

A Clear-cutting History Survey of the UNDERC Property

Brian Mahon
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Advisor: Dr. Botkin

Abstract: From the time of the logging industry boom in the upper midwest until 1968, the land that the University of Notre Dame's Environmental Research Center encompasses has been open to logging. Because of this much of the forest on site is second growth. The purpose of this study was to survey the property and find the average age of the forest as well as determine individual stand ages to get an idea of what was logged when and where. To do this, thirty even aged stands were selected, and three eldest trees of a dominant species, and one eldest of all non-dominants, were cored and rings counted. The majority of the clear-cutting done on UNDERC's land happened during the 1950's. The oldest cutting happened around 1895, and the most recent in 1979. The non-dominant tree ages were taken to counter-point the dominant tree ages, but were not included due to inherent problems, such as whether they pre-dated the clear-cut and were survivors, or if they grew into the stand after the dominant species was established. Regardless, this study should prove valuable to future researchers needing information on the forest history of UNDERC.

Introduction:

The University of Notre Dame's Environmental Research Center is a 7500 acre property lying both in Wisconsin and the upper peninsula of Michigan. 5500 of these acres were given to the University in 1936 through the endeavors of Martin J. Gillen, a lawyer and

economist who was interested with Notre Dame since the 1920's (Gillen and Burns). Much of the land, along with most of Michigan's upper peninsula and surrounding areas of Wisconsin, was clear cut from 1880 to 1910, with the last logging operation having taken place in 1968. Because of this, much of the forest on the property is second-growth, with patches of old-growth forest remaining in areas that were too difficult to reach or simply deemed unworthy for logging. Both early successional and late successional trees can be found on the property. Some of these species are as follows: *Picea glauca* (White Spruce), *Abies balsamea* (Balsam Fir), *Pinus strobus* (Eastern White Pine), *Pinus resinosa* (Red Pine), *Tsuga canadensis* (Eastern Hemlock), *Acer saccharum* (Sugar Maple), and *Betula papyrifera* (White Birch). Since the White Pine was the major market demanded wood, vast numbers of it were harvested, such that whole stands of other tree species were cleared in order to access the pines. The land of UNDERC was no exception. Taking a quick survey of UNDERC will show the grown over remains of old logging roads, covered in tall grasses, bracken ferns, or smaller early successional trees such as *Populus tremuloides*, the Quaking (Trembling) Aspen. Currently, a forest survey of the property is being conducted in order to find the percentages and types of tree species on UNDERC. In conjunction with this, this experiment has conducted a tree age survey of the property to determine where, and roughly when, the last clear-cuttings took place. The main purpose is make a more detailed map of the property and to create a foundation for later forestry studies that would need some foreknowledge of stand ages and possible histories to them. To do this, thirty stands that appeared to be even aged were selected, focusing on ones closest to currently used and disused logging roads. The reasoning behind that is that these would

be the same roads used to access stands, and in order to find how recently the property has been logged, these would be the areas to investigate. And the reason for even aged stands showing a dominant species is that such stands are generally evident of succession following a clear-cut (Botkin, personal communication). Within each stand, the three oldest looking trees of the dominant species were cored along with the oldest apparent single tree of any other species. These core samples were then sanded down and their rings counted to find the trees' ages. The oldest tree of the dominant stand is used as an indicator of when the area had been cut, and the average ages of the three used to find the overall stand age. The non-dominant species representative is used as a control against the dominant species samples, either to confirm the stand's age or as an exemplar of what the area held previously.

Materials and Methods:

