

Preliminary Survey to Determine the Distribution of Norway Maple (*Acer platanoides*) in Acadia National Park: Project Summary and Treatment Recommendations

Acadia National Park Resource Report 2015-7

Camilla Seirup, Biological Science Technician

October 29, 2015

Introduction:

Norway maple (*Acer platanoides*), an invasive deciduous tree, poses a serious threat to Northeastern forest composition and diversity. It is the most widespread maple in its native European range, which stretches across most of Europe and into eastern Russia and Iran, and has been hugely successful in North America (Nowak and Rowntree, 1990). Since its introduction in 1756, it has become the most common landscaping tree in the United States; winning over even George Washington, who had two Norway maples planted at Mount Vernon (Rhoads and Block, 2011). Unfortunately, the many characteristics that have made Norway maple a desirable ornamental tree have also allowed it to penetrate native forests.

Norway maple is a large tree with smooth gray bark that becomes evenly furrowed as it ages. At first glance, its leaves are similar to those of the native sugar maple, but several differences distinguish the two species. The leaves of a Norway maple are generally wider than they are long and its lobes end in fine 'eyelash tips'. The leaves of a sugar maple are longer than they are wide and its leaf edges are more rounded. In addition, the sap of a Norway maple is a milky white, while sugar maple sap is clear. Norway maple is most conspicuous in the fall because its leaves remain a dark green late in the season after native maples have senesced (Rhoads and Block, 2011). Therefore, surveys for Norway maple should occur in October and early November.

Most non-native plant species with an invasive habit tend to have an advantage over native species in disturbed areas, allowing them to colonize and out-compete natives on a wide scale. However, these invaders are less able to penetrate mature, undisturbed forest because a closed canopy decreases light availability on the forest floor, giving the advantage back to native species that are more shade tolerant. This theory of the resilient forest unfortunately does not apply to Norway maple and other shade tolerant non-native invasive species, such as *Berberis* sp., which have colonized the interior of previously undisturbed Northeastern forests (Webb *et al.* 2000). Wyckoff and Webb (1996) found that Norway maple regeneration matched or bettered sugar maple regeneration under a sugar maple canopy. Under a Norway maple canopy, they

found that 98% of seedlings were Norway maple and they only found Norway maple saplings. In addition, the high abundance of seedlings in the understory may be decreasing understory diversity and abundance of native herbs and shrubs. The deep shade cast by a mature Norway maple and its relatively shallow root system may also be impeding the growth of native wildflowers (Rhoads and Block, 2011). These findings suggest that once Norway maple is established, it can maintain its population and has the potential to replace stands of native trees and affect understory diversity and abundance.

Norway maple's competitive advantage over sugar maple and other native trees may be linked to its greater phenotypic plasticity in response to variation in light availability (Paquette *et al.* 2012). In both low and high light environments (mimicking a closed canopy and a canopy gap), Norway maple photosynthesized and grew more than sugar maple in the same environments. In addition, sugar maple in the canopy gap environment placed more emphasis on root over shoot growth while Norway maple did the opposite. This allows Norway maple to quickly take advantage of a disturbance and could allow it to out-compete sugar maple seedlings. Sugar maple seedlings' higher root to shoot ratio should make them more resilient to drought and browsing pressure but whether this will translate into a competitive advantage in the Northeast is yet to be seen.

Norway maple's real photosynthetic advantage comes from its longer growing season. Despite growing side by side, a sugar maple stops growing taller at about mid-summer, while a Norway maple can continue growth into the fall (Paquette *et al.* 2012). This difference is evident in the timing of leaf senescence; native maples begin to lose their leaves almost a month before Norway maples. With the extension of the growing season due to global climate change, this trait could become even more advantageous.

Norway maple has changed forest canopy and understory composition and has the potential to impact previously undisturbed communities. Its threat will only increase with global climate change as Norway maple has proven an adaptable species that will benefit from a longer growing season. Immediate steps should be taken to remove individuals that threaten natural communities.

