Private Land Forestry in Canada's Maritime Provinces:

A Common Practice Scenario

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Contents

The Acadian Forest Region

The Acadian Forest Region (AFR) is a forest type that covers most of the Canadian Maritime provinces (New Brunswick, Nova Scotia, and Prince Edward Island), and is defined by the presence of red spruce (*Picea rubens* Sarg.) in association with balsam fir (*Abies balsamea* (L.)), eastern hemlock (*Tsuga canadensis* (L.) Carr), eastern white pine (*Pinus strobus* L.), yellow birch (*Betula allegheniensis* Britt., sugar maple (*Acer saccharum* Marsh.), and American beech (*Fagus grandifolia* Ehrh.), in predominantly late-successional forest types (Loucks 1962, Rowe 1972). Along New Brunswick's and Nova Scotia's coasts, red spruce also forms early successional associations with black spruce (*Picea mariana* (Mill.) B.S.P.), red maple (*Acer rubrum*, L.), trembling aspen (*Populus tremuloides* Michx.), and white birch (*Betula papyrifera* Marsh.).

A boreal forest component of the AFR is found in northwestern New Brunswick and the Cape Breton highlands, where the forest is dominated by associations of black spruce, balsam fir, trembling aspen, white birch, white spruce (*Picea glauca* (Moench) Voss), tamarack (*Larix laricina* (Du Roi) K. Koch), red pine (*Pinus resinosa* Ait.), and red maple (Loucks 1962, Rowe 1972). More recently, centuries of large-scale fire disturbances, forest management, and human settlement in extended parts of the AFR have produced early successional forest types of mixed black spruce, jack pine (*Pinus banksiana* Lamb.), balsam fir, and tamarack, although scattered remnants of late-successional and old-growth forest can be found (Mosseler *et al.* 2003). Furthermore, the AFR was classified in 2001 as an endangered forest type by the World Wildlife Fund (Davis *et al.*, 2001).

Historic Forest Conditions of the Maritime Provinces

According to Mosseler *et al.* (2003), "based on expected patterns of ecological succession, disturbance dynamics, and stand development following catastrophic natural disturbance intervals of about 1000 years, and from what the geological record tells us about forest cover before European settlement, we can project that as much as 50% of Maritime forest landscape may have been dominated by late-successional old-growth forest types over the 4000-5000 years before European settlement." More specifically, Mosseler *et al.* (2003) summarize land grant surveys and indicate that "the percentage of old-growth forest across the landscape in pre-European settlement forests of northeastern North America ranged from 60 to 85% compared with recent estimates from Nova Scotia of between 1% of forested area greater aged than 100 years [reference within] and about 5% of the forested area [reference within]".

Human Impacts on the Acadian Forest

The AFR has had a long history of human use and associated impacts. Prior to European settlement, the Aboriginal Peoples of the region used the forests for food, shelter, and transportation, but impacts do not appear to have been significant (Loo & Ives 2003). From sources within Mosseler *et al.* (2003), it appears that in eastern North America, catastrophic disturbances were rare in the pre-settlement forest landscape, and fires became more significant in the landscape after European settlement.

Upon European settlement of the region beginning in the late 16th century, more significant uses of- and changes to the forests of the AFR began, most notably with land clearing for agriculture, intentional and unintentional fires, high-grading of white pine for ships' masts, and then the lumber trade (Loo & Ives 2003). In the last few hundred years of settlement, changes to the Acadian Forest have continued and accelerated, due to anthropogenic influences: acid rain and fog, introduced tree insect pests and diseases (e.g. Dutch elm disease, beech bark disease, butternut canker), continued land clearing for agriculture and urbanization, increased fire frequency and smaller fires, and widespread intensive forest management (clearcutting, plantations, forest composition borealization) (Loo & Ives 2003). The composition, age structure, and distribution of Acadian Forest species are now considerably changed compared to its original pre-settlement condition, and old-growth Acadian Forest patches are now small and scattered. For example, Mosseler *et al.* (2003) calculate only 300 ha of old-growth conifer forest remain in scattered patches in Nova Scotia, somewhat less in New Brunswick, and almost nothing in Prince Edward Island.

New Brunswick

Small private lands account for 30% (1.9 million ha) and industrial private lands 21% (1.2 million ha) of the New Brunswick landbase. According to the Canadian Council of Forest Ministers (CCFM) National Forestry Database, private woodlots in New Brunswick are held by more than 40,000 separate owners (CCFM 2017a). According to CCFM 2017a,

> "Acts and regulations governing forest management on private land include the *Clean Water Act [SNB 1989, c C-6.1]*, *Forest Products Act [RSNB 1973, c F-21]*, and *Natural Products Act [SNB 1999, c N-1.2*]. All forest management on private land must comply with the *Clean Water Act*. The *Forest Products Act* established the Forest Products Commission and governs the powers, duties and activities of the Commission including the oversight and general supervision of the Forest Products Marketing Boards. The underlying objective of both the *Forest Products Act* and the *Natural Products Act* (with respect to farm products of the forest) is the control and regulation of primary forest products coming from private woodlots in New Brunswick."