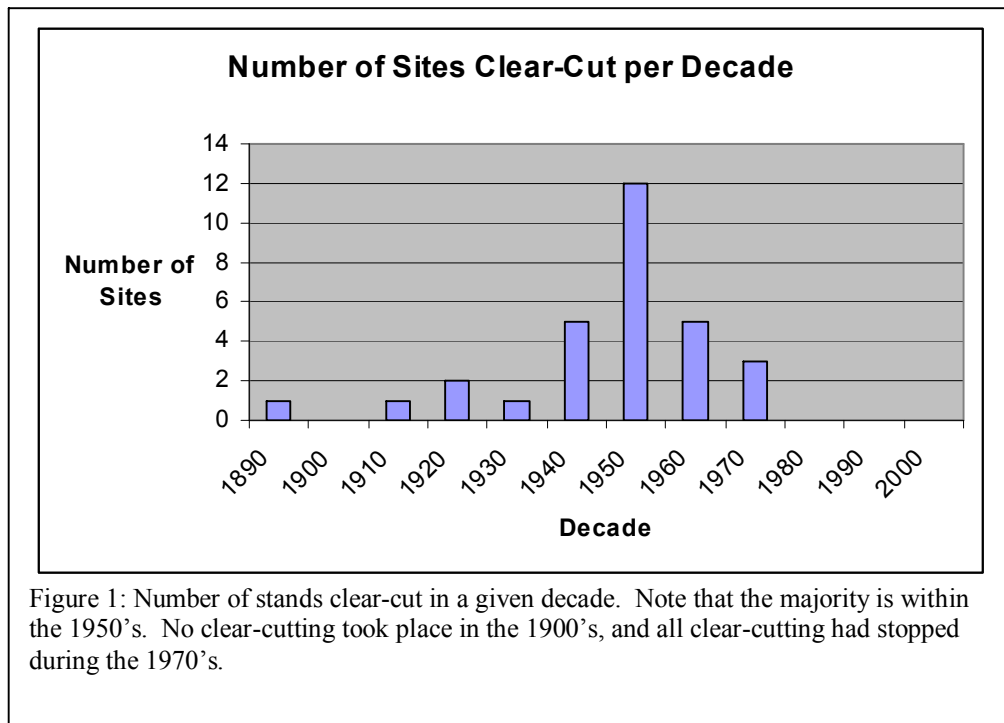
Equipment: Fine grain sand paper, dissecting scope, tree corer, straws, tape for labeling

To find suitable stands, a preliminary tour of the property was needed. Using the UNDERC map made by Christina Gurnett, all roads were surveyed and tree stands noted. Any cleared areas that reached far into the tree line were considered as possible old logging roads and marked. Only even aged stands with a more or less determinable dominant species were chosen for sampling. In cases where an older but slightly less dominant species was present, the elder was chosen to get the more accurate stand age. This was only in cases where it was apparent that the less numerous, older species was

not the product of a few survivors of a clear-cut, but of a strong stand already being succeeded by another. Of these marked stands, thirty were selected to create an even spread of samples across the whole property, with some focus on stands around property gates. Once a stand was selected, the area of sampling was 0.64ha (80x80m) surrounding the highest concentration of desired species in a stand. To select the trees for coring, the stand was thoroughly explored, and the three largest by diameter at breast height were then cored. The cores themselves were placed inside plastic straws and labeled with both species and location. For the other species sample, the largest tree in general was selected, taking into consideration too growth rate differences among species. This is to avoid, for example, finding a 70cm diameter Quaking Aspen that is 37 years old and ignoring a 55cm diameter Sugar Maple that is 45 years old. These samples were taken back to the lab and sanded down to better expose the rings for counting, since the process of coring left rough surfaces. Rings were counted using the dissectiscope, and sometimes not if the color contrasts between ring and wood were so slight as to be washed out with the lamp. Estimates of tree ages had to be taken in cases where the heartwood appeared rotted and either crumbled or was wholly incapable of being read. The oldest dominant tree sample was considered to be the oldest successor tree in the stand, and the ages of the three dominant trees were averaged to give an age for the stand's start in general. The other species tree age stood alone as a comparative value against the dominants as well as a reference value to provide further insight into the stand's history.

Results:

The results of the study were mostly consistent with the known history of UNDERC. Clear-cutting had occurred from 1895 to 1979, with a buildup in frequency during the 1940's, a peak in the 1950's, and then declining to nothing by the end of the 1970's, shown in Figure 1. The stands collective ages averaged to 52.5 years old, with a standard deviation of 17.9 years. Each site's individual age is given in Figure 2 below. In nineteen of the thirty stands, the dominant tree species did not hold the oldest tree within the stand as seen in Figure 3. Table 1 is present in conjunction with Figure 4 to clarify the location of each stand and to indicate which species were sampled there. One third of the sampling sites were dominated by Quaking Aspen, a fast growing, early successional tree that is usually a pioneer in clear-cut areas.