Norway Maple Distribution Surveys:

Shari Latulippe and I conducted surveys to determine the distribution of Norway maple in Acadia National Park during October, 2015. Each tree located in the park was logged with a Trimble GeoXT 6000 Series and its GPS coordinates and diameter at breast height (DBH) in cm was recorded. Data points were corrected using Pathfinder and were imported into ArcGIS 10.2. Raw data and distribution maps can be found on the Acadia National Park shared drive at L:\Resource Management\Vegetation Stewardship\Inventory & Monitoring - Veg\Acer Platanoides. We concentrated our surveys in areas of the park close to towns or old home sites because these areas were the most likely locations for Norway maple. A complete list of survey

Seirup: Distribution of Norway Maple (*Acer platanoides*) in Acadia National Park
October, 2015

locations is provided starting on page 5 of this document. Areas that were identified as potentially containing Norway maple, but were not surveyed in 2015 are also listed in the Site Description section. I recommend that the survey for Norway maple distribution continue in 2016.

Treatment Options:

Treatment options for Norway maple are in most cases the same as for other invasive tree species.

Manual Treatment: Hand pulling seedlings and weed wrenching small saplings is effective against Norway maple if the entire root system is removed and either burned or dried. This treatment can be used anytime between March and November and is easiest if the soil is moist. Girdling will kill large trees but stump sprouts will have to be repeatedly cut or sprayed with herbicide.

Chemical Treatment: Glyphosate or triclopyr solutions are commonly used to treat Norway maple. Dense infestations of small Norway maple saplings and seedlings can be effectively treated by foliar spraying with a backpack sprayer when plants are fully leafed out: May through October. For saplings and small trees the cut-stump method is appropriate. Cut stems in late summer through the fall and apply herbicide immediately to the exposed surface. This method can be used on larger trees as well but felling large trees is often more dangerous and time consuming than other available methods. Trees up to 16cm diameter at breast height can be managed with basal bark treatments administered with a backpack sprayer. Apply herbicide to the entire circumference of the stem in an 8-18" swath including the root collar. Trees larger than 16cm DBH require a larger section of stem sprayed. Follow-up foliar treatment to stump-sprouts may be necessary. Basal bark treatment can be used all year round. The hack and squirt method can be effective for large trees; use a hand ax to make downward facing cuts into the sapwood and squirt herbicide into the gash. Cuts should be made at chest height and should be less than 2 inches apart.

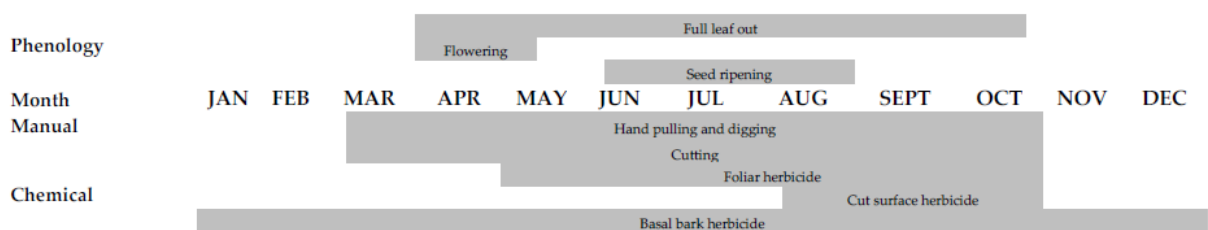


Figure 1: Timing of treatment methods. Credit: VT Nature Conservancy www.vtinvasives.org

Treatment Recommendations:

Seirup: Distribution of Norway Maple (*Acer platanoides*) in Acadia National Park
October, 2015