Harvest Rotations

Intensive rotation forestry, practiced on 40-60 year rotations, and relying on clearcutting followed by site preparation, planting (as needed), and herbicide applications, are the most common practices for industrial private forestry land in New Brunswick (S. Banks 2016, pers. comm., 7 November). There is even movement now toward shortening plantation rotations to 32-36 years on private industrial land, due to their planting of genetically improved tree stock with improved growth rates (S. Banks 2016, pers. comm., 7 November). Rotations are somewhat more difficult to ascertain for small private lands, although the trend has decidedly been toward increased mechanization and increased harvesting intensity, which has likely yielded a reduction in rotation age. Species composition, such as in areas with a high proportion of short-lived species like balsam fir and poplar, also contribute to shorter harvest rotation (P. Doucet 2017, pers. comm., 6 March).

Harvest methods / intensity

According to harvesting data for 1990 to 2014 in the National Forestry Database (Canadian Council of Forest Ministers [CCFM] 2016), private lands in New Brunswick represent a disproportionate amount of harvesting of total private forest lands in Canada. In spite of containing only 11.6% of all of Canada's private forest lands, New Brunswick's private lands represent an average of 39% of hectares harvested (on private lands) in Canada from 1990-2014.

CCFM data also shows that clearcutting has been consistently the dominant harvesting practice on private lands in New Brunswick for the last 26 years (Figure 1). On private lands in New Brunswick, a significantly greater area of land is harvested yearly by clearcutting (average of 32,694 ha per year) than by selective cutting (average of 12,601 ha per year).

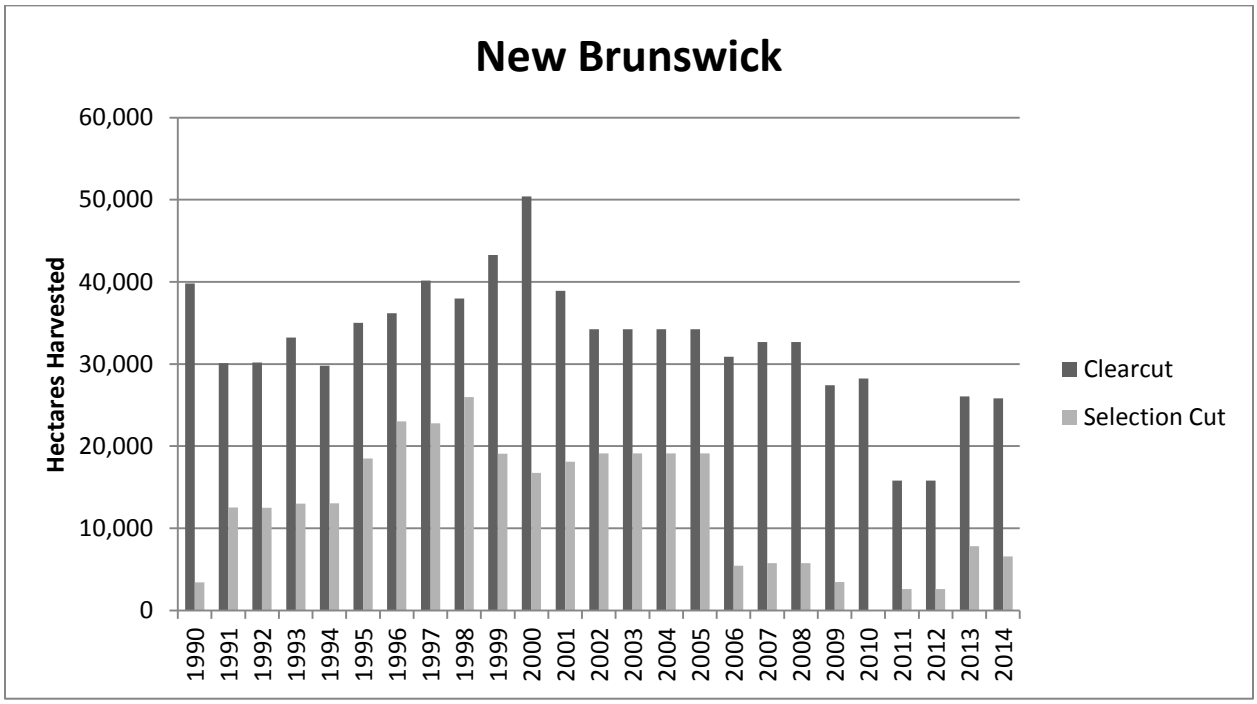

Figure 1. Hectares harvested by clearcutting and selection harvesting in New Brunswick from 1990-2014.