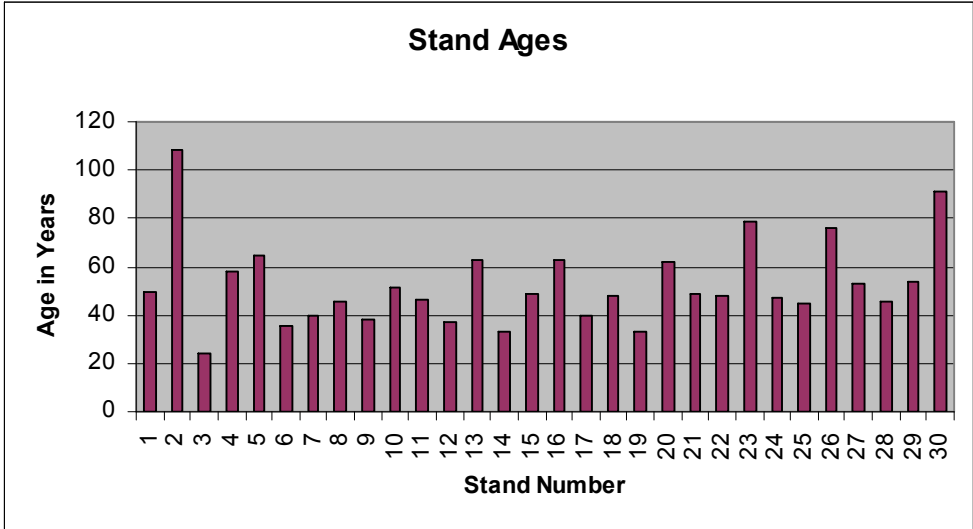


Figure 2: Ages of each stand. The average age of all the stands is 53 years old, putting the average time of clear-cut at 1950.

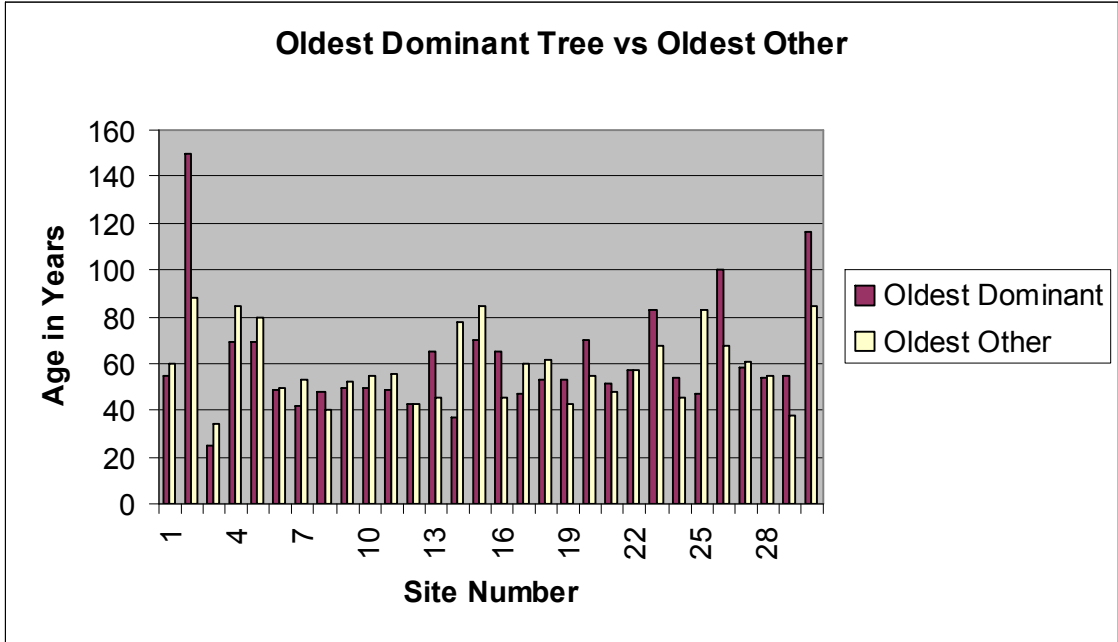


Figure 3: Age of oldest representative of the dominant species vs. oldest tree of any other species. In roughly 1/3 of all stands is the dominant species older than the other species.

