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Comparing the Natural Capital to the Timber Value of the Catchacoma Old-growth Forest, Northern Peterborough County, Ontario

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Logging in the Catchacoma Forest, Peterborough County, Dec. 2019

"In the short-term, individual groups and societies might profit from forest destruction. However, with old-growth forest vanishing at an unprecedented pace, mankind as a whole loses the ecosystem services provided by these forests... [including their] spiritual and/or aesthetic nature, genetic resources, non-timber products, habitat for wildlife, the sequestration of carbon, the prevention of floods and erosion, to name only a few... Data on old-growth forests are generally scarce... NGOs involved in the protection of old growth or primary forests need fast and efficient survey methods and, given the land-use pressure on the remaining areas, they cannot afford to waste time."

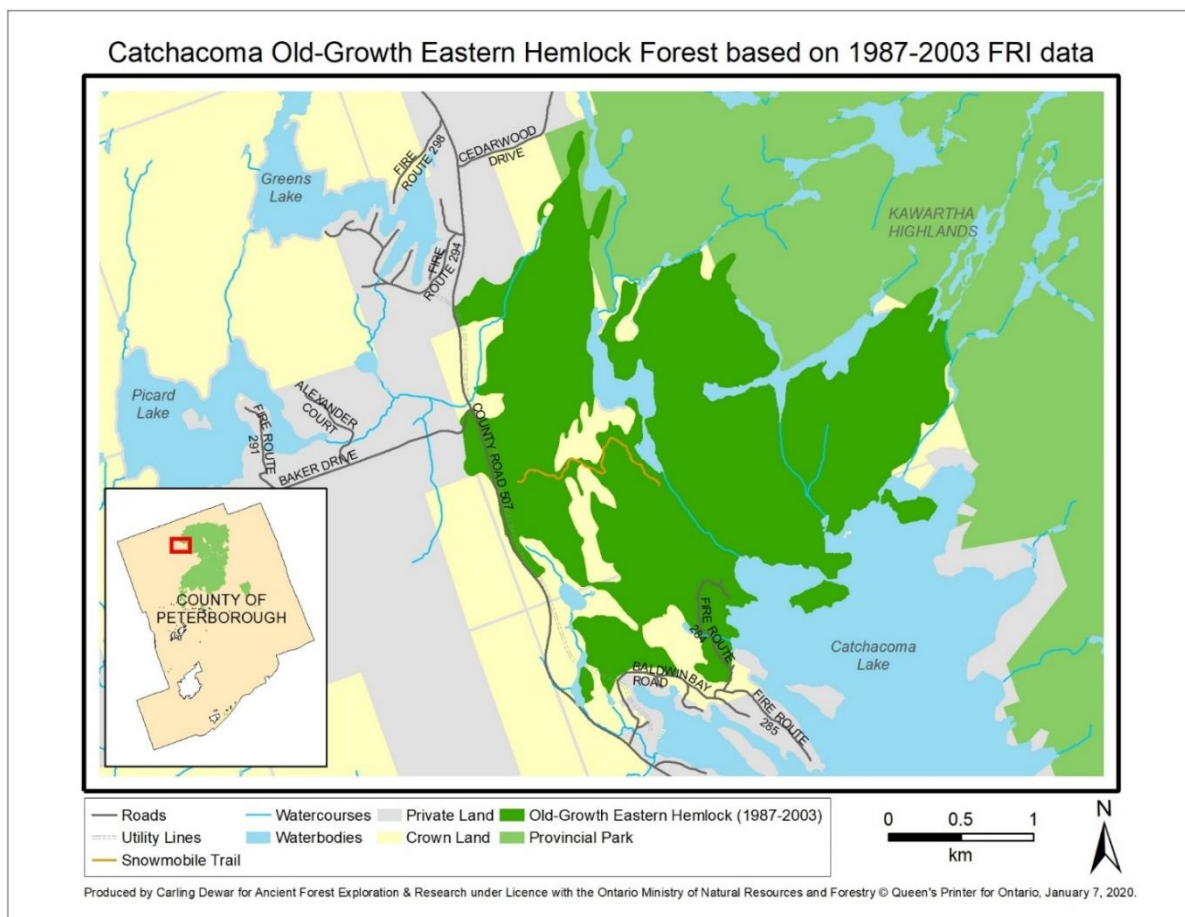
(Old-Growth Forests, Wirth et al. 2009)