On small private land, the trend over the last 10-15 years has also increasingly been toward more mechanization and more intensive and large-scale harvesting, where once most harvesting was single-tree selective harvesting using power saws and more stand-level cutting, and now full woodlot liquidation is most common (C. Spencer 2017, pers. comm., 19 January). This trend is clearly shown in Figure 1. The low rates of selection harvesting on private land reflect more a lack of contractors and markets to support managing for multiple objectives, than a desire by landowners for those less-intensive management options (L. Barkley 2016, pers. comm., 16 November). The trend toward increased mechanization and increased harvesting intensity is due to the low value of wood (currently the lowest in 20 years) and continually increasing operating costs, which drives most contractors to harvest as much wood as efficiently as possible and produces more woodlot-wide liquidations as a result

(C. Spencer 2017, pers. comm., 19 January). Contractors find it increasingly difficult to sell their wood locally, since most local mills no longer accept wood at the gates and only by contract, which further increases operating costs. As a result, in the south of the province, approximately 40% of woodlots harvested are clearcut in entirety, regardless of stand age, composition, or condition, 25% of woodlots are subjected to stand-level clearcuts (i.e. stands identified as ready for harvest), 25% experience less intrusive partial or patch cuts, and the remaining 10% are single-tree or thinning harvests (C. Spencer 2017, pers. comm., 19 January). In the north of the province, complete liquidation is even more common (about 60% of properties), stand-level clearcuts account for another 35%, and there are almost no partial or selective cuts (P. Doucet 2017, pers. comm., 6 March).

By comparing the mean annual percentage of private forests harvested from 1990-2014, it's clear that in each of the Maritime Provinces (as well as combined) there has been significantly more forest harvested by clearcutting than by selective cutting (Fig. 2). This is also clearly not the case across all of Canada (Fig.2).

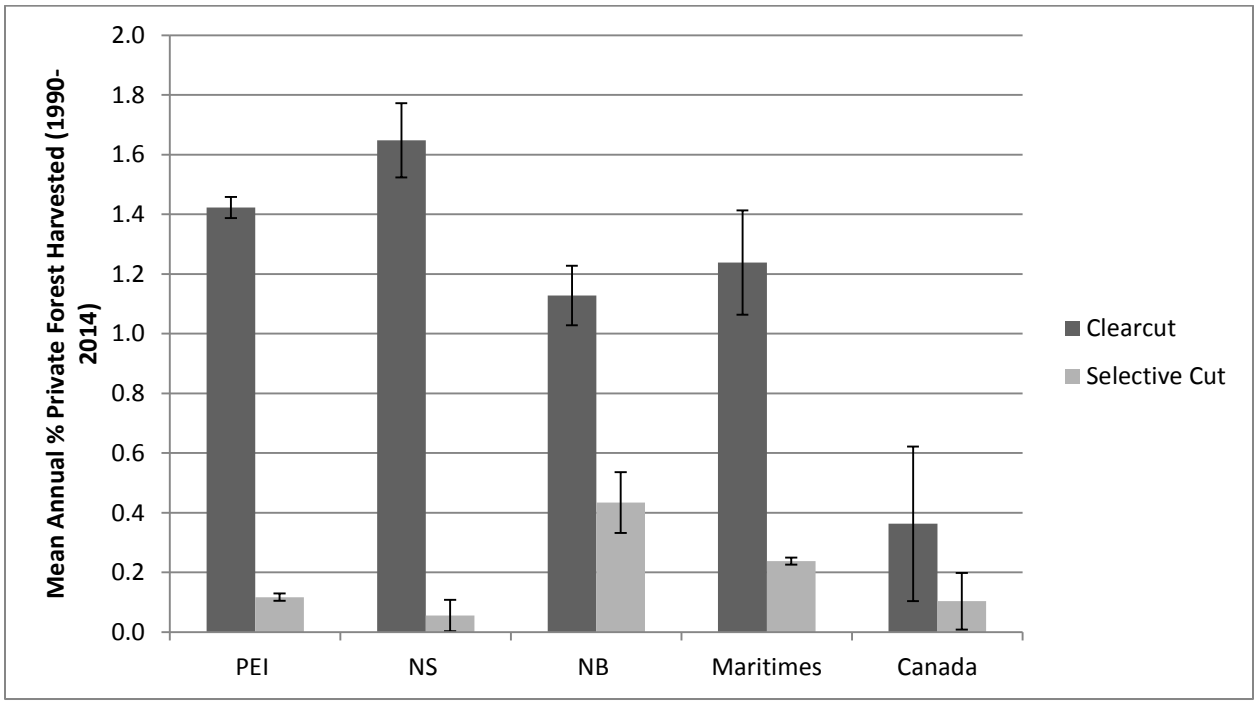

Figure 2. Mean annual % private forest harvested between 1990-2014 in NB, NS, PEI, the Maritimes combined, and all of Canada. Error bars are 95% confidence intervals (p = 0.05).

