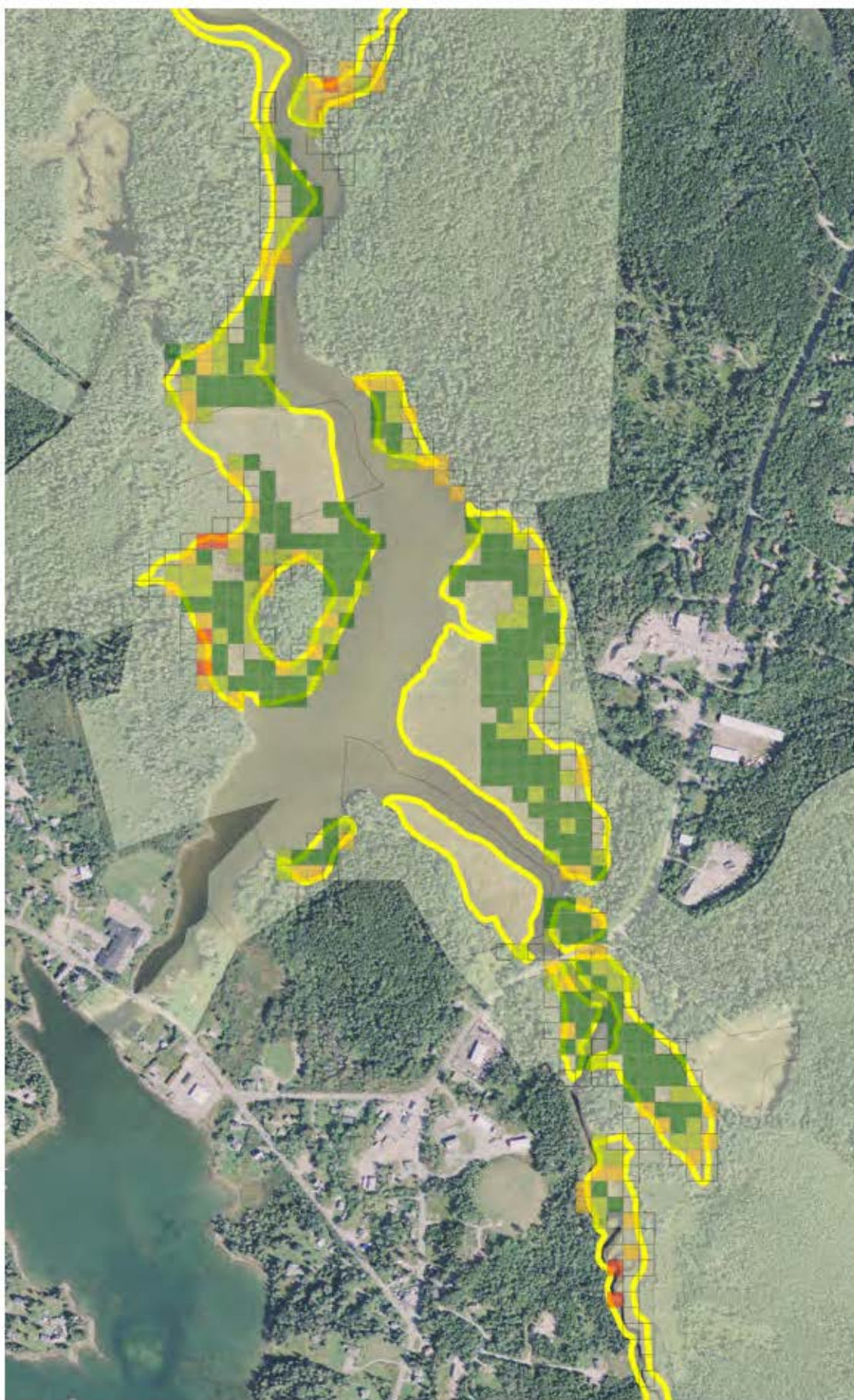
*Spiraea alba* var. *latifolia*



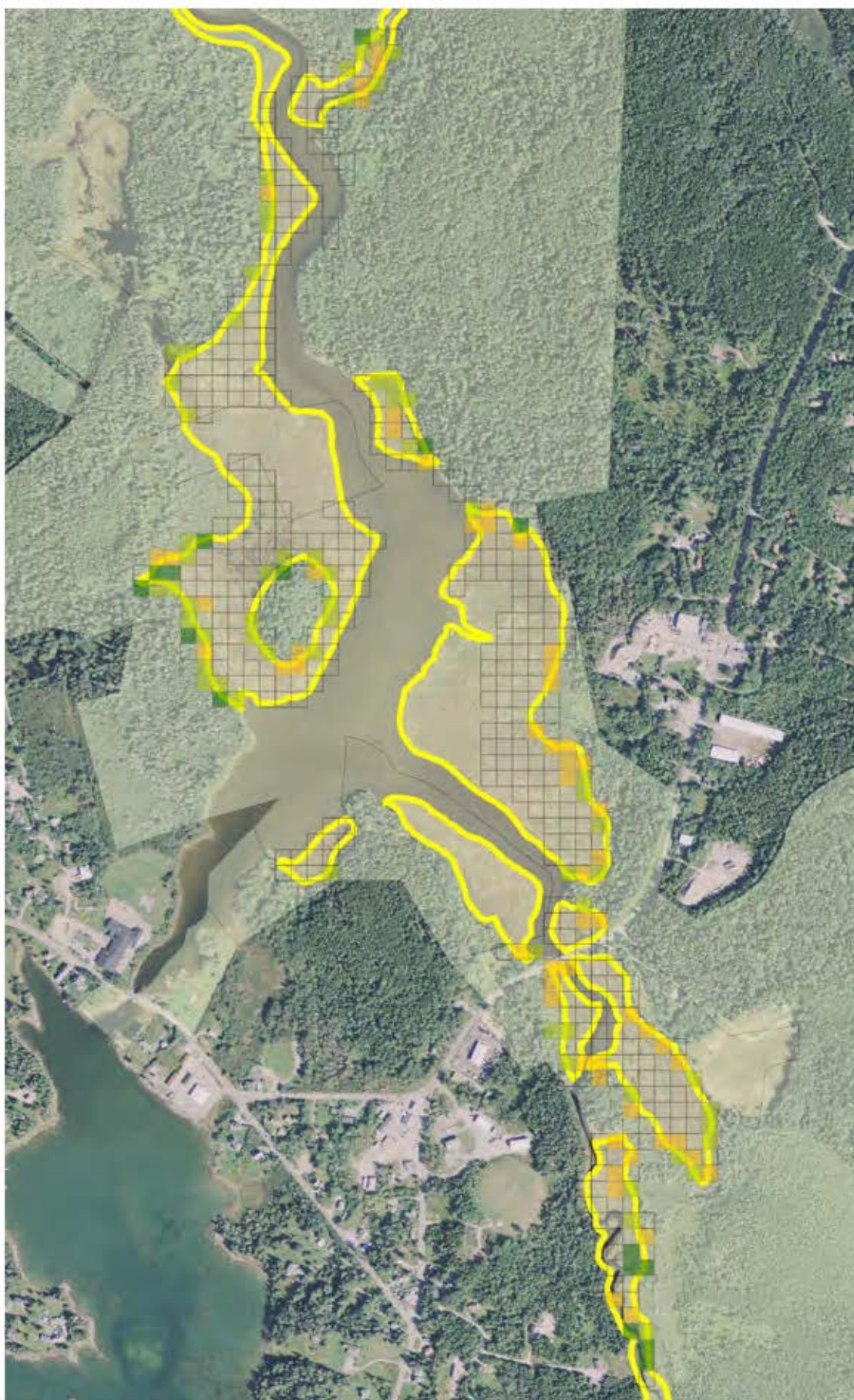
*Sporobolus alterniflorus*



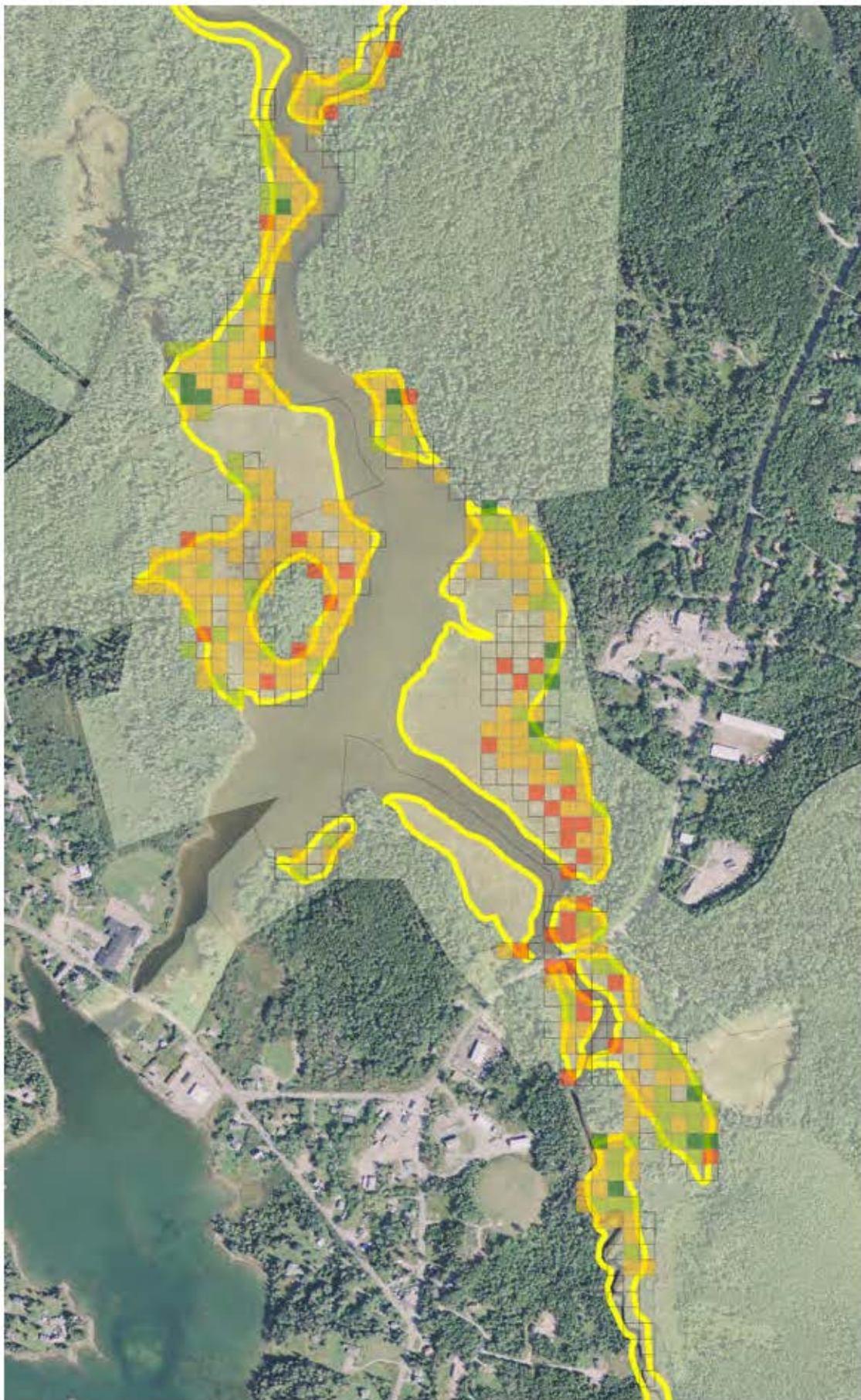
*Sporobolus michauxianus*



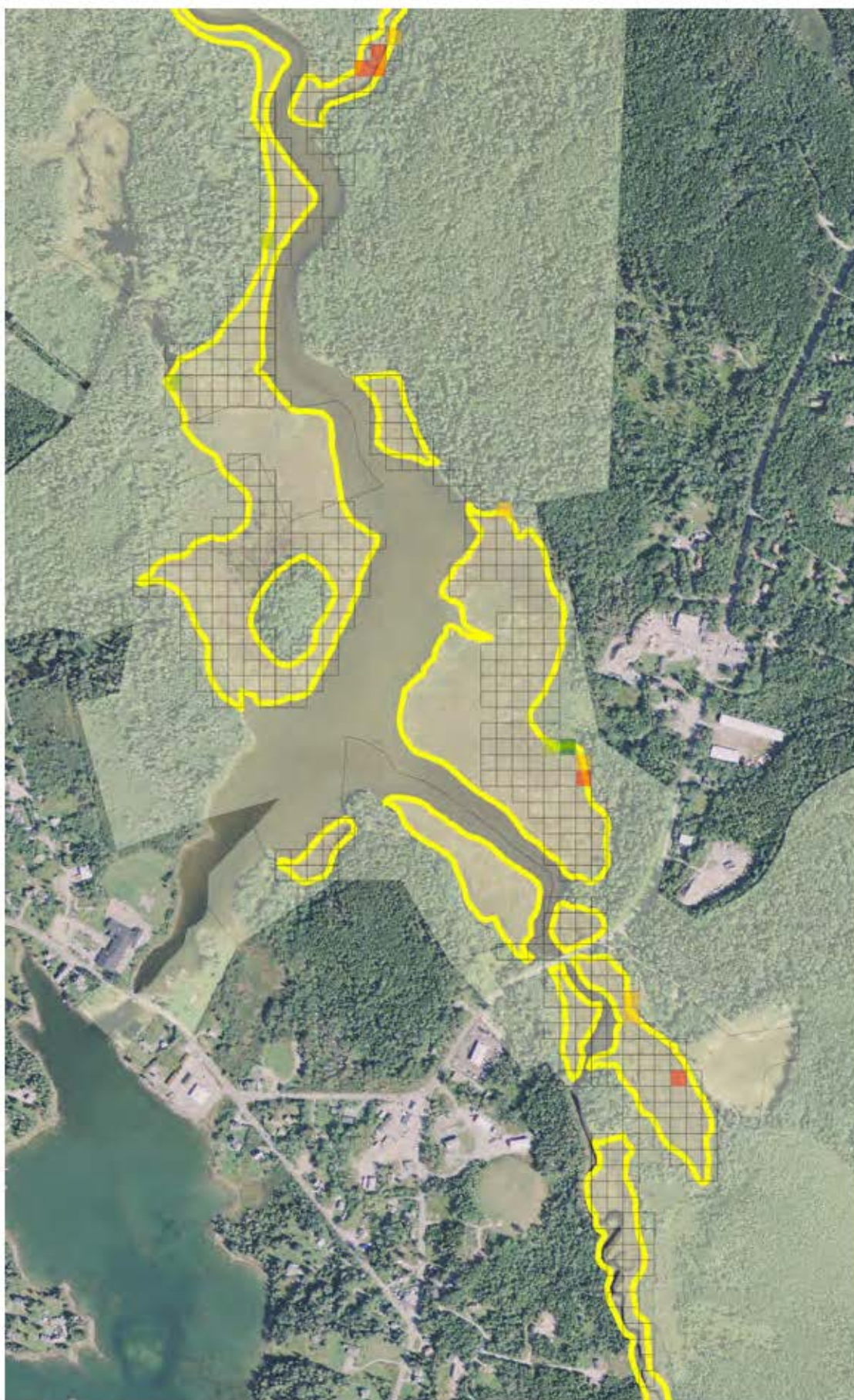
*Sporobolus pumilus*



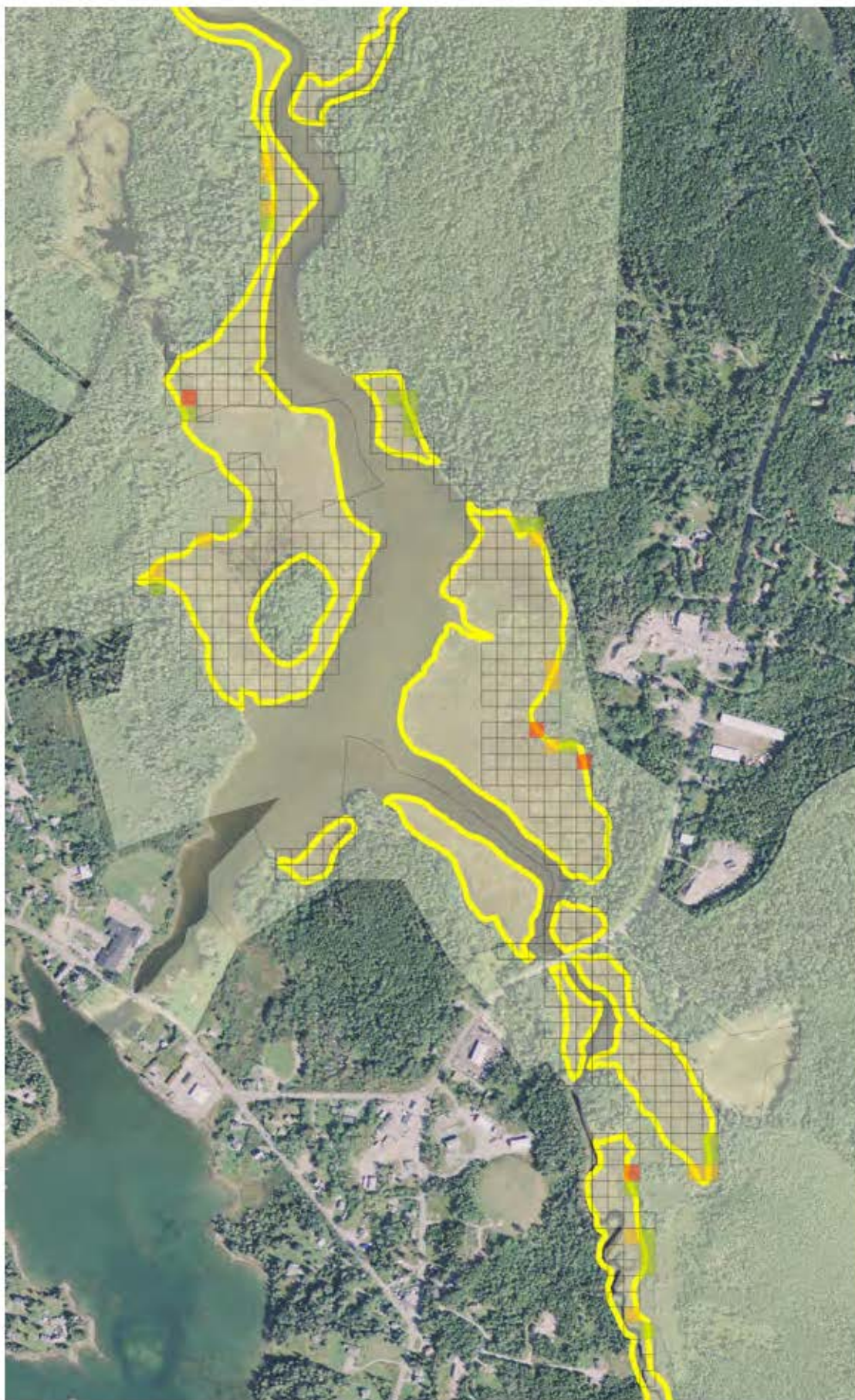
*Symphyotrichum* sp.



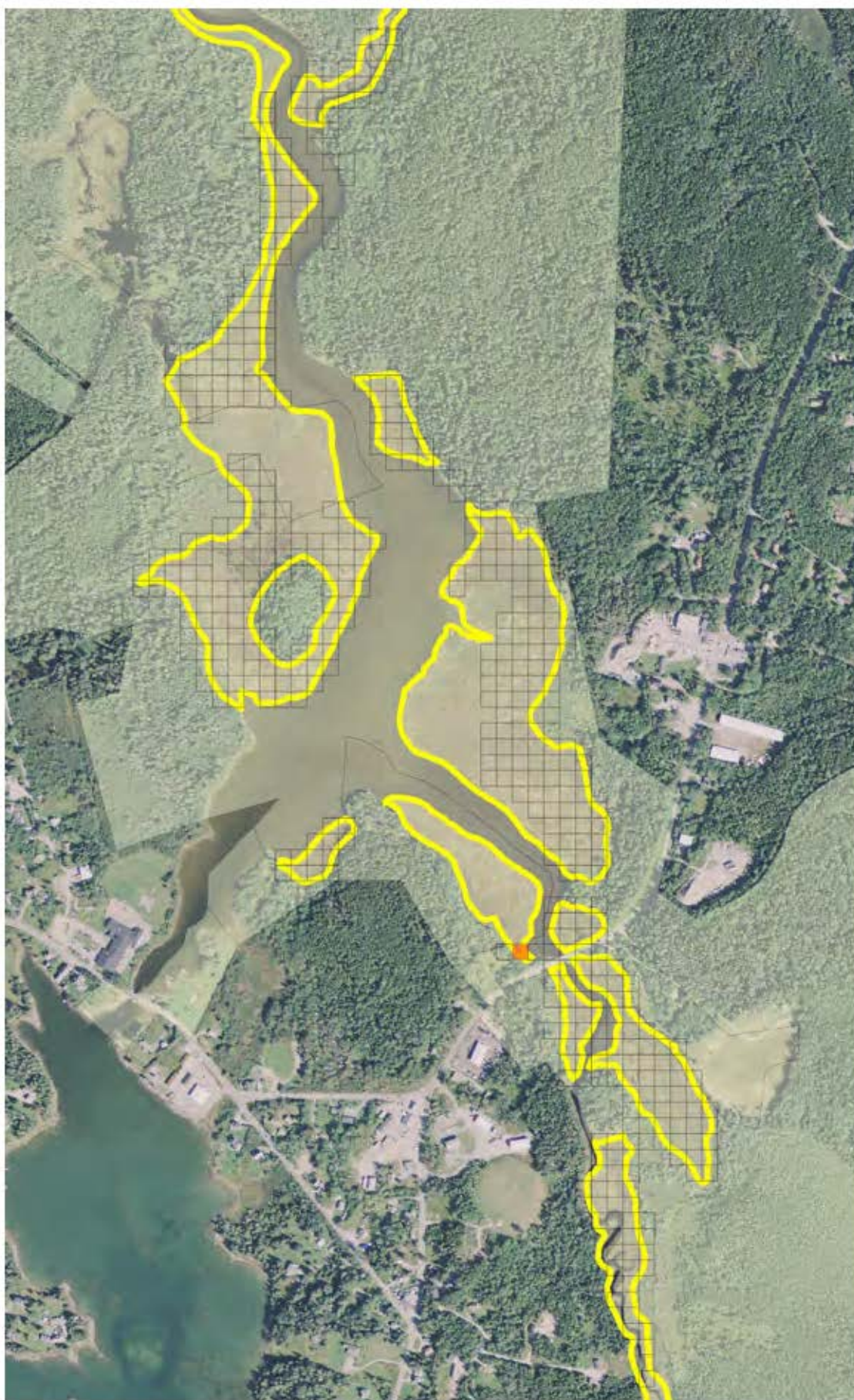
*Triglochin maritima*



*Typha latifolia*

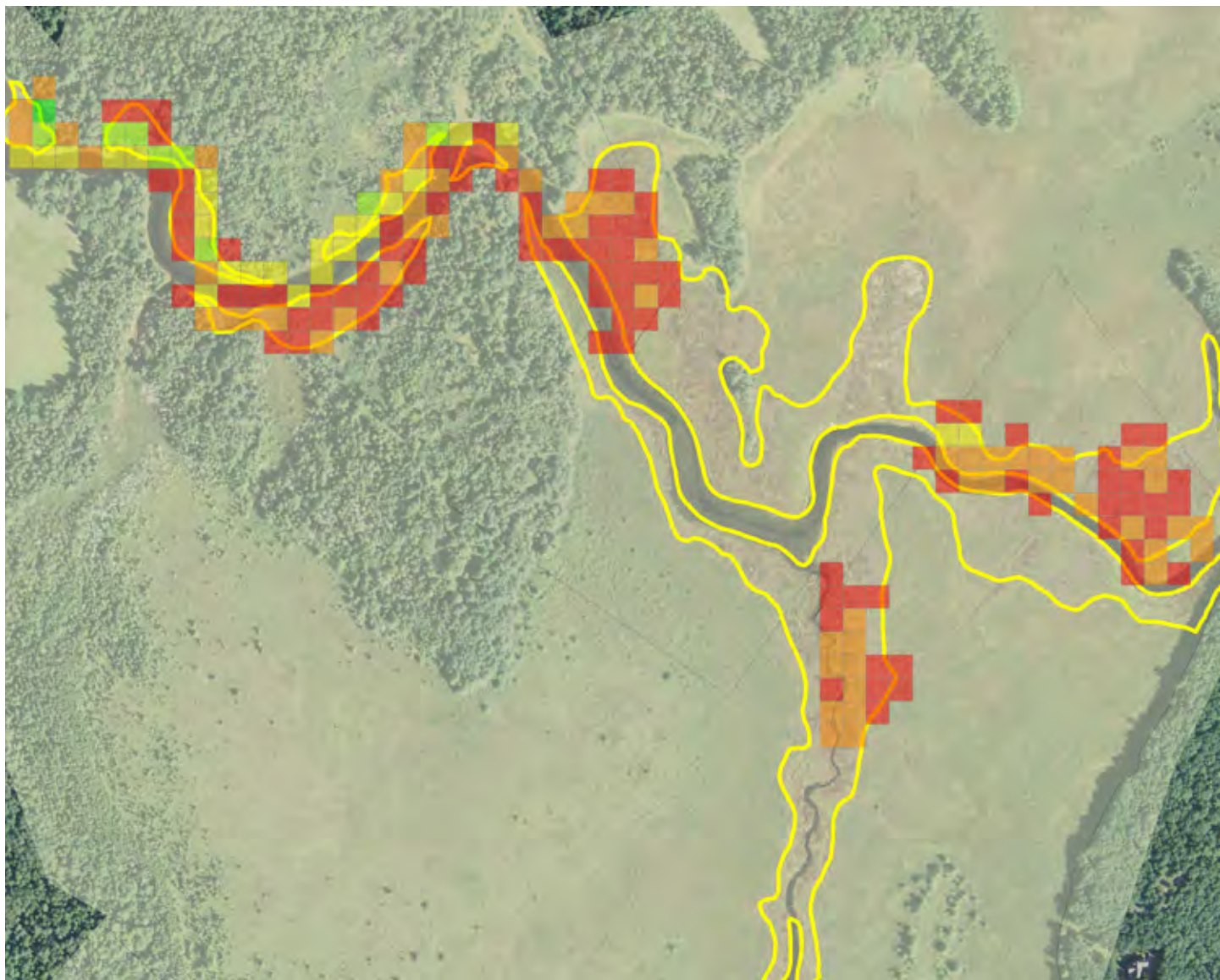


*Vaccinium macrocarpon*

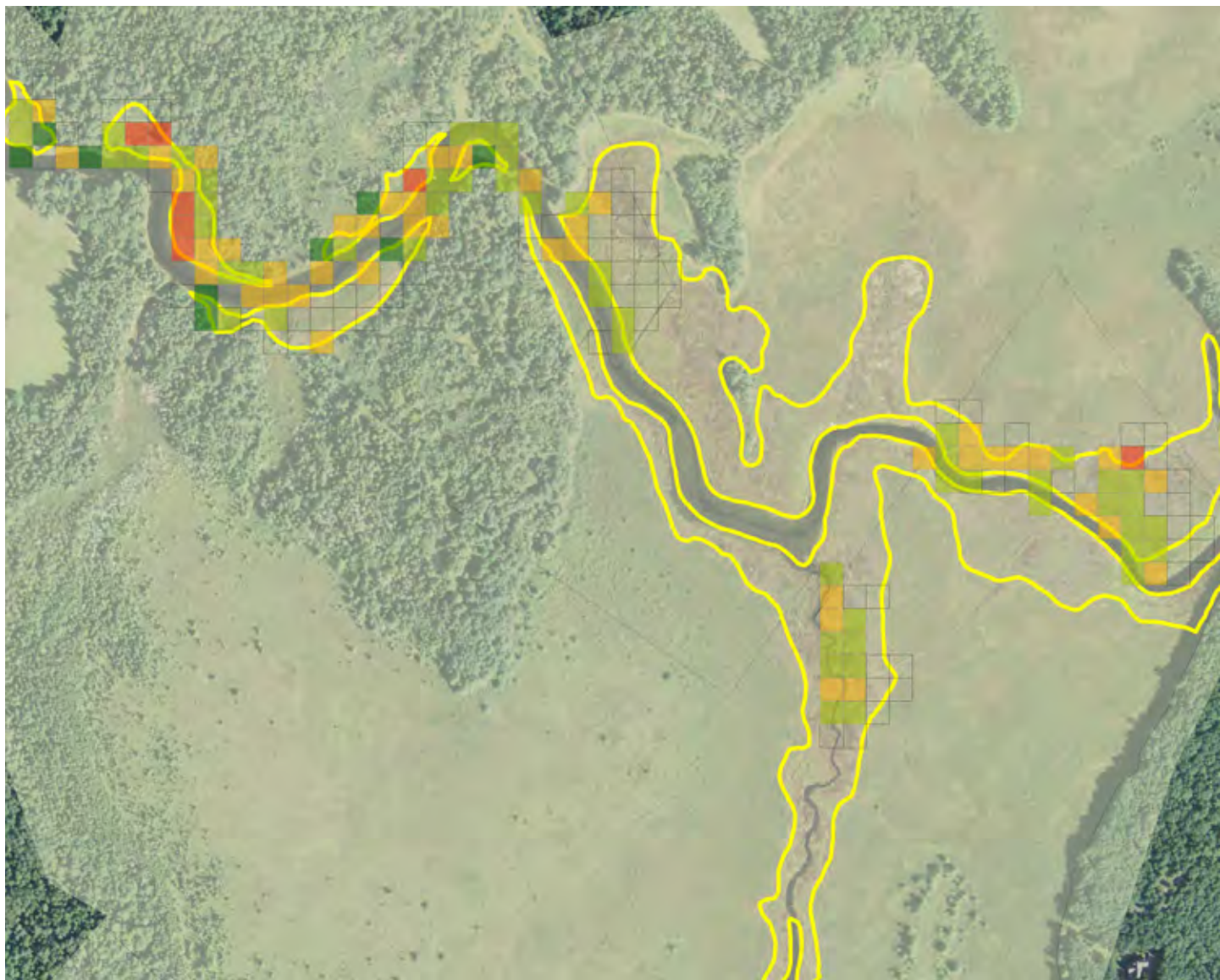


*Vicia cracca* ssp. *cracca*

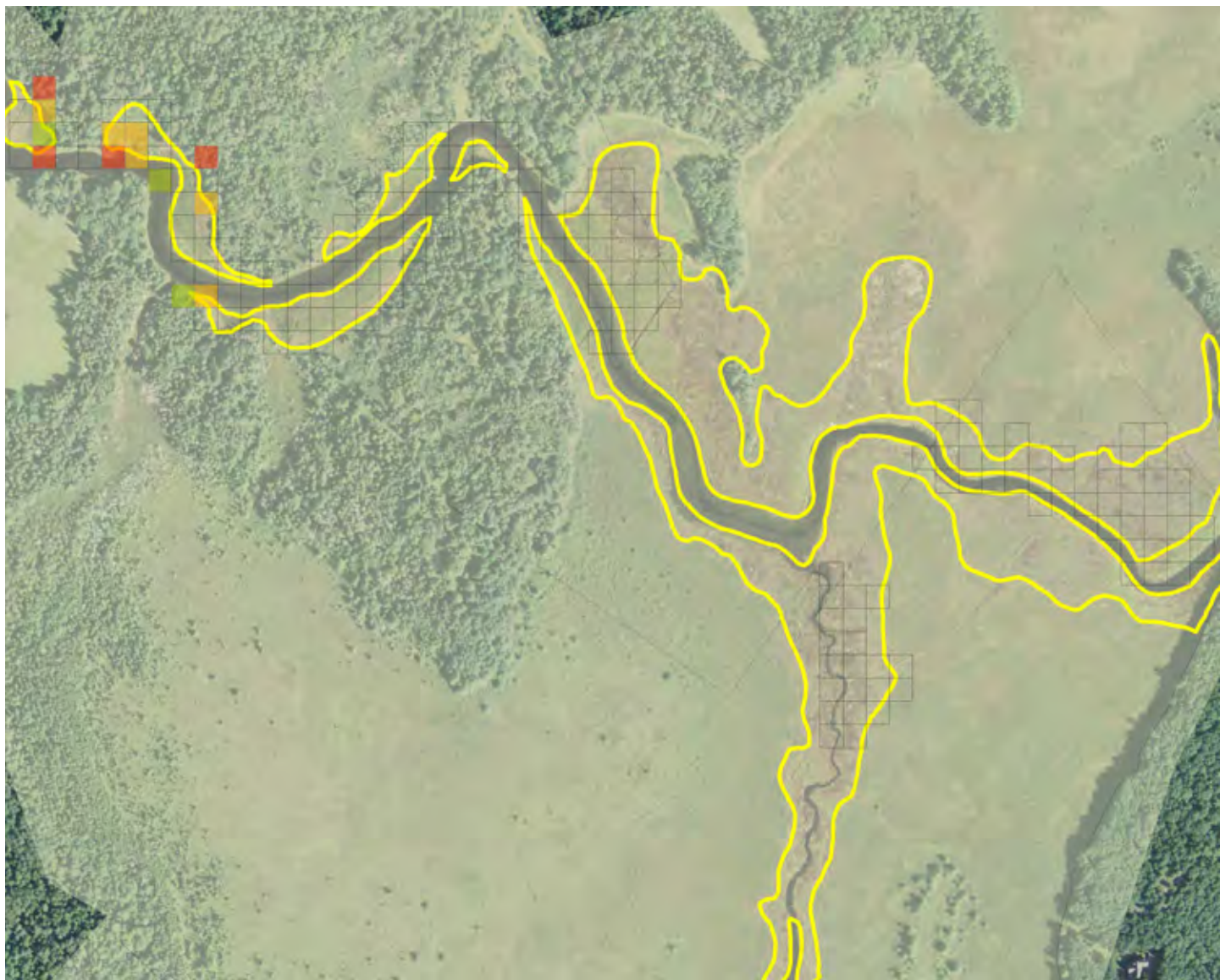
Appendix 2. Plant distribution maps for the salt marsh area at Northeast Creek



