Eurasian water milfoil (*Myriophyllum spicatum*) Pre/Post Herbicide and Fall Bed Mapping Surveys Sand Lake - WBIC: 2661100 Barron County, Wisconsin

EWM (Berg 2007)

2014 June EWM Treatment Areas

Project Initiated by:

The Sand Lake Management District, Lake Education and Planning Services, LLC, and the Wisconsin Department of Natural Resources

Posttreatment NWM/EWM in NW Bay/Burned Deepwater EWM

Survey Conducted by and Report Prepared by:

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June 17, August 1, and October 12 and 26, 2014

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INTRODUCTION:

Sand Lake (WBIC 2661100) is a 322 acre drainage lake in northwestern Barron County, Wisconsin in the Town of Maple Plain (T36N R14W S17 NW NE). It reaches a maximum depth of 57ft in the south basin and has an average depth of approximately 30ft. Sand Lake is mesotrophic bordering on oligotrophic in nature with good water clarity. From 1988 to 2014, summer Secchi readings have ranged from 10-18ft with an average of 13.3ft (WDNR 2014). The bottom substrate is predominately sand and sandy muck with scattered gravel primarily along the shoreline. Some areas of thick organic muck occur in bays on the west side of the lake and at the far north and south ends (Miller et al. 1965).

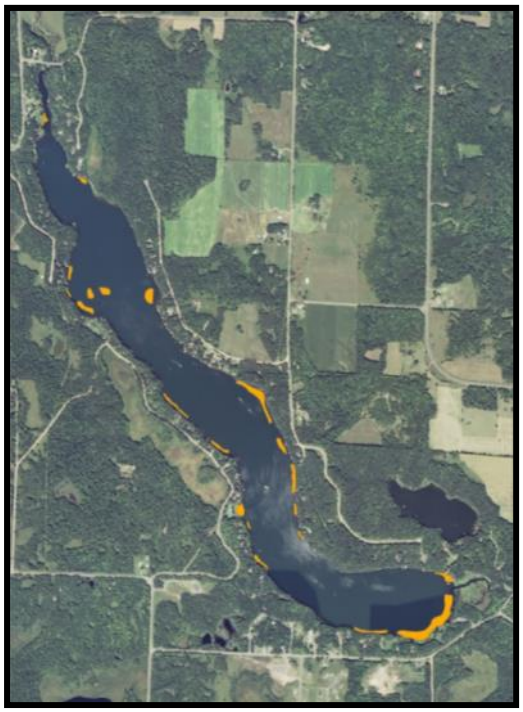


Figure 1: 2014 June EWM Treatment Areas

Eurasian water milfoil (*Myriophyllum spicatum*) (EWM) was discovered in the lake in 2002, and the Sand Lake Management District (SLMD) is engaged in active management to control this invasive exotic species. Following the 2013 fall EWM bed mapping survey that found EWM plants and beds scattered throughout the lake, the SLMD, under the direction of Lake Education and Planning Service, LLC (LEAPS), decided to chemically treat 21 areas in June of 2014. Collectively, they totaled 15.27 acres or 4.7% of the lake's surface area (Figure 1).

On June 17th, we conducted a pretreatment survey to gather baseline data and to allow LEAPS to finalize treatment plans. Following the June 25th lakewide herbicide treatment and an additional July 15th spot herbicide application, we completed an August 1st posttreatment survey to evaluate the effectiveness of the treatment. After two additional spot treatments on August 20th and September 30th, we also conducted an October 12th and 26th EWM bed mapping survey to determine where EWM control might be considered in 2015. This report is the summary analysis of these field surveys.

METHODS:

Pre/Post Herbicide Survey:

In 2013, Short, Elliot, Hendrickson, Inc biologists generated 200 pre/post survey points in beds throughout the lake. As in 2013, these points did not mirror the 2014 proposed treatment areas, but were used because of a miscommunication on our part about the goals of the pretreatment survey resulting from the changeover in project managers. Of the 200 points, approximately 110 occurred within the final treatment areas with the other "exploratory points" falling in areas that formerly supported EWM growth. These points equated to approximately 7pts/treatment acre which was well within the 4-10pts/acre required by WDNR protocol (Appendix I).