| Site | Location | Dominant Spp. | Other Species |
|------|---|---------------|---------------|
| 1 | 10.2 Miles West of Peter/Paul Lakes | S. Maple | Q. Aspen |
| 2 | North tip of Trout Pond Road | S. Maple | Q. Aspen |
| 3 | 0.1 Mile South of Bog Pot | Q. Aspen | B. Fir |
| 4 | Southern East Gate | Q. Aspen | S. Maple |
| 5 | Gate 1 to Crampton Lake | Y. Birch | S. Maple |
| 6 | Long Lake | R. Maple | B. Spruce |
| 7 | North Gate | Q. Aspen | E. Hemlock |
| 8 | 0.9 Miles North of Roach Lake/Pres. Lodge intersection | A. Larch | B. Fir |
| 9 | West of North Gate/by T-foot Creek | B. Fir | B. Spruce |
| 10 | Random Plot | Q. Aspen | R. Maple |
| 11 | 0.1 Mile Down Cranberry Road | R. Pine | A. Larch |
| 12 | 0.3 Miles North of Roach Lake | Q. Aspen | S. Maple |
| 13 | 0.5 Miles Down Cranberry Road | S. Maple | W. Birch |
| 14 | Logging Road 1 – at Cranberry Bog | B. Fir | R. Pine |
| 15 | Roach Lake | S. Maple | W. Birch |
| 16 | Trout Pond Road - by Angela's Plots | Q. Aspen | B. Spruce |
| 17 | 0.2 Miles Down Ward Lake Road | Q. Aspen | W. Birch |
| 18 | Trout/Main Road Intersection | Q. Aspen | Shingle Oak |
| 19 | 50 ft. South of Firestone/Main Intersection | B. Spruce | B. Fir |
| 20 | 0.3 miles North of wet lab toward apartments | W. Birch | S. Maple |
| 21 | Logging Road 2 - Just west of T-foot Creek on road to Storage | B. Spruce | W. Birch |
| 22 | On North side of Bog Pot | B. Spruce | R. Pine |
| 23 | 0.6 miles east of Craig House | S. Maple | E. Hemlock |
| 24 | Logging Road 3 - 0.5 miles from Northern East Gate | Q. Aspen | W. Pine |
| 25 | 0.2 miles east of Logging road 4 | B. Spruce | E. Hemlock |
| 26 | 0.2 miles north on Plum Lake Road | E. Hemlock | R. Pine |
| 27 | 0.25 miles east on Berger Lake Road | S. Maple | W. Birch |
| 28 | Kickapoo Lake | B. Fir | N. White Ced |
| 29 | Bolger Bog cul-de-sac | B. Spruce | B. Fir |
| 30 | Logging Road 4 - 0.3 miles east of Plum Lake/South Gate roads | S. Maple | Y. Birch |

Table 1: List of site information including location, species type that was dominant, and the species of oldest other tree sampled.