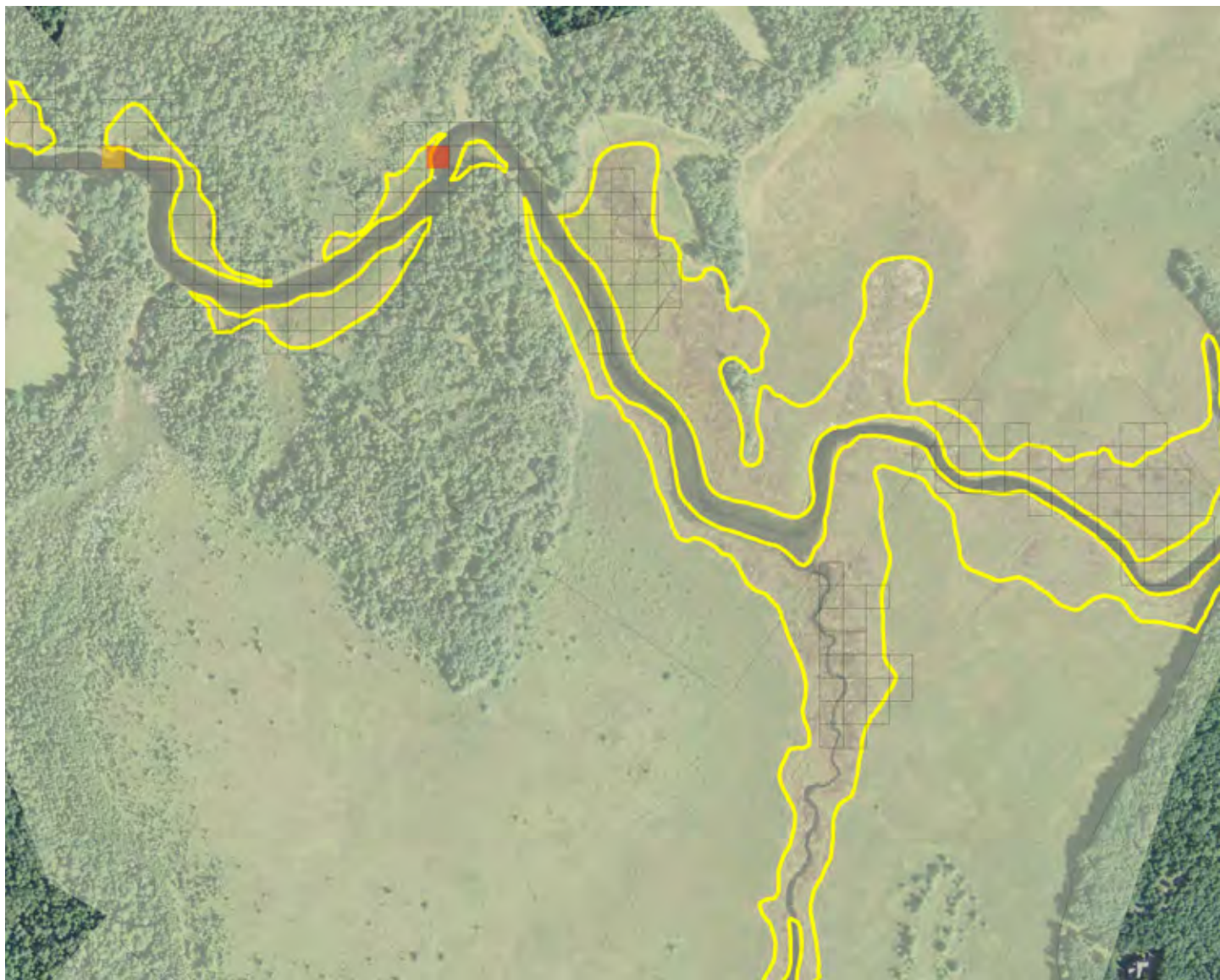
Number of species per grid cell



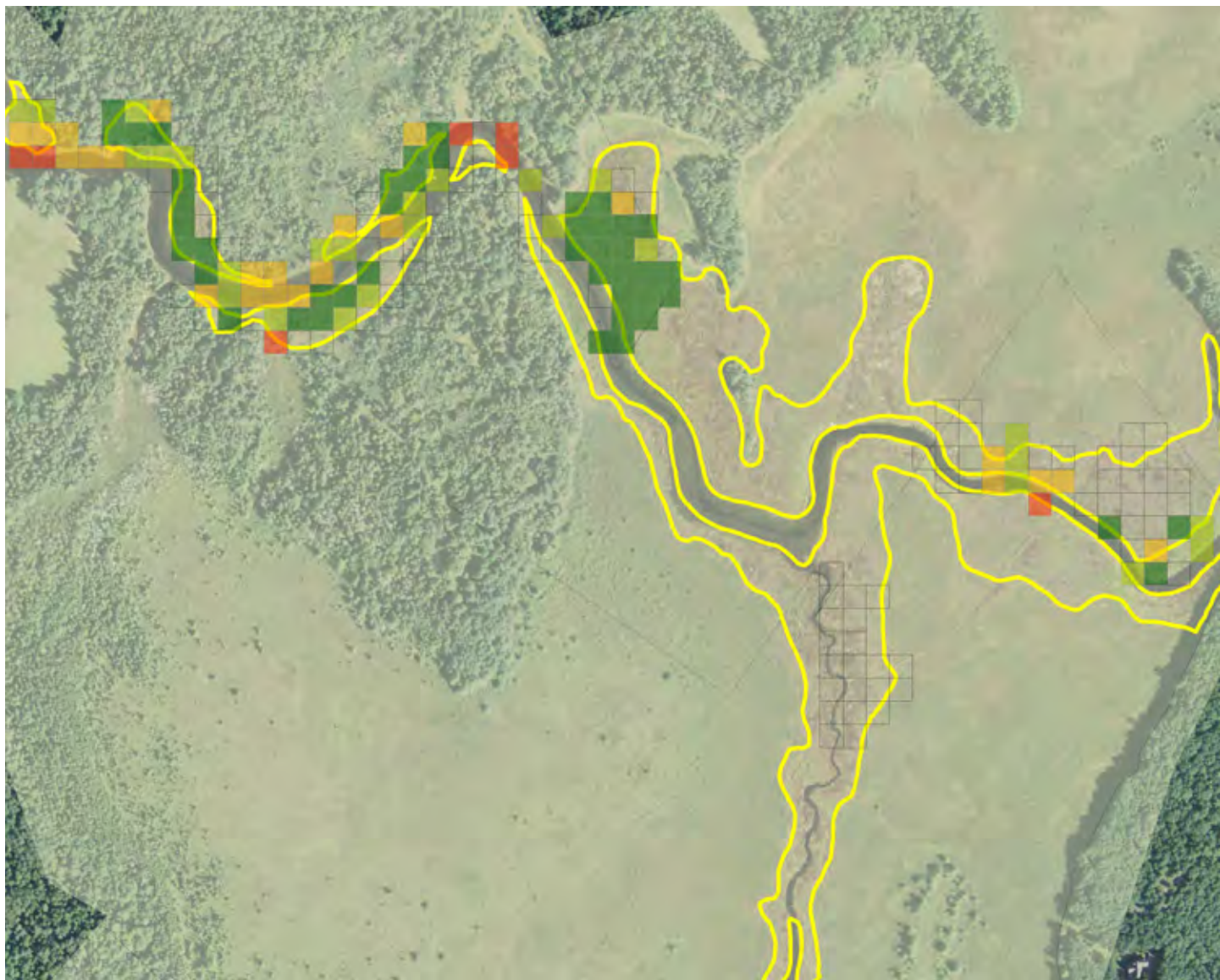
*Agrostis stolonifera*



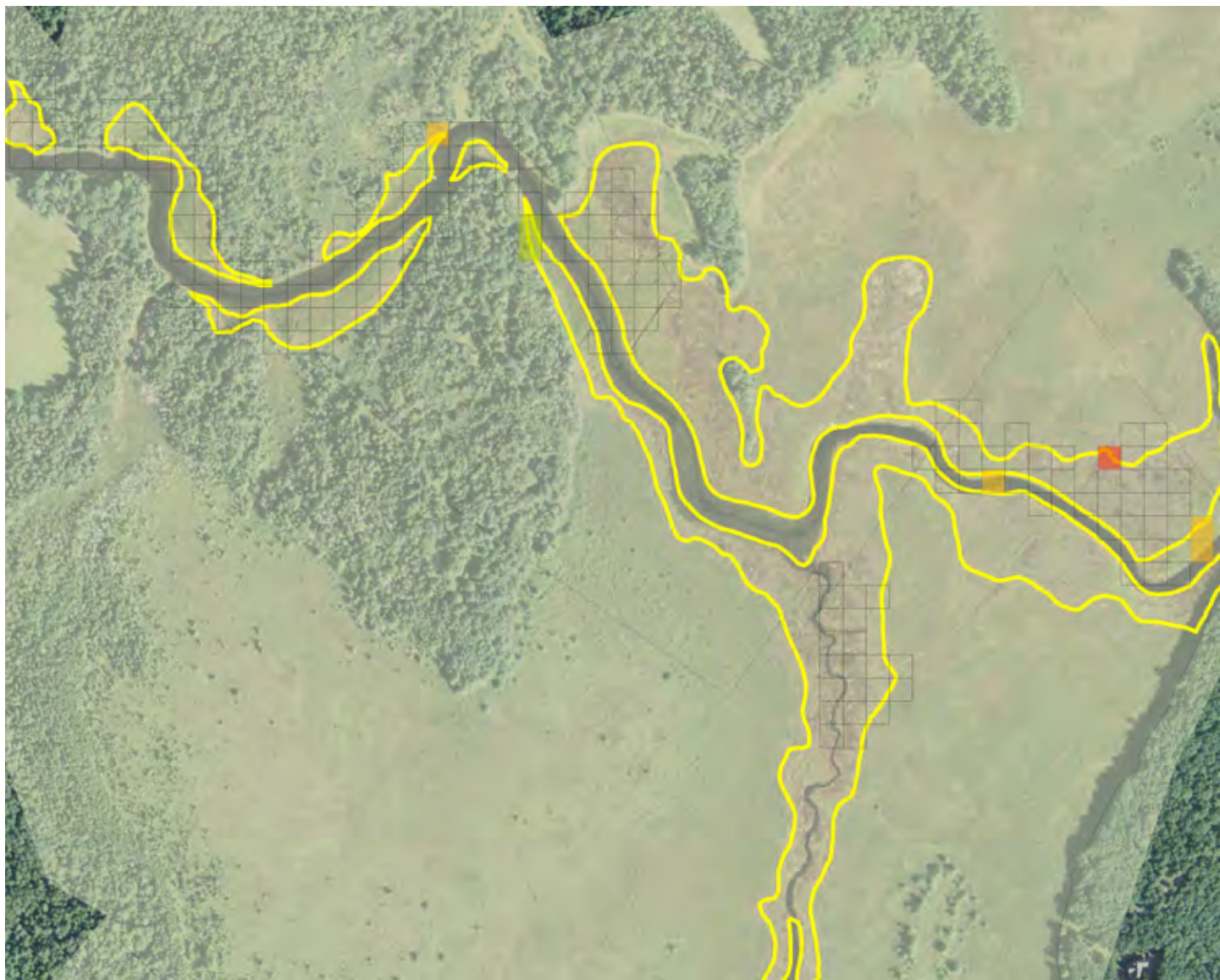
*Anthoxanthum nitens* ssp. *nitens*



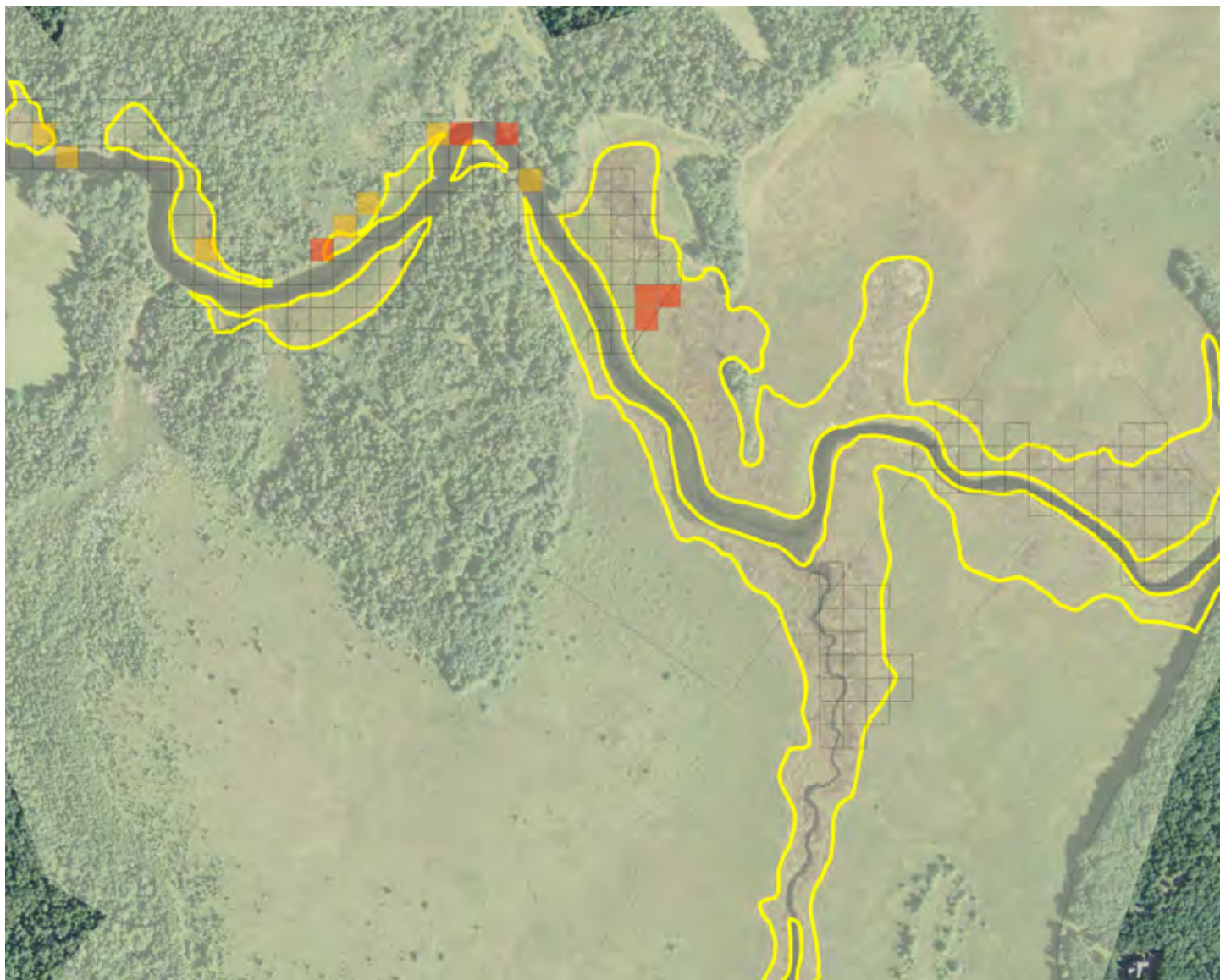
*Atriplex acadiensis*



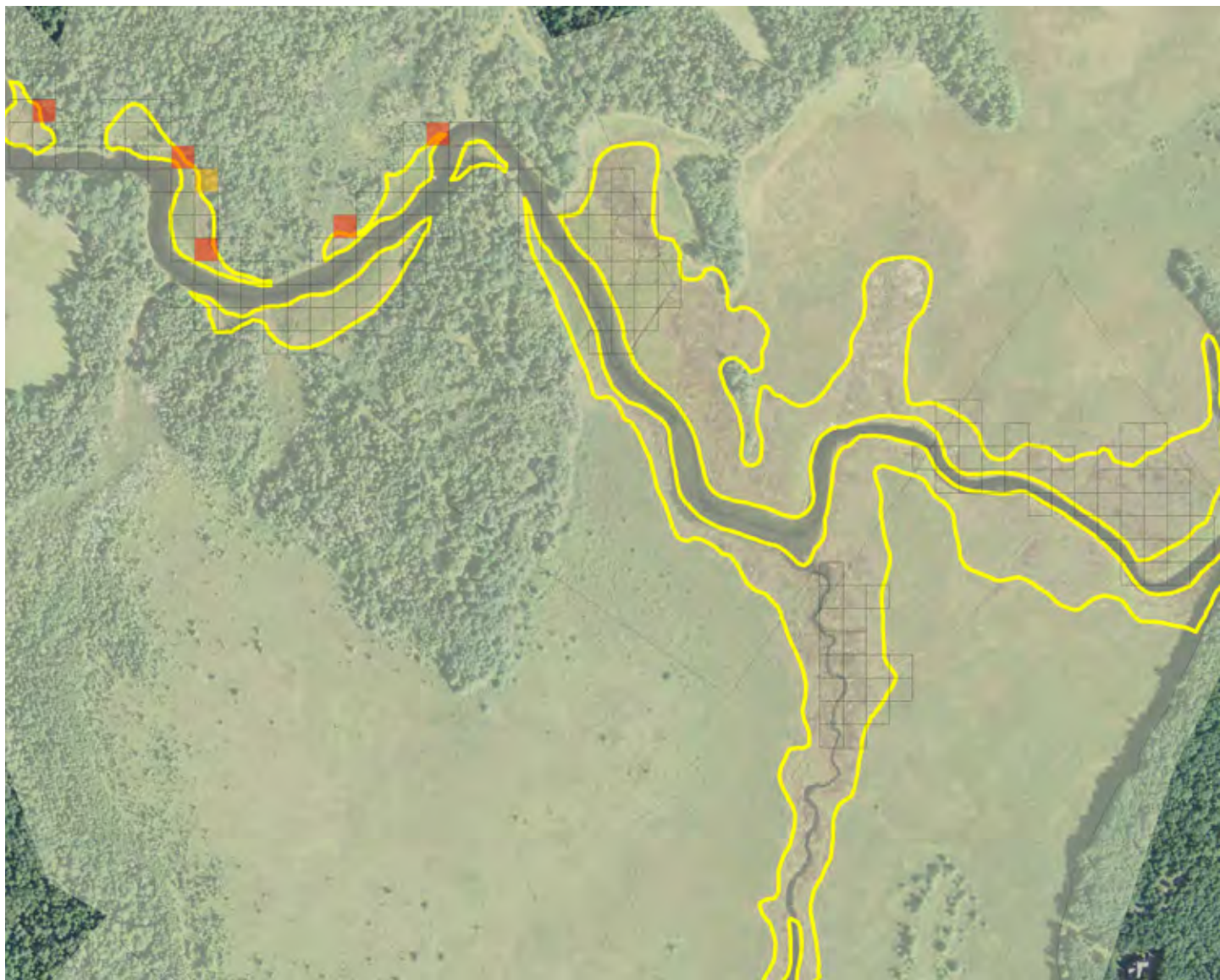
*Bolboschoenus maritimus* ssp. *paludosus*



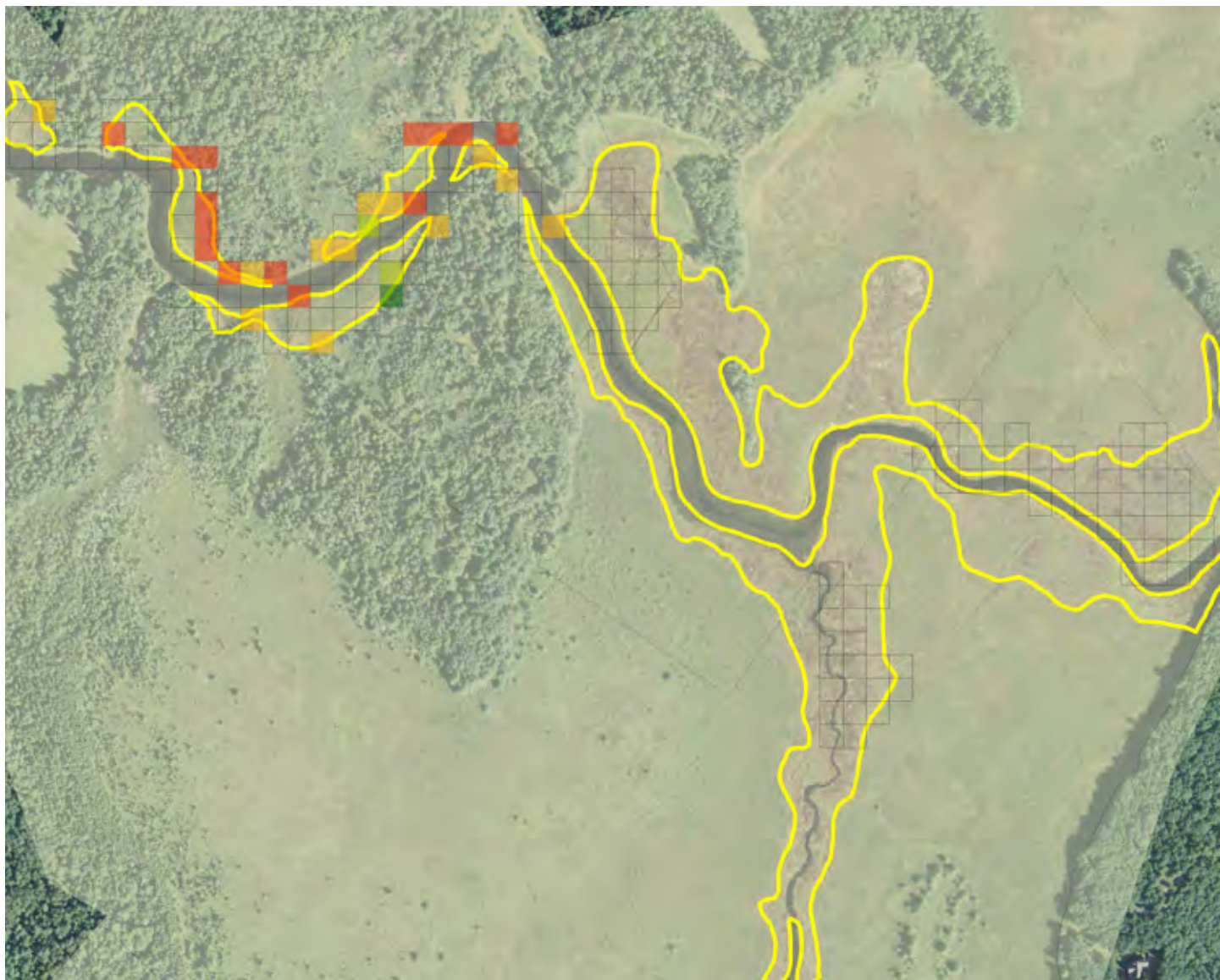
*Calamagrostis canadensis*



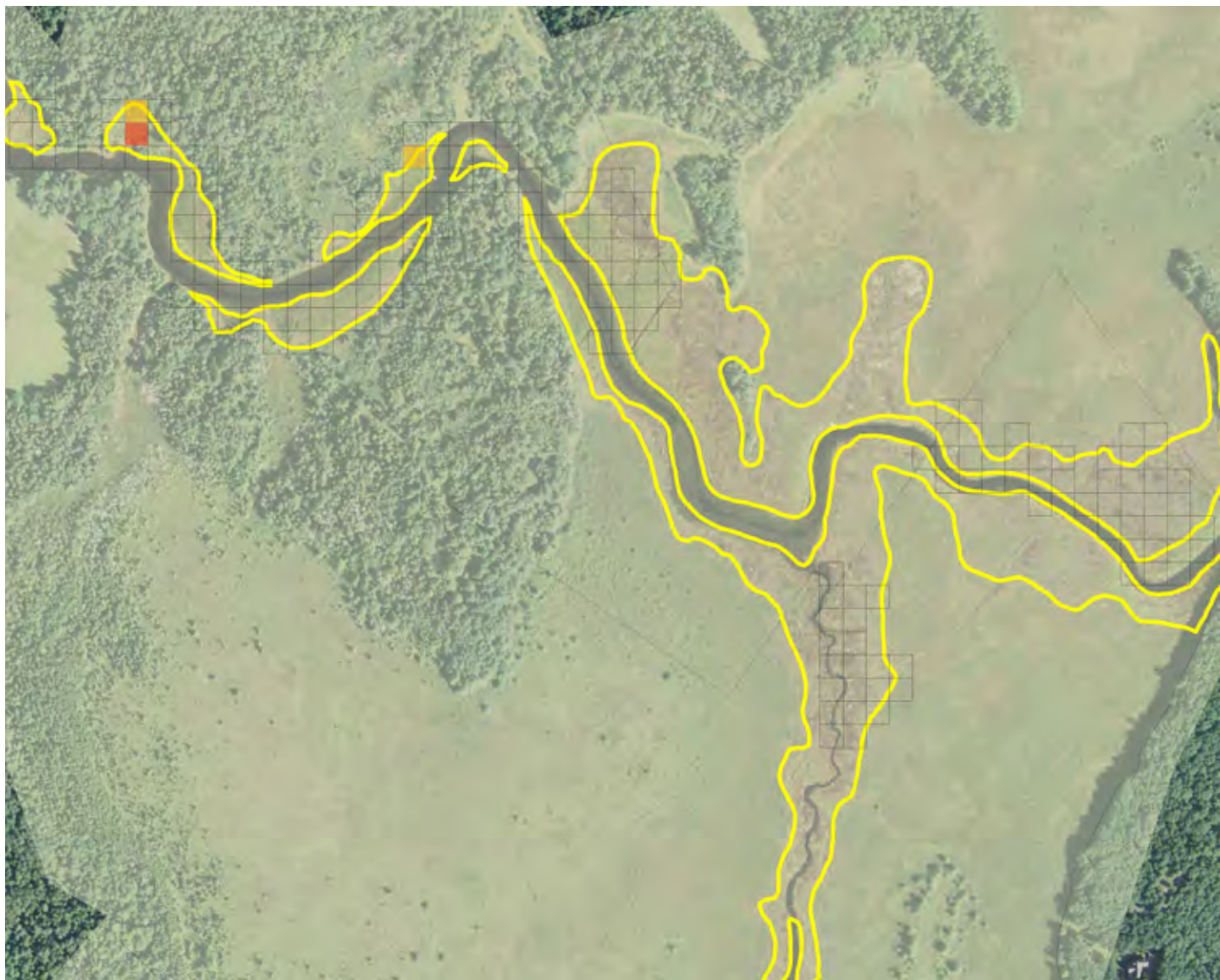
*Calystegia sepium*



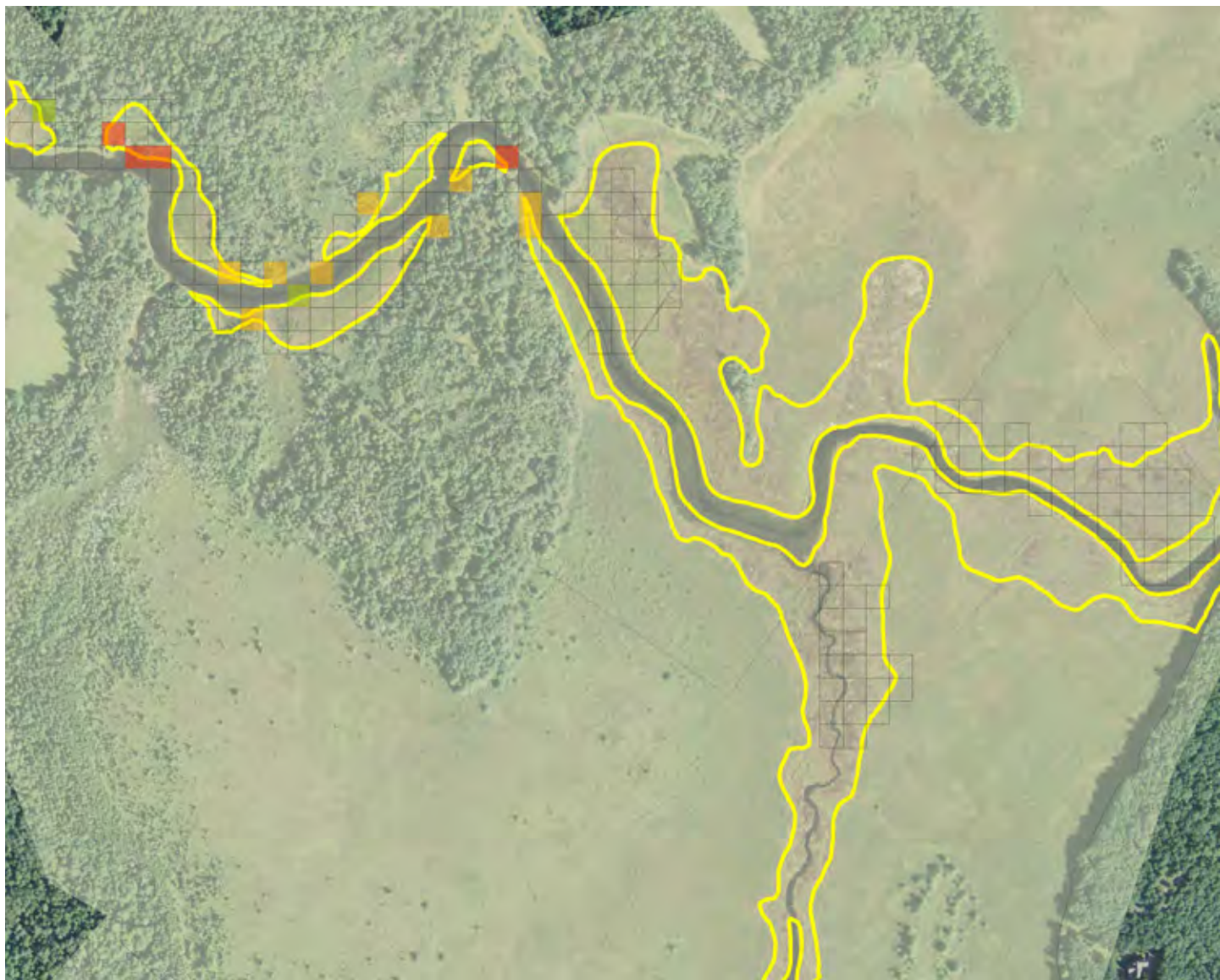
*Carex folliculata*



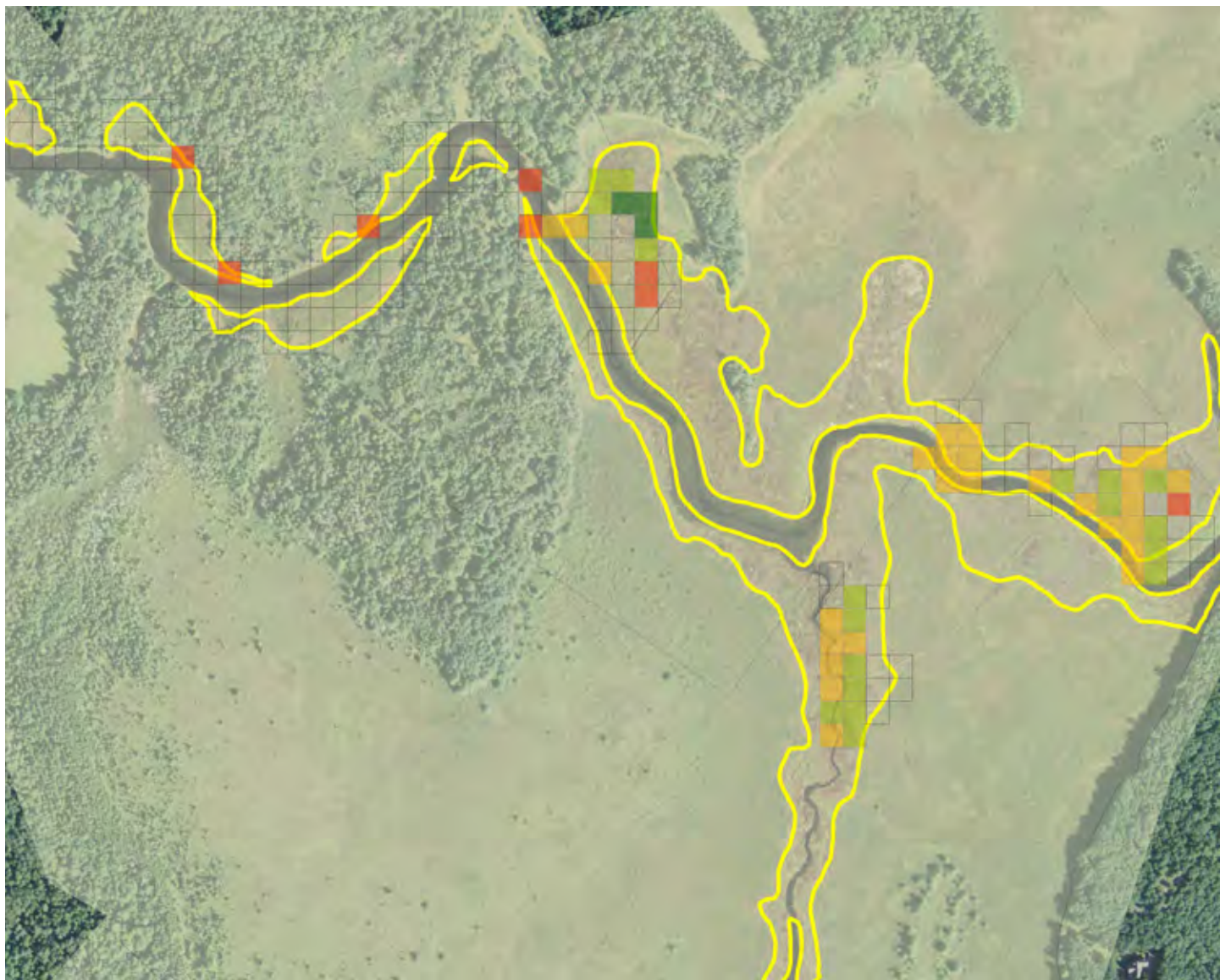
*Carex hormathodes*



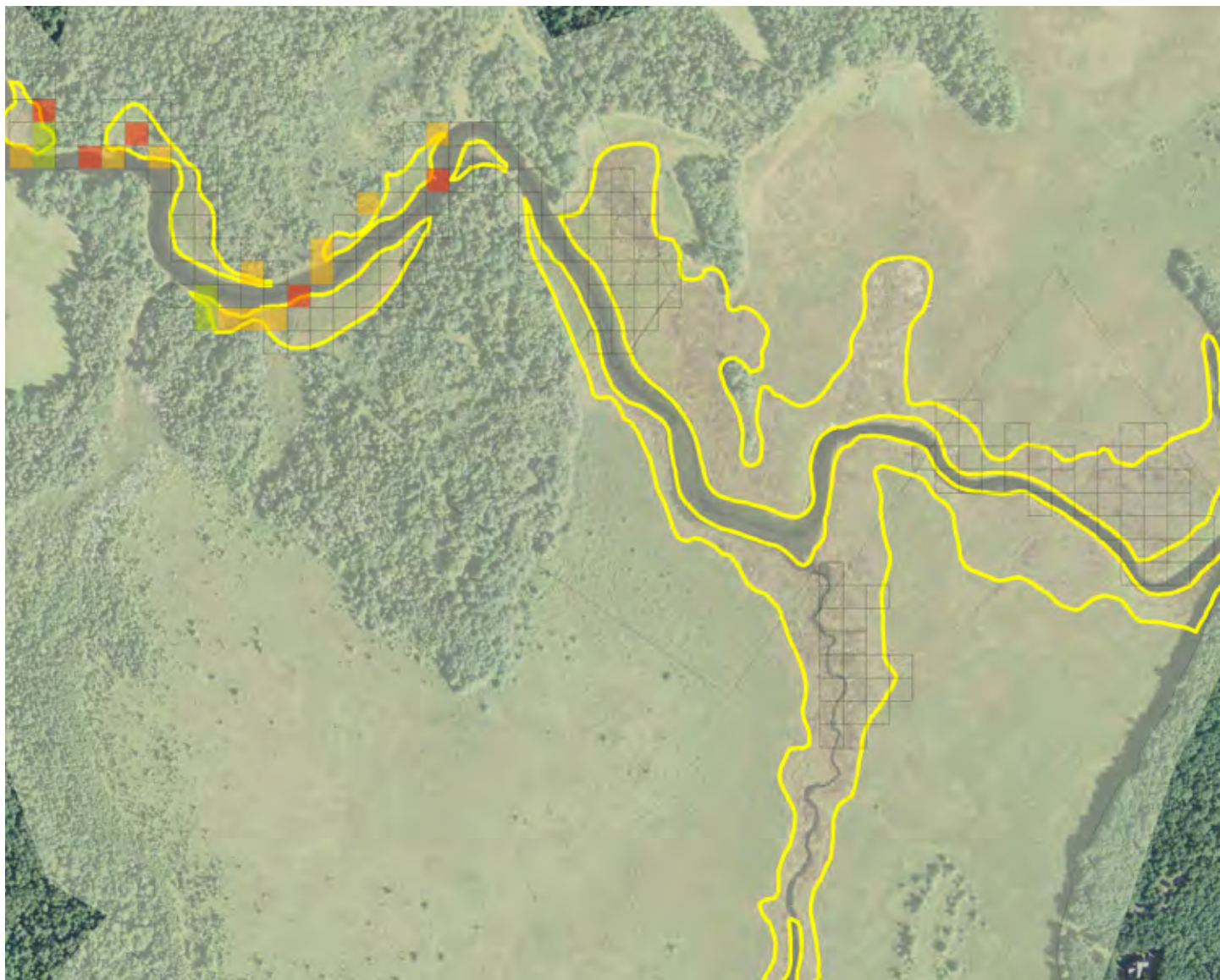
*Carex paleacea*



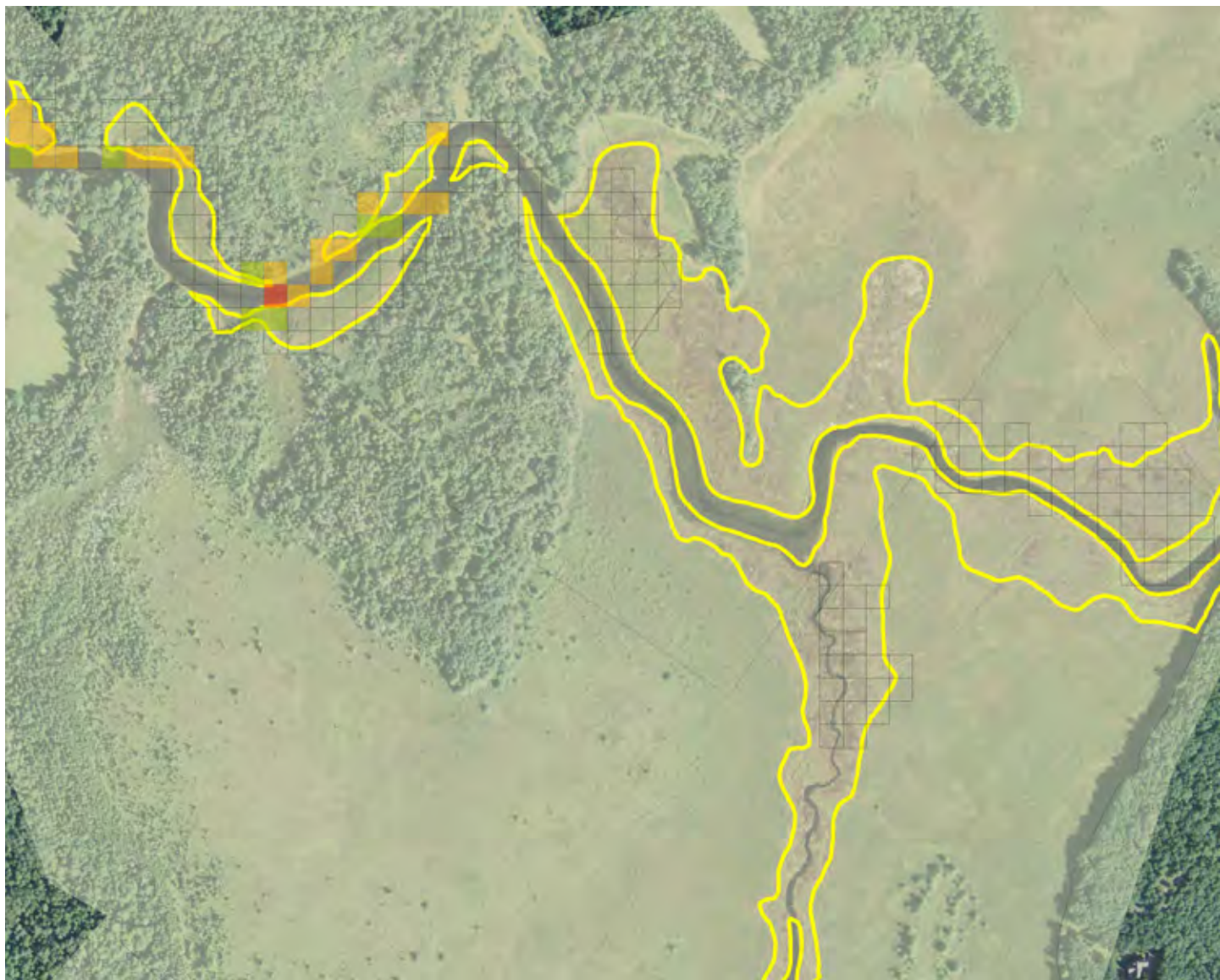
*Chamaedaphne calyculata*



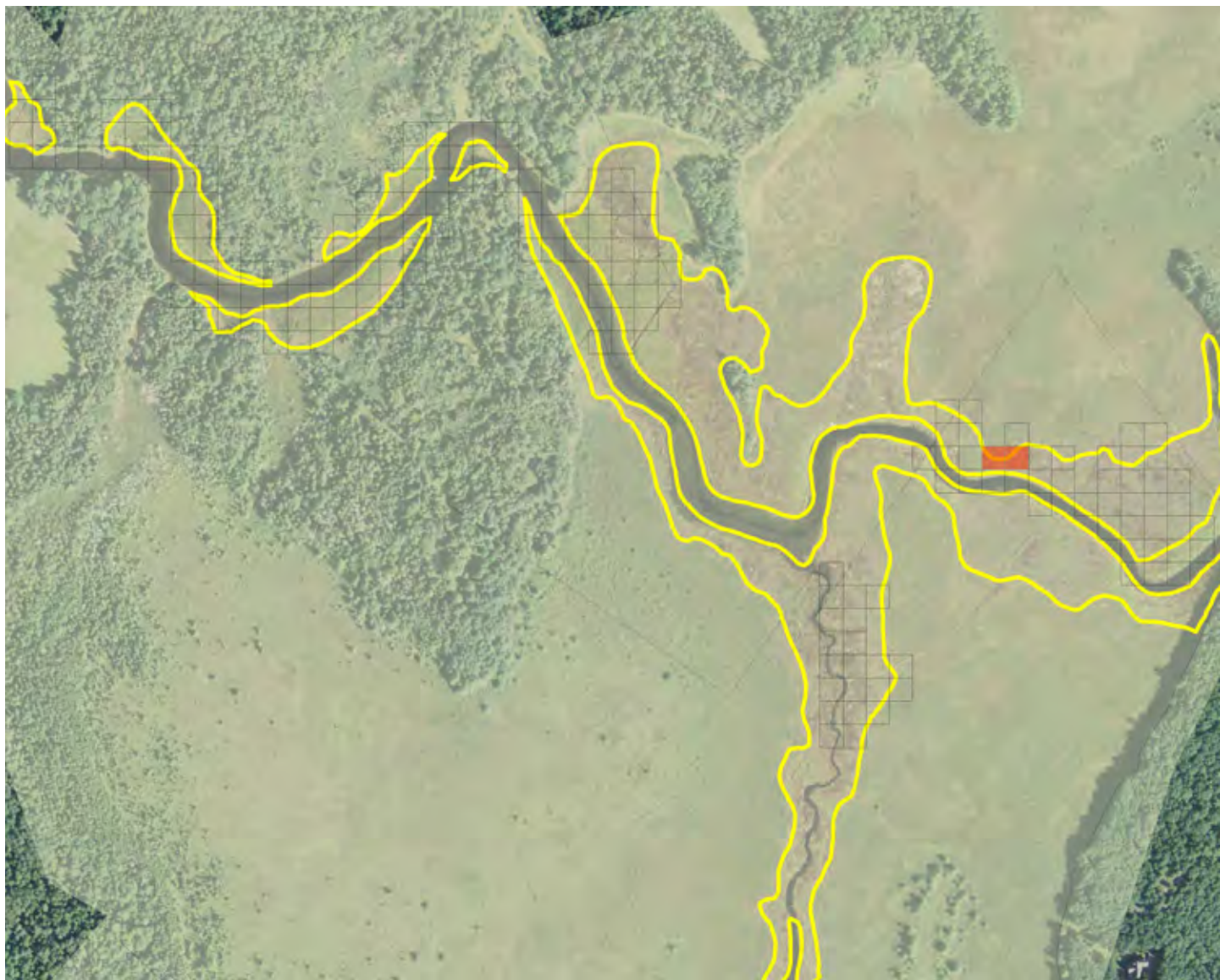
*Eleocharis* sp.