During the surveys, we located the points using a handheld mapping GPS unit (Garmin 76CSx) and used a rake to sample an approximately 2.5ft section of the bottom. All plants on the rake were assigned a rake fullness value of 1-3 as an estimation of abundance, and a total rake fullness for all species was also recorded (Figure 2). Visual sightings of EWM were noted if they occurred within 6ft of the point. In addition to plant data, we recorded the lake depth using a hand held sonar (Vexilar LPS-1) and the bottom substrate (bottom type) when we could see it or reliably determine it with the rake. We entered all data collected into the standard APM spreadsheet (Appendix II). These data were then analyzed using the linked statistical summary sheet and the WDNR pre/post analysis worksheet (UWEX 2010). Pre/post treatment differences were determined to be significant at $p < .05$, moderately significant at $p < .01$, and highly significant at $p < .005$.

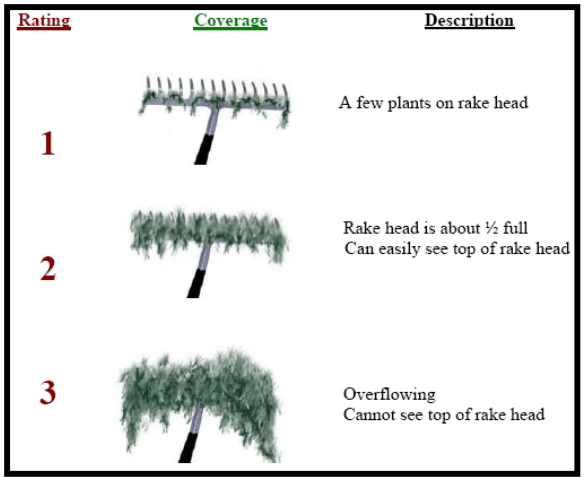


Figure 2: Rake Fullness Ratings

Fall Eurasian Water Milfoil Bed Mapping:

On October 12th, we searched the entire visible littoral zone of the lake and mapped all known beds of EWM. A "bed" was determined to be any place where we visually estimated that EWM made up >50% of the area's plants and was generally continuous with clearly defined borders. After we located a bed, we motored around the perimeter of the area, took GPS coordinates at regular intervals, and estimated the average rake fullness rating of EWM within the bed. Using the WDNR's Forestry Tool's Extension to ArcGIS 9.3.1, we generated bed shapefiles from these coordinates and determined their acreage to the nearest hundredth of an acre. We also GPS marked individual plants outside of beds.

RESULTS AND DISCUSSION:

Finalization of Treatment Areas:

Initial expectations were to treat 34 areas totaling 9.83 acres with liquid or granular 2, 4-D (Navigate/Sculpin G/DMA4) at concentrations of 3-4ppm (Figure 3) (Appendix I). Unfortunately, the pretreatment survey found that EWM was more widespread than expected. Because of this, the treatment was revised to include 21 areas covering 15.27 acres (Table 1). This treatment was conducted by Dale Dressel - Northern Aquatics Services (NAS) on June 25th. Based on additional documents provided by NAS, three additional herbicide treatments covering 2.05 acres and 223 individual "spots" occurred on July 15, August 20th, and September 30th (Table 1).