Introduction

Forests are valuable to society for numerous reasons. One of these primary values is the natural capital of forests, which is defined as ecosystem services derived from the stock of natural assets (Natural Capital Coalition 2019). Some common natural assets include pollination, carbon sequestration, water and air filtration/purification, and erosion control. By quantifying the value of a forest in capital, we can examine the economic trade-offs of extracting fibre (logging) for the timber market compared with not logging a forest, allowing it to continue providing its natural capital assets indefinitely. For this study, we compared the natural capital (NC) of the Catchacoma Old-growth Forest (OGF) with its timber market value (TMV). The same calculation was completed for four scenarios, each with a different combination of size (area) and level of logging intensity. Our results show that the NC is an order of magnitude greater than the TMV of this unique forest landscape.

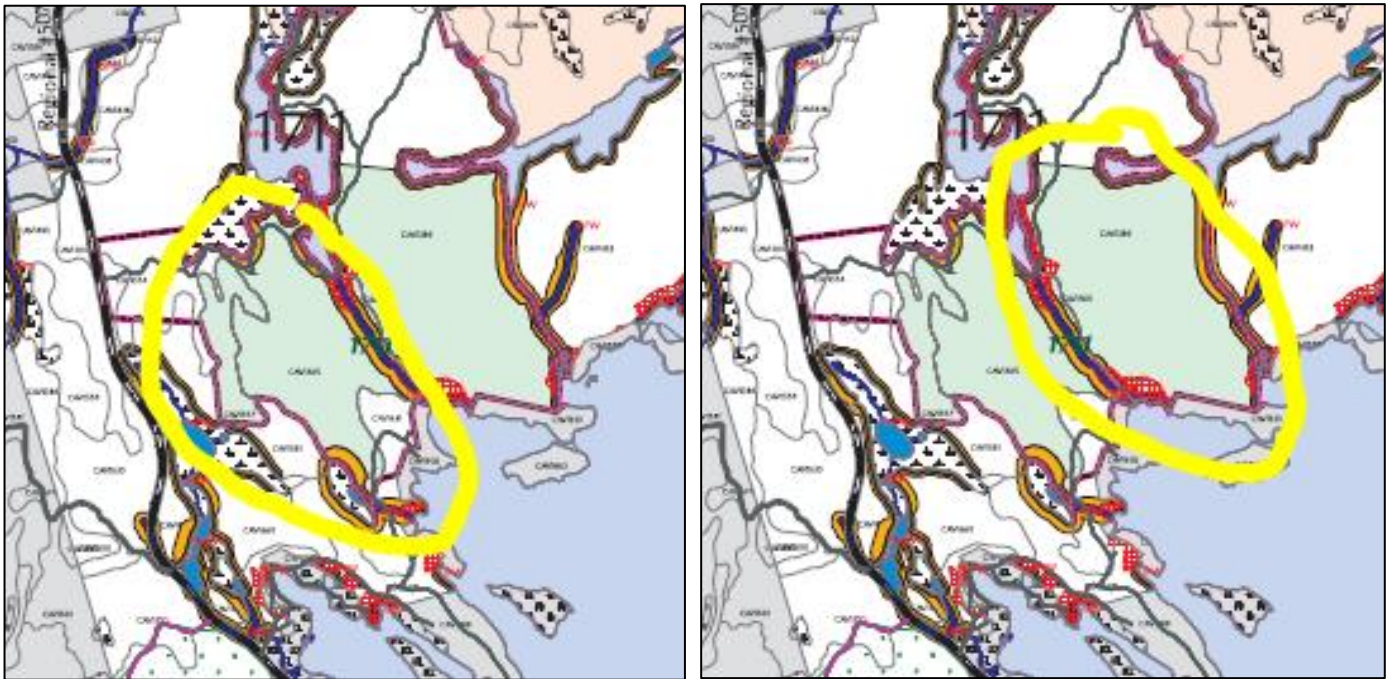
The Catchacoma OGF, located in northern Peterborough County, Ontario (Figure 1), is the largest documented eastern hemlock OGF in Canada (550 ha; Quinby 2019a). It is also an endangered ecosystem type (Quinby 2019b) and despite its provincial and national significance, it remains unprotected. This landscape supports many species-at-risk (8 spp. confirmed; Conlin et al. 2020-in prep) and is currently threatened by logging and by hemlock woolly adelgid.