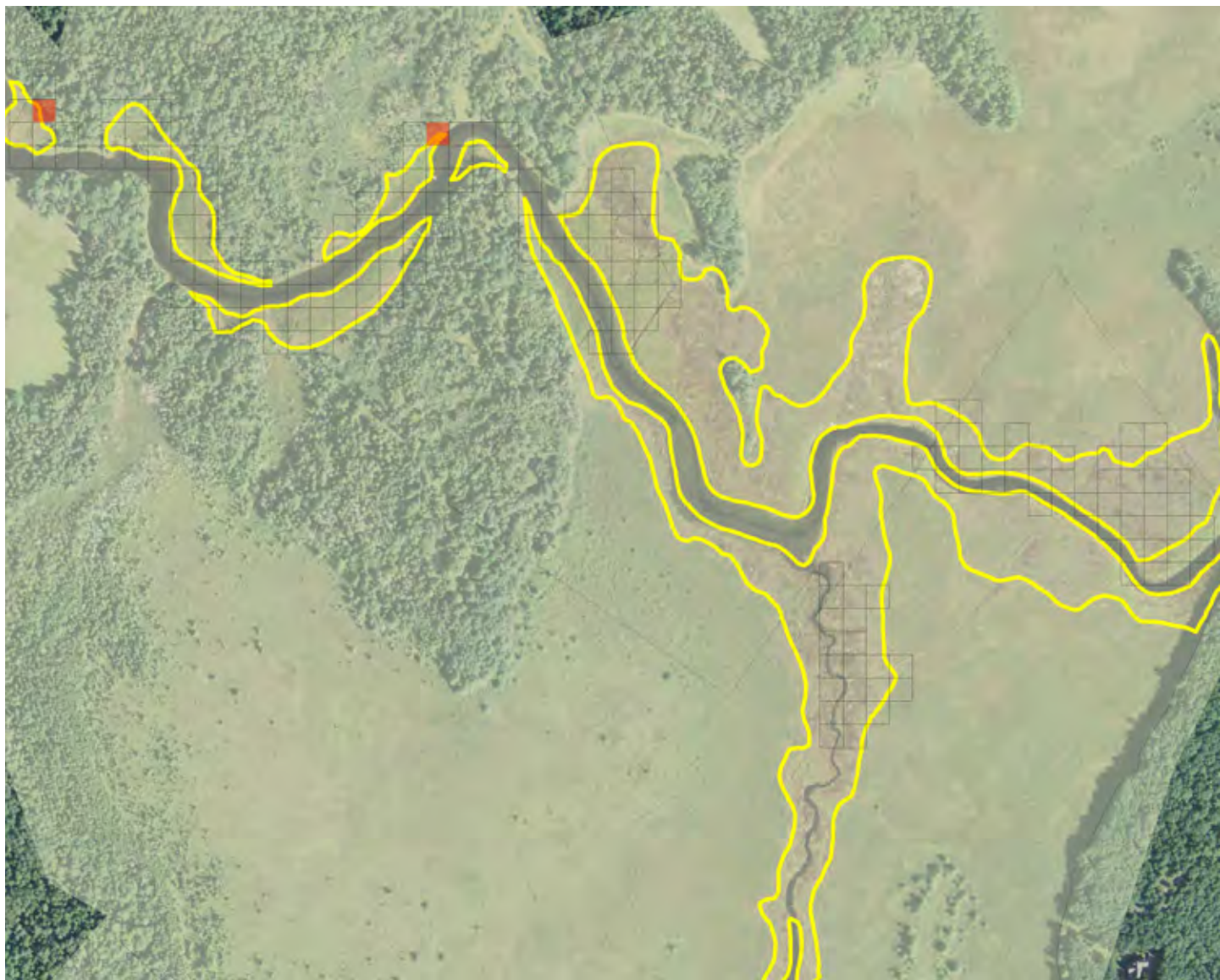
*Elymus trachycaulus*



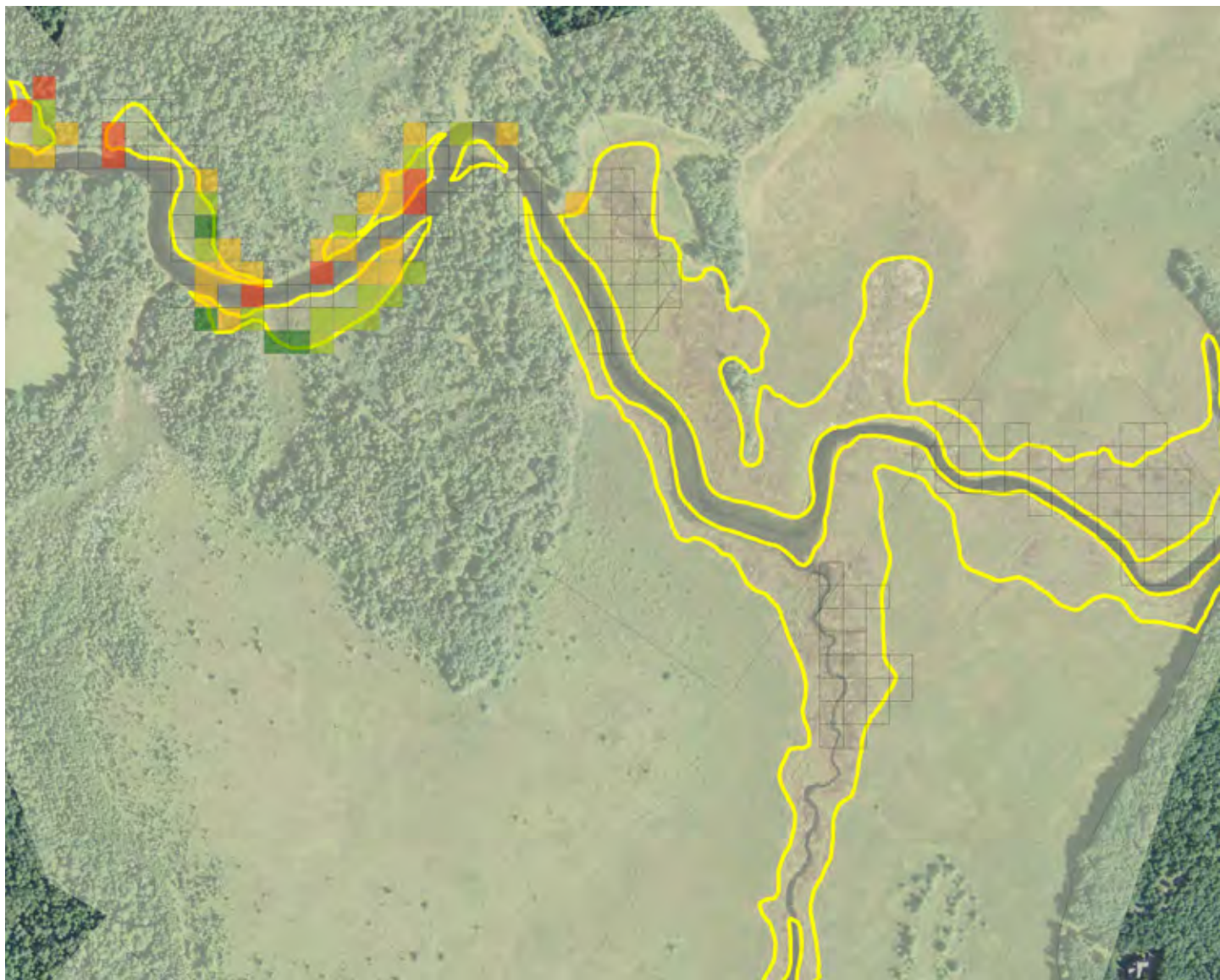
*Festuca rubra*



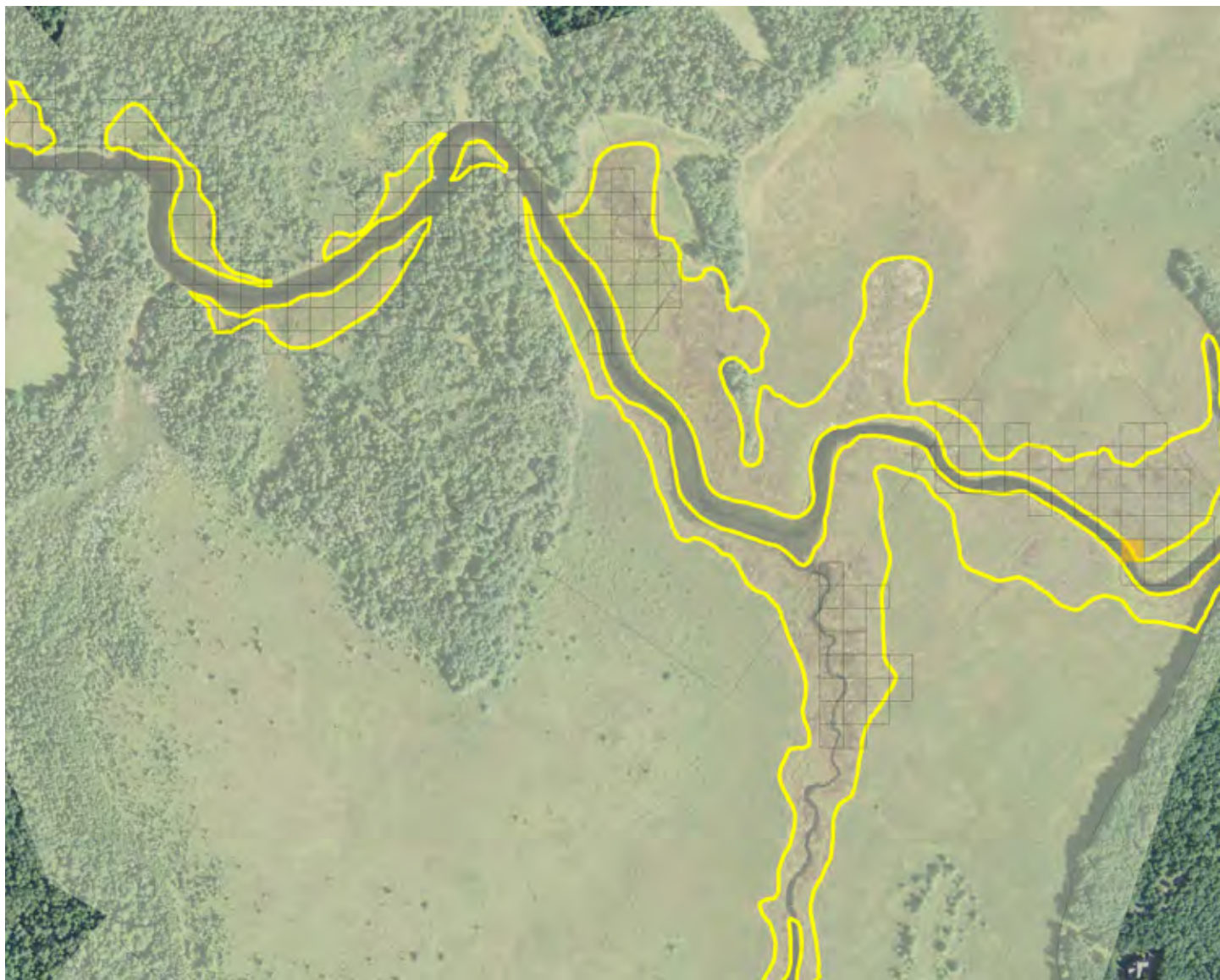
*Galium* sp.



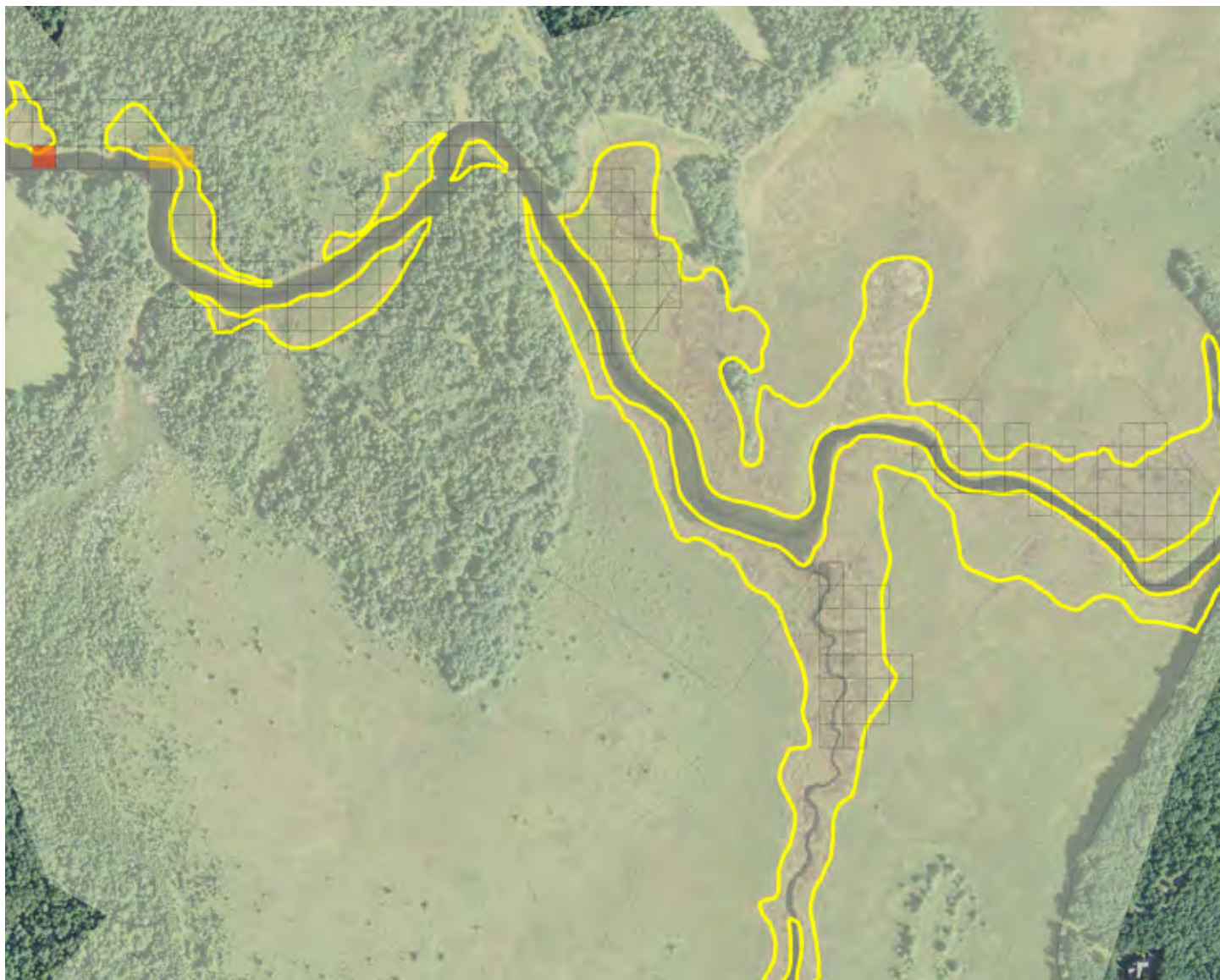
*Iris versicolor*



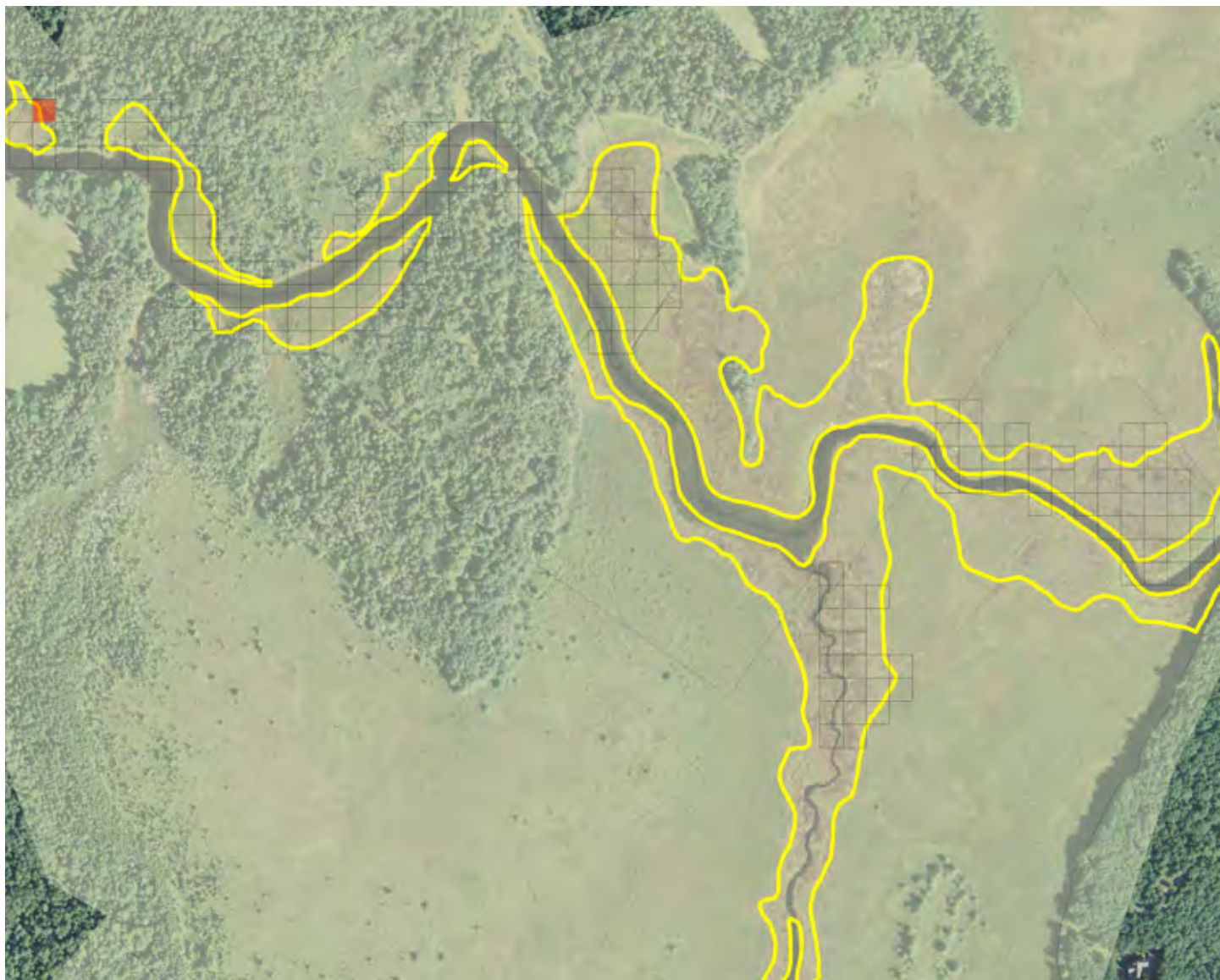
*Juncus balticus* ssp. *littoralis*



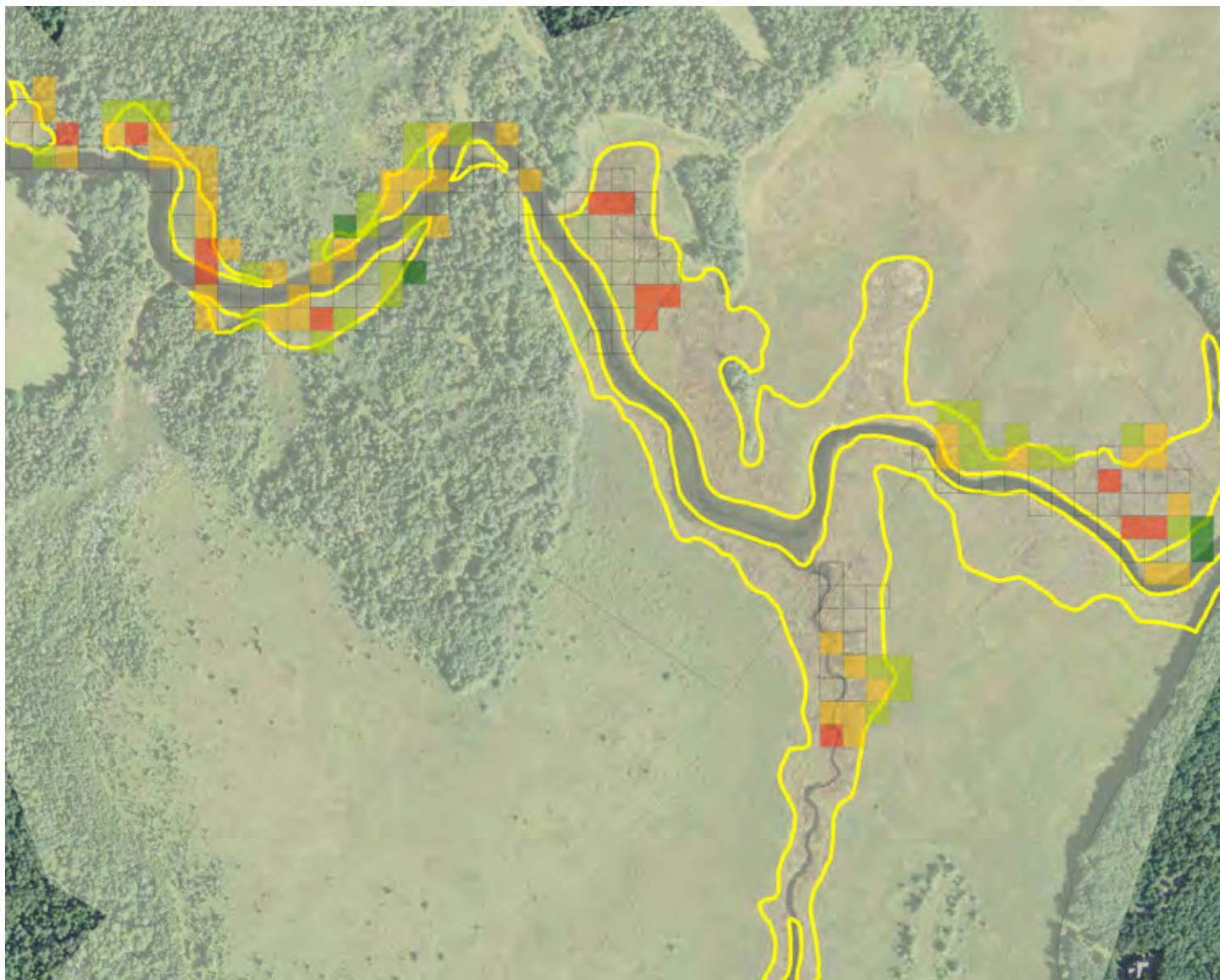
*Juncus brevicandatus*



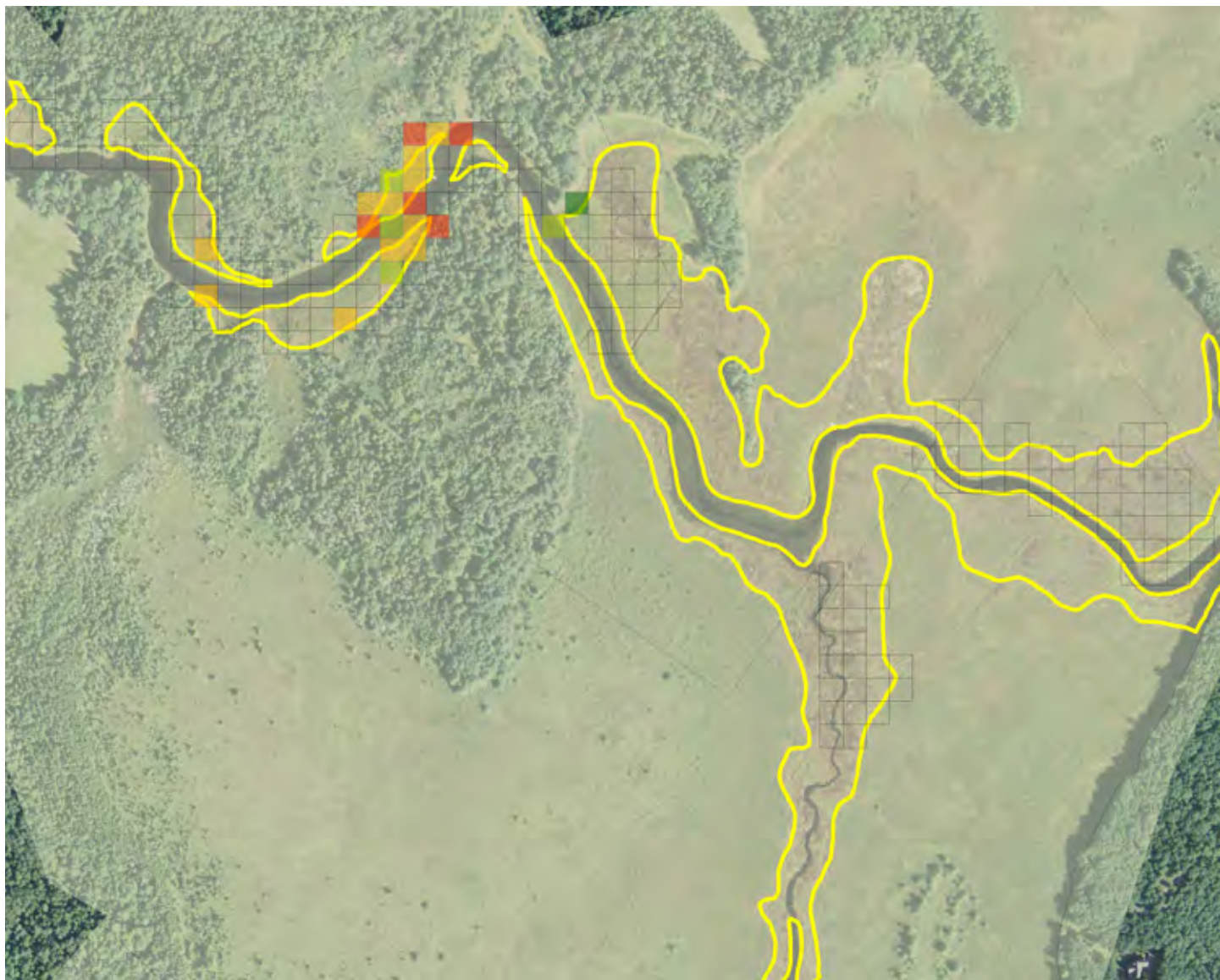
*Juncus gerardii*



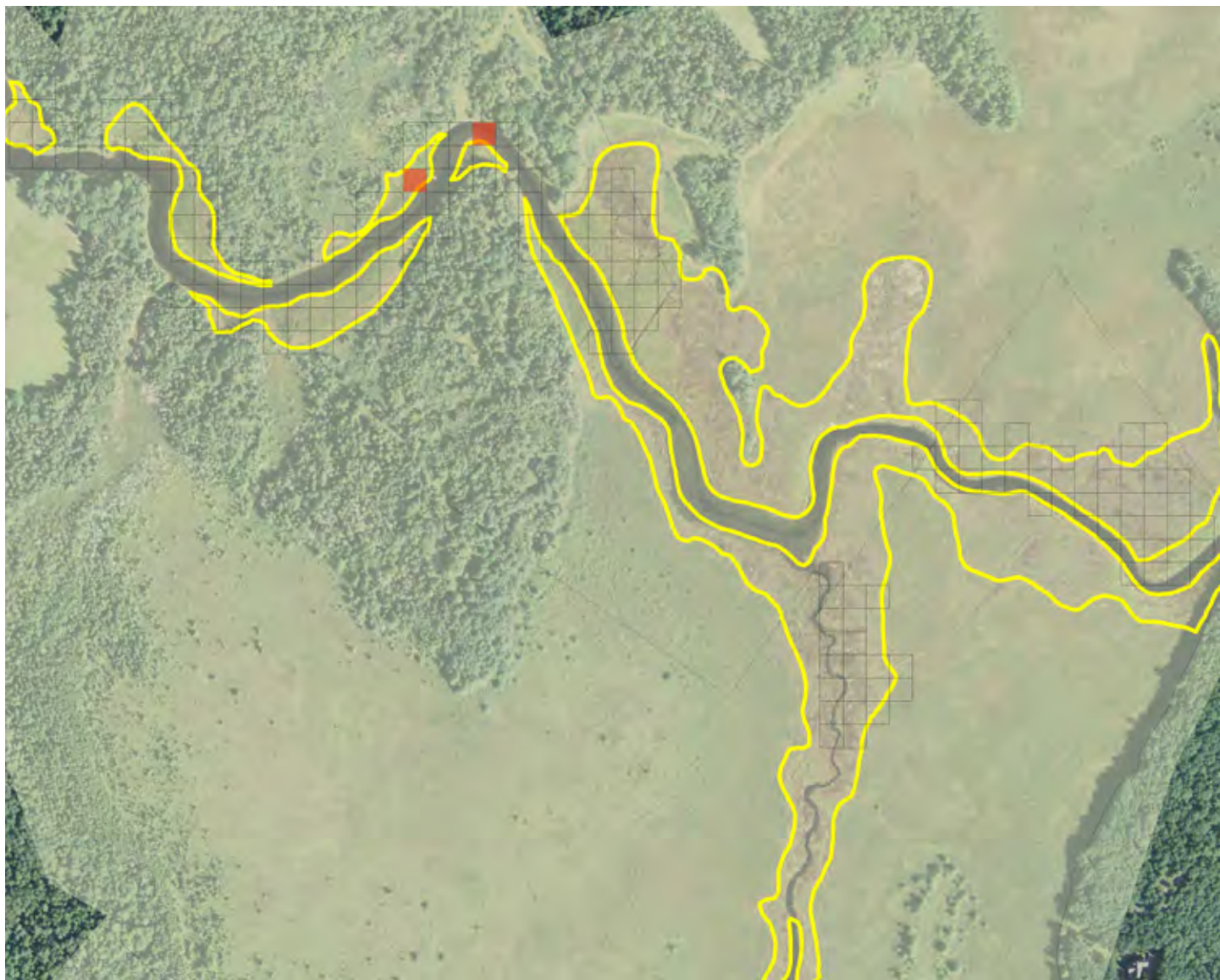
*Lysimachia terrestris*



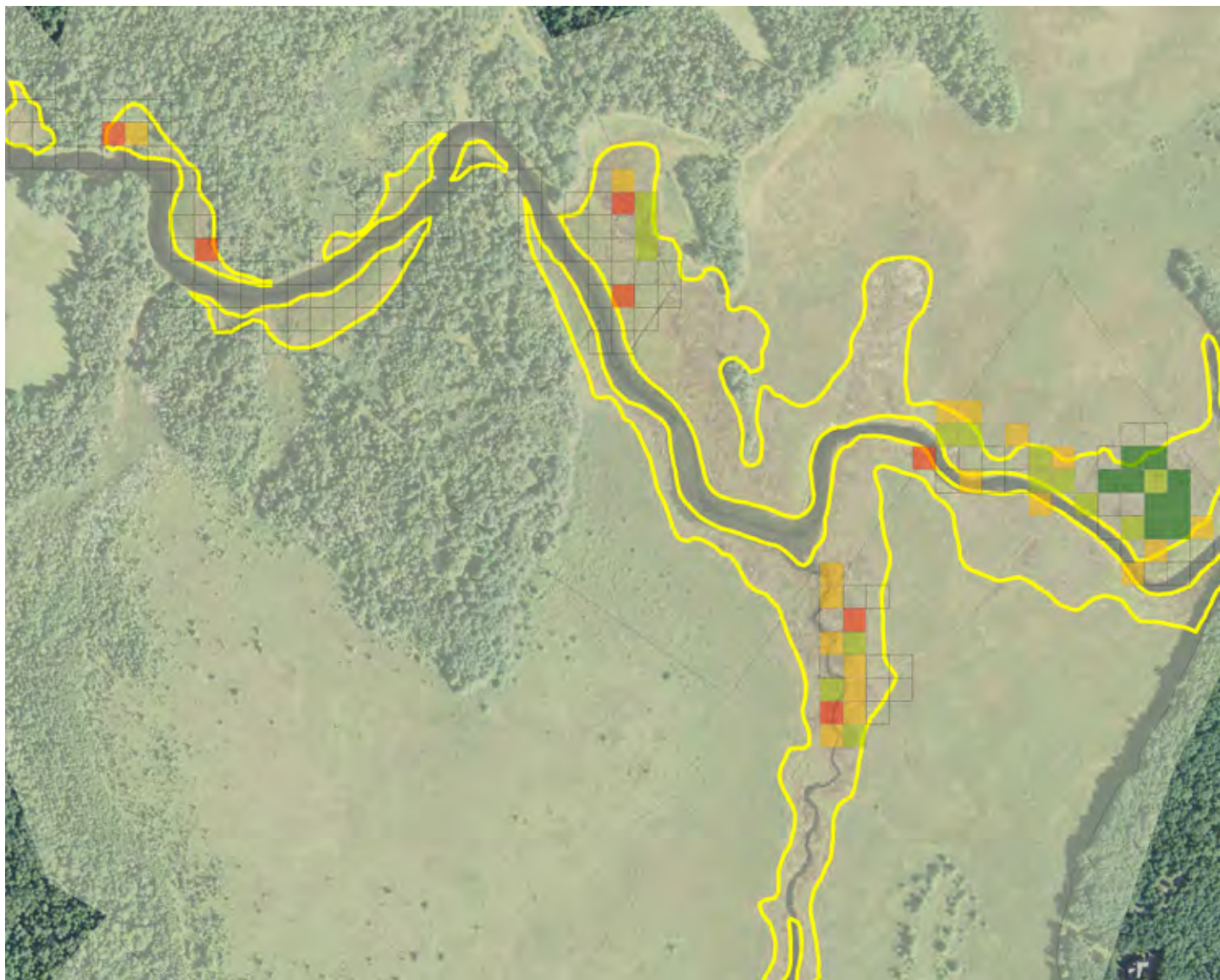
*Myrica gale*



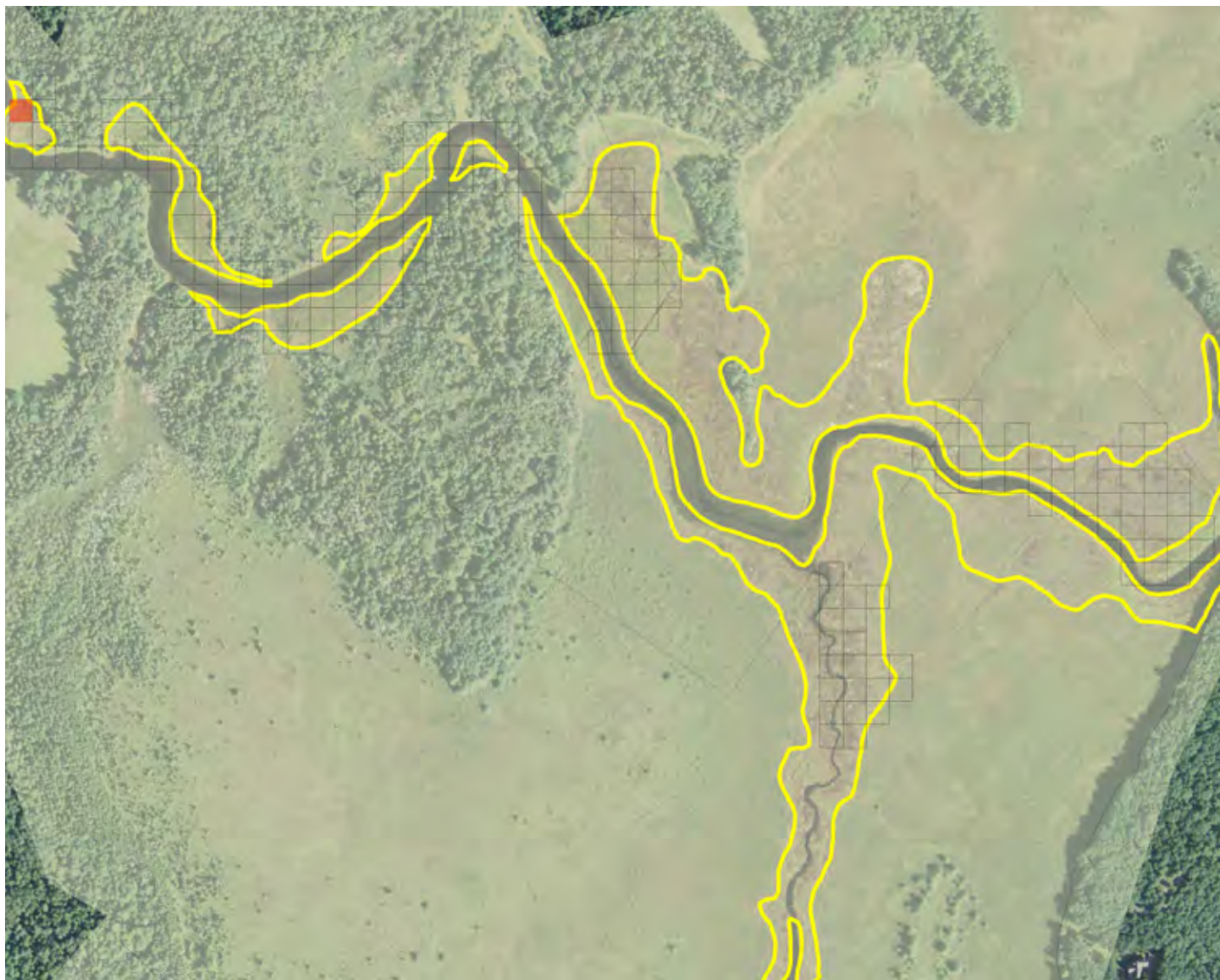
*Poa palustris*



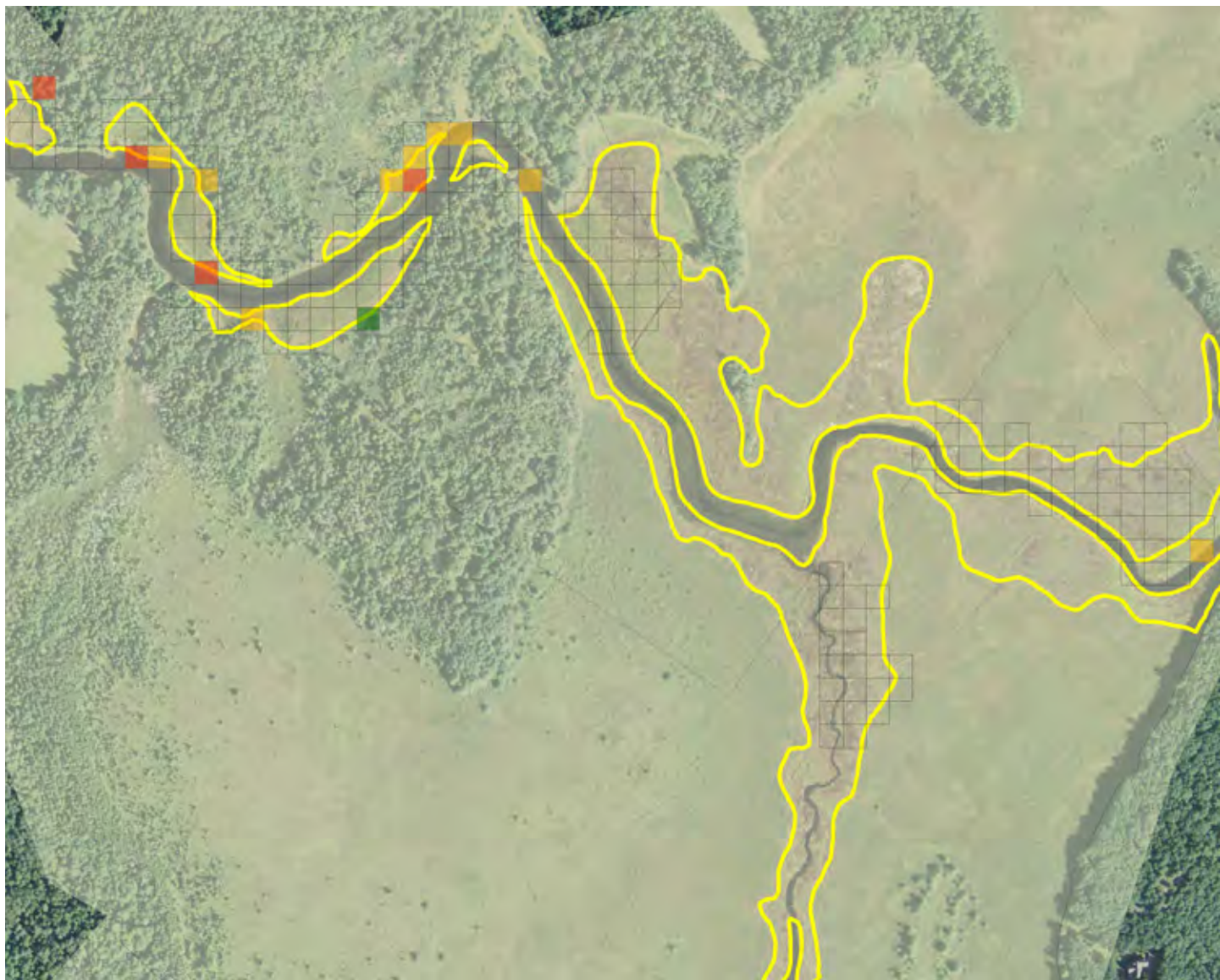
*Rosa* sp.