On MDI, Norway maple was used extensively as a shade tree by almost all the towns on the island including the towns bordering the park most closely: Bar Harbor and Otter Creek. Most of the Norway maple in the park is therefore concentrated around these epicenters and in and around old estates sites that are now in the park. Because a mature Norway maple can produce large quantities of mature seed that are wind-dispersed, it is my recommendation that small populations closest to undisturbed forest be removed first, saving well-established populations like Compass Harbor for last. Oddly, I did not see high densities of Norway maple seedlings under and around established Norway maples. This could be due to the time of year at which this survey was conducted. If regeneration is indeed limited, which is unlikely considering the number of saplings and small trees found, removal of mature trees may seriously slow the spread of the species. However, removal of canopy cover may release the seed bank and trigger a flush of young Norway maples. I do not recommend removing all large trees as it is both dangerous and time consuming, but instead leaving them as snags for wildlife habitat if they do not pose a danger to visitors or infrastructure (Shari Latulippe, personal communication).

In all areas, care should be used to ensure that trees being treated are on federal property.

High priority sites:

- Small collection of trees on Duck Brook Road
- Small group of individuals at the intersection of Ledge lawn Extension with the Park Loop Road
- The individuals at the Jordan Pond House
- The strip of Norway Maples bordering the Kebo Valley Golf Course near Harden Farm Road

Medium priority sites:

- Individuals at the old home sites off Schooner Head Road. It is a very disturbed area, but the Norway maples are at a low density.
- Bar Island is also a very disturbed habitat but Norway maple seems pretty well contained by the trail and in the southeastern corner and could possibly be eradicated from the island.
- Great Meadow Road (formerly Ledge lawn Road Extension). Well established population of medium to large trees, but appears to be mostly contained in a fairly small area with low visitation. Large trees could be girdled and the rest could be treated with cut – stump or basal bark treatments. Norway maple does make up a majority of the canopy at this site, so treatment should be coupled with a native re-vegetation effort and monitored for an increase in Norway maple seedlings and other invasives.

- Otter Cliff Road. Apparently only one individual on park property but more individuals just outside the boundary. Worth monitoring.
- Duck Brook from Rt.3 past the Park Loop Road bridge. Numerous individuals but most are smaller trees <20cm and saplings that could probably be treated effectively by basal bark and cut stump treatments. I think they originated from the old hotel sites on either side of the brook. It's a large area but it is very close to undisturbed forest. Not visible from Park Loop Road, so backlash from visitors is unlikely.

Low priority sites:

- Grover Ave, village of Otter Creek. All age classes represented at this site: seedlings, saplings, and a large tree. This is a very disturbed, but small site, with many other invasives. The maples can probably be dealt with when the other species are addressed.
- Park Loop Road exit to West Street (shortcut to Bar Harbor). Seedlings, saplings, and small trees present at this site. Unfortunately, the maples here are part of a contiguous population that stretches outside the park boundary. Perhaps the Exotic Plant Management Team can work with the owner of the property to removal the whole population? Otherwise, removal of trees in the park will probably have limited success.
- Compass Harbor. The densest and largest population of Norway maple in the park. Treatment of this area will take a very long time and will probably have to be done in stages. Park boundaries should be noted and care taken to manage trees only on NPS property. There are many other non-native species in Compass Harbor and opening up the canopy may result in an increase in abundance of these species as well as more Norway maple seedlings. The easiest place to start might be treating all the sampling and small trees with the cut – stump method. Girdling and/or removal of canopy trees should be paired with a re-vegetation effort to suppress invasives and give native vegetation a head start.

Site Descriptions:

Great Meadow Drive (Ledgelawn Extension):

Majority large trees (20-50cm DBH). In the main stand behind the recycling area, Norway maple is the dominate canopy tree. Removal would essentially mean clear cutting the slope. Also few outlier trees where Ledgelawn Extension meets the Park Loop Road. No apparent recent regeneration; no seedlings and very few small diameter saplings.