Species Harvested & Planted

In spite of holding 11.6% of private land in Canada, an average of 3,365,026 m^3 of softwood was harvested per year from New Brunswick private lands from 1990 to 2014, which is 16% of the softwood harvested per year from private forest lands across Canada (21,863,791 m^3; CCFM 2016). Similarly, hardwood harvested from New Brunswick private forest lands represents a disproportionate amount of the whole: an average of 17% per year (1,741,076 m^3) of the average yearly hardwood harvest (10,394,373 m^3) from private forest lands in all of Canada.

In the south, of the species harvested, the majority is spruce and fir (50-60%), followed by intolerant hardwood species (white birch, red maple, poplar – 25-30%), and the remainder a mix of yellow birch, sugar maple, tamarack, and white pine (10%) (C. Spencer 2017, pers. comm., 19 January). In the north, balsam fir and spruces unquestionably make up the most of harvest, followed by poplars, and white birch and red maple, and relatively little tolerant hardwood is harvested (P. Doucet 2017, pers. comm., 6 March).

For tree planting, an average of 8,561 ha was planted per year on New Brunswick private lands from 1990-2014, which represents 29% of the private land that was planted (32,543 ha) in all of Canada during that time (CCFM 2016). This means that an average of 17,134,635 tree seedlings were planted per year on New Brunswick private lands from 1990-2014. The vast majority (90%) of seedlings planted in New Brunswick are spruce (white, red, and black, and determined by site conditions), with the remaining 10% as red and white pine (C. Spencer 2017, pers. comm., 19 January).

Post-Harvest Treatments

After harvest, common treatments on private land are site-preparation (i.e. mechanical or chemical treatments to improve conditions for seed or seedling establishment), and following tree planting or natural regeneration, herbicide applications and stand tending (i.e. thinnings and improvement cuttings). Plantation cleaning and pre-commercial thinning are both widely used in the decade following planting, especially in the north of the province, although these interventions are decreasing as plantations decrease (P. Doucet 2017, pers. comm., 6 March). Insecticide applications are periodically used on private land, usually in response to wide-spread outbreaks of insect pests like Spruce Budworm (S. Banks 2016, pers. comm., 7 November).

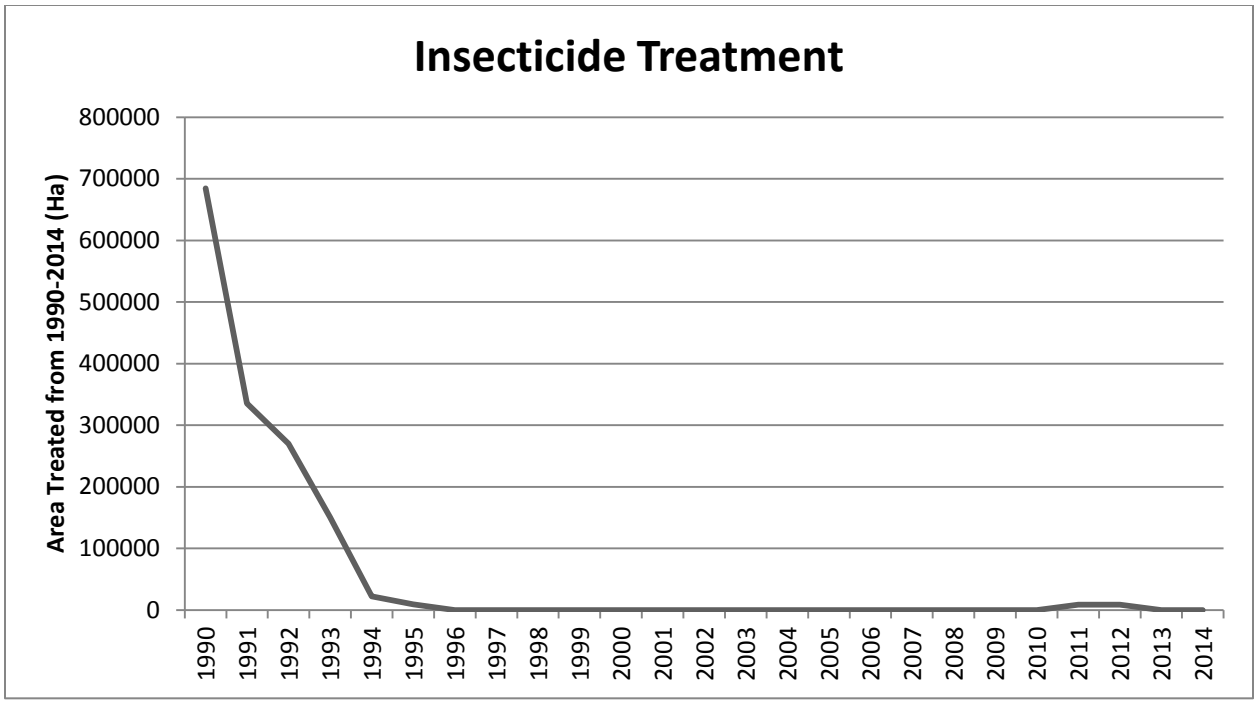

Figure 3. Hectares of New Brunswick land (private and public [Crown] lands combined) treated with insecticides from 1990-2014.