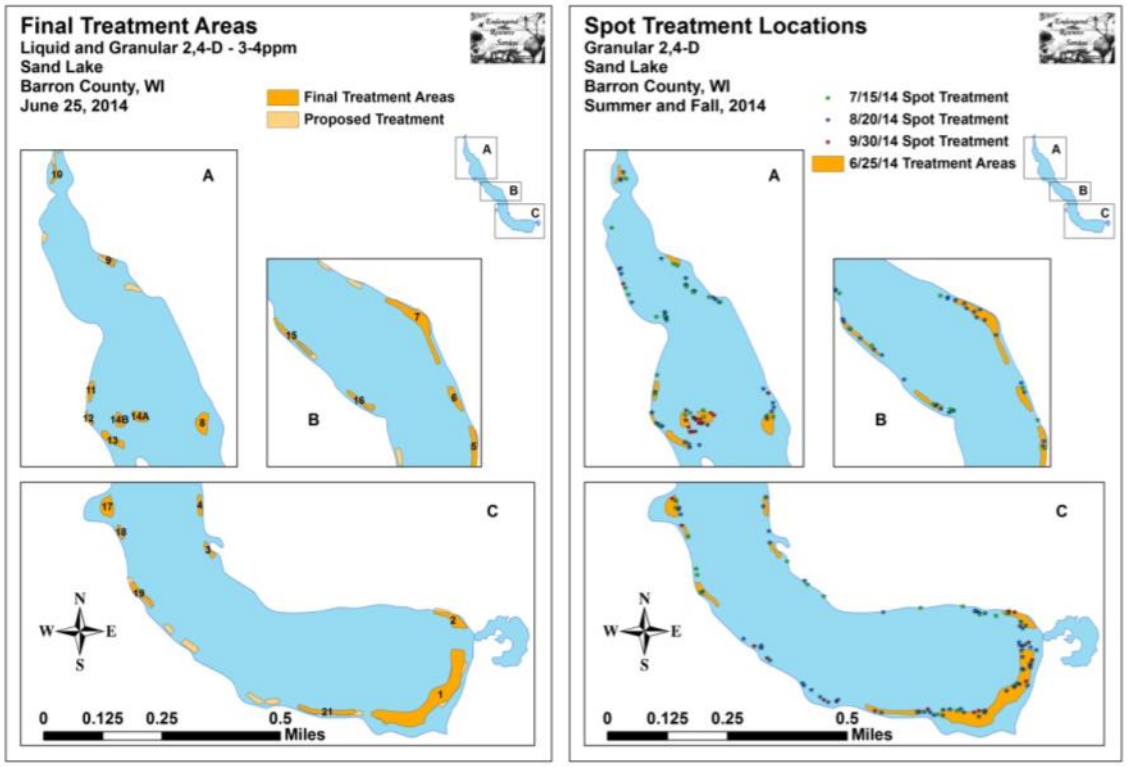


Figure 3: 2014 June Treatment Areas and July-Sept. Spots Treatments

Table 1: EWM Treatment Summary
Sand Lake – Summer and Fall 2014

Date	Proposed/ Allowable Acreage	Final Acreage/ Spots
June 25	9.83	15.27/0 spots
July 15	2.0	0.50/43 spots
August 20	3.0	0.80/136 spots
September 30	20.0	0.75/44 spots
Total Acres	**9.83**	**17.77**

EWM Pre/Post Herbicide Surveys:

The lake's littoral zone extended to at least 11.0ft during both surveys. Mean and median depths for all plants were 6.2ft and 6.0ft respectively during the pretreatment survey and 5.9ft and 6.0ft in the posttreatment survey (Table 2). Most EWM was established over organic and sandy muck in 4-11ft of water (Figure 4) (Appendix III).