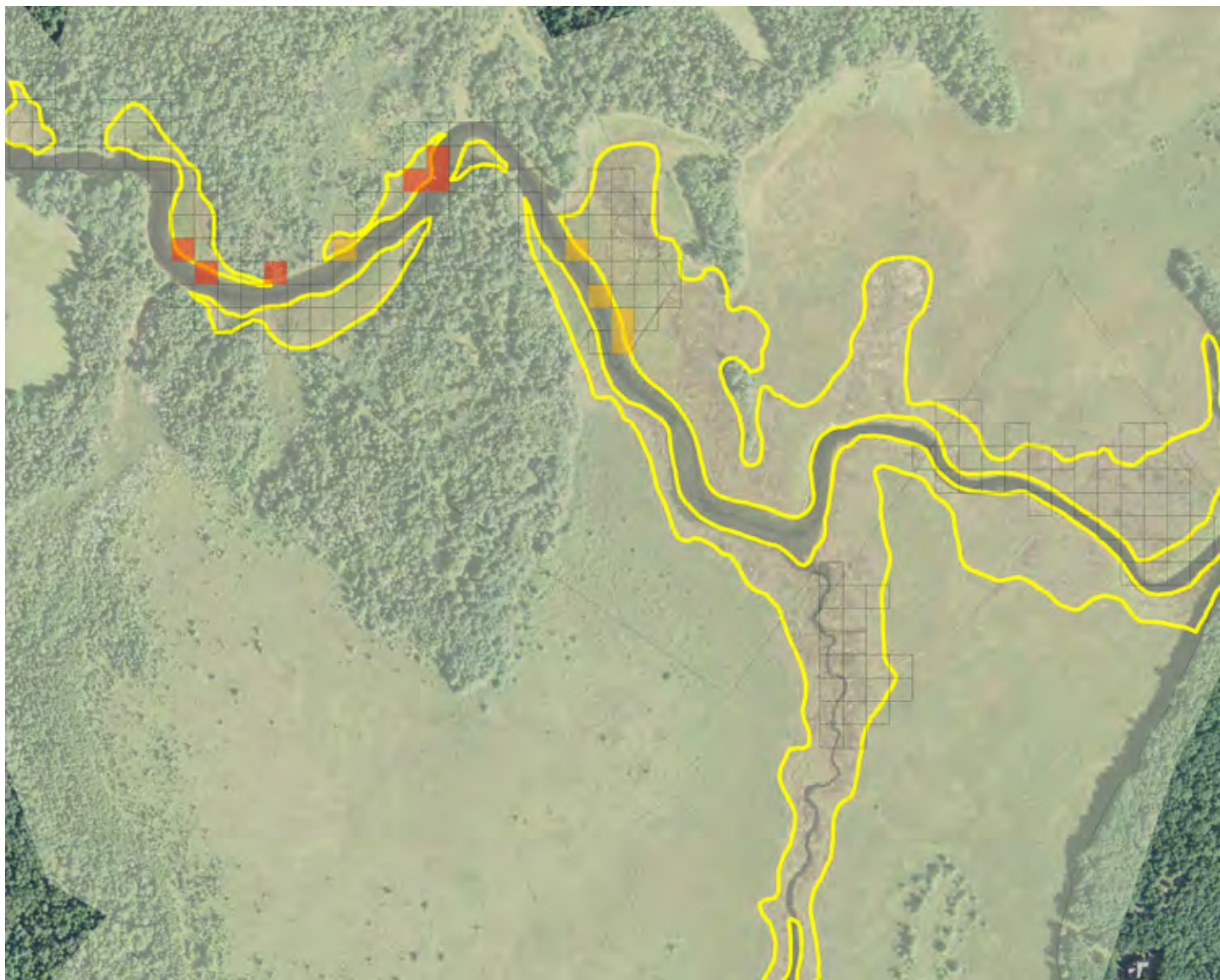
*Schoenoplectus tabernaemontani*



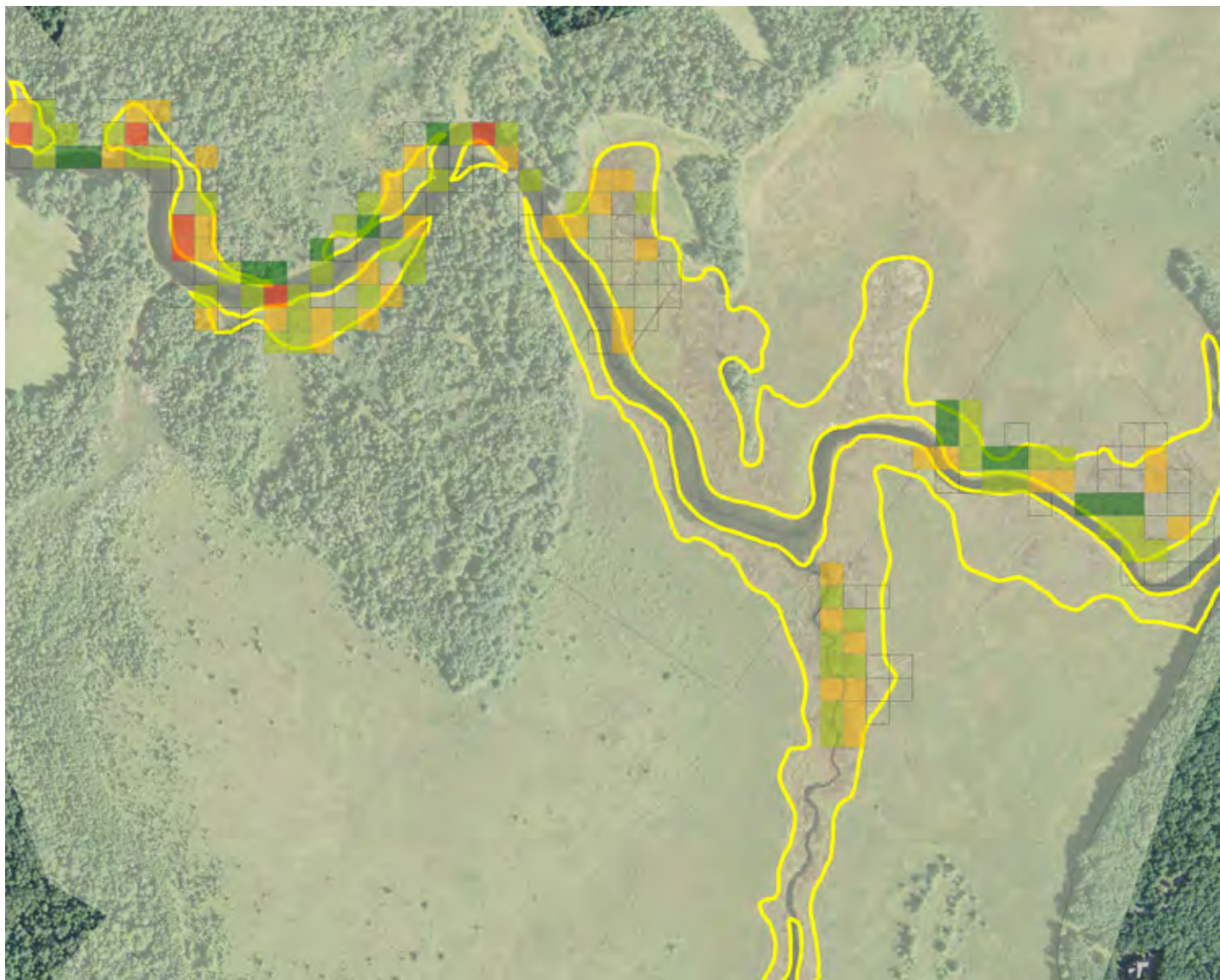
*Solidago sempervirens* var. *sempervirens*



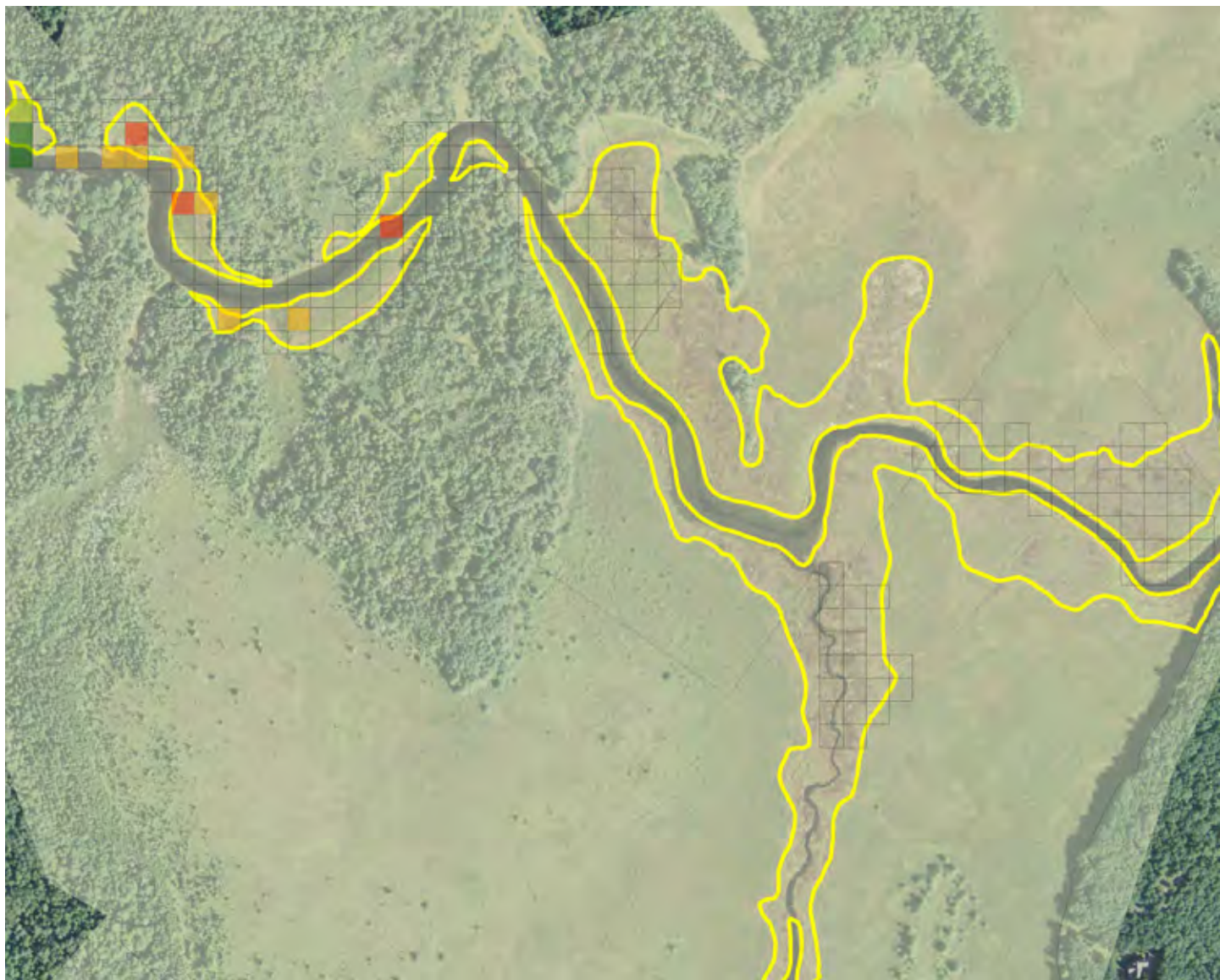
*Spiraea alba* var. *latifolia*



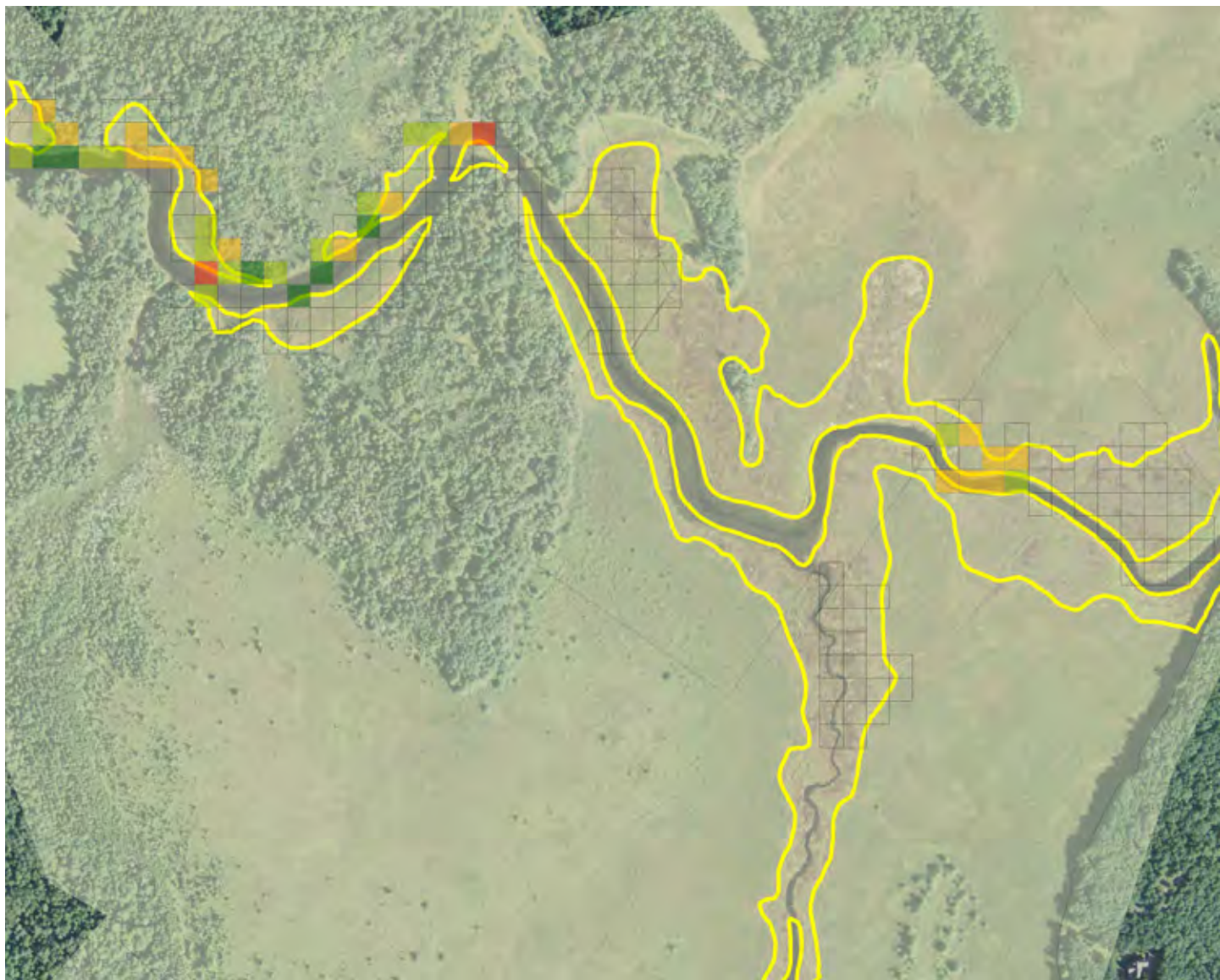
*Sporobolus alterniflorus*



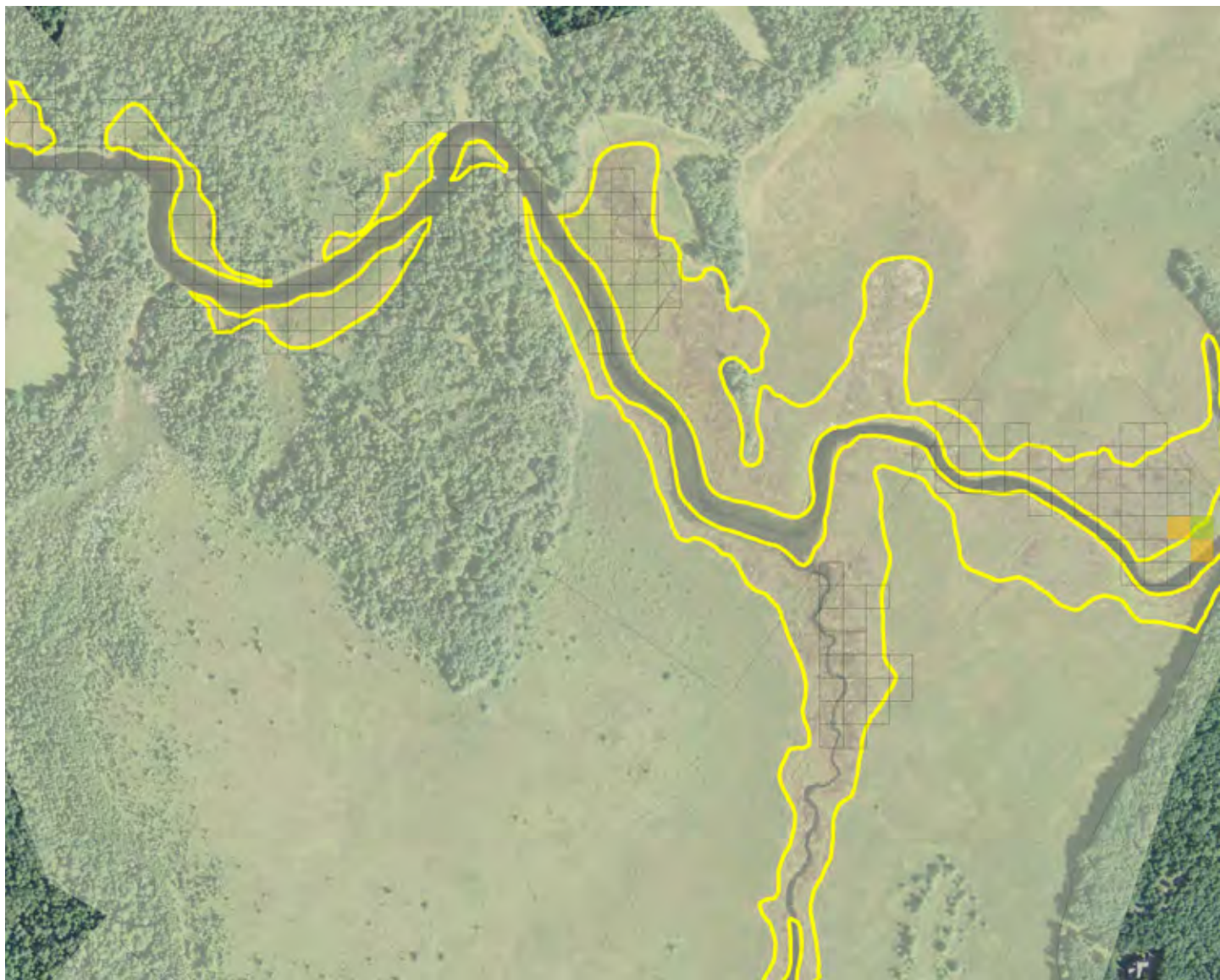
*Sporobolus michauxianus*



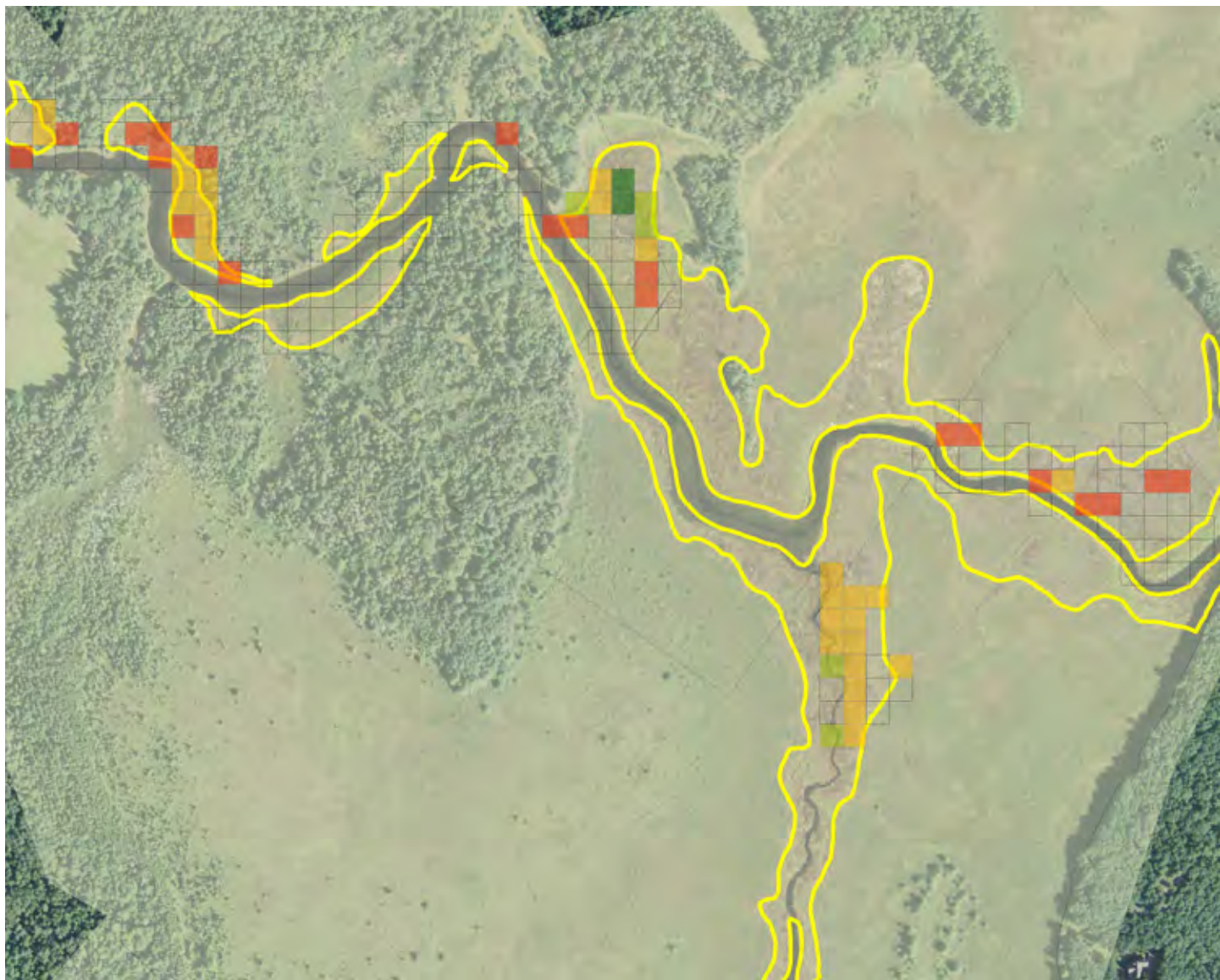
*Sporobolus pumilus*



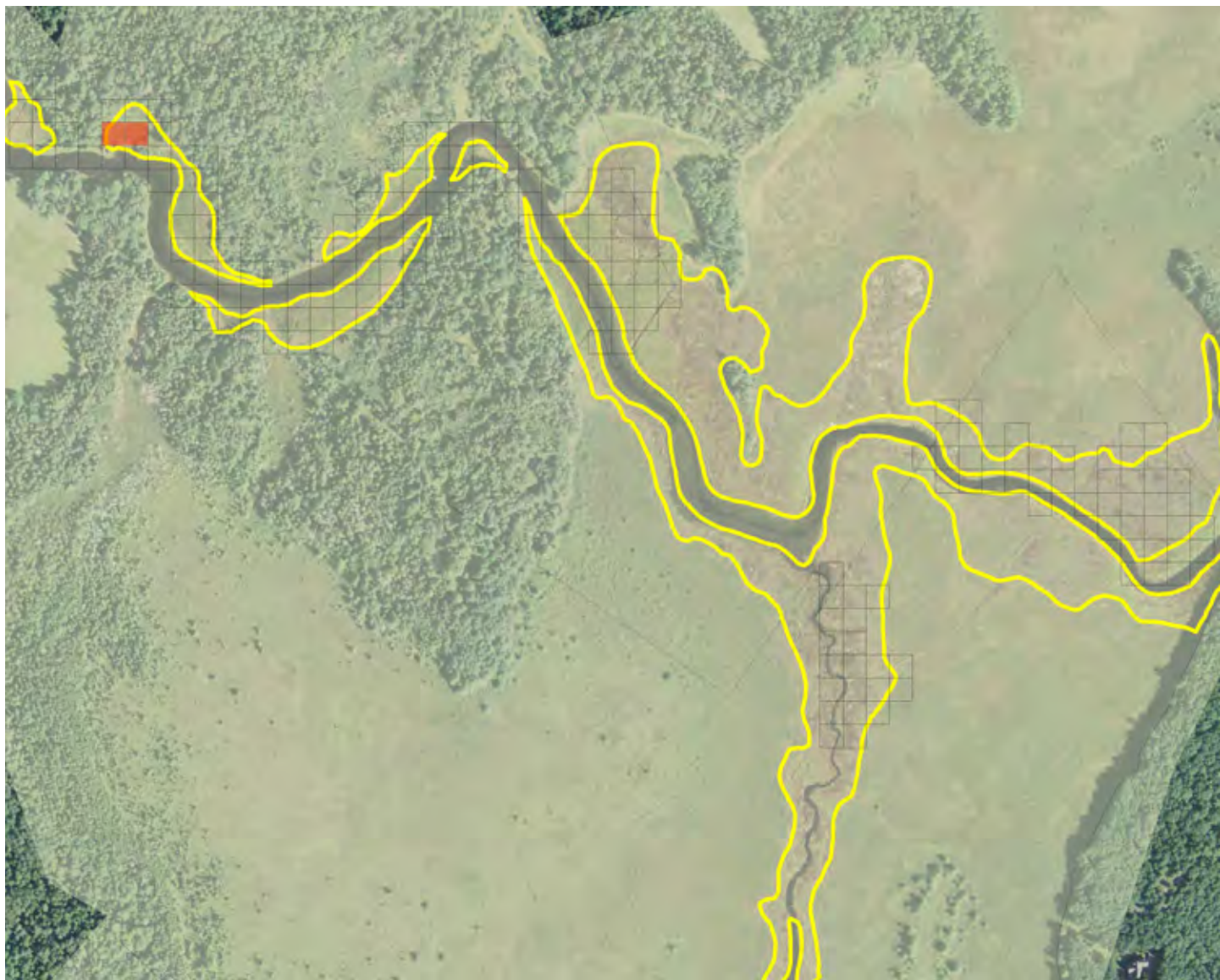
*Symphyotrichum* sp.



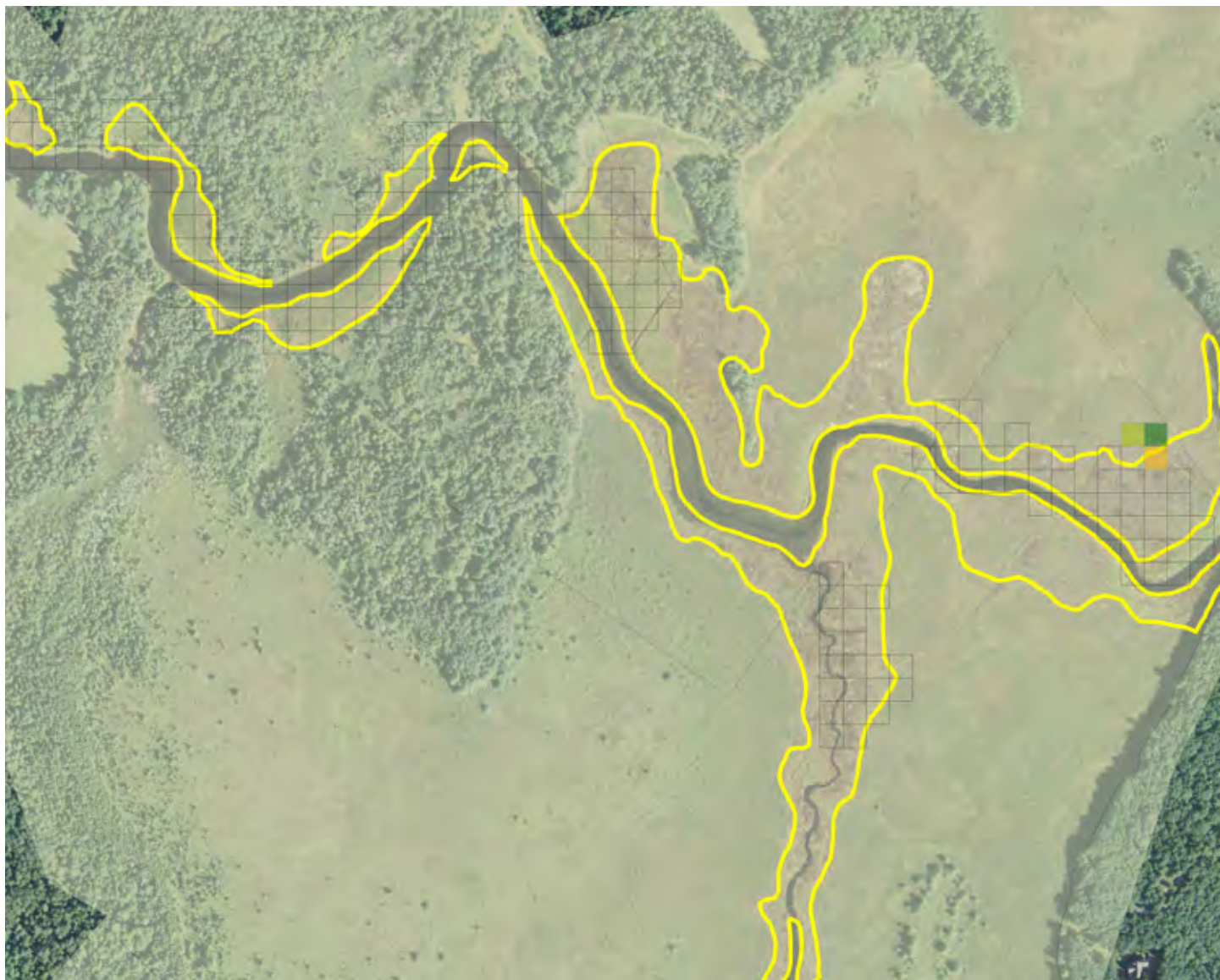
*Thelypteris palustris* var. *pubescens*



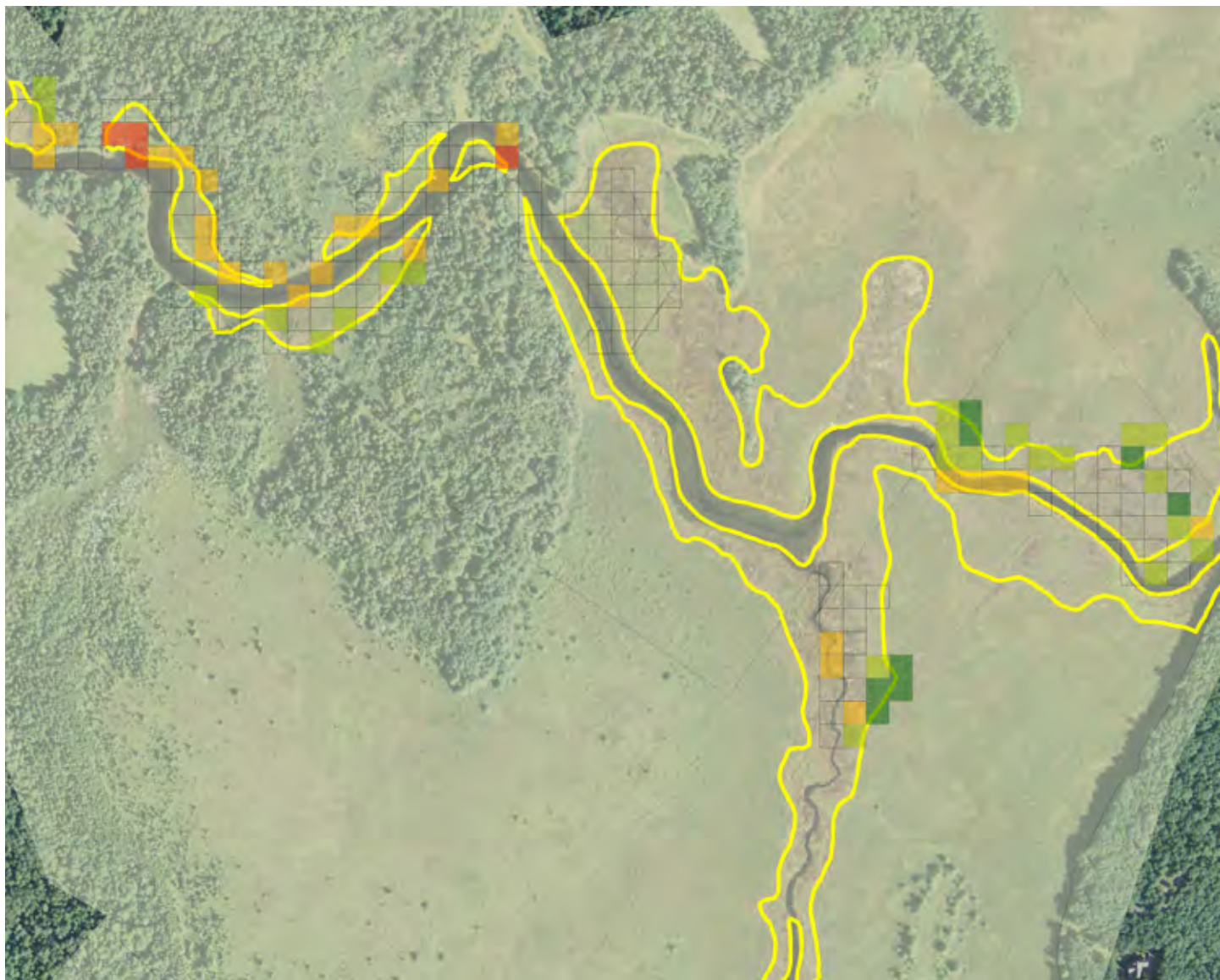
*Triglochin maritima*



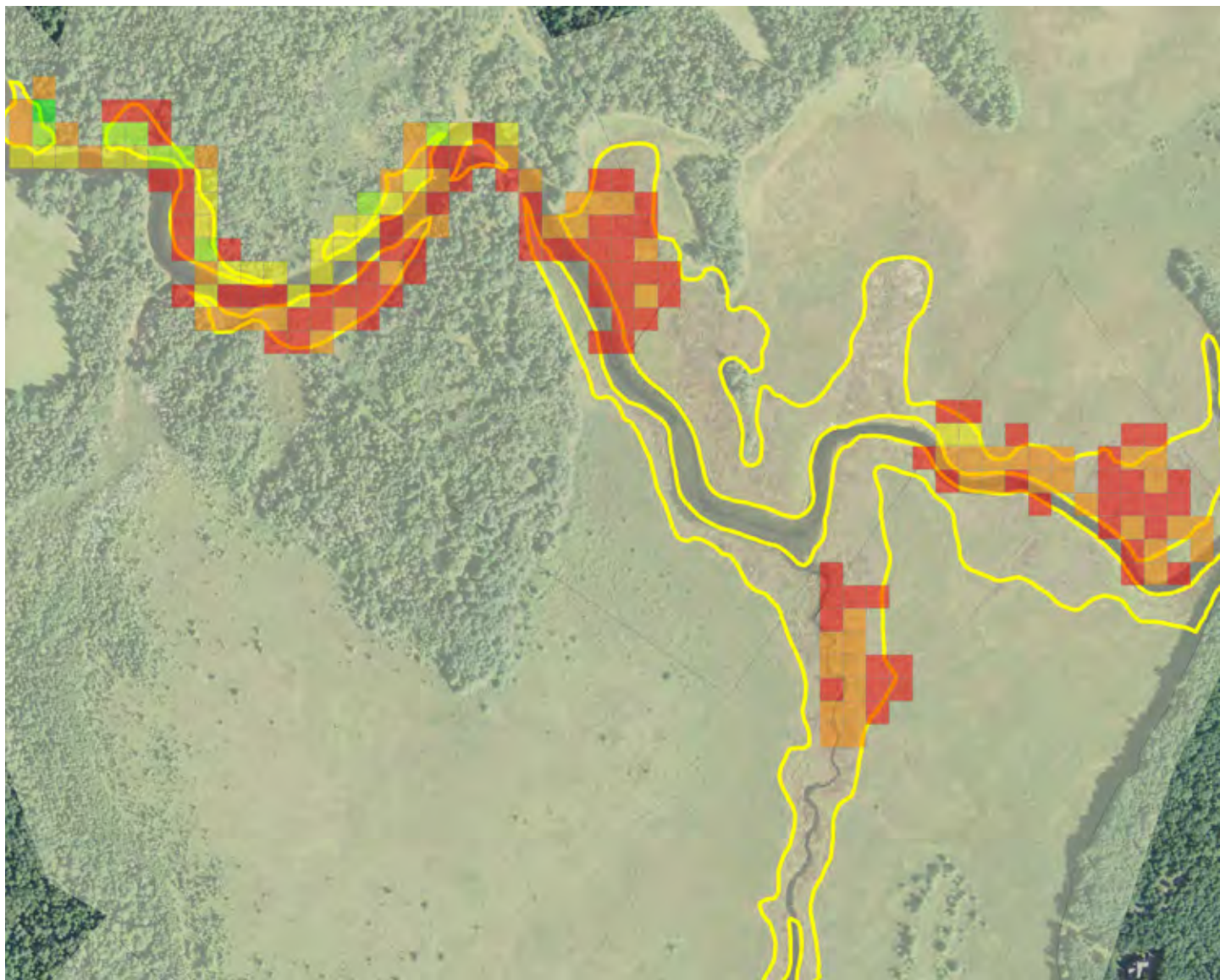
*Typha angustifolia*



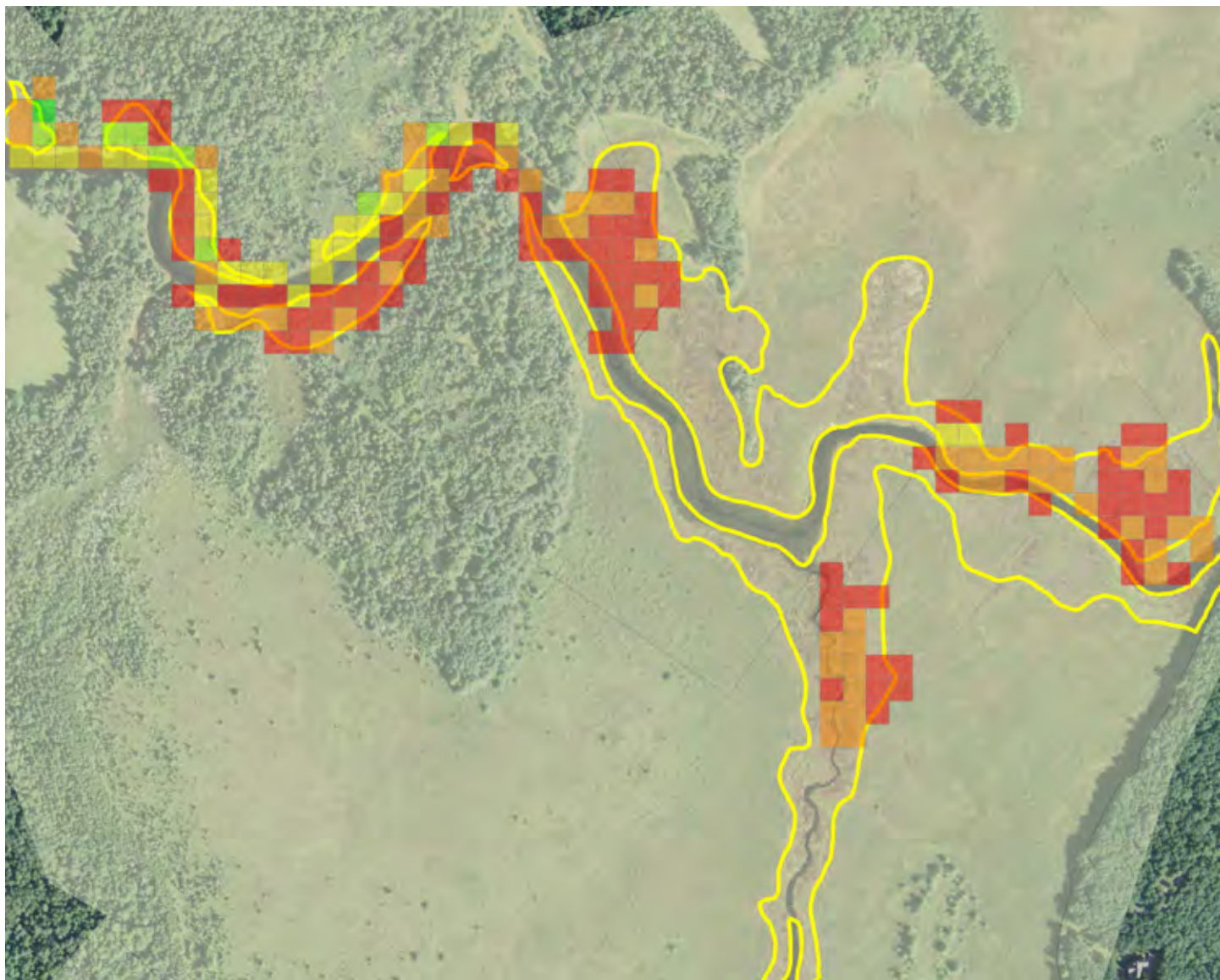
*Typha latifolia*



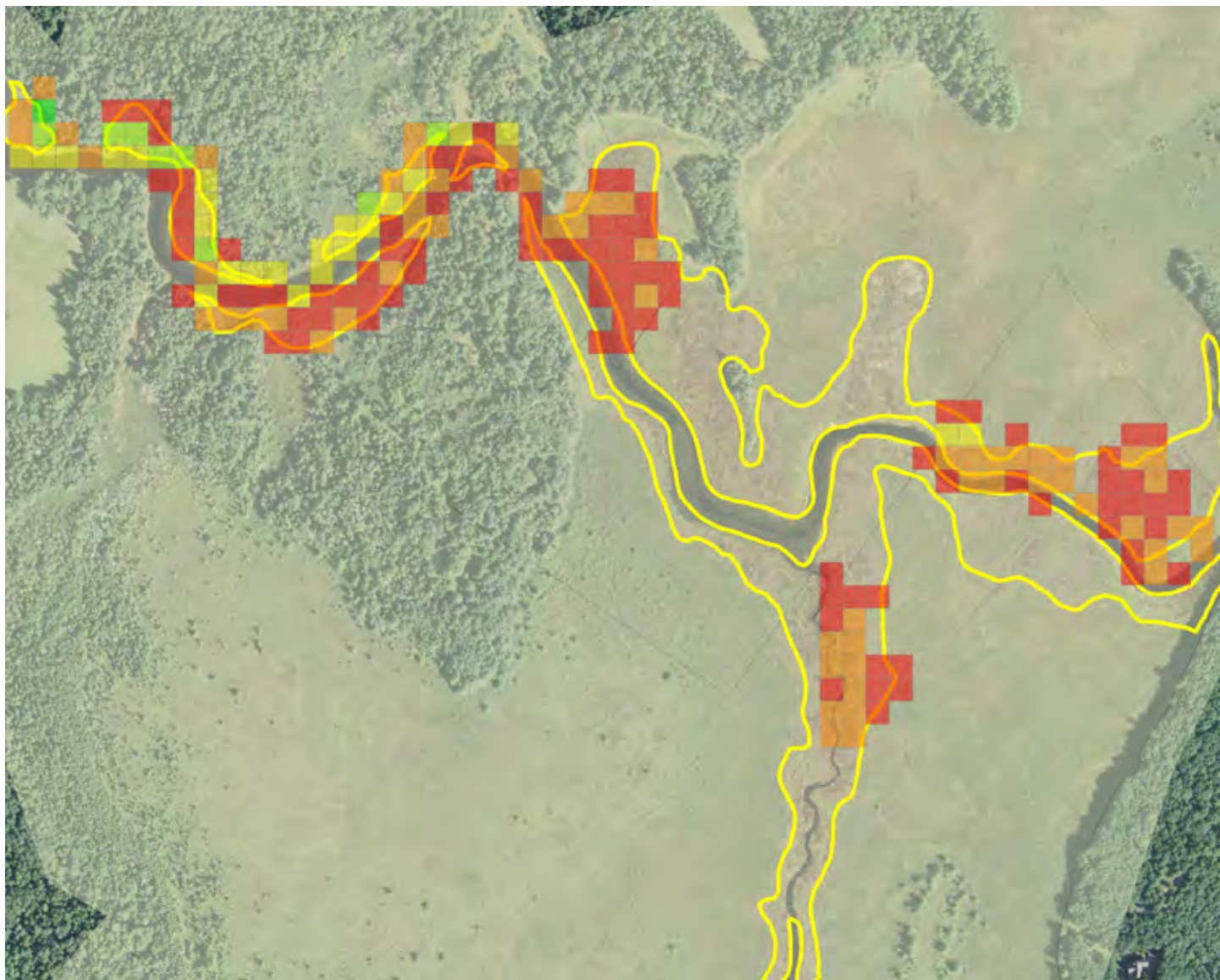
*Vaccinium macrocarpon*



*Acer rubrum*

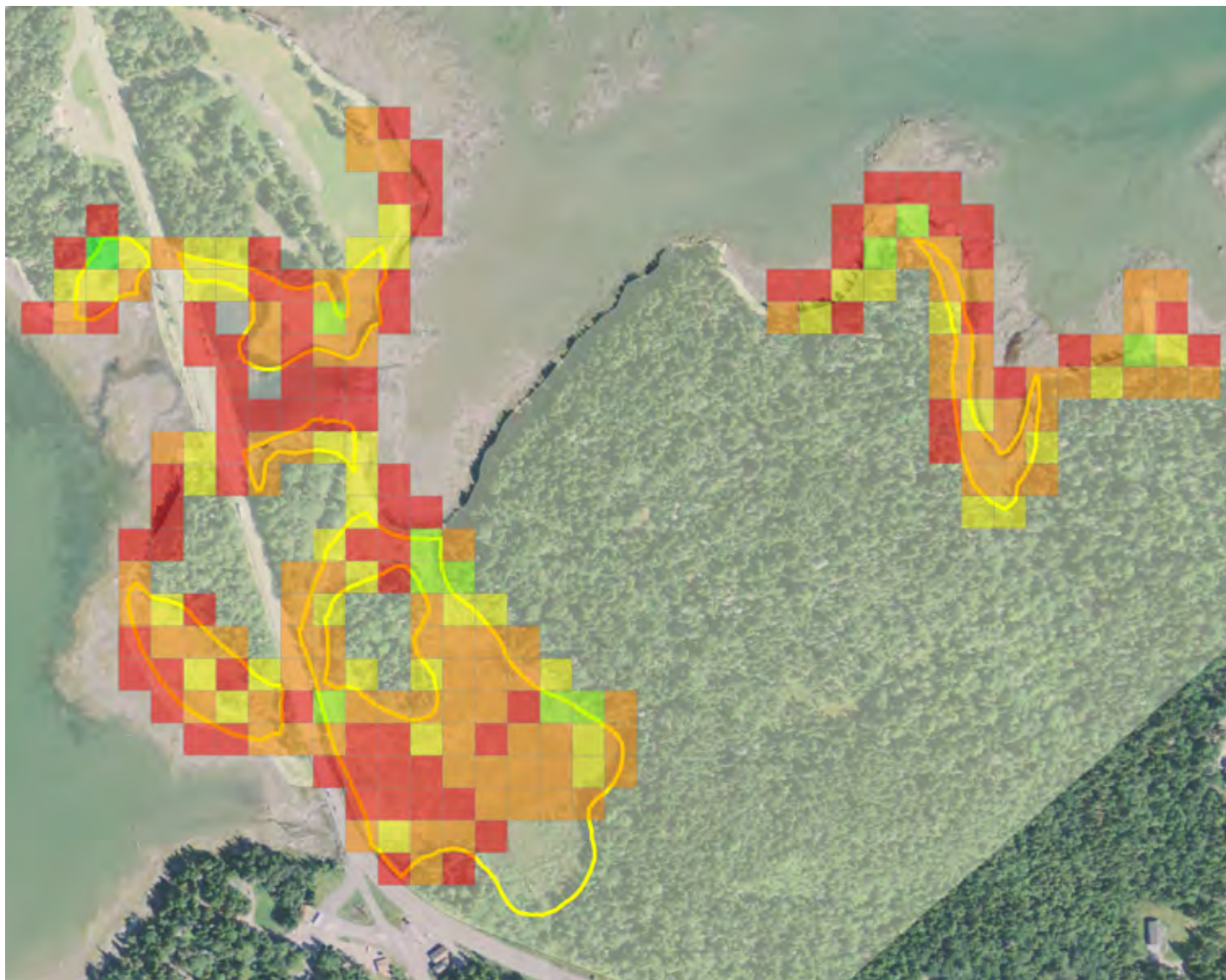


*Acer rubrum*



*Acer rubrum*

Appendix 3. Plant distribution maps for the salt marsh areas for the Thompson Island area