Data provided by CCFM indicates that relatively little insecticide has been sprayed on NB forest lands (private and public lands combined) since the last major Spruce Budworm outbreak that carried into the early 1990s (Fig. 3).

Herbicide treatments, however, have stayed relatively stable, at an average of 25,696 hectares (private and public lands combined) sprayed per year (Fig. 4). In spite of only containing 3% of Canada's total forests (private and public lands combined), the hectares treated with herbicides in New Brunswick are on average 17% of the total forest lands sprayed in Canada (CCFM 2016). The fluctuations in herbicide treatments likely follow the fluctuations in tree planting subsidies, since herbicide applications are permitted twice per plantation; once for use as site-preparation, and a second time for stand tending (S. Barkley 2016, pers. comm., 16 November).

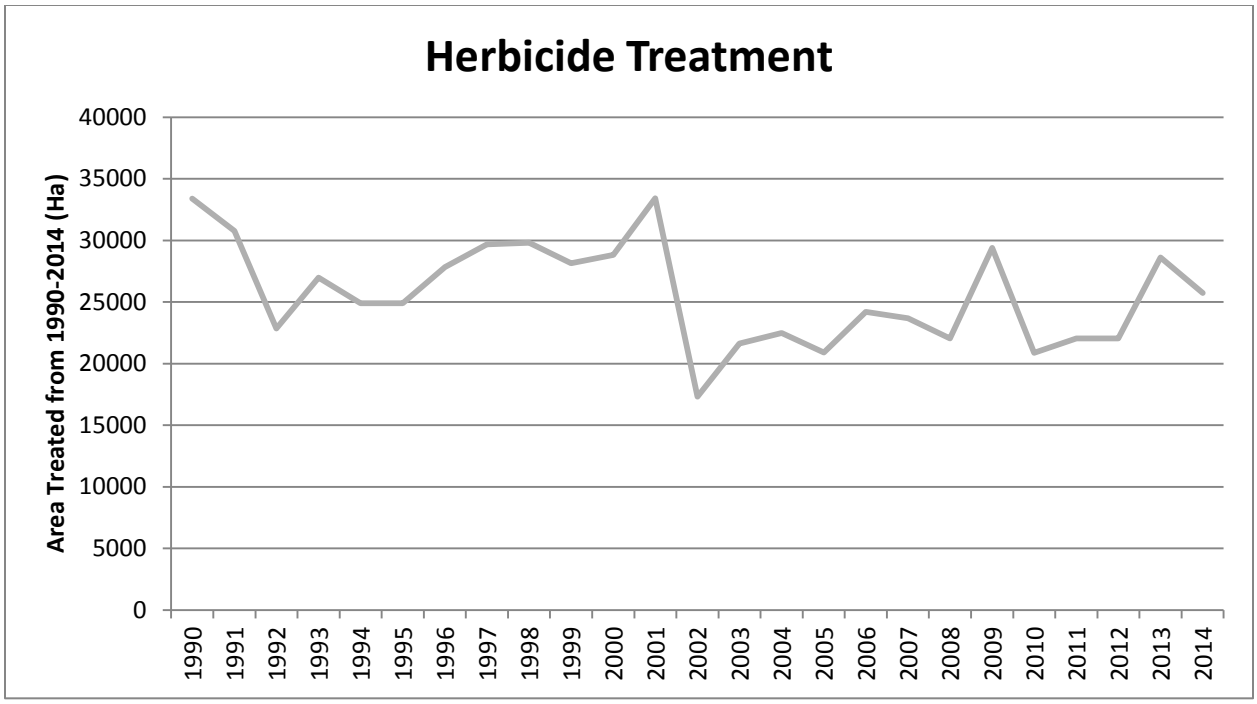

Figure 4. Hectares of New Brunswick land (private and public [Crown] combined) treated with herbicides from 1990-2014.

When comparing post-harvest treatments for private land in New Brunswick versus all of Canada, New Brunswick private lands also account for a disproportionate amount of the whole. Despite New Brunswick private lands accounting for only 11.6% of total private lands in Canada, site preparation on New Brunswick private lands averages 40% (7702 ha) per year of the total hectares treated with site preparation on private lands in Canada, and for stand tending (i.e. thinnings and improvement cuttings), New Brunswick averages 37% (22,131 ha) per year of the total hectares of private land treated in Canada (CCFM 2016).