Figure 1. Catchacoma Forest Location (Dewar 2019)



According to the Bancroft Minden Forest Company's Annual Work Schedule Operations Map, a total of 130 ha is currently slated for logging in the Catchacoma OGF. The left map segment (Figure 2) highlights the west side of the area to be logged, which is 56 ha to be cut in the winter of 2020. The east side of the area to be logged (right side of Figure 2) is 74 ha and is also slated for logging in 2020.

Figure 2. The East and West Sides of the Catchacoma OGF to be Logged in 2020 (MNRF 2018)



Methods

Natural Capital

Natural capital is the total asset stock value of all goods and services that an ecosystem provides expressed in dollars (Natural Capital Coalition 2019). To estimate the NC of the Catchacoma OGF, a report by the Nature Conservancy of Canada (NCC; 2017) entitled: *Putting a Value on the Ecosystem Services of Forests in Canada: Case Studies on Natural Capital and Conservation* was used. For these case studies, the following ecosystem services were evaluated: carbon storage and sequestration, water filtration and purification, flood control and air filtration (Table 1).

Table 1. Ecological Services Provided by Forests (from NCC 2017)

Box 1: Ecological services provided by forests
carbon storage*
carbon sequestration*
disease regulation
water filtration and purification *
flood control*
pollinator habitat
nutrient recycling
pest control
soil erosion prevention
recreation and exercise
air filtration *
shade and cooling
soil formation
wildlife habitat
opportunities for wildlife viewing
* Ecological services that are included in the case study valuations

The NCC report (2017) provides the NC estimate for two natural forests located in the Great Lakes-St. Lawrence Forest Region, which is the eco-region where the Catchacoma OGF is located. One forest is valued at \$19,400/ha/year and the other is valued at \$20,000/ha/year. Neither of these forests appear to have OGF properties based on the information

provided in the NCC report (2017), but they are the best available baseline NC data for our study. To estimate the NC of the Catchacoma OGF, we used the mean of these two values (\$19,700).

Timber Value

The Haliburton Forest and Wildlife Reserve Ltd. (2019a) owns and operates the Haliburton Forest Sawmill, which is located less than 100 km northwest of the Catchacoma OGF. The Sawmill processes eastern hemlock logs, which are used to build log cabins, cardboard and pallets. Eastern hemlock wood splits easily and is not durable enough to sustain high-quality goods such as conventional building construction, flooring and furniture (The Wood Database 2019). Eastern hemlock timber is not worth much at market; the wholesale price of milled eastern hemlock timber is \$650 per 1,000 board feet (83.3 ft³, 2.36 m³) (Haliburton Forest and Wildlife Reserve Ltd. 2019b).

Eastern hemlock trees typically grow to a maximum of 60-70 feet (18.3-21.3 m) in height (Little and Knopf 1980, Hosie 1990, Petrides and Wehr 1998). In the Catchacoma OGF, eastern hemlocks that measure over 40 cm DBH are estimated to be at or near their full height (Quinby 2020). However, not every tree that has been marked to be cut in the Catchacoma OGF is over 40 cm DBH (though many are), so for calculation purposes, we used 18.3 m for tree height (h), which is the lower end of the range of maximum height for this species.

The mean DBH of eastern hemlocks (≥ 10 cm DBH) that we assessed in the Catchacoma OGF during the 2019 field season was 31.3 cm, which is a radius (r) of 15.7 cm. To determine tree (bole only) volume, we used the formula for calculating the volume of a cylinder (πr^2h) using a mean height of 18.3 m and a mean radius of 15.7 cm (or 0.16 m). Finally, the dollar value of the average eastern hemlock tree was calculated by multiplying mean tree volume (1.41 m³) by \$275.4, which is the value of eastern hemlock per cubic meter (\$650/2.36 m³).

Based on our field data, the Catchacoma OGF has a density of 115 trees (mean of 31.3 cm DBH)/ha, which was used to determine total TMV for a given area. To do this for a 20-year period (assumed logging cycle), we multiplied the dollar value of the average eastern hemlock tree in the Catchacoma OGF by an estimate of the number of trees removed.