Number of species per plot



*Achillea millefolium* ssp. *lanulosa*



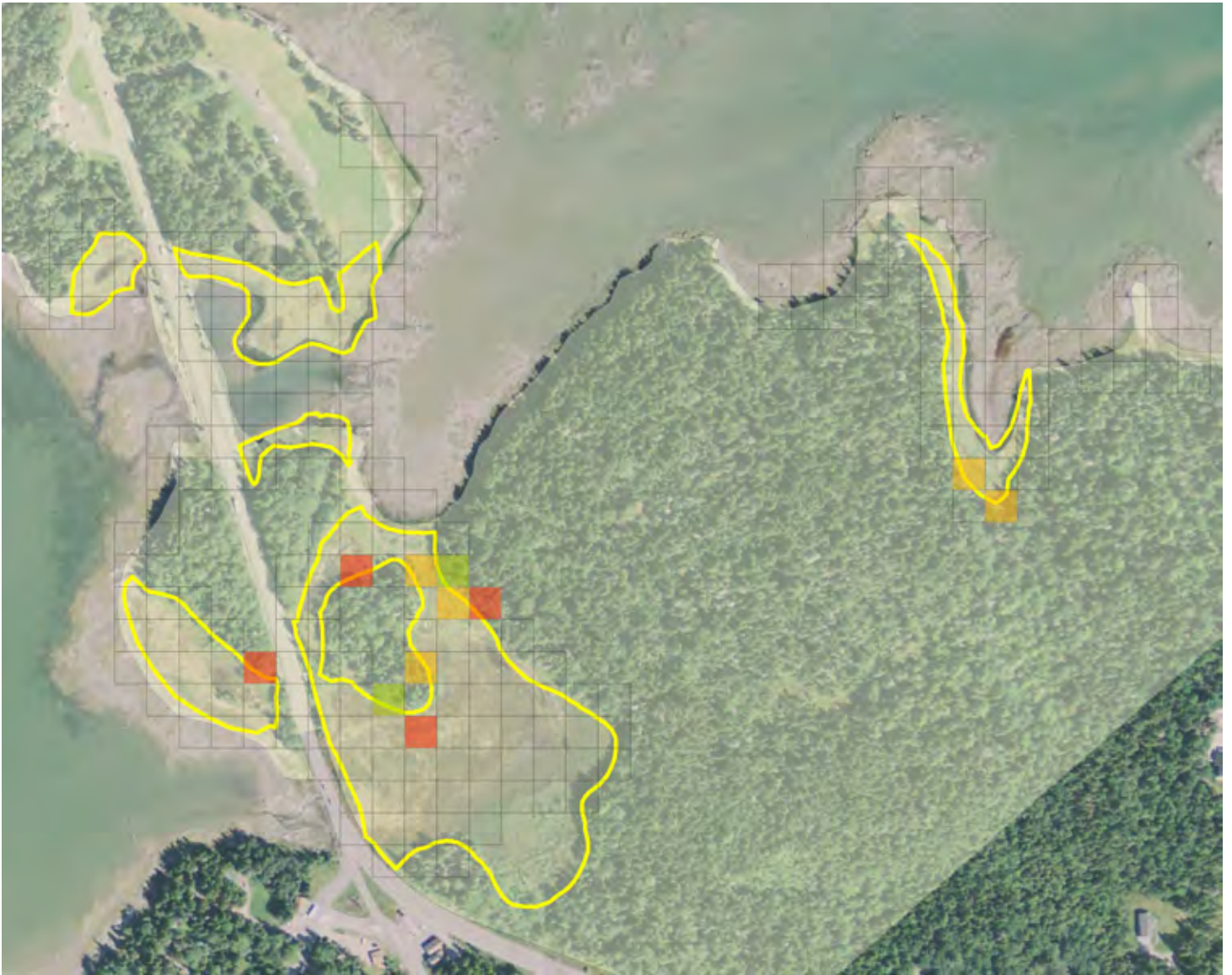
*Agrostis stolonifera*



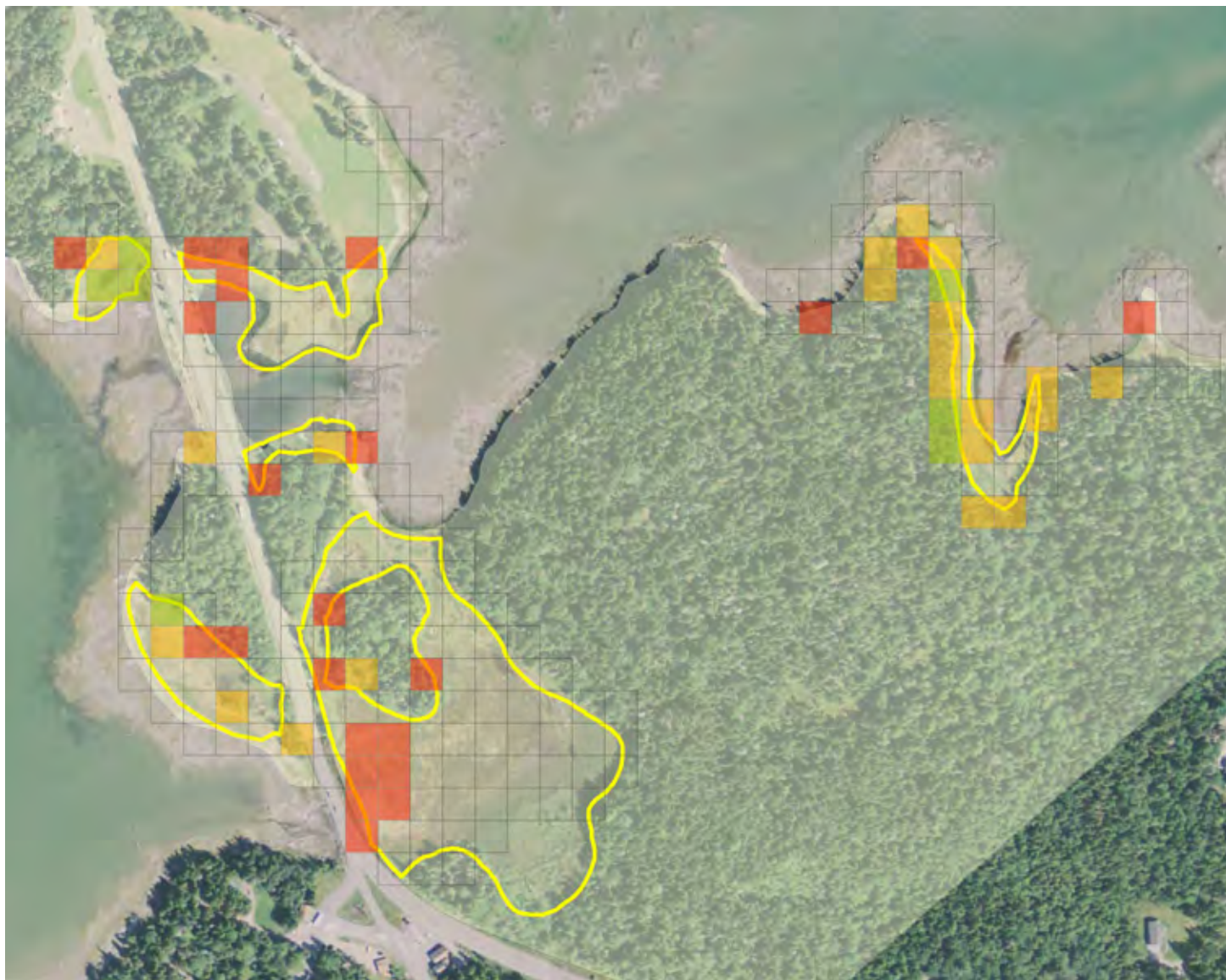
*Angelica lucida*



*Anthoxanthum nitens* ssp. *nitens*



*Argentina egedii* ssp. *groenlandica*



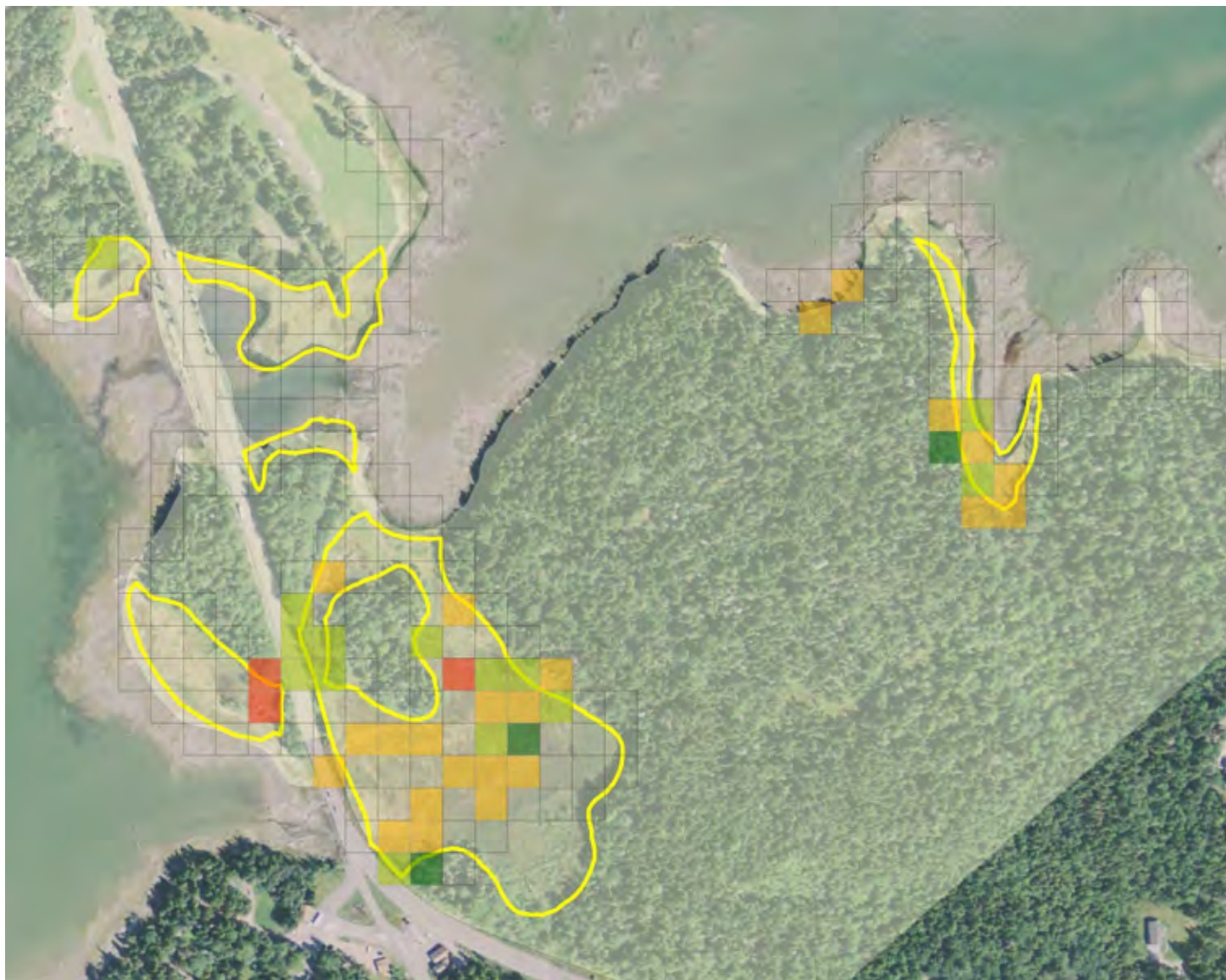
*Atriplex acadiensis*



*Atriplex glabriuscula*



*Atriplex* sp.



*Bolboschoenus maritimus* ssp. *paludosus*



*Cakile edentula* ssp. *edentula* var. *edentula*



*Calamagrostis canadensis*



*Calystegia sepium*



*Carex bormathodes*



*Carex paleacea*



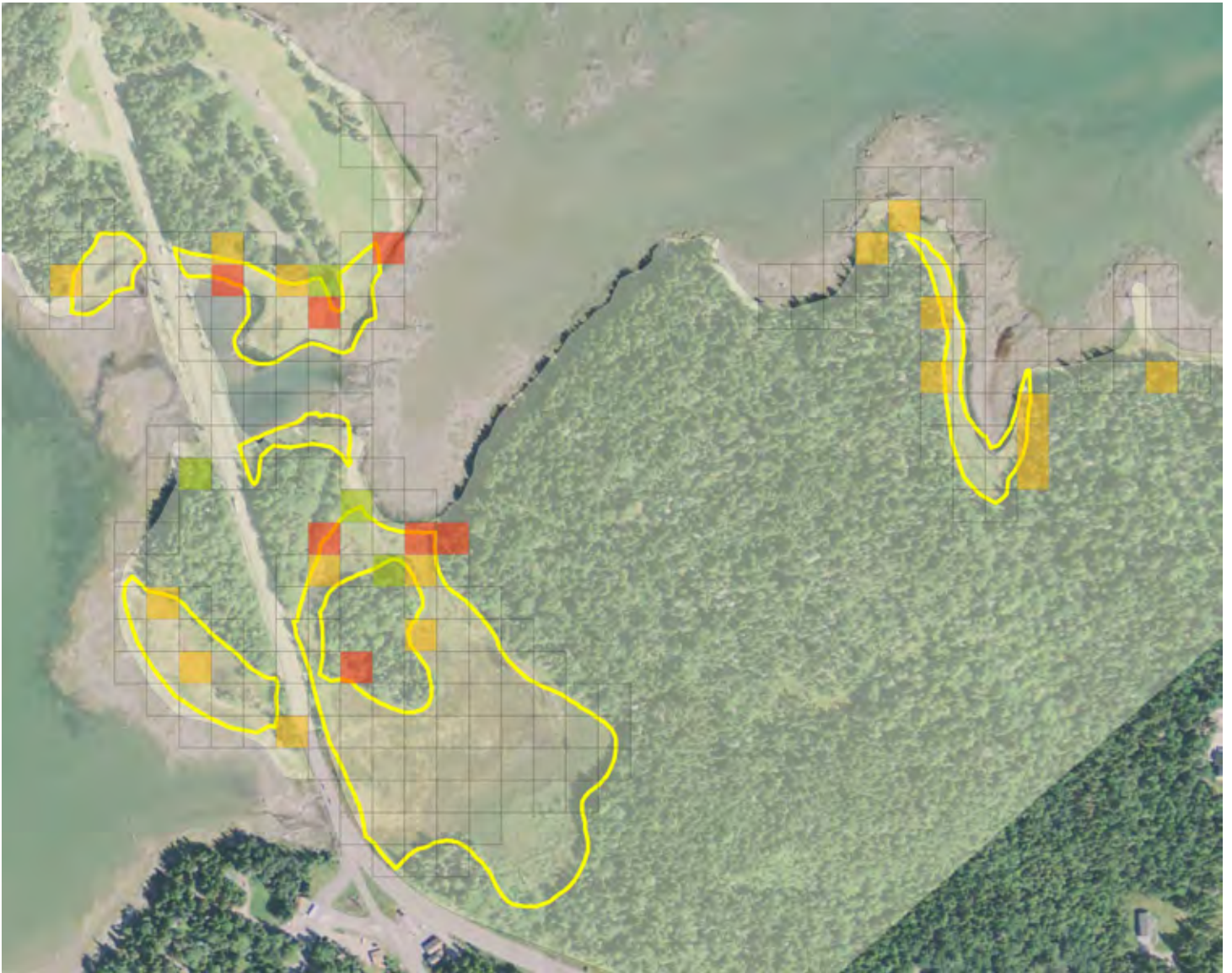
*Carex viridula* ssp. *viridula* var. *viridula*



*Chamaedaphne calyculata*



*Chenopodium* sp.



*Elymus repens*



*Elymus trachycaulus*



*Elymus virginicus*



*Festuca rubra*



*Galium* sp.



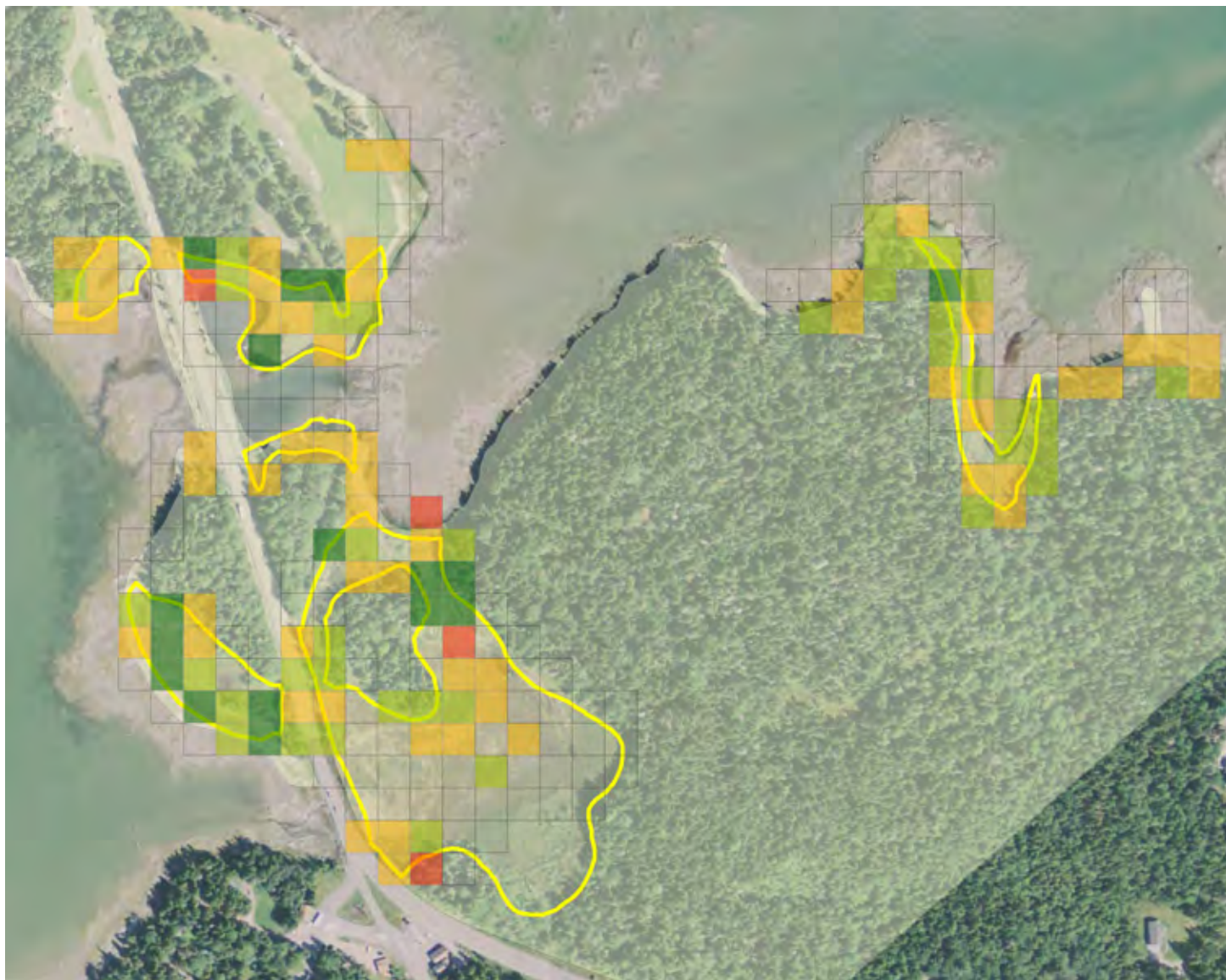
*Gaylussacia baccata*



*Iris versicolor*



*Juncus balticus* ssp. *littoralis*



*Juncus gerardii*



*Juncus pylaei*



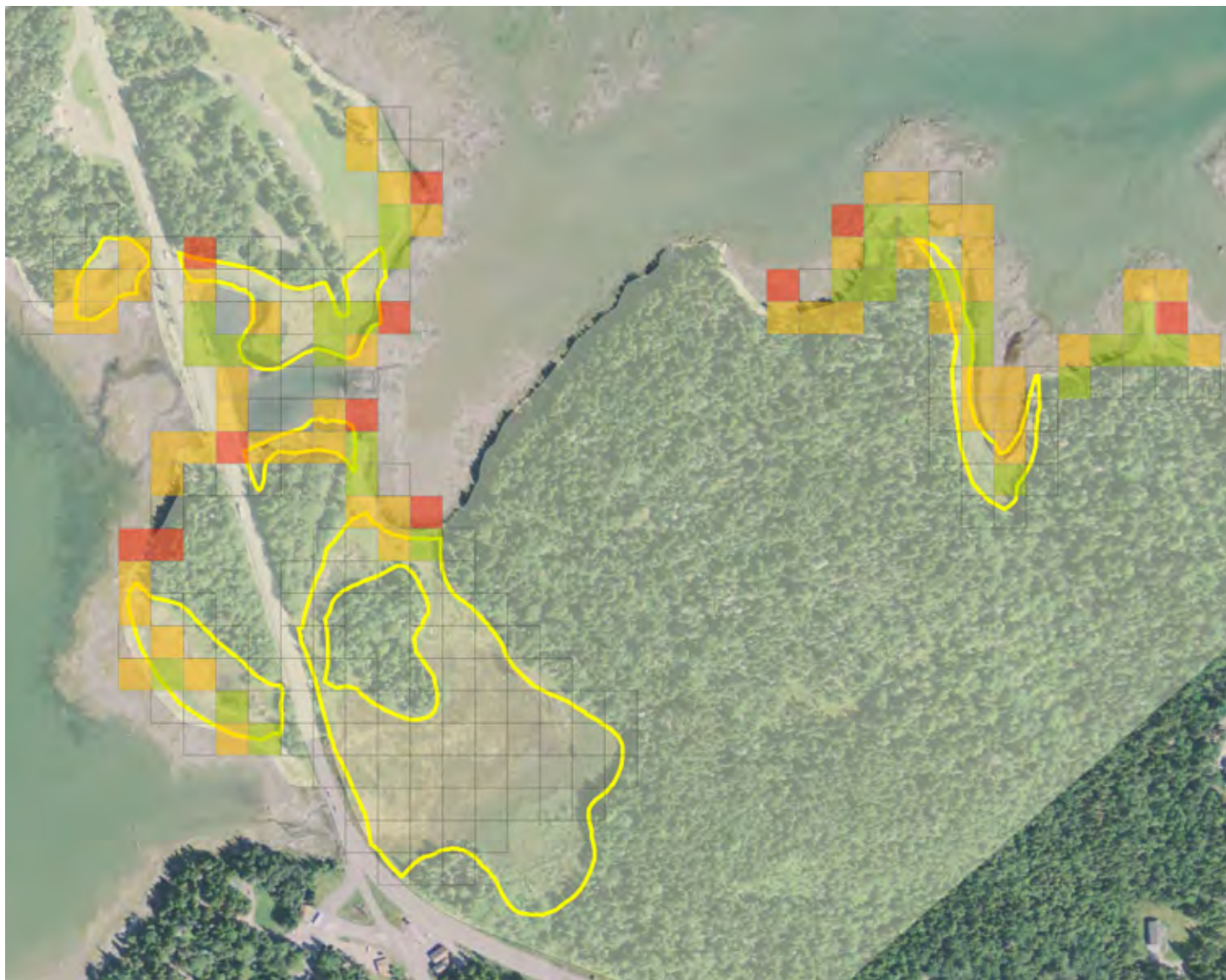
*Kalmia angustifolia* ssp. *angustifolia*