Survey: Complete

Treatment Priority: Medium

Seirup: Distribution of Norway Maple (*Acer platanoides*) in Acadia National Park
October, 2015

Compass Harbor, Bar Harbor:

Many individuals! Trees are generally clustered and smaller in diameter than the trees at the Ledge lawn Extension site (majority 10 – 30 cm DBH). There are a few very large old trees with a diameter greater than 50 cm at breast height. One individual approaches 100cm diameter at breast height. Also, a good number of saplings are present (1-10cm DBH) but still not many seedlings. The area close to the parking lot was more open and did have some seedlings, all under 15 cm. The Norway maples are not generally not co-dominate at this site but a quite a few are intermediate. However, because of their large, dense canopies they still create much of the shade in some areas. There are some very dense concentrations on the west half of the parcel nearest the parking lot where most of the large trees are located. This area is almost only Norway maple and American ash. On the eastern section of the parcel near the old estate, the forest composition is more diverse.

Survey: Complete

Treatment Priority: Low

Schooner Head Road:

Located a few individuals by old house sites on the east side of the road just after you enter the park coming from Bar Harbor (across from the Thrumcap). Did not find Norway maples during a driving survey of the rest of road down to the Sand Beach overflow parking lot.

Survey: In progress

Treatment Priority: Medium

Duck Brook (mouth):

Mid-size individuals (15-30cm DBH) and saplings on near the culvert/Rt. 3 and upstream past the Park Loop Road bridge on the west bank extending west into the forest (old hotel sites?).

Survey: Complete

Treatment Priority: Low

Rt. 3 from Hull's Cove VC towards Bar Harbor:

Norway maples of varying sizes along the road. Not individually surveyed due to their proximity to the roadside and lack of safe parking.

Survey: Driving Survey Complete

Duck Brook Road:

A few individuals along roadside. This site is a good candidate for treatment as there are only a few individuals but they present a threat to the interior of the park.

Survey: Complete

Treatment Priority: High

Park Loop Road - exit to West Street (shortcut to Bar Harbor):

Many individuals of varying size classes along the road concentrated at the park boundary. Seedlings and saplings as well as mid-size intermediate trees. The private lands bordering the park here are also full of Norway maple.

Survey: Complete

Treatment Priority: Low

Otter Cliff Road:

Many individuals on private land bordering the park but only one individual located in the park. This area should be monitored.

Survey: Complete

Treatment Priority: Medium

Grover Avenue, Village of Otter Creek:

By right of way down to cove, small population with seedlings, saplings, and one large tree. Lots of other invasive species present. No individuals found along trail to causeway.

Survey: Complete

Treatment Priority: Low

Blackwoods Campground:

No individuals found.

Survey: In progress

Hunter Beach Trail:

No individuals found.

Survey: Complete

Stanley Brook Road/Entrance:

Two individuals found bordering the town park on by the parking lot on the east side of Stanley Brook. No individuals found along the road on the west side of Stanley Brook.

Survey: Complete

Treatment Priority: Low

Wildwood Stables:

No individuals found.

Survey: Complete

Thompson Island:

No individuals found.

Survey: Complete

Carroll Homestead:

No individuals found.

Survey: Complete

Fernald Point Road/Valley Cove Fire Road:

No individuals found.

Survey: Complete

Kebo Valley Golf Course Boundary and Harden Farm Road:

Saplings and mid-size trees present in the strip of park between Harden Farm Road and the cemetery as well as Harden Farm Road and the Kebo Valley Golf Course. No evidence of Norway maples penetrating the forest, yet.

Survey: Complete

Treatment Priority: High

Lakewood Parking Area/Beach:

No individuals found.

Survey: Complete

Eno Pines:

No individuals found.

Survey: Complete

Bar Island:

Scattered individuals on the trail up to the field and on the south side of the island where the old home sites are. A few large, well established trees.

Survey: In progress

Treatment Priority: Medium

Hull's Cove Maintenance Area:

Survey: Incomplete

Park Nursery (near Sand Beach Residence):

Survey: Incomplete

Jordan Pond House:

Two planted trees reported but not confirmed.