Four Scenarios

Conservatively, a selection cut may remove approximately 20% of the basal area in a given area, however, as much as 40% of the basal area could be cut with this logging method. Thus, to cover this range, the following four scenarios were assessed and evaluated: (a) Scenario 1 - 20% selection logging of 56 ha, (b) Scenario 2 - 40% selection logging of 56 ha, (c) Scenario 3 - 20% selection logging of 130 ha, and (d) Scenario 4 - 40% selection logging of 130 ha.

Results and Discussion

Natural Capital Calculations

Scenario 1 - 20% selection logging of 56 ha	= \$216,700/yr (11 ha x \$19,700 ha/yr)
Scenario 2 - 40% selection logging of 56 ha	= \$433,400/yr (22 ha x \$19,700 ha/yr)
Scenario 3 - 20% selection logging of 130 ha	= \$512,200/yr (26 ha x \$19,700 ha/yr)
Scenario 4 - 40% selection logging of 130 ha	= \$1,024,400/yr (52 ha x \$19,700 ha/yr)

Timber Market Value Calculations

Scenario 1 - 20% selection logging of 56 ha	= \$24,854/yr (\$388 X 1,280 trees = \$497,088/20 yrs)
Scenario 2 - 40% selection logging of 56 ha	= \$49,709/yr (\$388 X 2,560 trees = \$994,176/20 yrs)
Scenario 3 - 20% selection logging of 130 ha	= \$57,825/yr (\$388 X 2,978 trees = \$1,156,506/20 yrs)
Scenario 4 - 40% selection logging of 130 ha	= \$115,631/yr (\$388 X 5,955 trees = \$2,312,624/20 yrs)

Natural Capital (NC) vs Timber Market Value (TMV)

Scenario 1 - 20% selection logging of 56 ha	=	\$216,700/yr NC	vs	\$24,854/yr TMV
Scenario 2 - 40% selection logging of 56 ha	=	\$433,400/yr NC	vs	\$49,709/yr TMV
Scenario 3 - 20% selection logging of 130 ha	=	\$512,200/yr NC	vs	\$57,825/yr TMV
Scenario 4 - 40% selection logging of 130 ha	=	\$1,024,400/yr NC	vs	\$115,631/yr TMV

A comparison of the NC with the TMV for each scenario shows that the NC is roughly ten times greater than the TMV across all scenarios. For example, under scenario 4 over a 20-yr logging cycle, the TMV was estimated at \$2.3 million compared with an NC of \$20.5 million for the area logged (52 ha). Since the logging of roughly 10% of the Catchacoma OGF (550 ha) will have negative ecological effects on the other 90% of the stand, it is important to also consider the NC of the entire stand, which is \$217 million over a 20-yr period.

It is important to note, however, that:

- (a) because only a portion of the stand will be being logged, only a portion of the NC will be lost;
- (b) only five of 15 potential ecosystem services were evaluated for the NC estimates; and
- (c) our TMV estimates do not include the costs associated with damages to ecological integrity resulting from the construction and operation of logging and skidder roads that cause erosion, soil compaction, biodiversity loss, and fossil fuel combustion (e.g., CO₂ release).

Thus, our estimates of NC are low since ten of 15 ecosystem services (including values associated with the OGF condition) were not considered in the NC estimates. In addition, TMV estimates are high since they do not include the costs associated with the loss of ecological integrity, which is diminished for roughly 100 years until the forest canopy closes and damaged areas are fully restored.

AFER's Mission and Guiding Principles

AFER is a non-profit scientific organization with a mission to carry out research and education that lead to the identification, description and protection of ancient (pristine) forested landscapes, including old-growth forests. The earth-stewardship principles that guide our work include the following.

- Many forest ecosystem types are now endangered. We consider these ecosystems and other ancient forests to be non-renewable resources, which is not consistent with the practice of mining or logging them.
- We consider biodiversity conservation needs at local, provincial, federal and international scales.
- We support the Government of Canada's official commitment to increase protected areas to 17% of the Canadian land base.
- We support the New York Declaration on Forests to end natural forest loss by 2030.

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