*Larix laricina*



*Leymus mollis* ssp. *mollis*



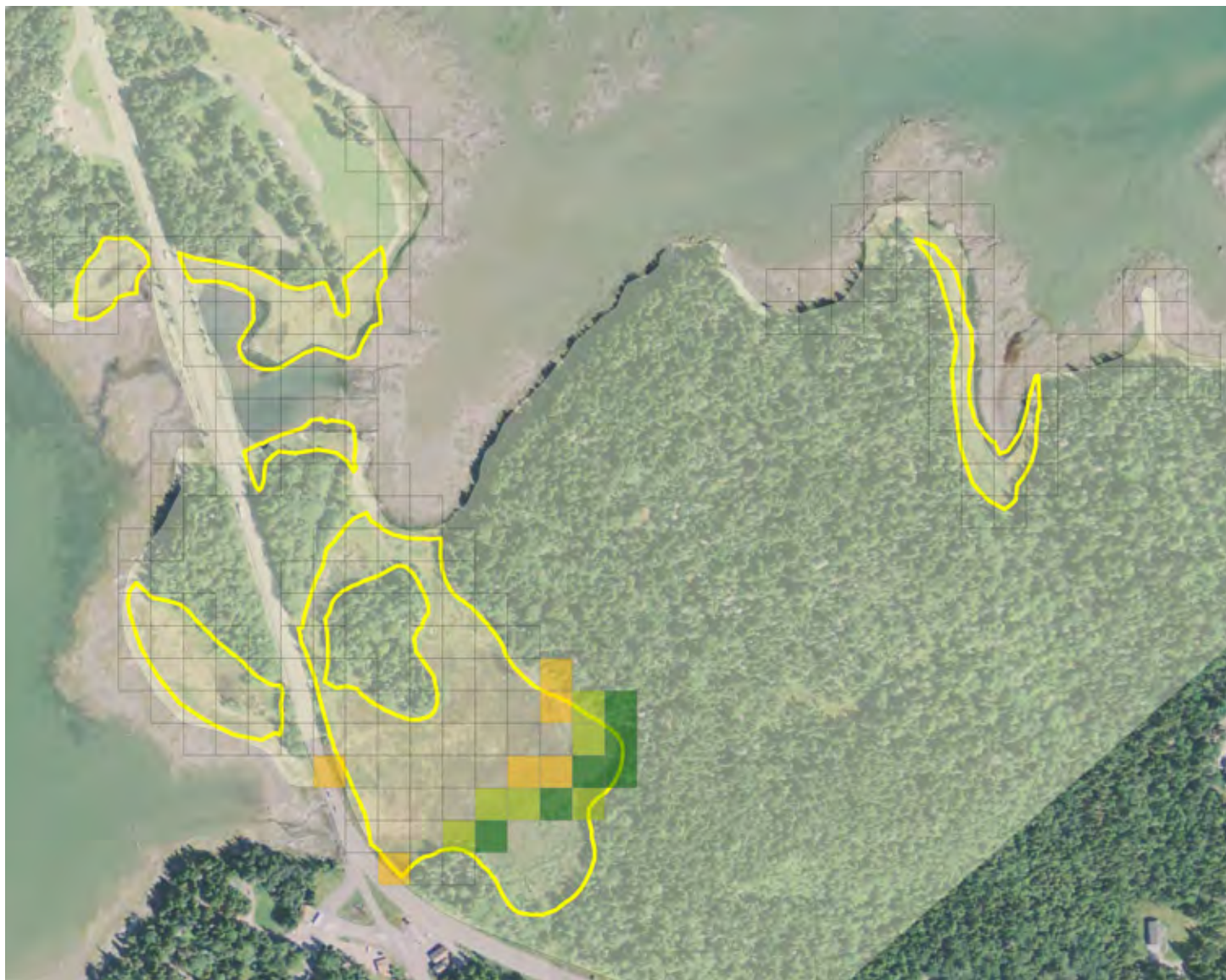
*Limonium carolinianum*



*Lysimachia maritima*



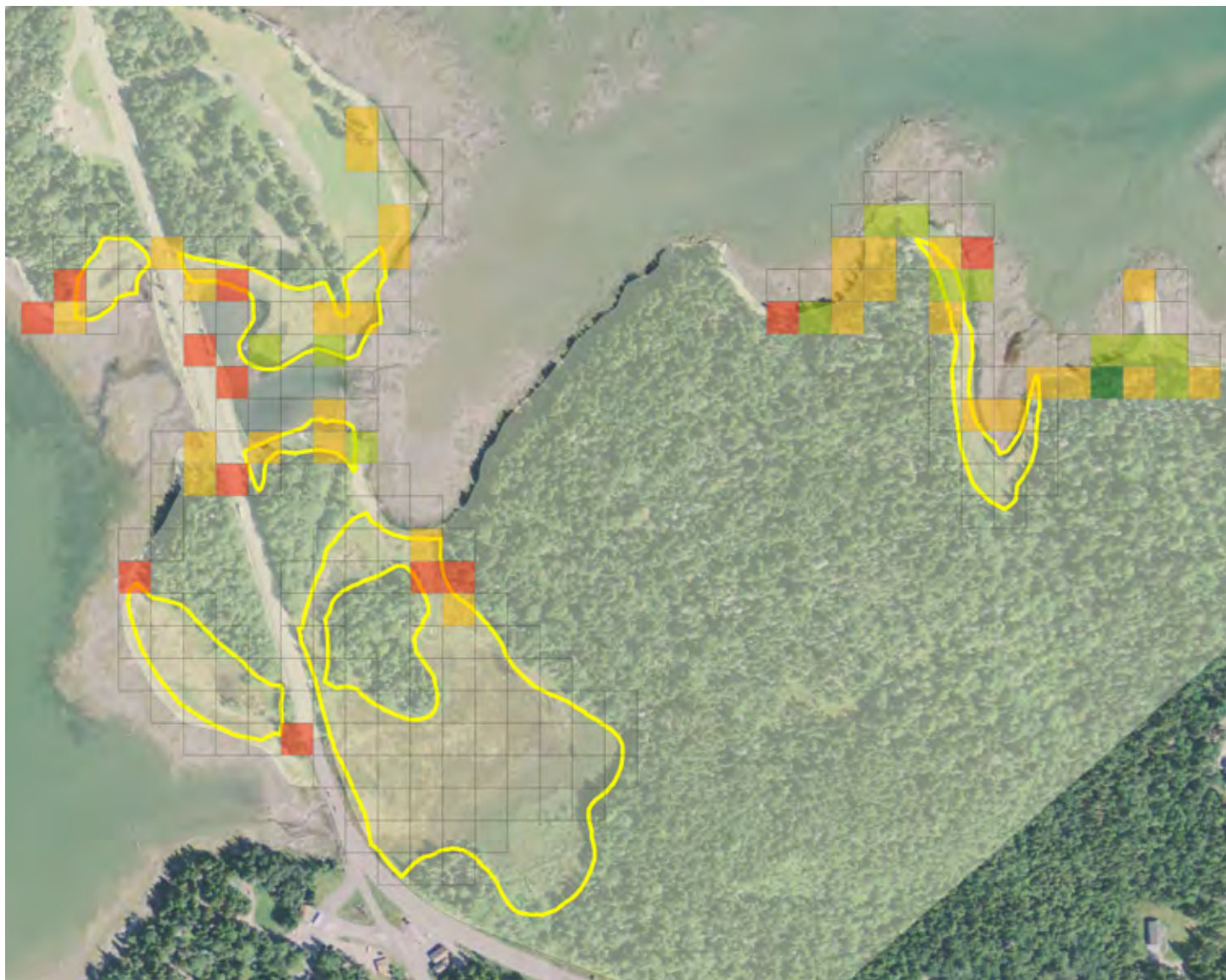
*Morella caroliniensis*



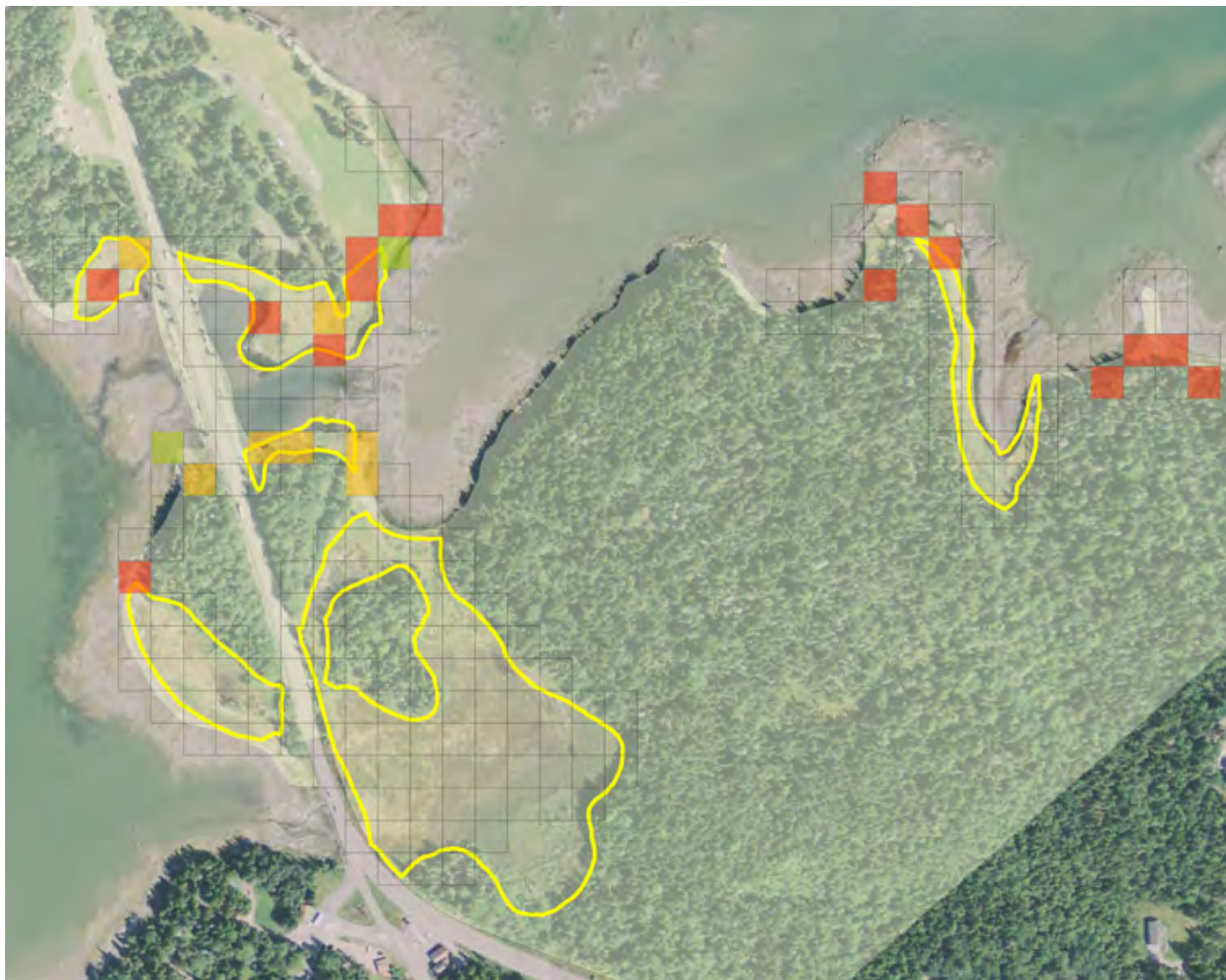
*Myrica gale*



*Picea mariana*



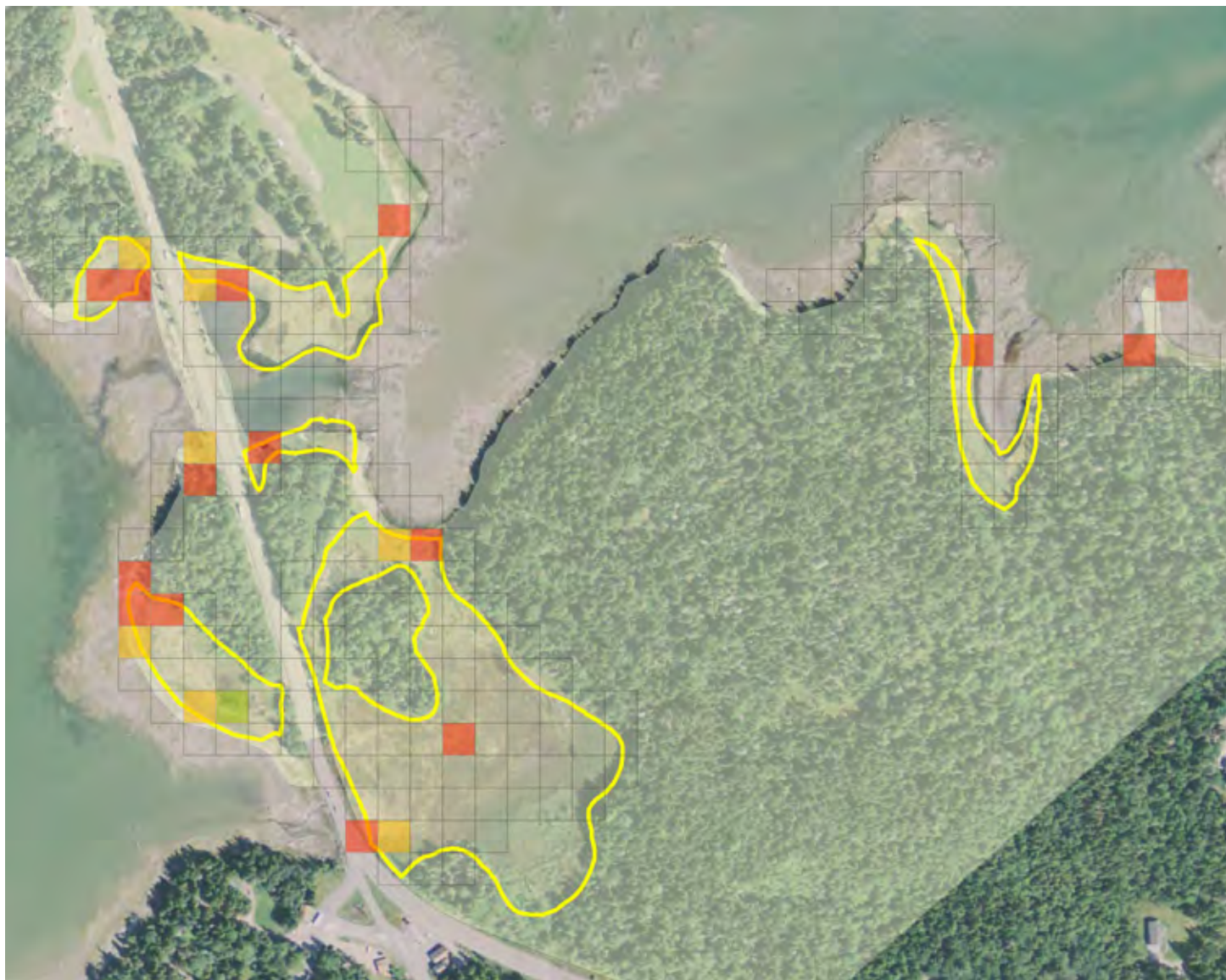
*Plantago maritima* ssp. *juncooides*



*Puccinellia pumila*



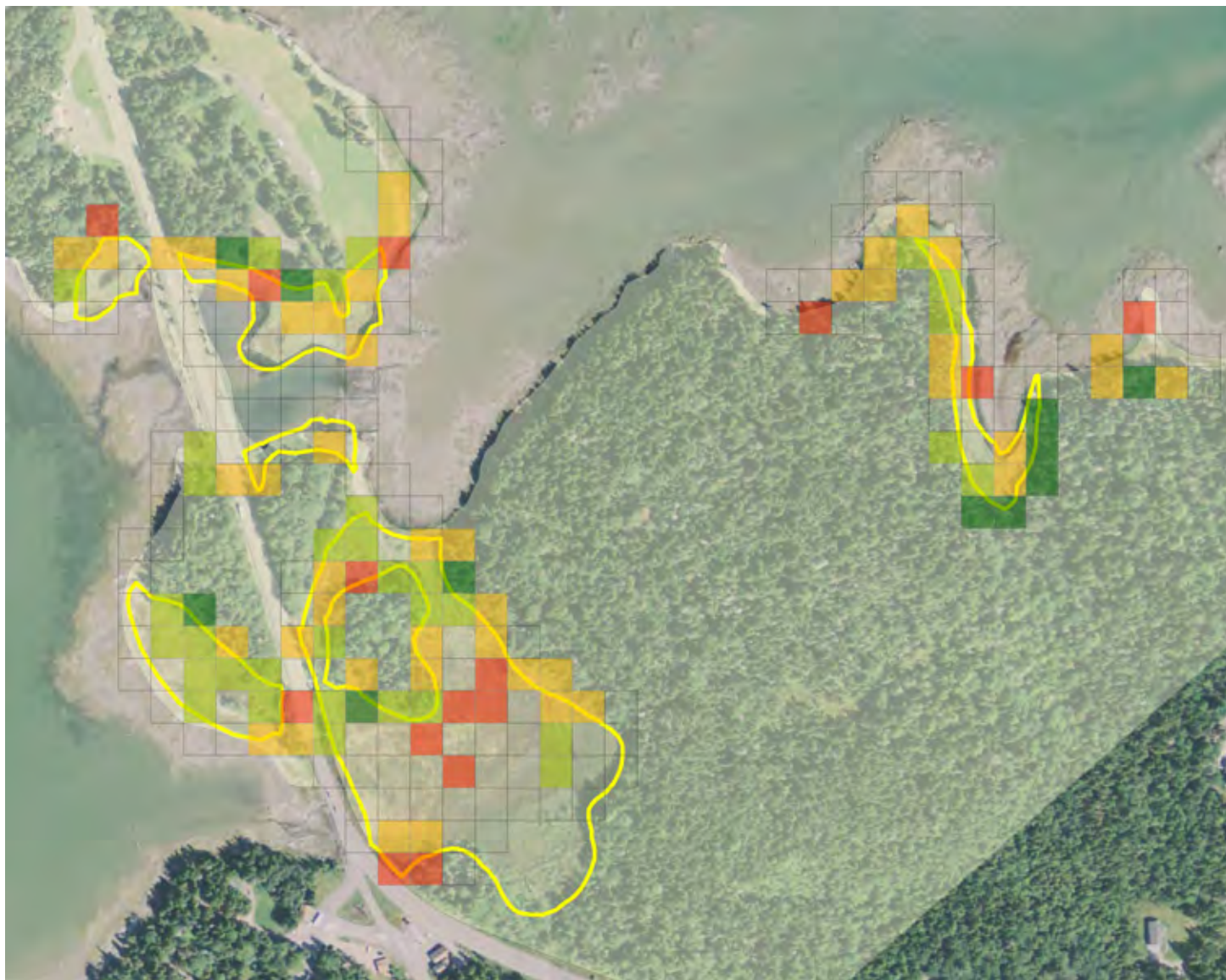
*Rosa* sp.



*Salicornia depressa*



*Solanum dulcamara*



*Solidago sempervirens* var. *sempervirens*



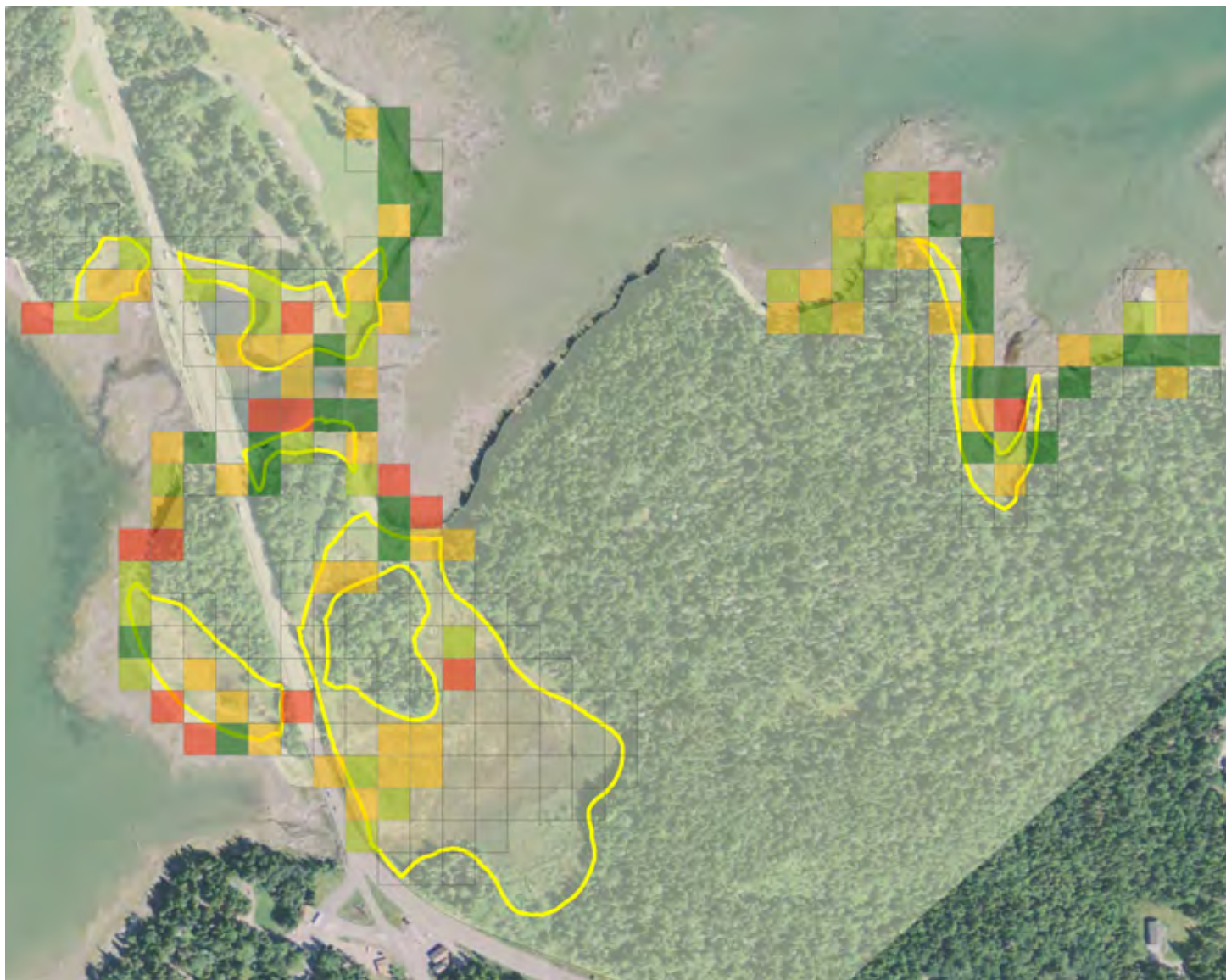
*Spargularia canadensis* ssp. *canadensis*



*Spargularia marina*



*Spiraea alba* var. *latifolia*



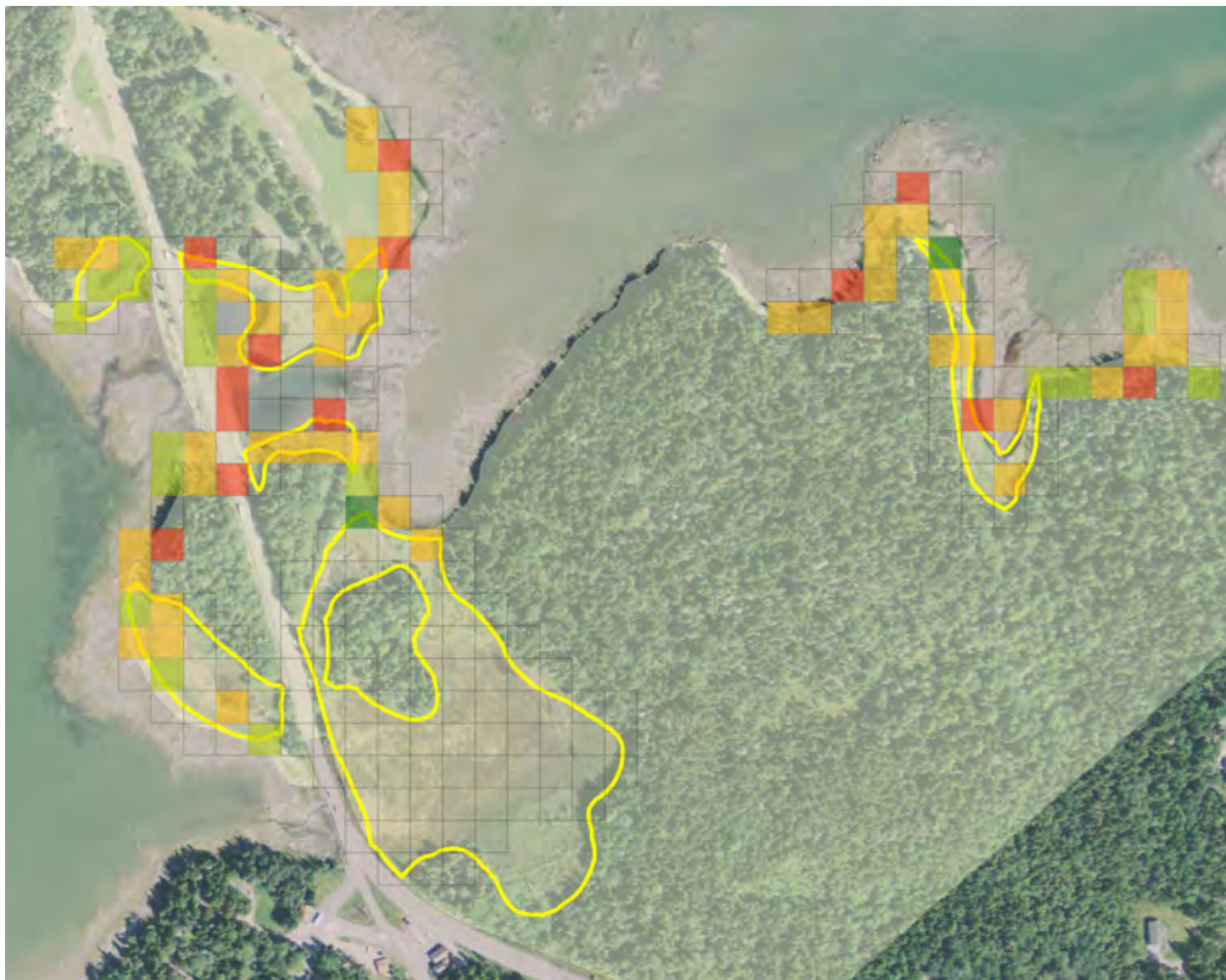
*Sporobolus alterniflorus*



*Sporobolus michauxianus*



*Sporobolus pumilus*



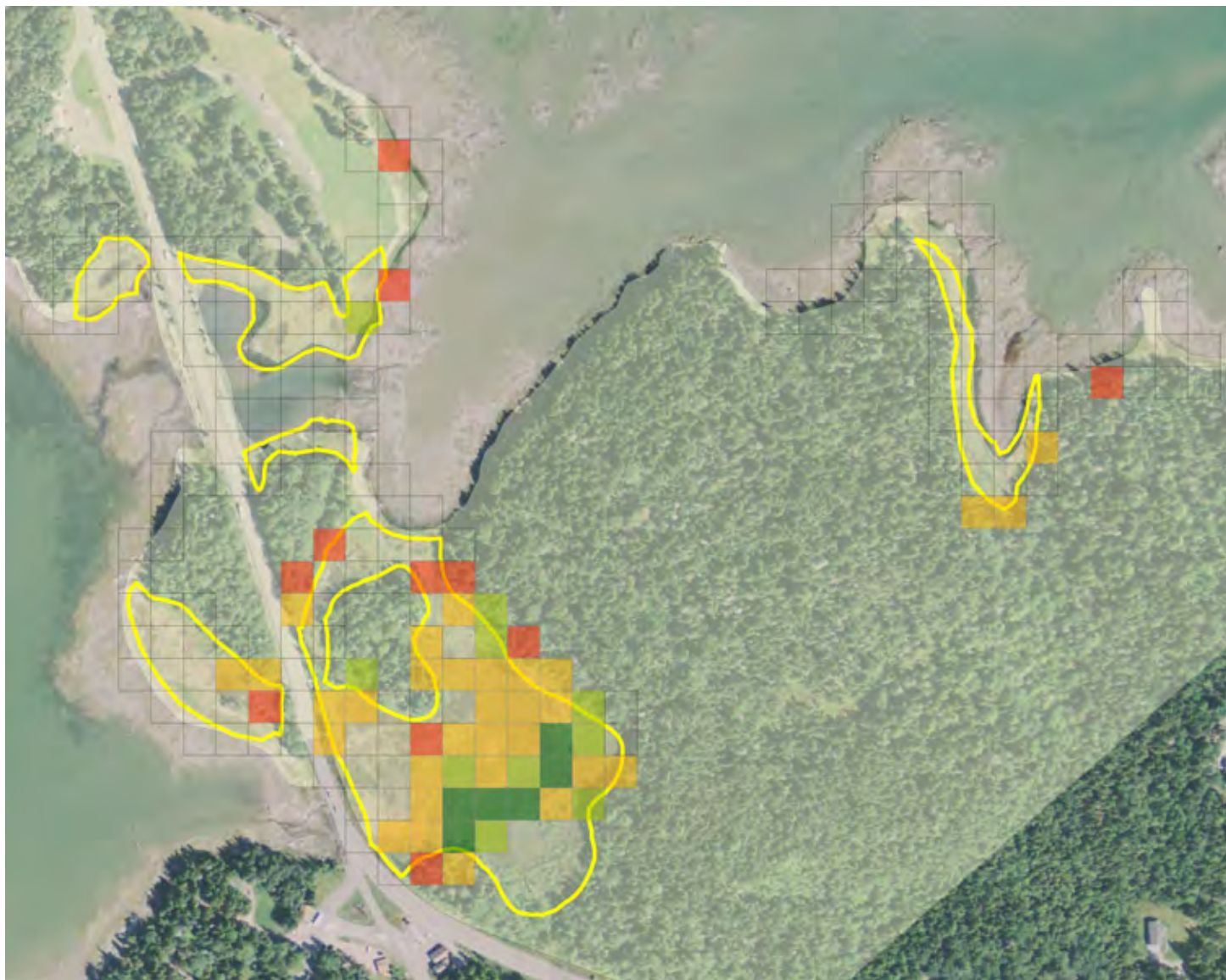
*Suaeda* sp.



*Symphyotrichum* sp.



*Toxicodendron rydbergii*



*Triglochin maritima*



*Typha latifolia*

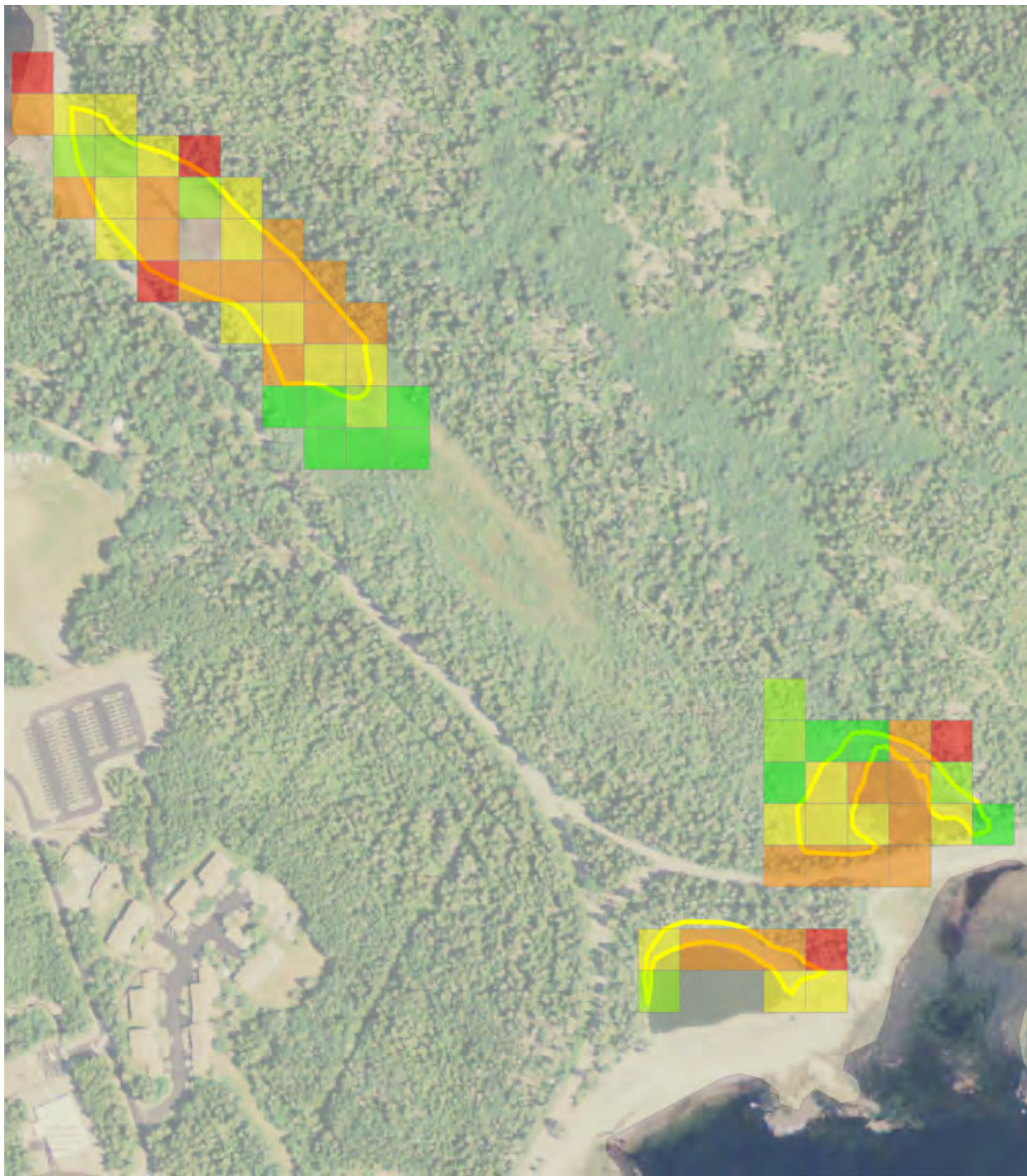


*Vaccinium macrocarpon*

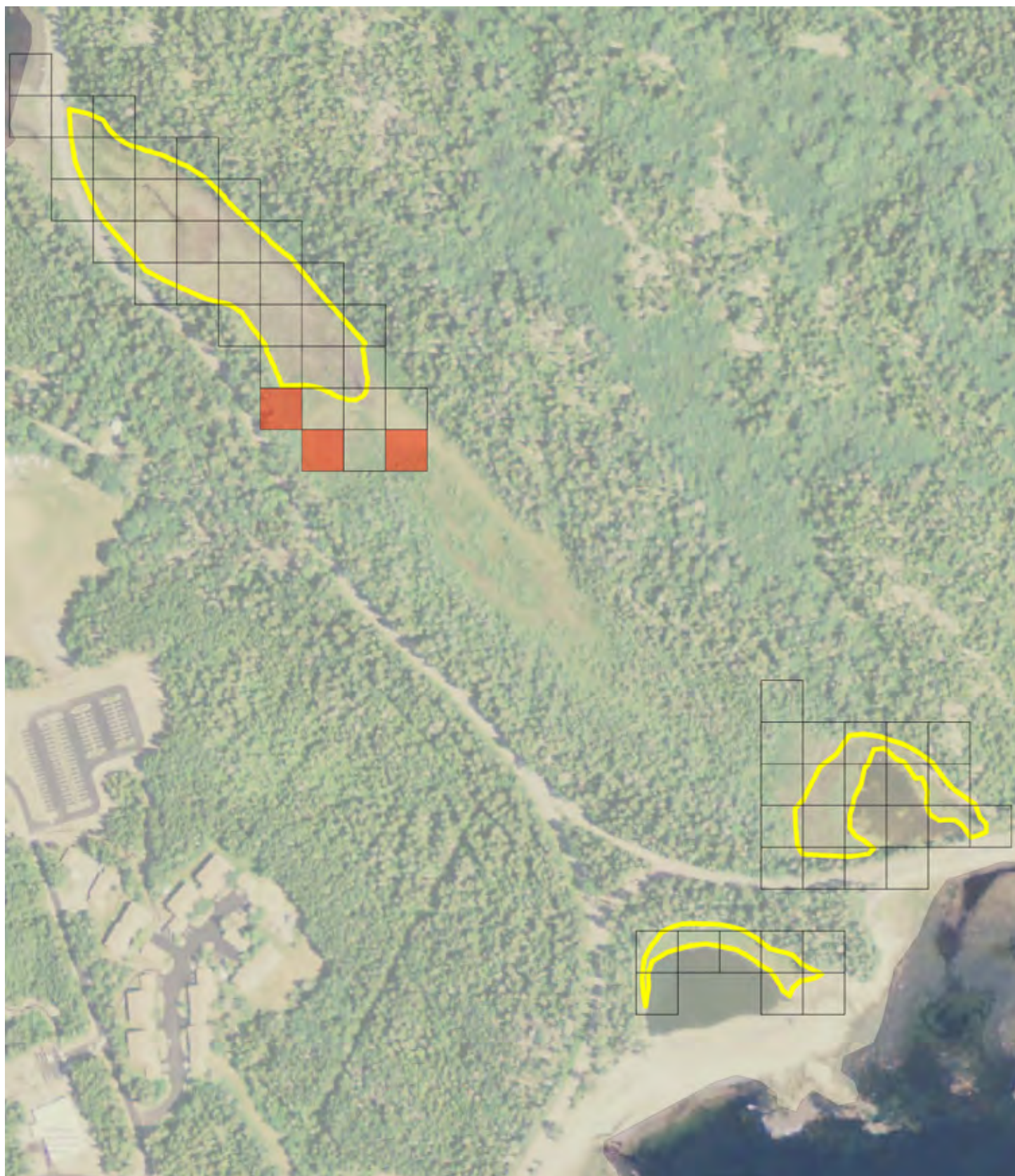


*Zostera marina*

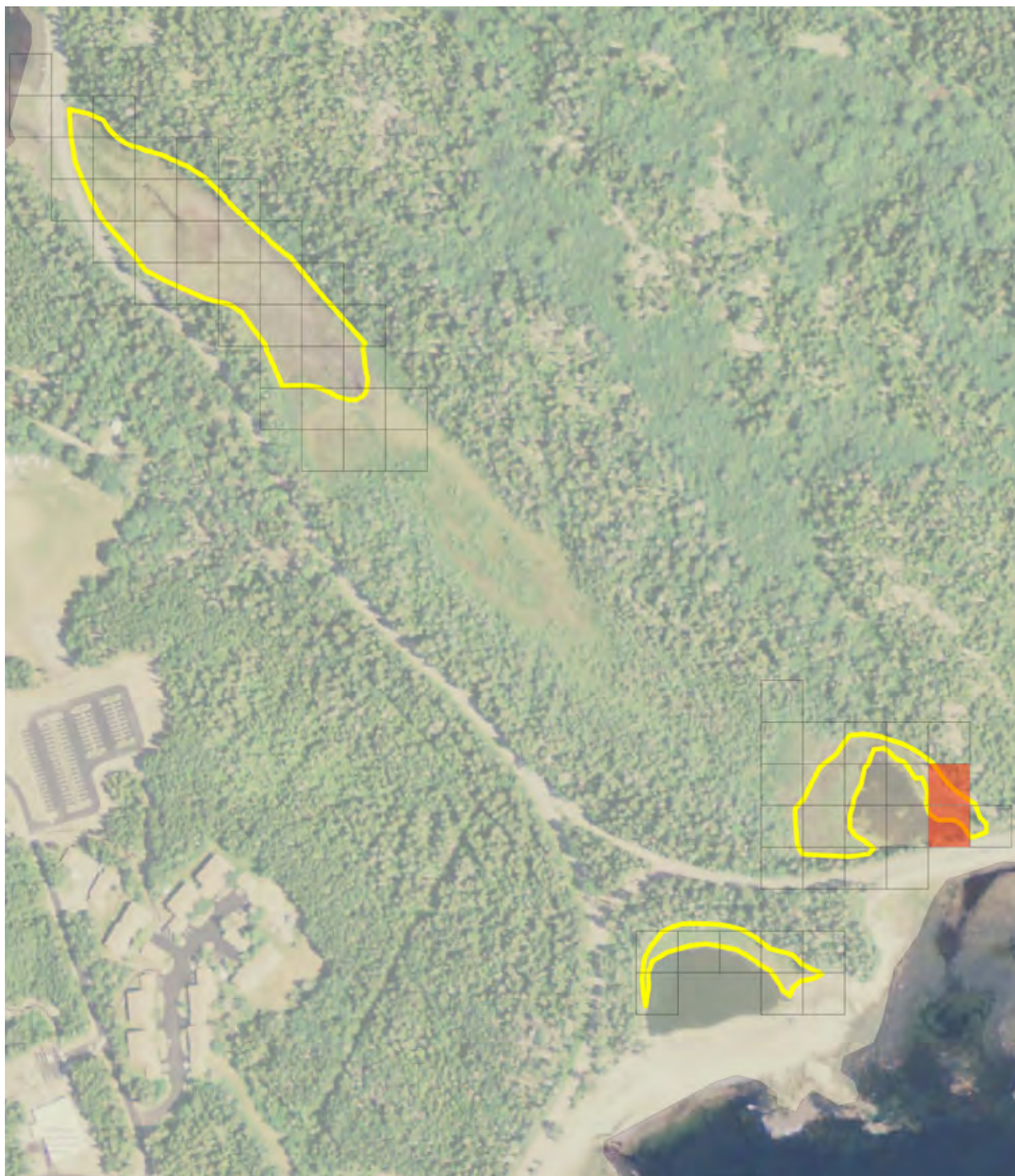
Appendix 4. Plant distribution maps for the salt marsh area on Schoodic Peninsula



Number of species per grid cell



*Acer rubrum*



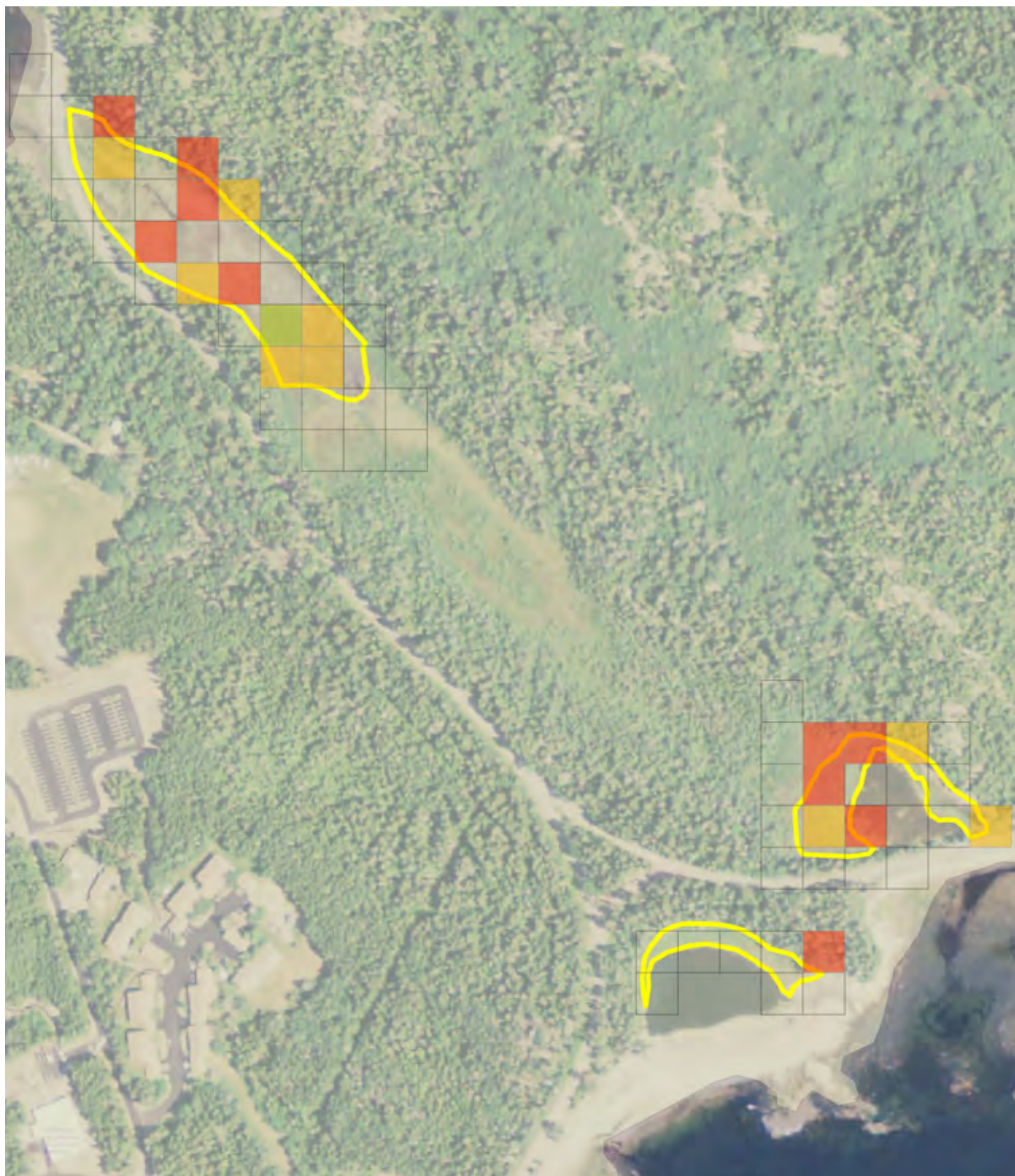
*Agrostis stolonifera*



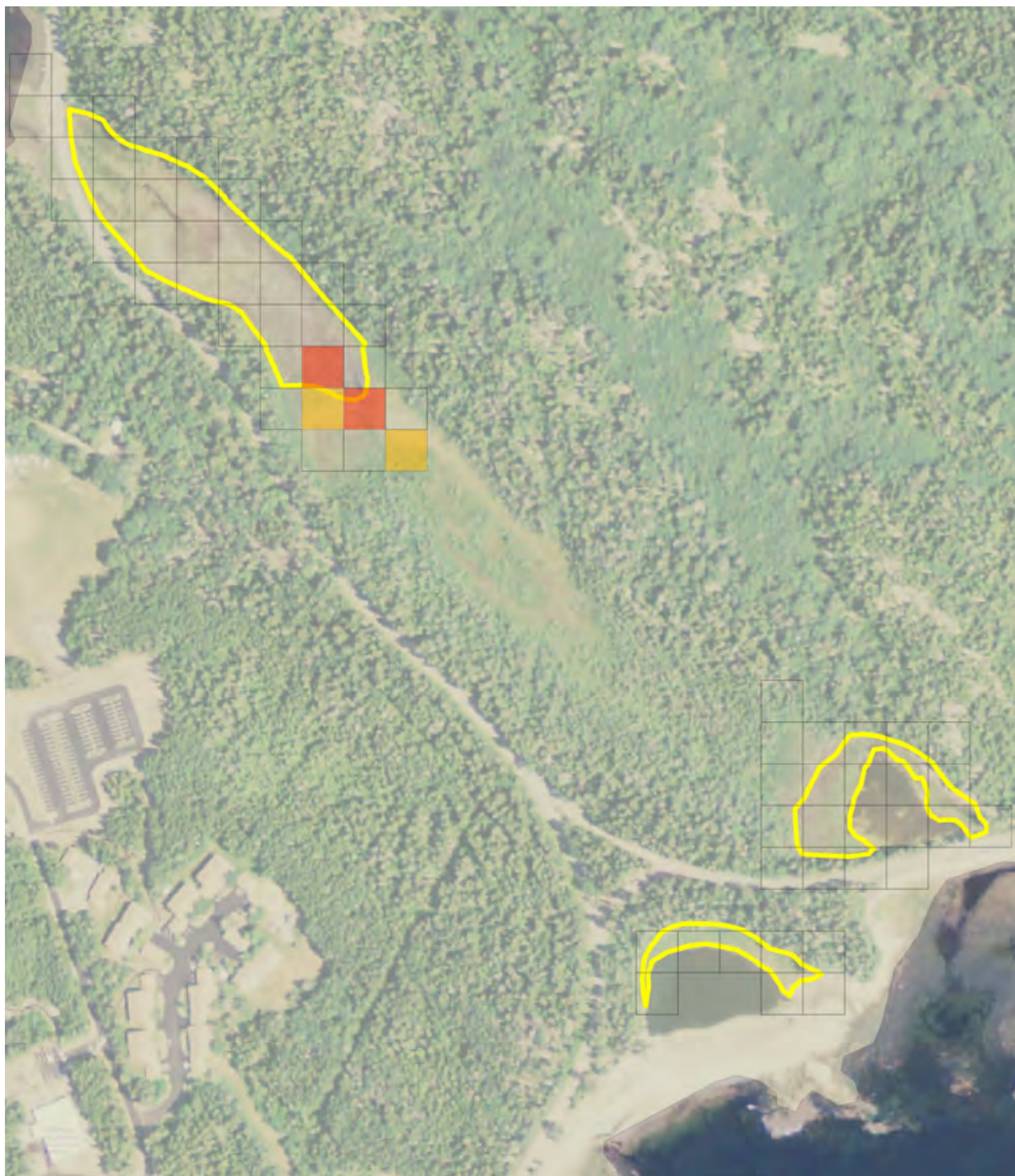
*Amelanchier* sp.