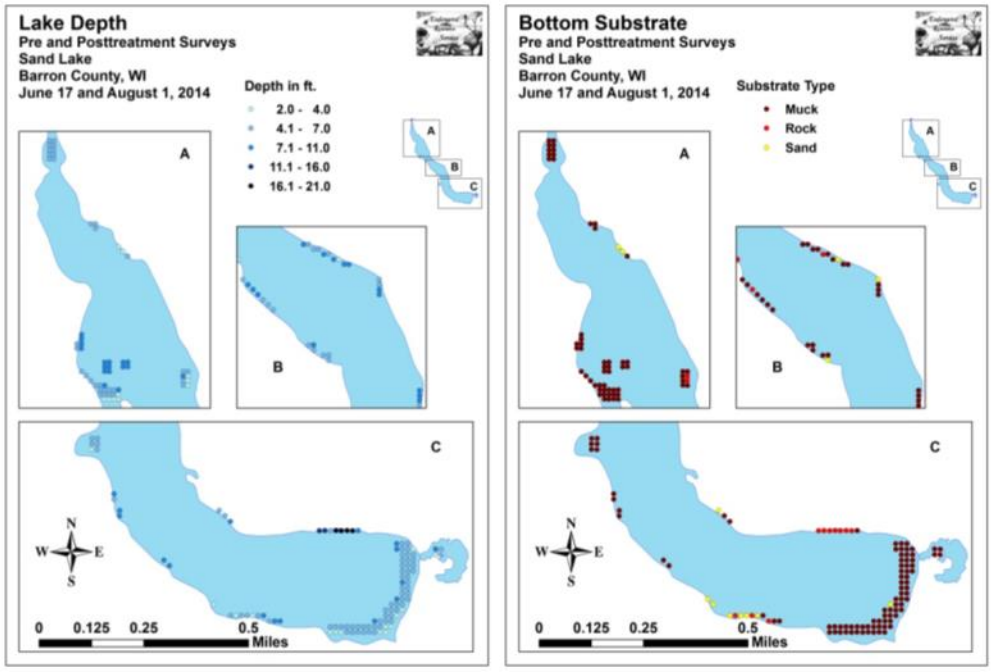


Figure 4: Depths and Bottom Substrate

Table 2: Pre/Post Survey Summary Statistics
Sand Lake, Barron County
June 17 and August 1, 2014

Summary Statistics:	Pre	Post
Total number of points sampled	200	200
Total number of sites with vegetation	189	190
Total number of sites shallower than the maximum depth of plants	194	194
Frequency of occurrence at sites shallower than maximum depth of plants	97.42	97.94
Simpson Diversity Index	0.87	0.90
Mean Coefficient of Conservatism	6.1	6.2
Floristic Quality Index	27.1	30.2
Maximum depth of plants (ft)	11.0	11.0
Mean depth of plants (ft)	6.2	5.9
Median depth of plants (ft)	6.0	6.0
Average number of all species per site (shallower than max depth)	2.82	3.30
Average number of all species per site (veg. sites only)	2.90	3.37
Average number of native species per site (shallower than max depth)	2.68	3.16
Average number of native species per site (native veg. sites only)	2.78	3.26
Species richness	21	25
Mean rake fullness (veg. sites only)	2.04	2.41

Initial diversity within the beds was moderately high with a Simpson Diversity Index of 0.87. This value increased slightly to 0.90 posttreatment. Mean native species richness increased from 2.78 species/site with native vegetation pretreatment to 3.26/site posttreatment (Figure 5). Mean total rake fullness at sites with vegetation increased from a moderate 2.04 pretreatment to a dense 2.41 posttreatment (Figure 6) (Appendix IV).