Riparian Management Areas

Private landowners are free to manage their woodlots as they deem appropriate and must only conform to the *Clean Water Act, SNB 1989, c C-6.1* (CCFM 2017a). Generally, it seems that these regulations are respected on private lands in New Brunswick, with many fewer incidences of illegal harvesting or machinery operating in wetlands, watercourses, and buffers than were reported 20-30 years ago.

Maximum Patch Cut Areas

There are very few limitations placed on area cut or patch cut size for private lands in New Brunswick (T. Fox 2016, pers. comm., 7 November). Of course, regulations from the *Clean Water Act, SNB 1989, c C-6.1*, and *Natural Products Act, SNB 1999, c N-1.2*, apply to private land, but these have little to do with the size or extent of forest operations, unless the operations affect water quality.

Nova Scotia

Private lands account for 69% (3,3840,780 ha) of the Nova Scotia forested landbase (NSDNR 2008), although that amount has very recently decreased with the transfer of some 200,000 of formerly private industrial land to ownership by the provincial government. According to CCFM 2017b,

> "The [Endangered Species Act, SNS 1998, c 11] provides for the designation of a species status, and is in addition to Canada's national species at risk legislation. As of 2013, black ash (Fraxinus nigra) is the only tree species listed as 'Threatened' under this Act and its harvest is now prohibited. Products made in or exported from Nova Scotia containing black ash must only use wood obtained from other Canadian provinces… Any person attempting to place primary or secondary forest products grown in Nova Scotia into a market would be covered by [the *Forest Sustainability Regulations* of the Forests Act, RSNS 1989, c 179] unless the volume of products is below the [identified] size limit. The Forests Act is enforced by the DNR. Due diligence verification that a registered buyer is in compliance with the Forests Act and Forest Sustainability Regulations can only be provided by DNR, through the Buyers Registry. Those buyers who acquire more than 5,000 cubic metres/year of privately sourced wood for manufacturing or export must provide for silviculture treatments. These treatments must adhere to the amounts specified in the Regulations or the buyer must make a payment to a special fund. Failure to do so would be an offence under this Act… As of 2014, five forest industry manufacturers and three woodlot owner organizations held third-party sustainable forest management certification on 1.3 million ha of land in Nova Scotia. These forests were certified to at least one of three certification systems: the Canadian Standards Association (CSA), the Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI)."

Harvest Rotations

In northern mainland Nova Scotia and Cape Breton much of the forests are dominated by balsam fir and white spruce, which reach maturity at 50-60 years, and so harvest rotations follow a similar 50-60-year timeline (K. Easthouse 2017, pers. comm., 8 February). Large areas of mainland NS have similar rotation ages, influenced largely by:

1) Land ownership is dynamic with some private land ownership surveys suggesting a 15 year turnover, with a high rate of cutting associated with new ownership, yielding a 50-60 harvest rotation on private land;
2) Large areas of NS (approx. 10%) are in old field forests of white spruce, most of which are on small private tenure, and these forests are susceptible to bark beetle which usually occurs between 40-60 years of age, such that many landowners harvest intensively either preventatively or in response to bark bettle infestations; and,
3) The Atlantic coastal forests are primarily balsam fir and white spruce on private tenure, which experience significant windthrow once they reach maturity (40-60 years), so landowners often

clearcut every 40 years to prevent losses due to windthrow (P. Neily 2017, pers. comm., 26 January).

Western NS tends to have more mixed woodlots, with old-field sites regenerating in more white pine than is seen in the rest of NS, but rotation ages still typically 50-60 years on private lands (P. Amero 2017, pers. comm., 14 February).

Harvest Methods

According to harvesting data for 1990 to 2014 in the National Forestry Database (Canadian Council of Forest Ministers [CCFM] 2016), private lands in Nova Scotia have experienced a disproportionate amount of harvesting of total private forest lands in Canada. In spite of containing only 9.1% of all of Canada's private forest lands, Nova Scotia's private lands represent an average of 34% of harvesting (on private lands) in Canada from 1990-2014.

According to harvesting data for 1990 to 2014 in the National Forestry Database (CCFM 2016), clearcutting has been consistently the dominant harvesting practice on private lands in Nova Scotia for the last 26 years (Fig. 5). On private lands in Nova Scotia, a significantly greater area of land is harvested yearly by clearcutting (average 36,148 ha per year) than by selection harvesting (average 1,212 ha per year). This is also clearly not the case across all of Canada (Fig.2).