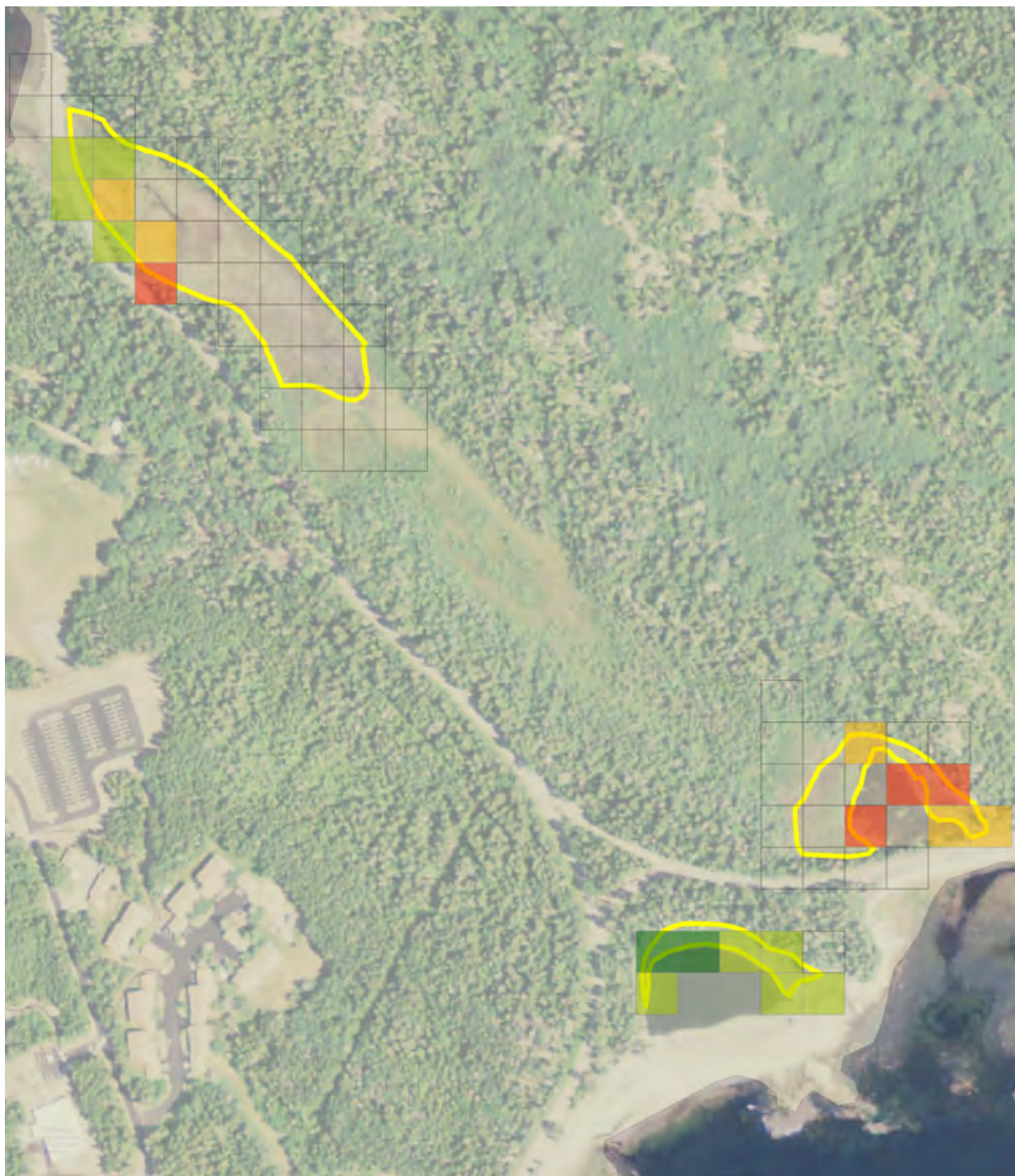
*Anthoxanthum nitens* ssp. *nitens*



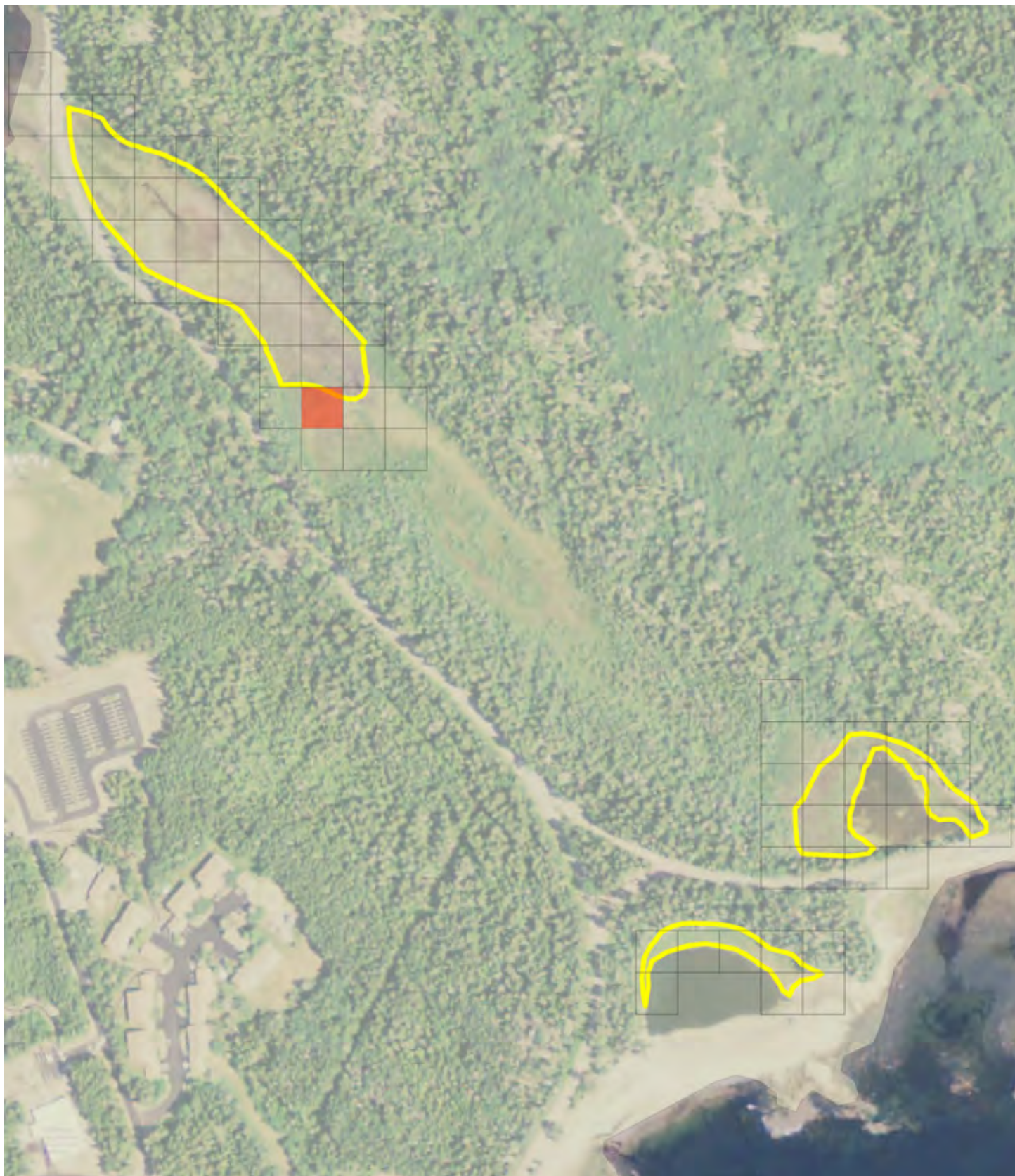
*Argentina egedii* ssp. *groenlandica*



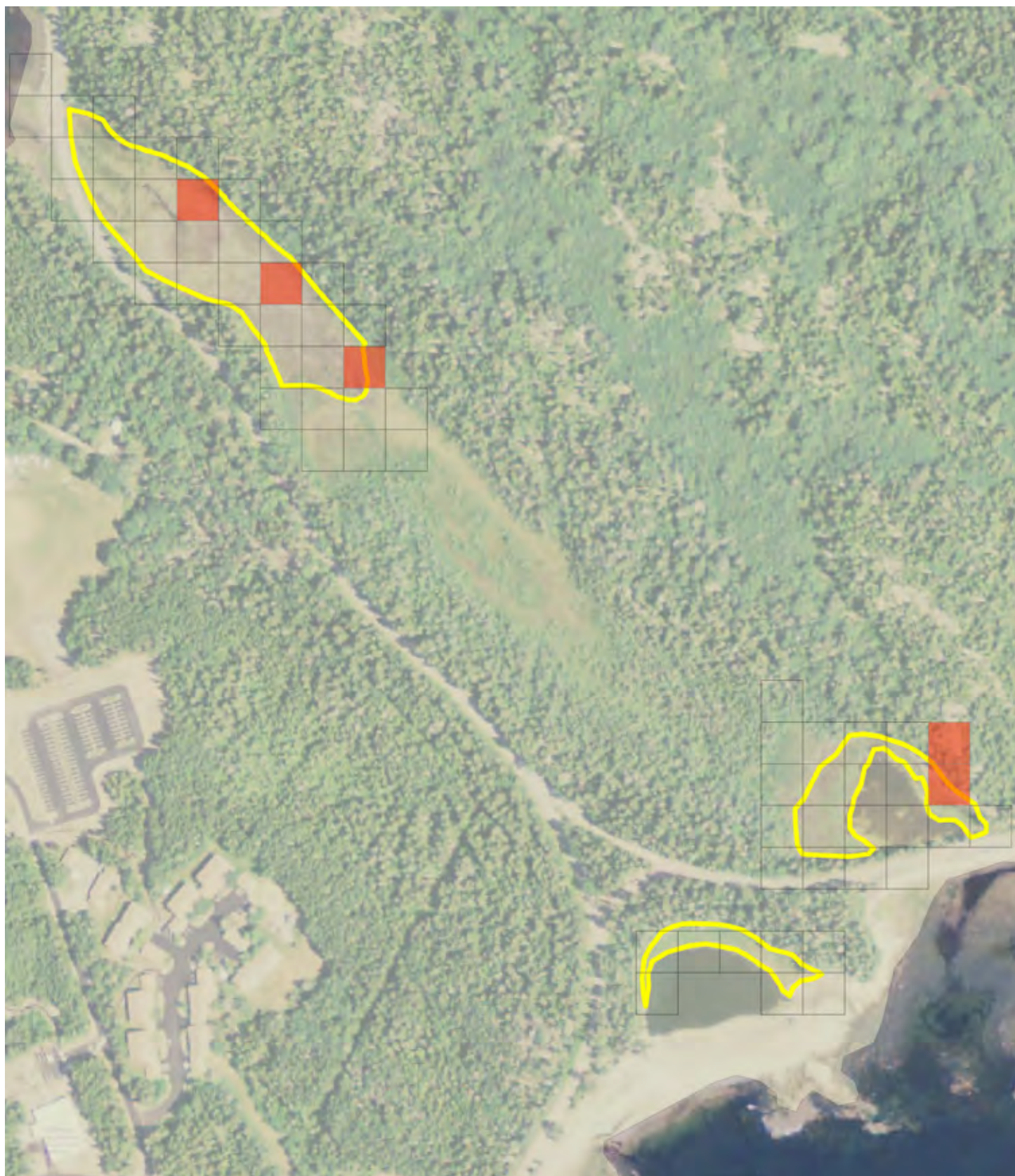
*Aronia floribunda*



*Atriplex acadiensis*



*Calopogon tuberosus* var. *tuberosus*



*Calystegia sepium*



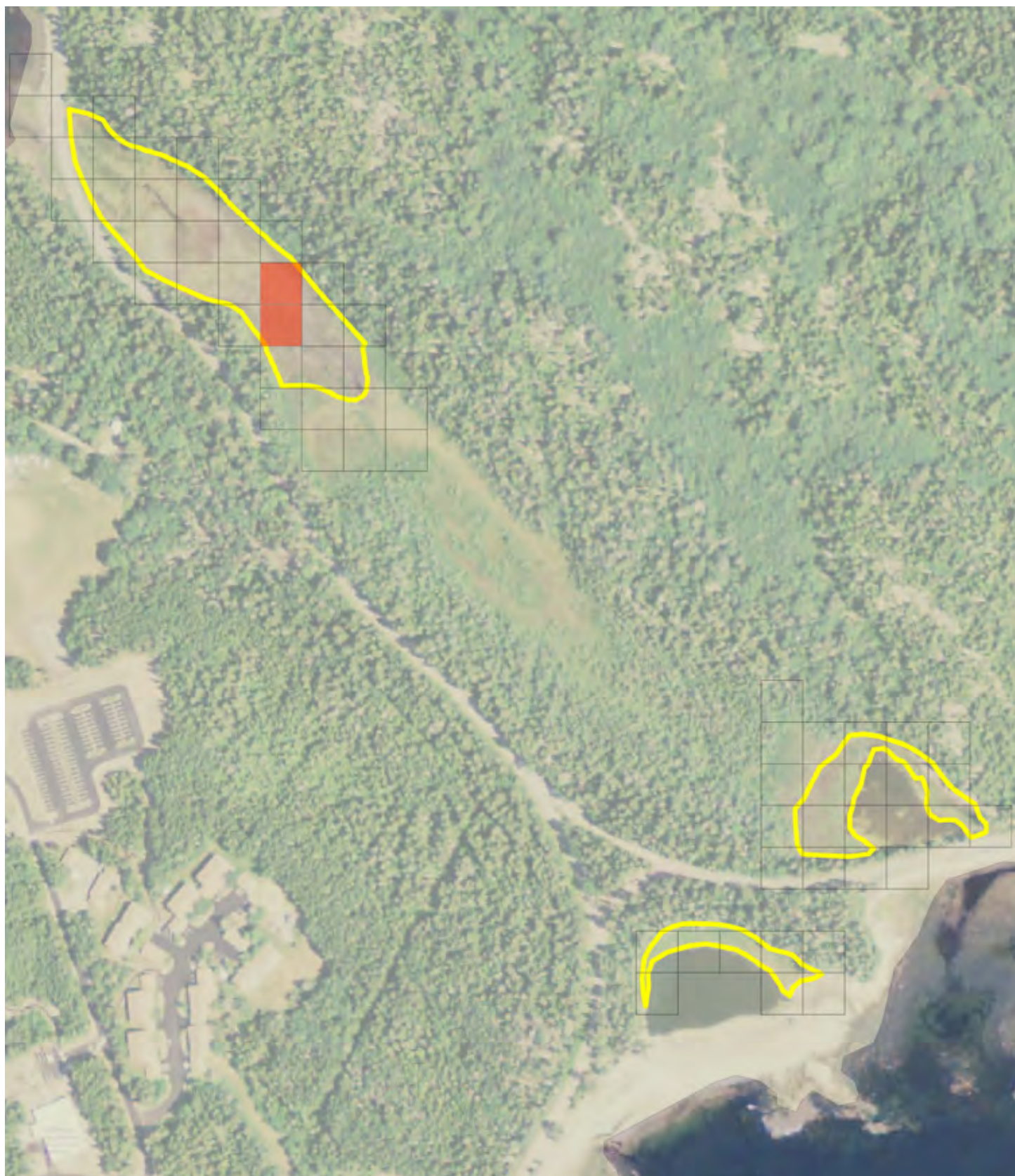
*Carex billingsii*



*Carex brunnescens*



*Carex exilis*



*Carex mackenziei*



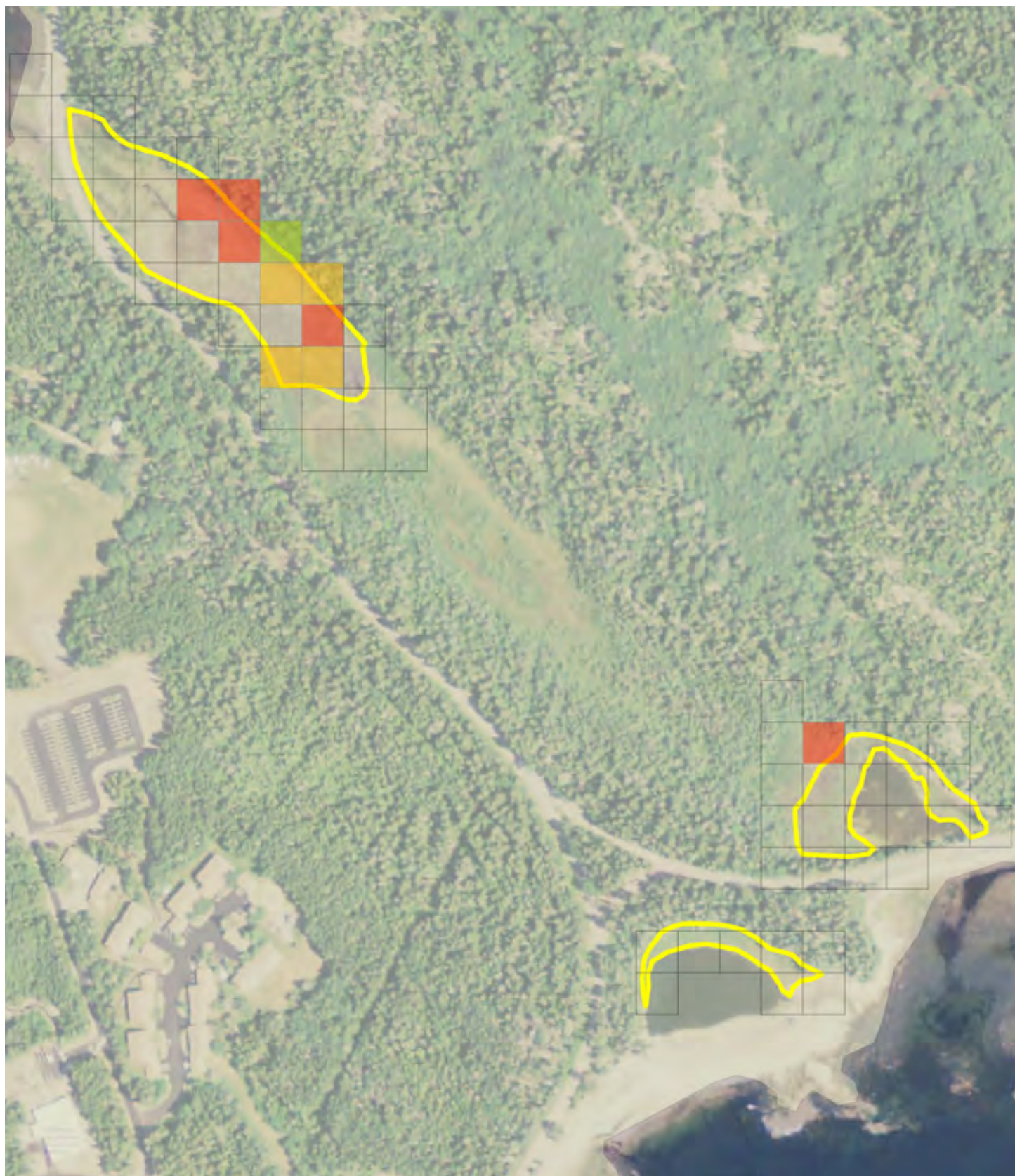
*Carex paleacea*



*Carex scoparia*



*Carex trisperma*



*Carex viridula* ssp. *viridula* var. *viridula*



*Chamaedaphne calyculata*



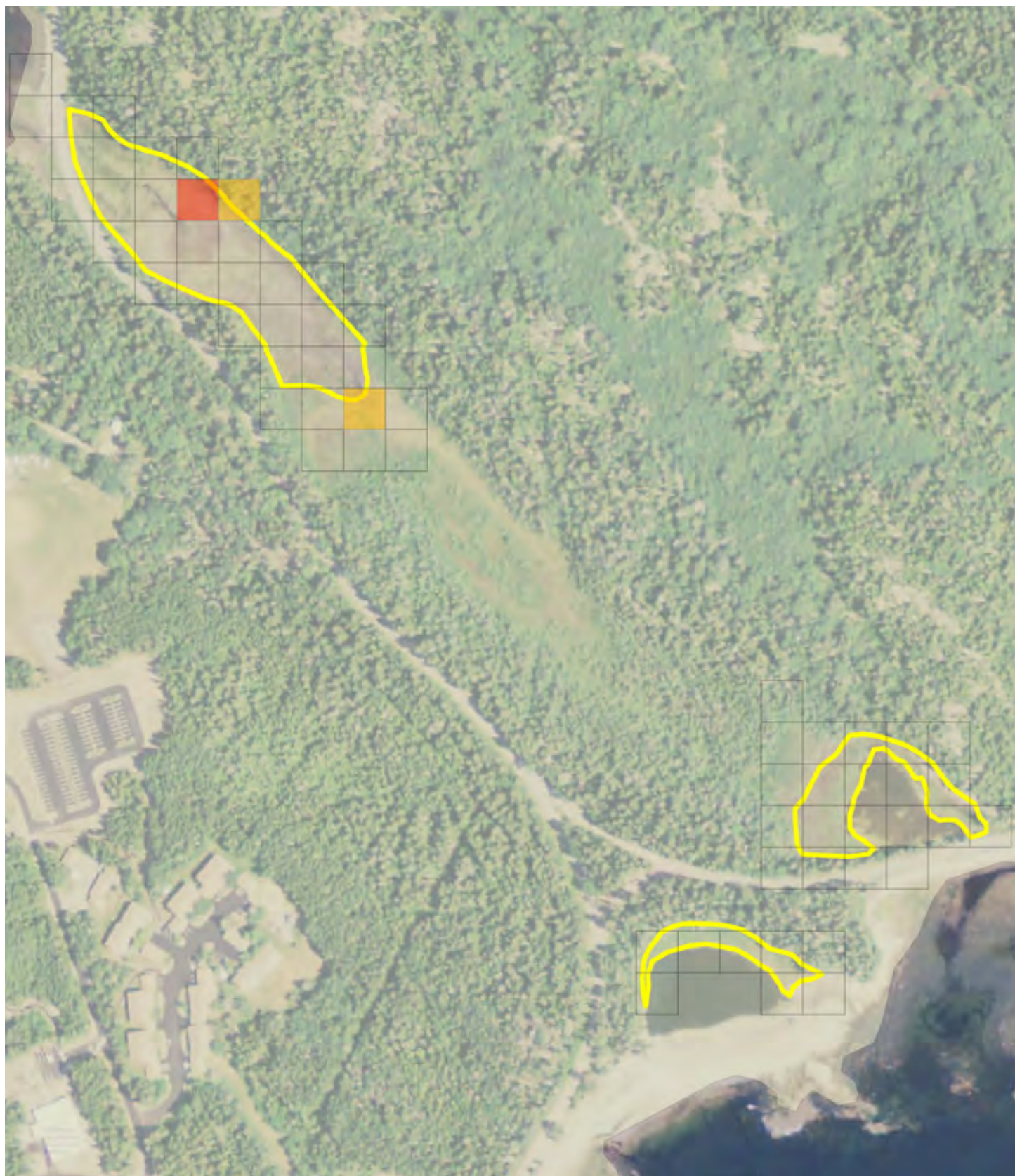
*Doellingeria umbellata* var *umbellata*



*Drosera intermedia*



*Drosera rotundifolia*



*Eleocharis* sp.