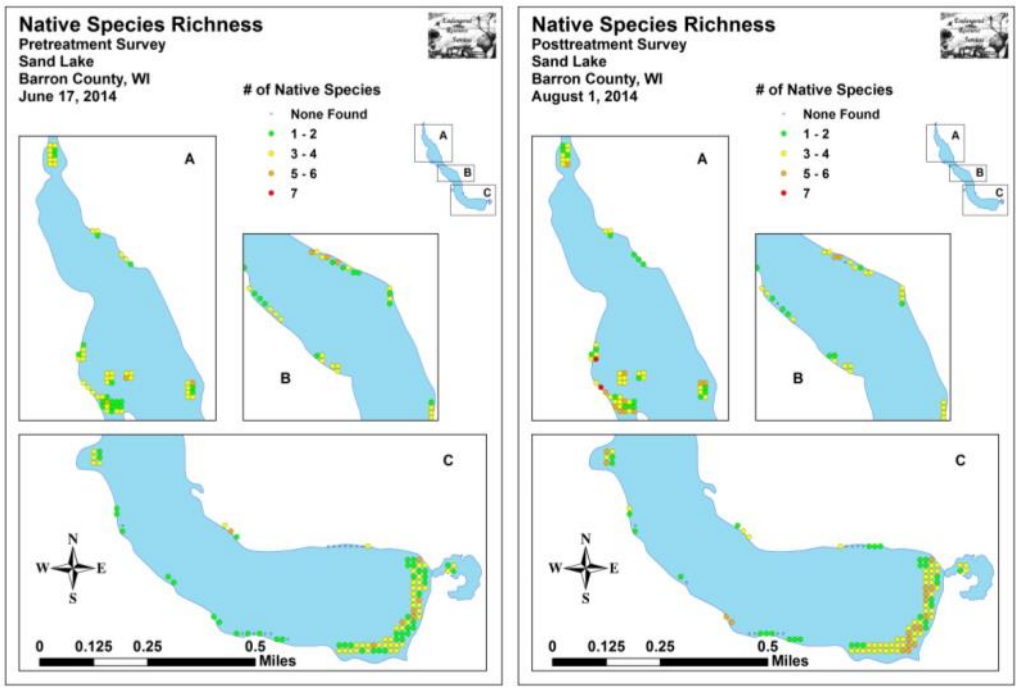


Figure 5: Pre/Post Native Species Richness

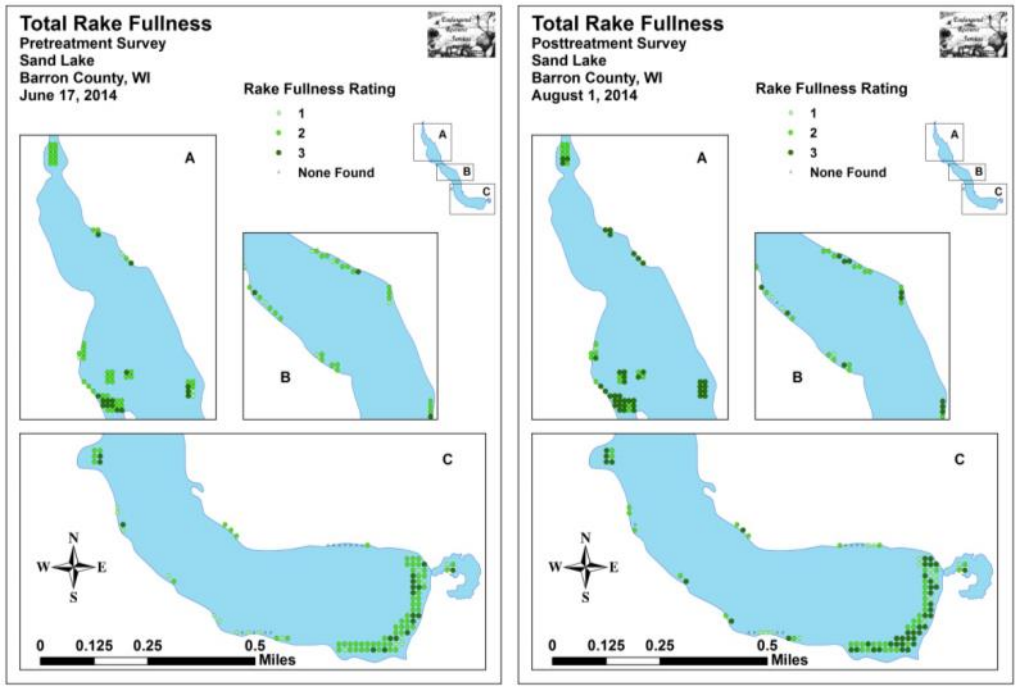


Figure 6: Pre/Post Total Rake Fullness

We found EWM at 28 sites during the pretreatment survey. These sites had an average rake fullness of 1.89 as five rated a 3, 15 were a 2, and the remaining eight had a rake fullness rating of 1. We also recorded EWM as a visual at 63 points. During the posttreatment survey, we found EWM at 27 sites that averaged a rake fullness of 1.74. Five rated a 3, ten were a 2, and 12 were a 1 with 34 additional visual records (Figure 7) (Appendix V). As in 2013, none of these changes suggested the herbicide treatment had a significant impact on the lake's overall Eurasian water milfoil population (Figure 8).