The trend in recent years has increasingly been away from stand-level or selective harvesting by manual (power saw) felling and toward mechanized, wide-scale liquidation harvesting (P. Neily 2017, pers. comm., 26 January). Approximately 85% of private woodlot harvests are done with total liquidation (clearcut) of all merchantable timber, and the remaining 15% are harvested using single-tree selection or patch cuts (P. Amero 2017, pers. comm., 14 February). In addition to market forces driving these intensive forest management practices, there may be a historical reason as well; namely, proximity to a pulp mill. In western NS, there have been fewer pulp mills operating and for a shorter period than in northern NS and in Cape Breton, which might explain why forest operations have been more intensive in the north, with a long history of regional overcutting to feed the pulp mills (P. Amero 2017, pers. comm., 14 February).

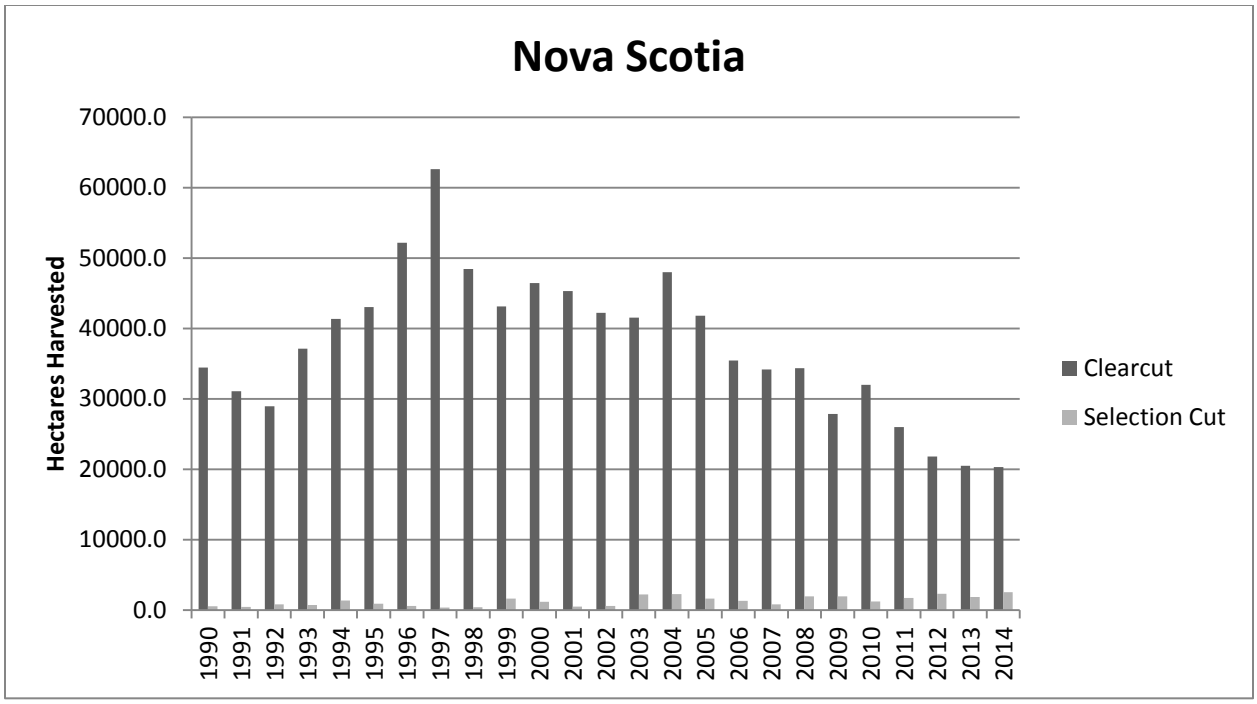

Figure 5. Hectares harvested by clearcutting and selection harvesting in Nova Scotia from 1990-2014.

Species Harvested & Planted

Red spruce, hemlock, white spruce, balsam fir and tolerant hardwood are the main species harvested off private lands in mainland NS; the white spruce is a reflection of the large areas of old field white spruce (P. Neily 2017, pers. comm., 26 January). In eastern mainland NS and Cape Breton, of the species harvested, approximately 40% are balsam fir, 40% white spruce, and 10% black spruce (K. Easthouse 2017, pers. comm., 8 February). In western NS, red spruce likely accounts for about 80% of trees harvested, followed by less than 20% white pine, and a small amount of hemlock (P. Amero 2017, pers. comm., 14 February).

On average, 3,895,009 m^3 of softwood was harvested per year from Nova Scotia private lands from 1990 to 2014, which is 18% of the average 21,863,791 m^3 of softwood harvested per year from private forest lands across Canada (CCFM 2016). Hardwood harvested from Nova Scotia private forest lands represents a smaller proportion of the whole: an average of 640,617 m^3 per year, or 6.2% of the average 10,394,373 m^3 harvested yearly from private lands in all of Canada.

Based on provincial nursery records, red spruce, black spruce and white spruce account for most of the seedling production and therefore these species are the typical species planted on private tenure, with some small amounts of European larch and Norway spruce planted on industrial private lands (P. Neily 2017, pers. comm., 26 January).