*Elymus trachycaulus*



*Empetrum nigrum*



*Festuca rubra*



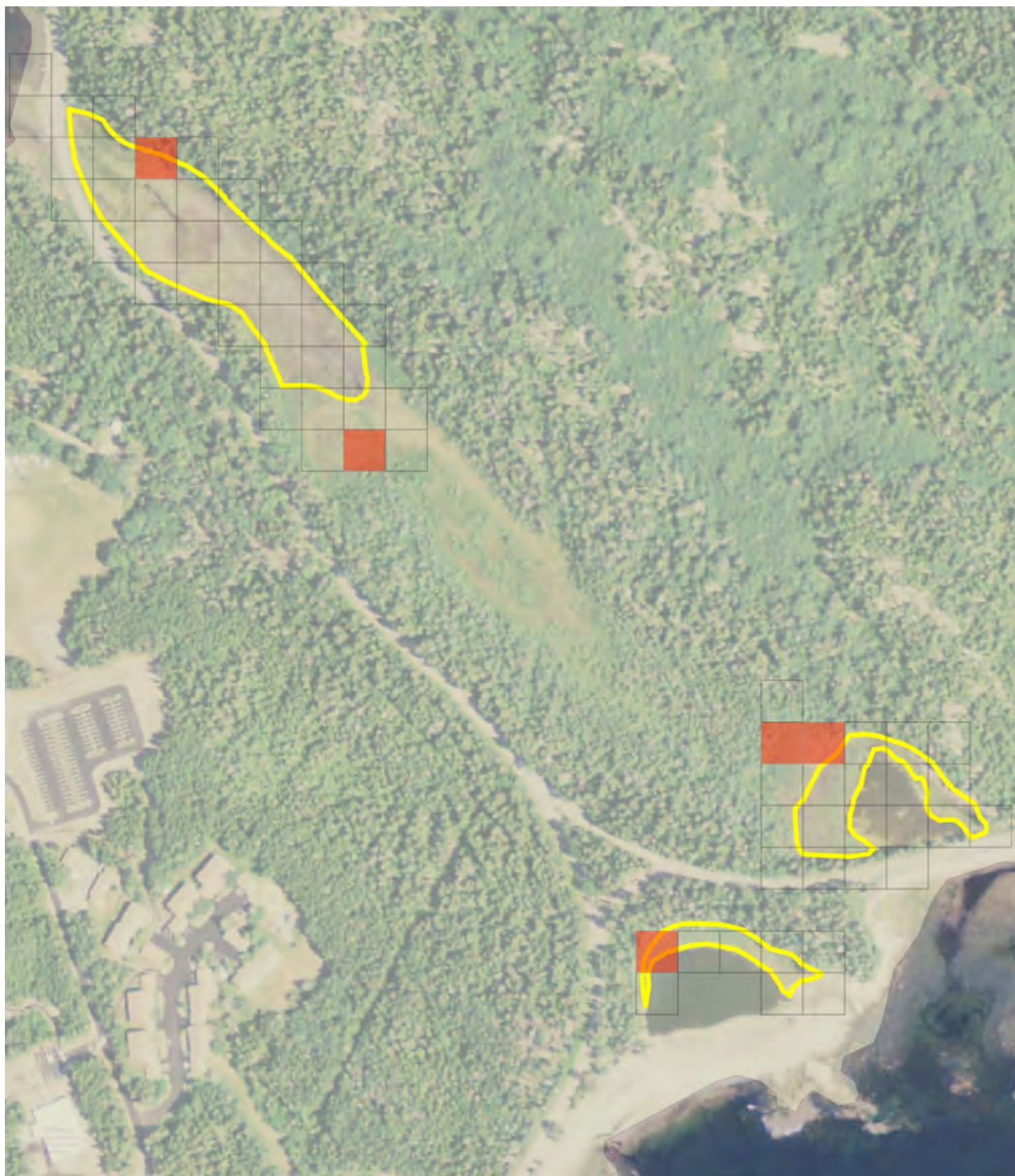
*Gaylussacia baccata*



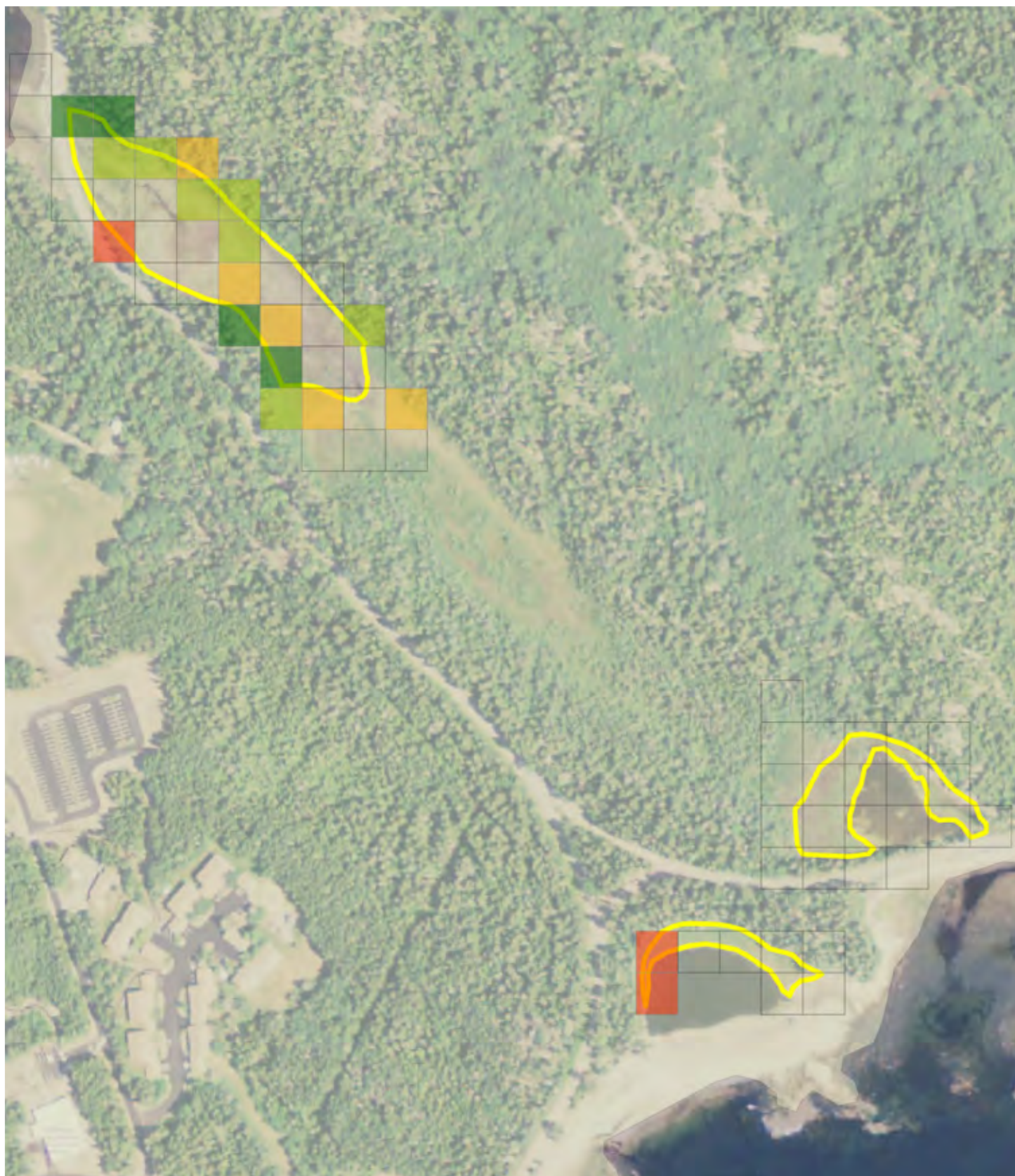
*Ilex mucronata*



*Ilex verticillata*



*Iris versicolor*



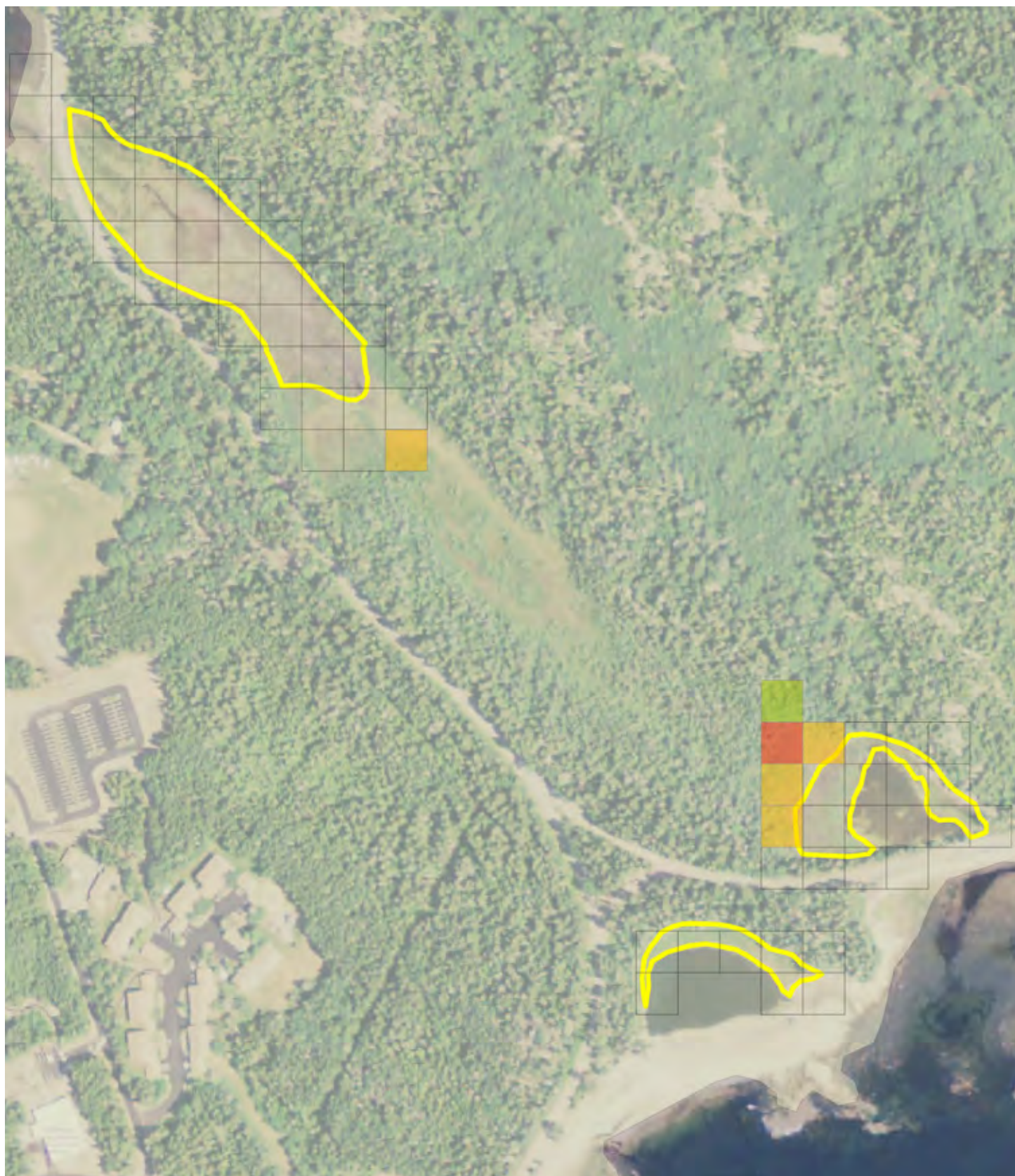
*Juncus balticus* ssp. *littoralis*



*Juncus gerardii*



*Kalmia angustifolia* ssp. *angustifolia*



*Larix laricina*



*Lathyrus japonicus* var. *maritimus*



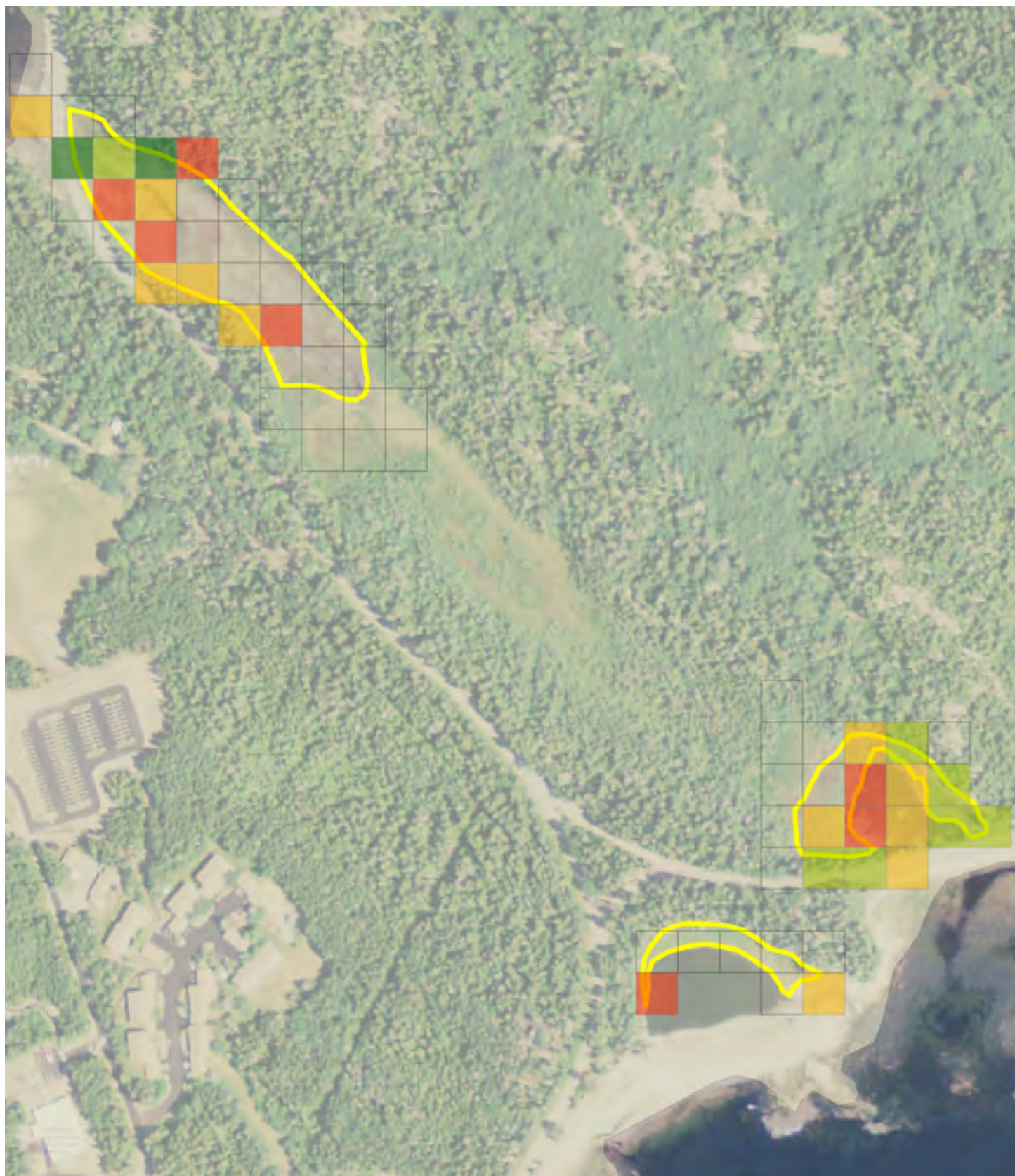
*Leymus mollis* ssp. *mollis*



*Ligusticum scoticum* ssp. *scoticum*



*Limonium carolinianum*



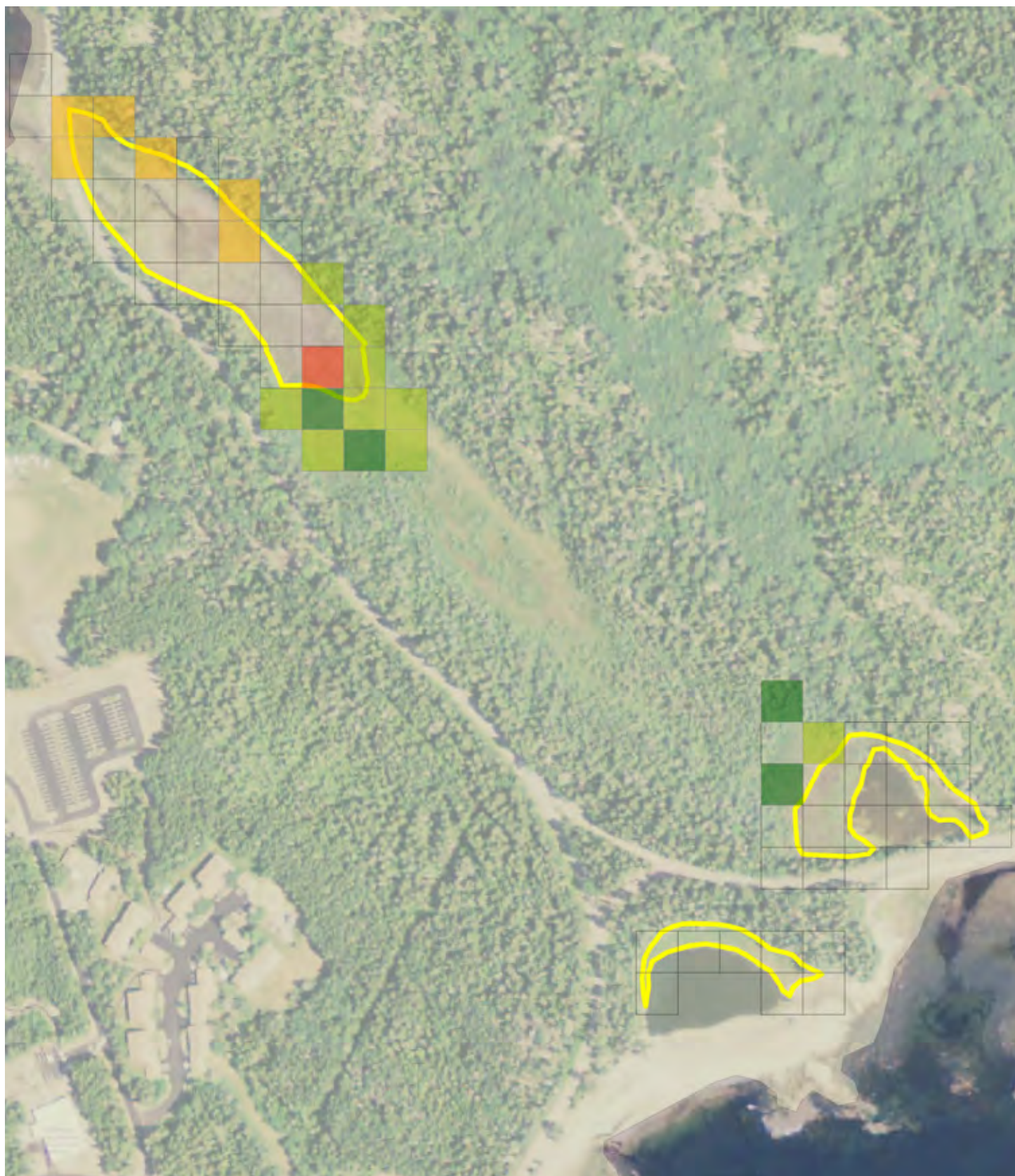
*Lysimachia maritima*



*Maianthemum trifolium*



*Morella caroliniensis*



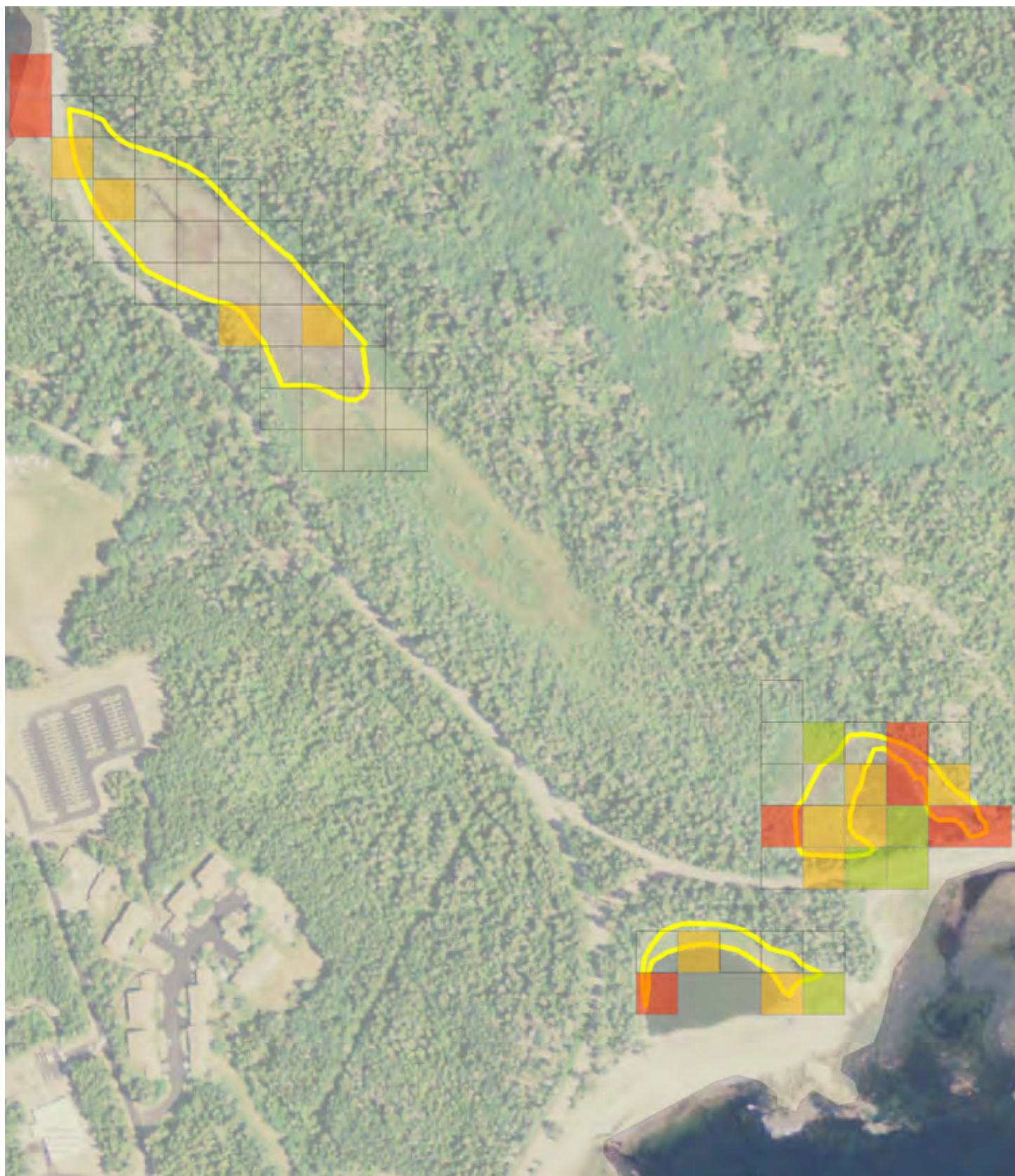
*Myrica gale*



*Oclemea nemoralis*



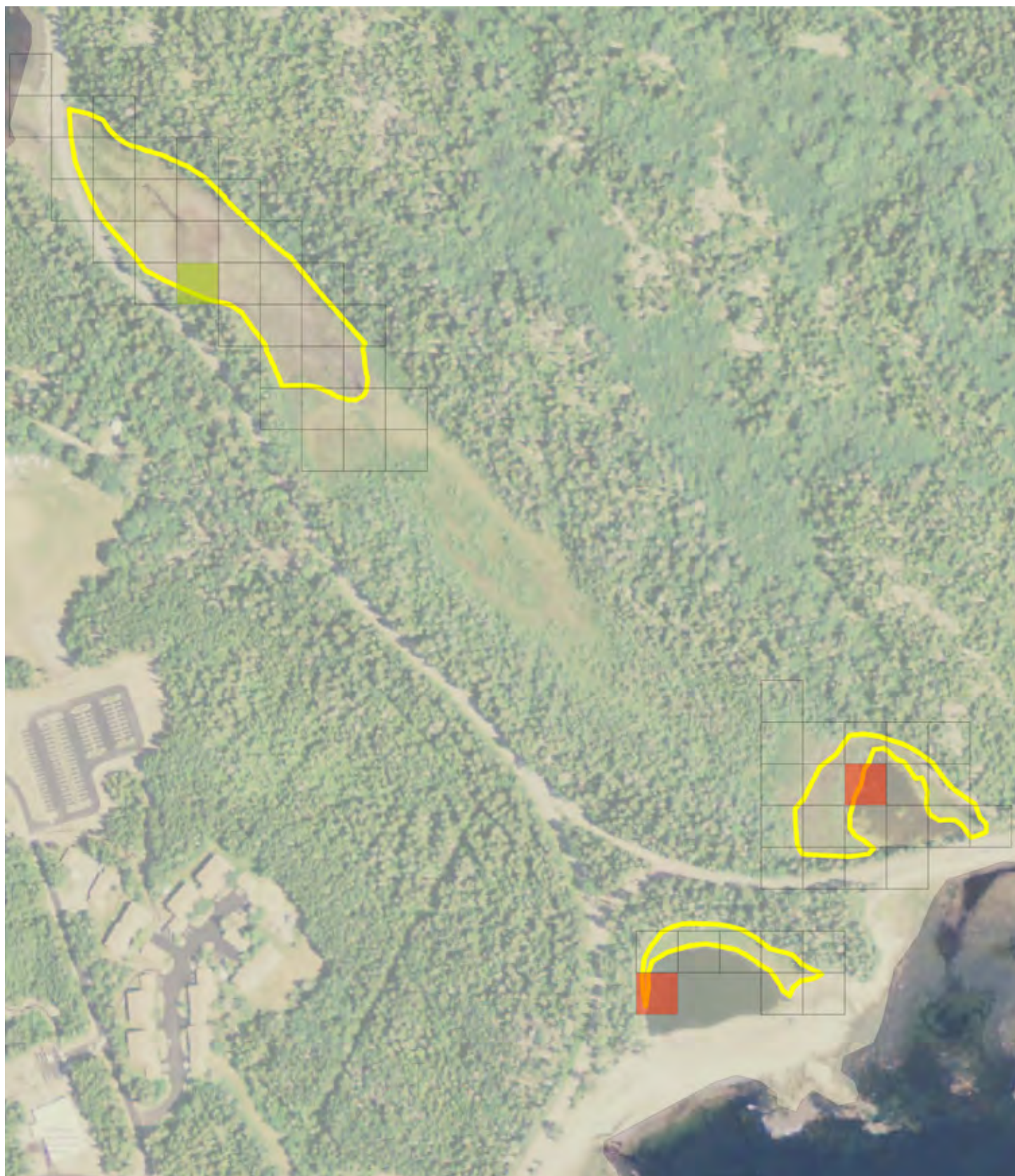
*Picea mariana*



*Plantago maritima* ssp. *juncoides*



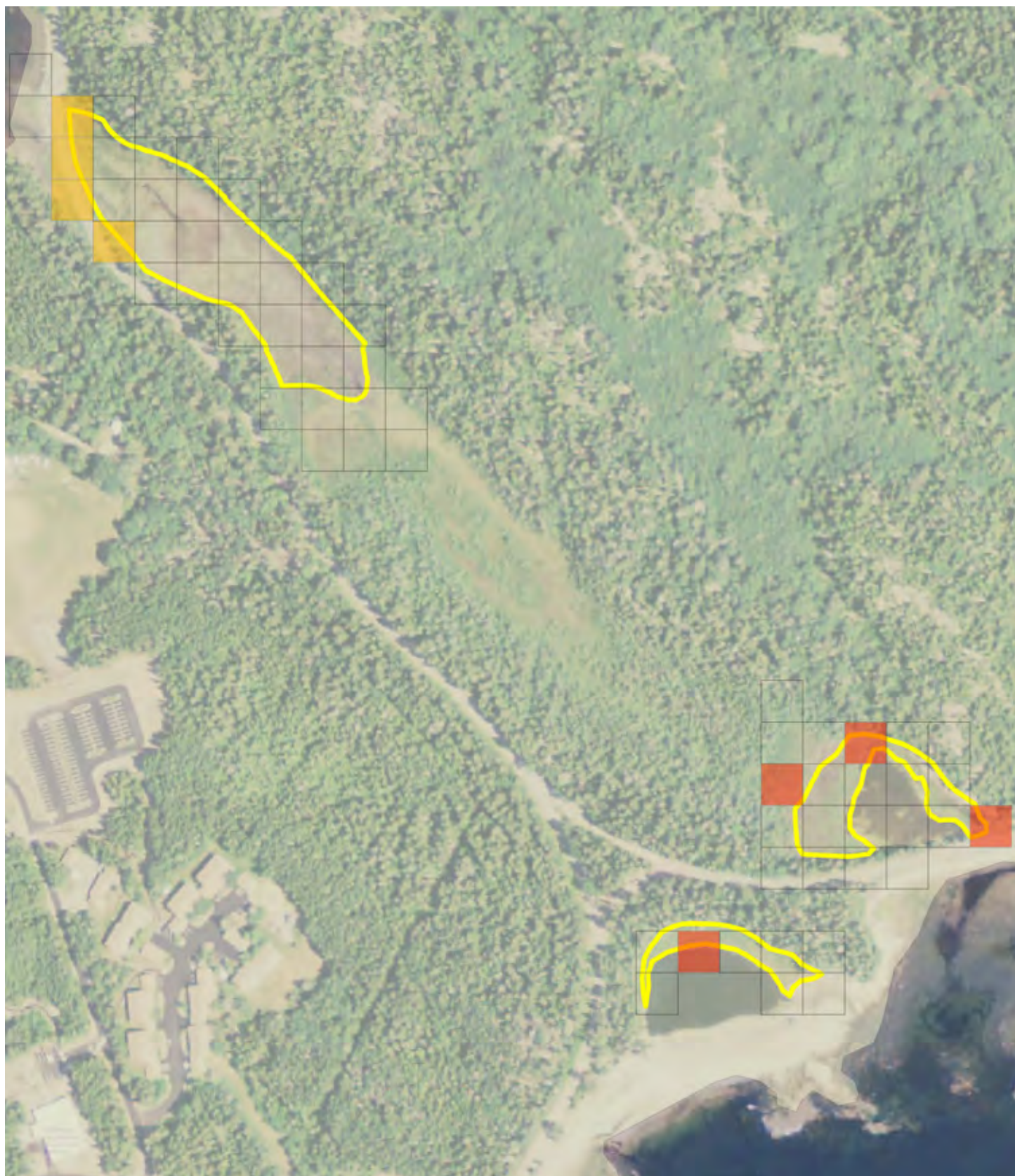
*Pogonia ophioglossoides*



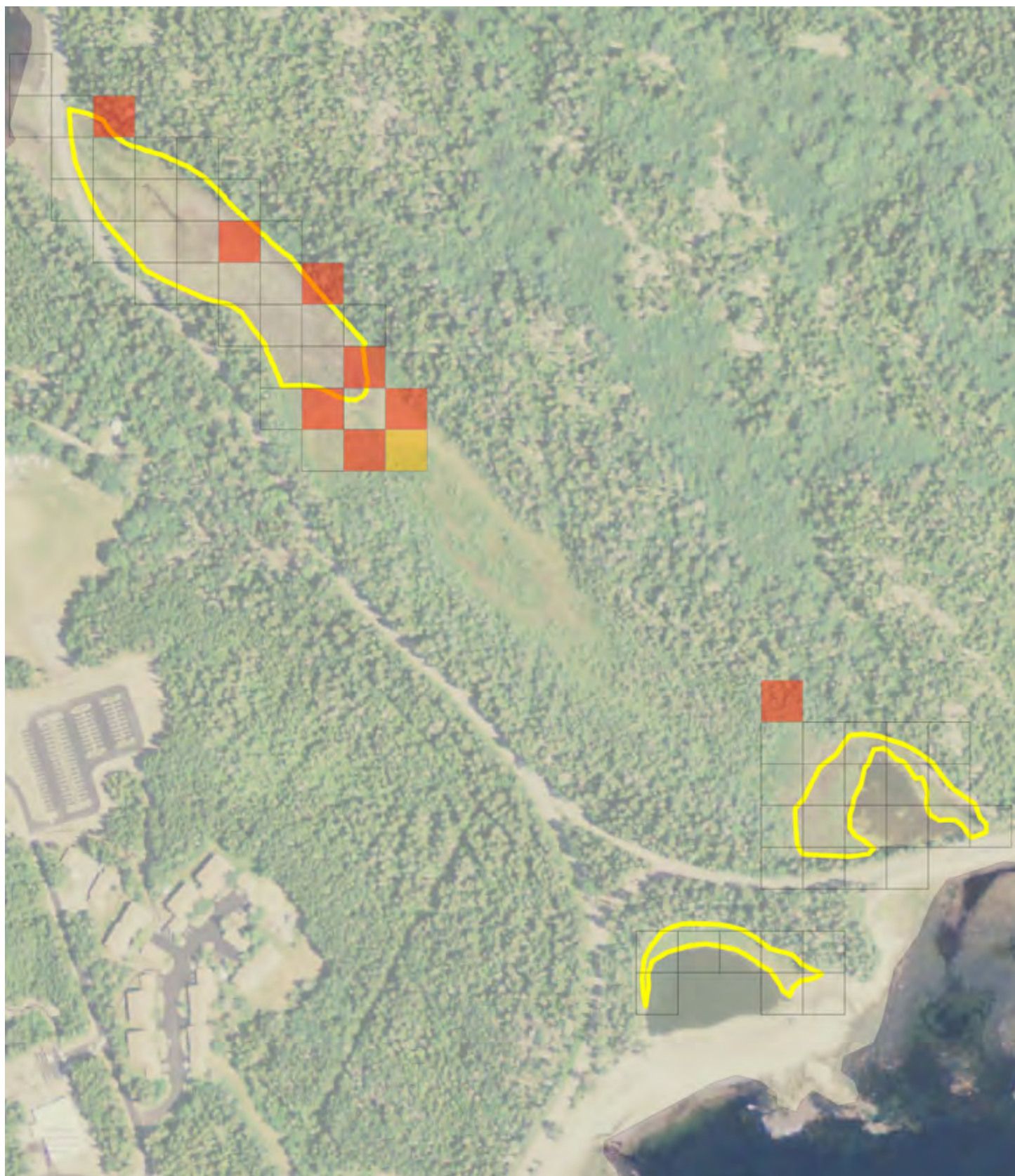
*Puccinellia pumila*



*Rhododendron groenlandicum*

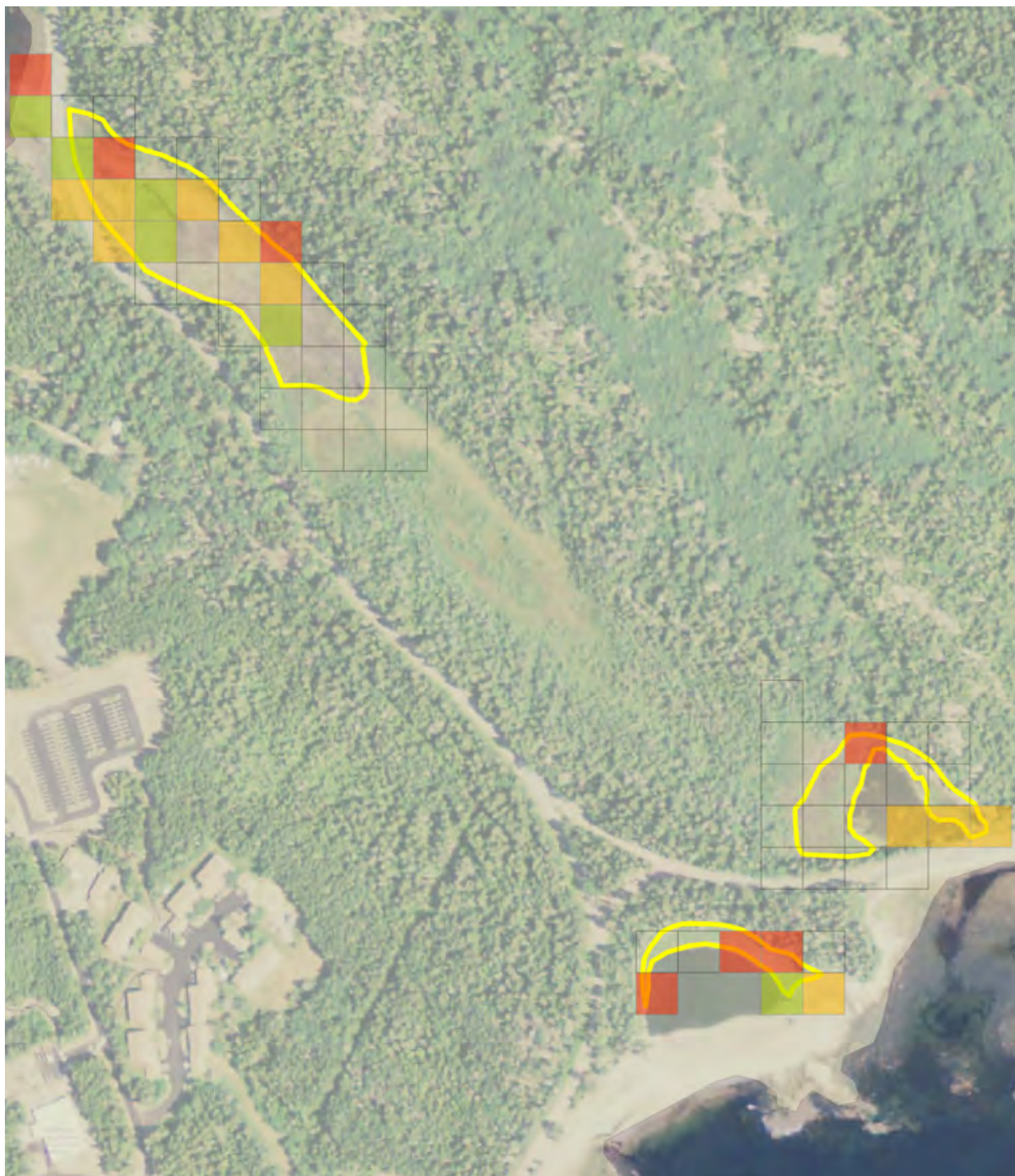


*Rosa rugosa*



*Rosa* sp.

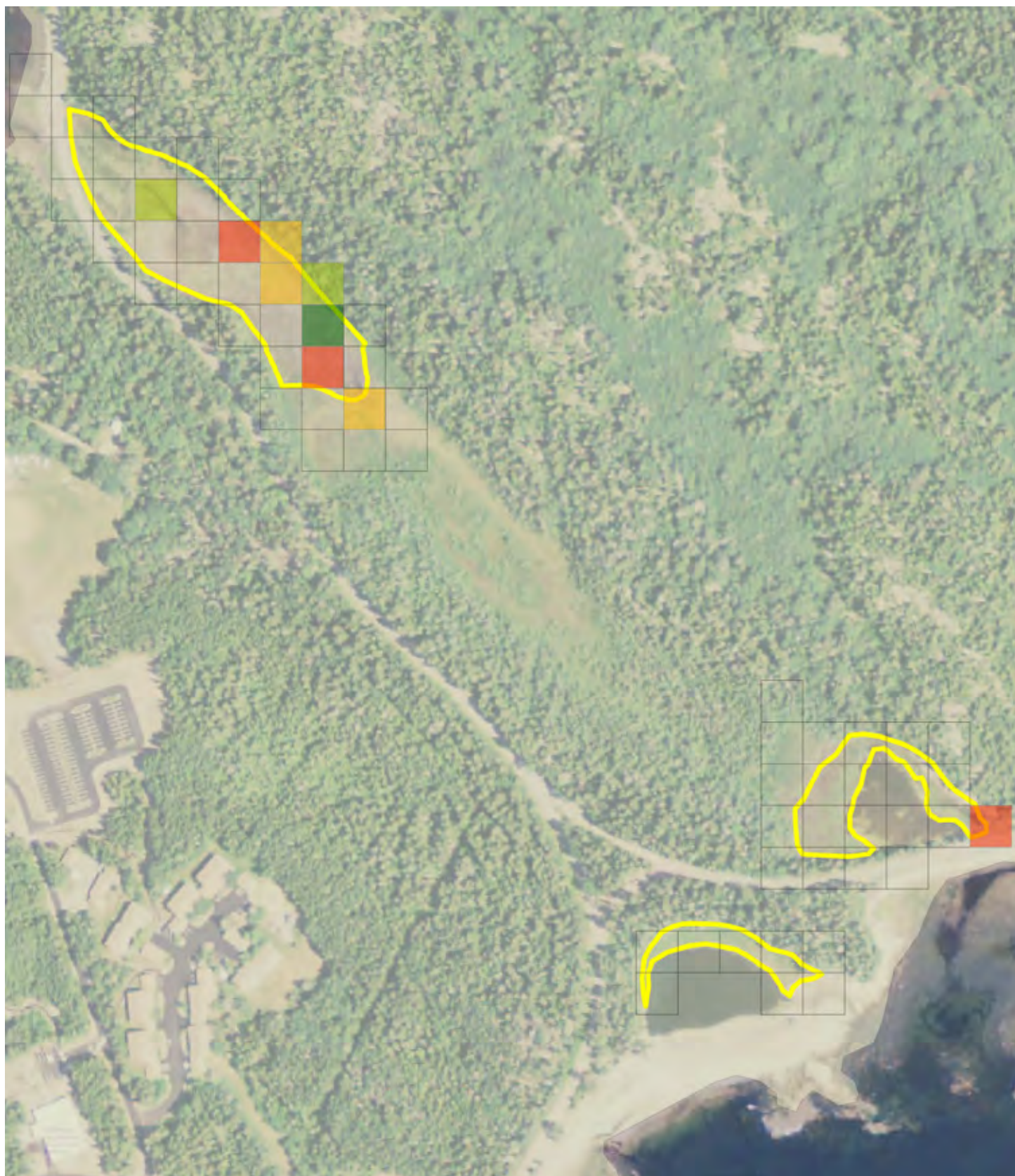
*Rubus* sp.



*Salicornia depressa*



*Sarracenia purpurea* ssp. *purpurea*



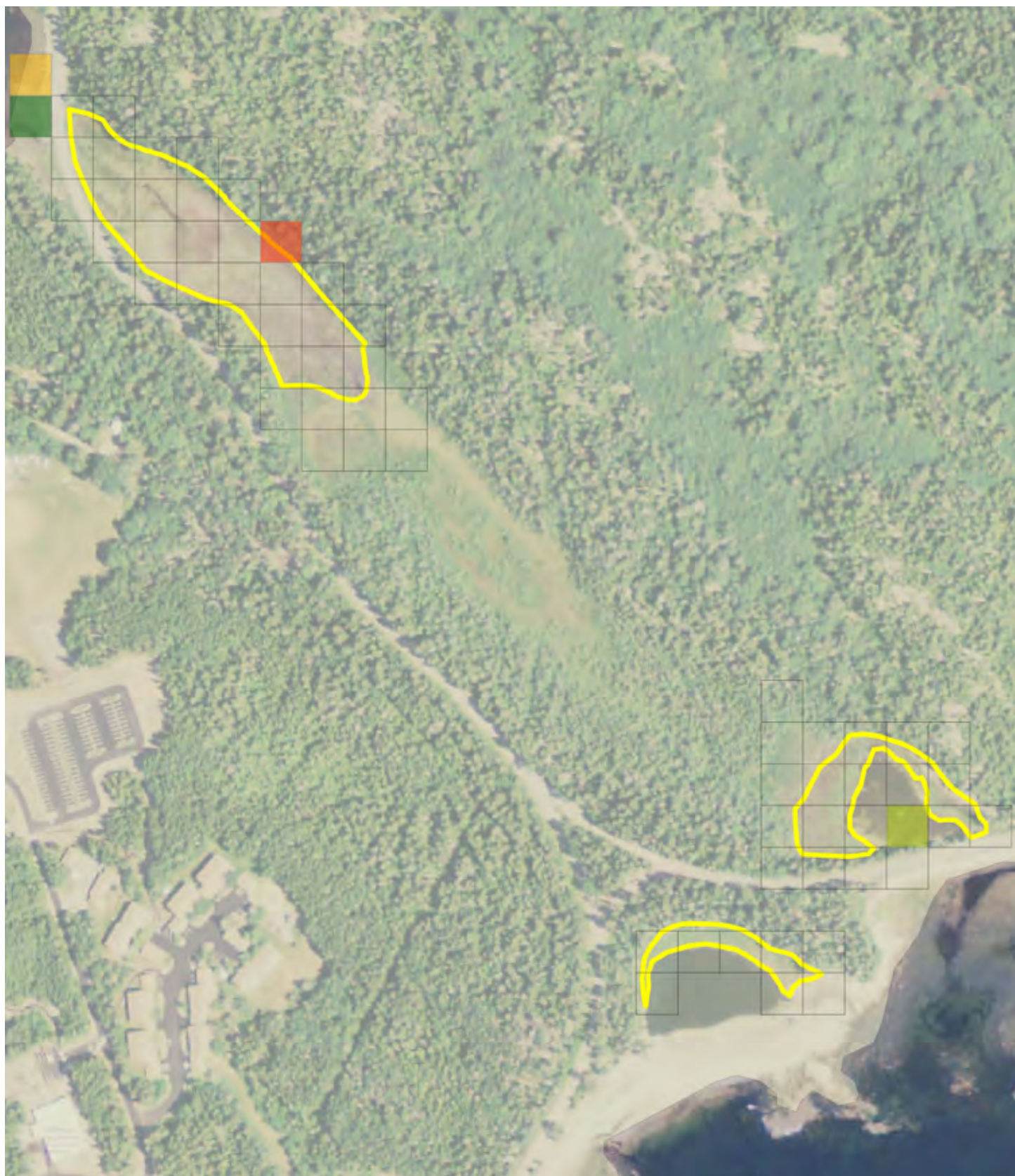
*Schoenoplectus tabernaemontani*



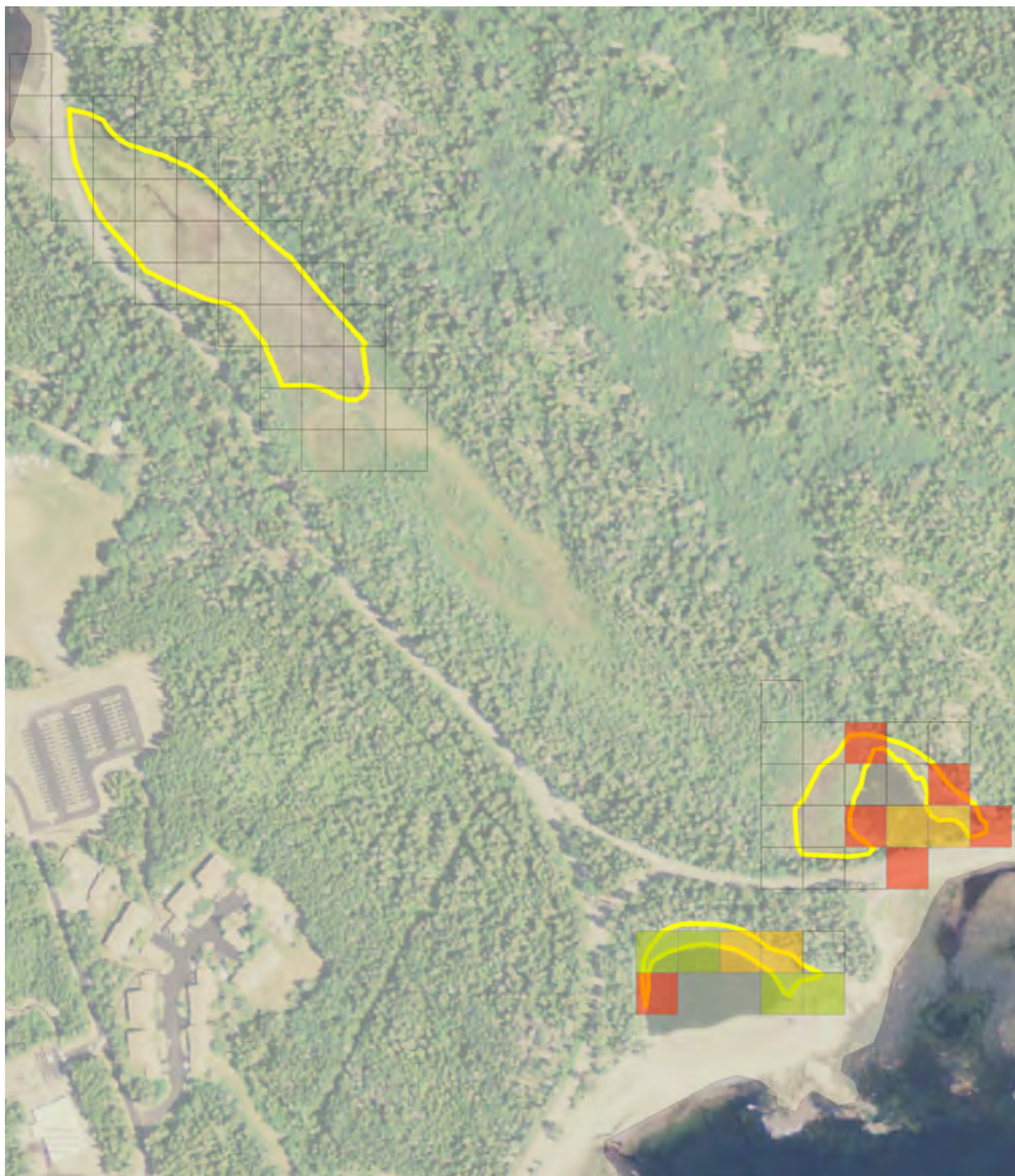
*Solidago sempervirens* var. *sempervirens*



*Spiraea alba* var. *latifolia*



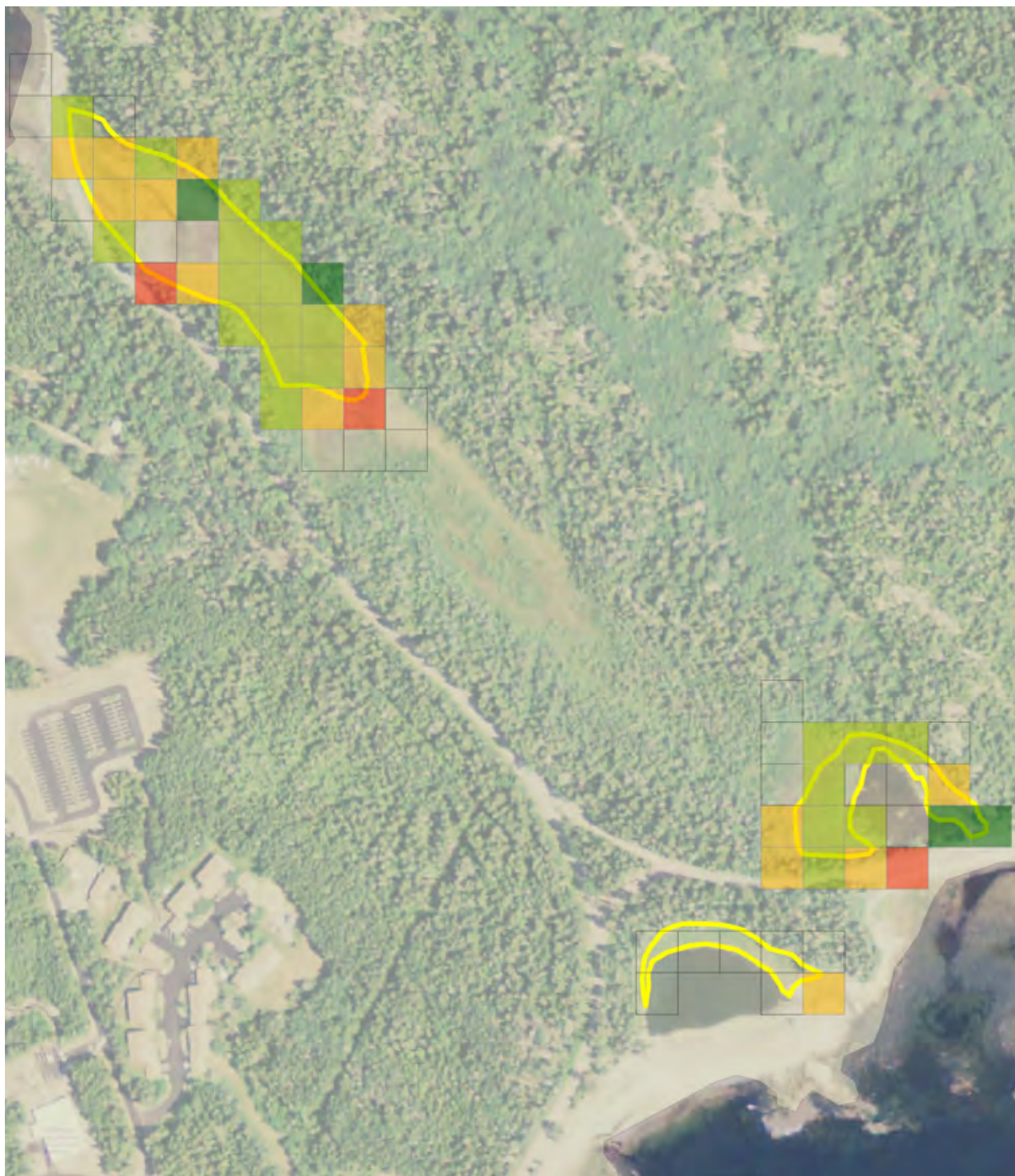
*Sporobolus* sp.



*Snaeda* sp.



*Thuja occidentalis*



*Triglochin maritima*



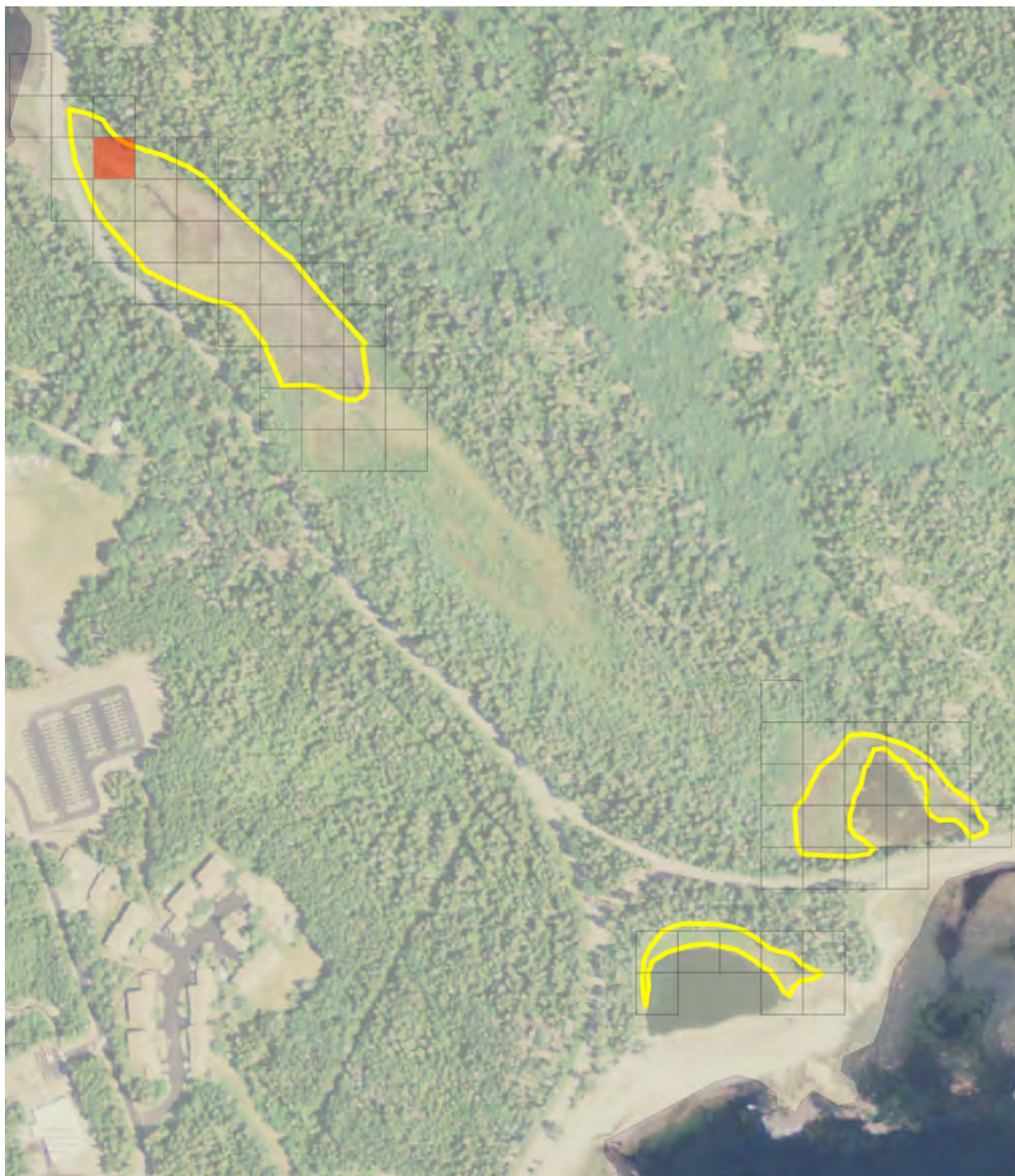
*Vaccinium macrocarpon*



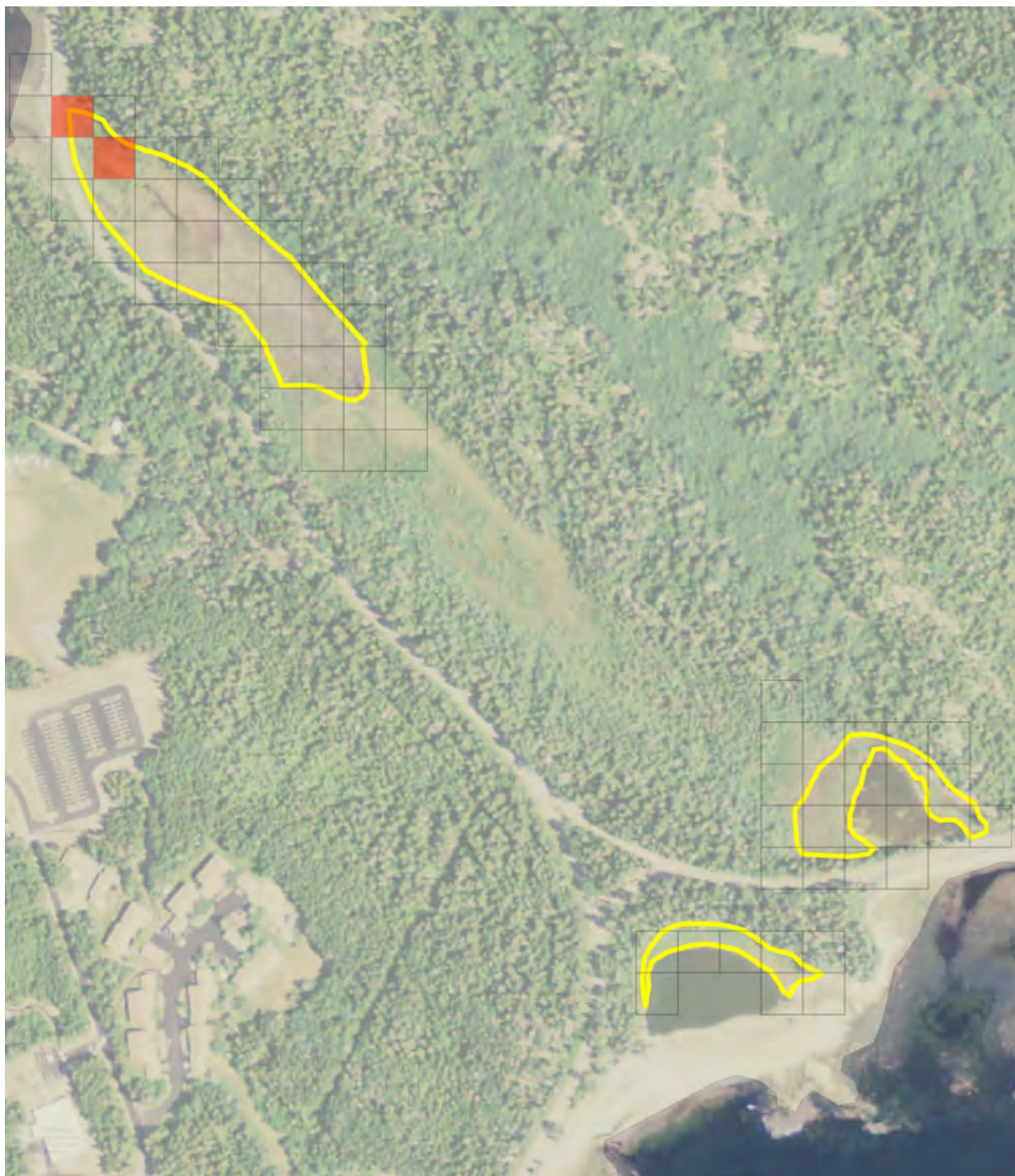
*Vaccinium myrtilloides*



*Vaccinium oxycoccos*



*Vaccinium vitis idaea* ssp. *minus*



*Viburnum nudum* var. *cassinoides*