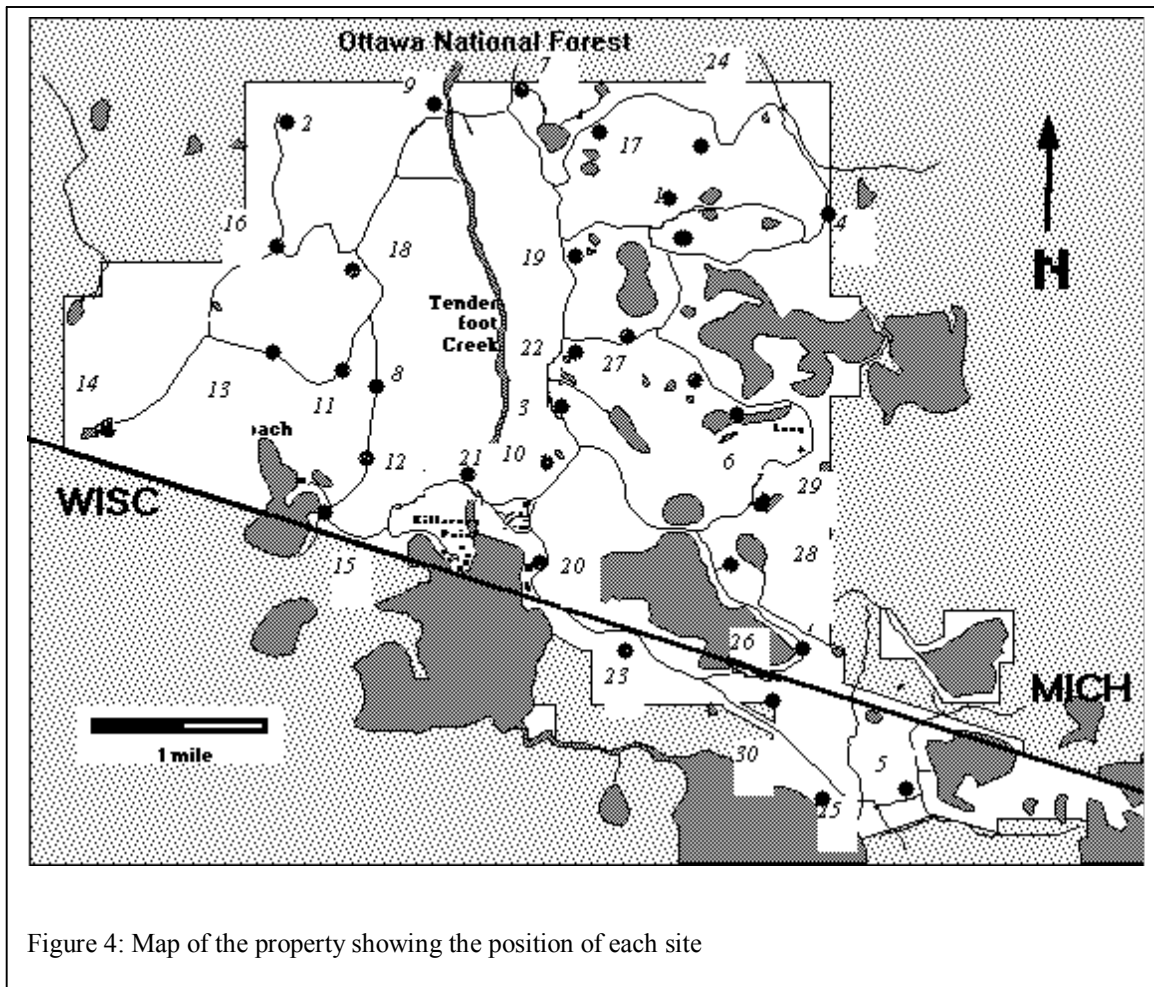


Figure 4: Map of the property showing the position of each site

Discussion:

The results have shown that the majority of the clear-cutting involved on the UNDERC property happened from the 1940's to the 1960's, with the most activity centered within the 1950's. There was a standard deviation of 17.9 years from the mean year of 1950. The full range of cutting was eighty-four years, from 1895 to 1979. To verify stand ages, the oldest looking tree that was not part of the dominant site species was also cored, in case the stand was in the latter stages of a succession. A problem lies in the youngest stand being dated to 1979, given that the property was closed off to all cuttings in 1968.

Site three is the youngest of the sampled areas, aged at twenty-four years old. But, the odd species tree in site three, a Balsam Fir, was cored to be thirty-four years old, setting back the most recent clearing date to 1969. For reasons like that, the non-dominant oldest trees were cored at each site. This data helps contrast against the ages of the dominant trees, but, on the other hand, isn't entirely plausible to use as the raw stand age in place of the average ages of dominant trees. Because in many sites there were only several trees of species other than the dominant one, it wouldn't be logical to use the oldest tree of two of a species to identify the age of a whole stand. In the case of site two, there was only one non-dominant tree in the sampled area, a Quaking Aspen that was sixty-two years younger than the oldest Sugar Maple. The non-dominant tree ages could have been averaged in with the dominant ones, but doing so could cause more harm than good. Older trees could have been survivors left by loggers because they were either not the desired type tree, or were either seedlings or saplings at the time of the clear-cut and therefore left alone. This was probably the case of site fourteen, where along the logging road there was only one Red Pine, but the dominant species on the road's west side was Balsam Fir, and the age difference was approximately forty years. So the best use for the non-dominant tree age is in a contrasting point of inference.

An interesting note in this is that half the sampling plots were comprised of Quaking Aspen and Sugar Maple stands. Ten different stand types were sampled, so with all things being equal, the two combined should only make up twenty percent instead of fifty. The scope of this study was merely to survey the property to date its forest to get a better idea of its history as a whole and to see what points of succession are taking place. In addition to this, a general survey of the tree type abundance has been made. This will

hopefully provide useful information to clarify UNDERC's history as a landscape as well as its composition.

References:

- 1) Guide to UNDERC: University of Notre Dame Environmental Research Center. Notre Dame, IN, Department of Biological Sciences, 1999.
- 2) The Ironwood Times (1943) "Famed Lawyer Gillen Dead", *The Ironwood Times*, 29 September 1943, 1, 4 .