Survey: Incomplete

Treatment Priority: High

Breakneck Fire Road

Survey: Incomplete

Great Head

Survey: Incomplete

Seawall Picnic Area

Survey: Incomplete

Seirup: Distribution of Norway Maple (*Acer platanoides*) in Acadia National Park
October, 2015

Acknowledgements:

I would like to thank Shari Latulippe for donating her time and expertise. She was integral to the completion of this project and helped out for almost all the fieldwork. I'd also like to thank Jim Burka for his help surveying the largest and densest population of Norway maple on MDI: Compass Harbor. Joe Kelley's instruction on Pathfinder, ArcGIS, and using the Trimble unit was immensely valuable and I am very grateful to him. Thank you also to Jesse Wheeler, Tony Tocci, and Bruce Connery for their suggestions on where I might find Norway maple in the park and also their advice on possible management options. Finally, thank you to Judy Hazen Connery for providing me with the opportunity to work on this project and for her help during all stages of this effort.

Bibliography:

- Acer platanoides (Norway maple). (2009). In Best Management Practices for Control of Non-Native Invasives. Maryland: National Capital Park and Planning Commission.
- Norway Maple, Acer platanoides. (n.d.). Retrieved October 20, 2015.
- Nowak D.J. and Rowntree R.A. 1990. History and Range of Norway Maple. Journal Arboriculture. 16:291-296.
- Paquette A., Fontaine B., Berninger F., Dubois K., Lechowicz M.J., Messier C., Posada J.M., Valladares F., and Brission J. 2012. Norway Maple Displays Greater Seasonal Growth and Phenotypic Plasticity to Light Than Native Sugar Maple. Tree Physiology. 00:1-9.
- Plant Invaders Mid-Atlantic Natural Areas: Control Options for Trees. (2010, November 11). Retrieved October 22, 2015, from <http://www.nps.gov/plants/alien/pubs/midatlantic/controltrees>.
- Rhoads, A., & Block, T. (2011, November 1). Norway Maple Acer Platanoides. Retrieved October 20, 2015.
- Webb S.L., Dwyer M., Kaunzinger C.K., and Wyckoff P.H. 2000. The Myth of the Resilient Forest: Case Study of the Invasive Norway Maple (Acer Platanoides). Rhodora. 102:332-354. <http://www.jstor.org/stable/23313384>
- Webber J.E. and Rooney S.C. 2017. Management Plans for Invasive Plant Species of Acadia National Park: Acer platanoides. Natural Resources Report NPS/NER/NRR--2007/018: 30-32.
- Wyckoff P.H and Webb S.L. 1996. Understory Influence of the Invasive Norway Maple (Acer platanoides). Bulletin of the Torrey Botanical Club. 123:197-205. <http://www.jstor.org/stable/2996795>
- Seirup: Distribution of Norway Maple (*Acer platanoides*) in Acadia National Park
October, 2015