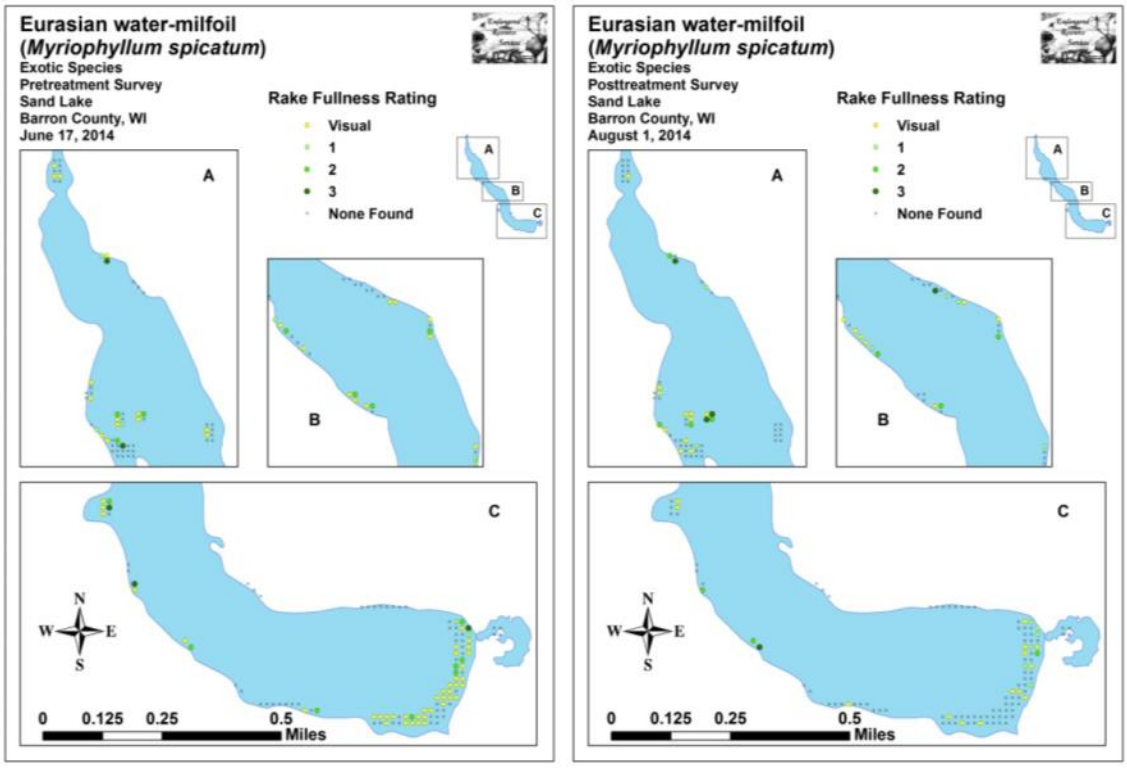
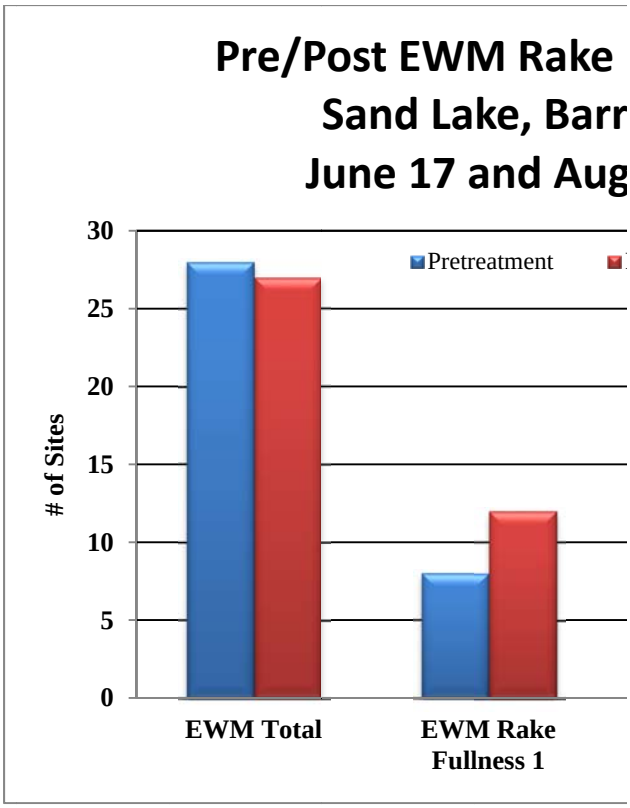


Figure 7: Pre/Post EWM Density and Distribution



Significant differences = * $p < .05$, ** $p < .01$, *** $p < .005$

Figure 8: Pre/Post Changes in E

As in 2013, Coontail (*Ceratophyllum demersum*) *zosteriformis*) were the two most common native surveys. Coontail showed a significant decline ir stem pondweed demonstrated a non-significant ir 10). Illinois pondweed was the only other specie posttreatment, and this is likely due to young plar (*Potamogeton gramineus*) being essentially indis as the defining character (the highly significant ir decline in Illinois pondweed leading us to conclu than any real change in these two populations). naiad (*Najas flexilis*) demonstrated a highly signi pondweed (*Potamogeton friesii*) and Filamentous and White water lily (*Nymphaea odorata*) and Fl *natans*) significant increases. All of these change the growing season (Maps for all native species f available in Appendixes VI and VII).