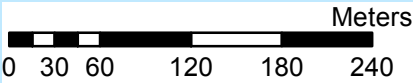
Norway Maple on Bar Island



Bar Island

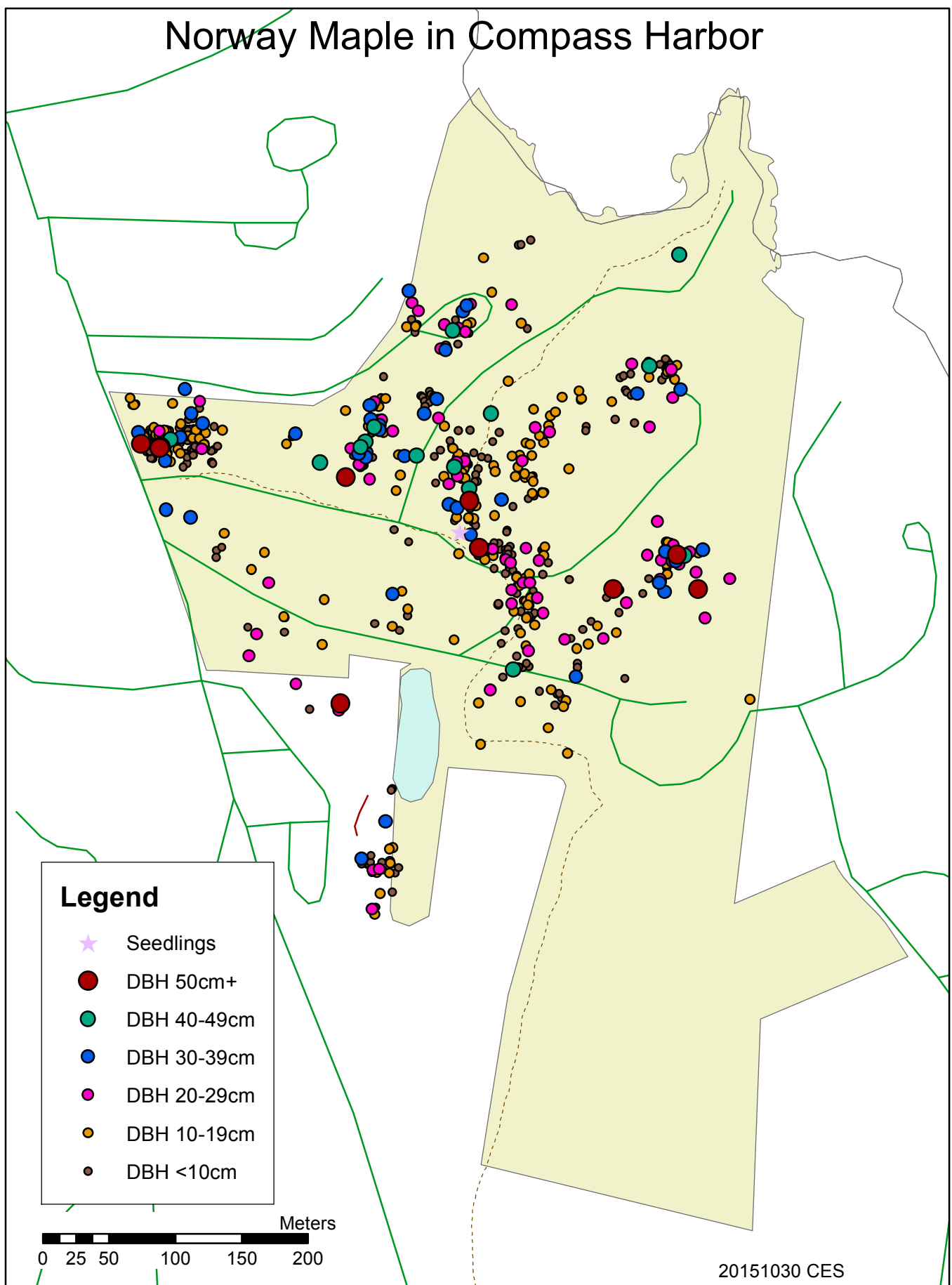
Legend

- Seedlings
- DBH 50cm+
- DBH 40-49cm
- DBH 30-39cm
- DBH 20-29cm
- DBH 10-19cm
- DBH <10cm
- Fee owned parcel
- Parcel to be acquired
- Conservation easement

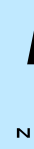


Bar Harbor

Norway Maple in Compass Harbor



Norway Maple by Duck Brook



Duck Brook

Route 3

Park Loop Road

Legend

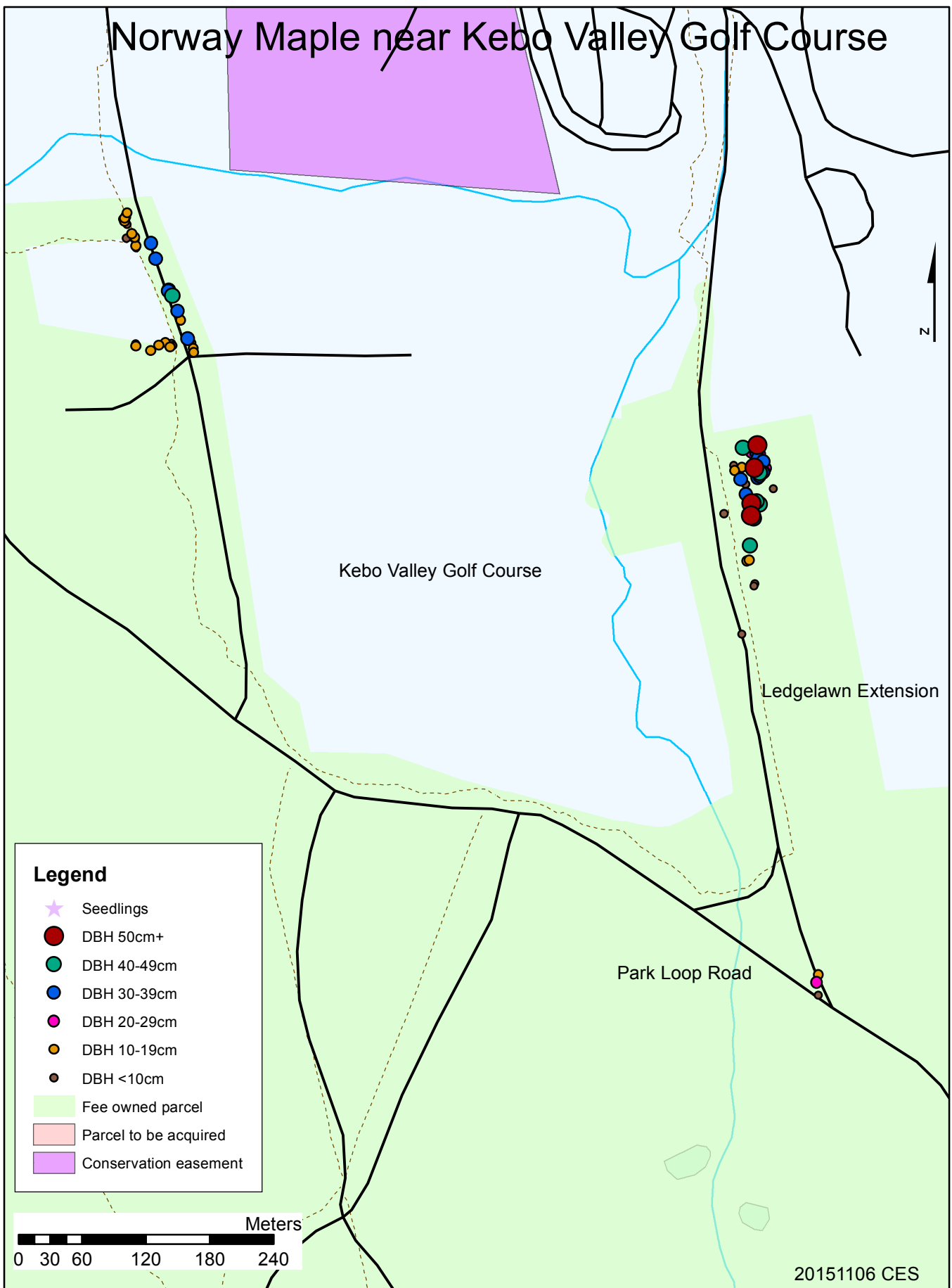
- ★ Seedlings
- DBH 50cm+
- DBH 40-49cm
- DBH 30-39cm
- DBH 20-29cm
- DBH 10-19cm
- DBH <10cm
- Fee owned parcel
- Parcel to be acquired
- Conservation easement

Meters

0 12.5 25 50 75 100

20151102 CES

Norway Maple near Kebo Valley Golf Course



20151106 CES

Norway Maple on MDI based on Oct. 2015 Surveys