For tree planting, an average of 7,179 ha was planted per year on Nova Scotia private lands from 1990-2014, which represents 23% of the private land that was planted (32,543 ha) in all of Canada during that

time (CCFM 2016). This means that an average of 13,891,198 tree seedlings were planted per year on Nova Scotia private lands from 1990-2014.

Post-Harvest Treatments

As in New Brunswick, common treatments after harvest on private land are site-preparation (i.e. mechanical or chemical treatments to improve conditions for seed or seedling establishment), and following tree planting or natural regeneration, herbicide applications and stand tending (i.e. thinnings and improvement cuttings).

Data provided by CCFM indicates that relatively little insecticide has be sprayed on NS forest lands (private and public lands combined) except for a small spike in 1995-1997 due to an outbreak of hemlock looper on Cape Breton Island; a large spike in 1998, which is attributed to an outbreak of Tussock moth; and a smaller spike in 2005, attributed to an outbreak of black-headed budworm in the Cape Breton Highlands (Fig. 6).

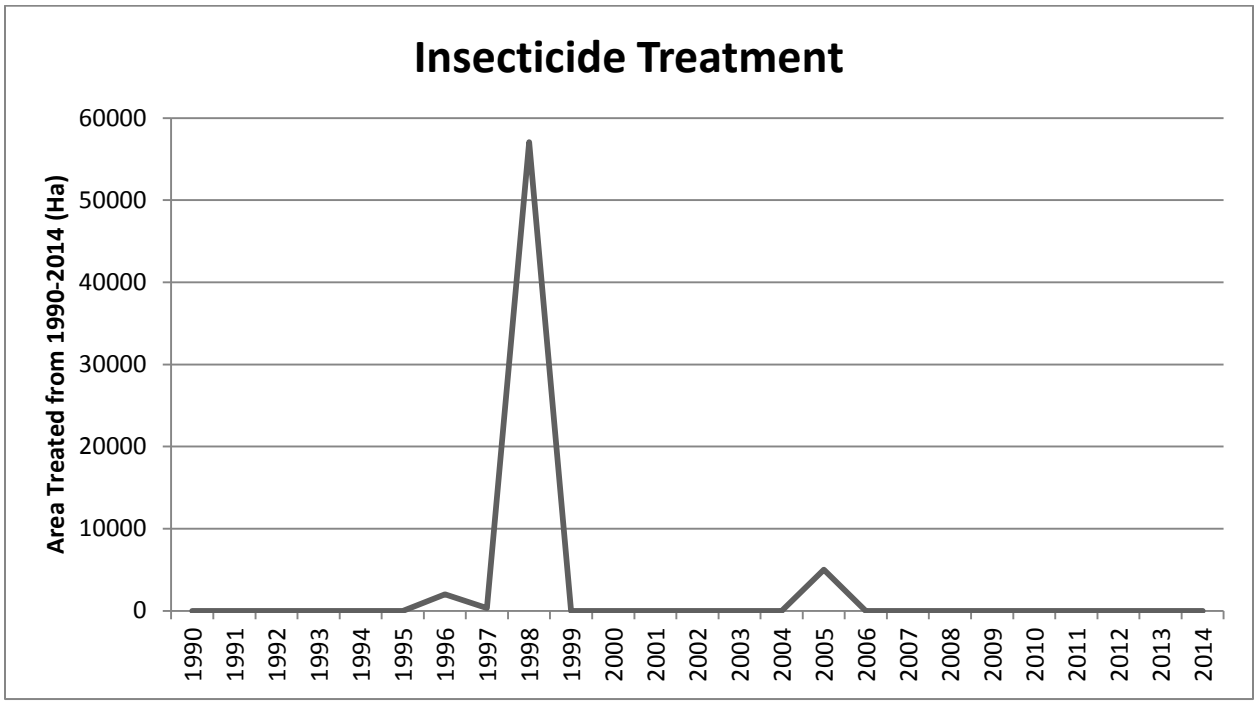

Figure 6. Hectares of Nova Scotia land (private and public [Crown] lands combined) treated with insecticides from 1990-2014.

Unlike in New Brunswick, herbicide treatments, were only modestly popular from 1990 to 1998 at an average of 8,351 hectares (private and public lands combined) sprayed per year (Fig. 7). Herbicide use is likely decreasing on all land tenures in favour of natural regeneration, and from increases in partial harvesting (P. Neily 2017, pers. comm., 26 January). Herbicide applications on private land have decreased significantly since provincial government subsidies ended (P. Amero 2017, pers. comm., 14 February). Nova Scotia represents 2.3% of Canada's total forests (private and public lands combined) and the hectares treated with herbicides in Nova Scotia are on average 2.3% of the total forest lands sprayed in Canada (CCFM 2016).

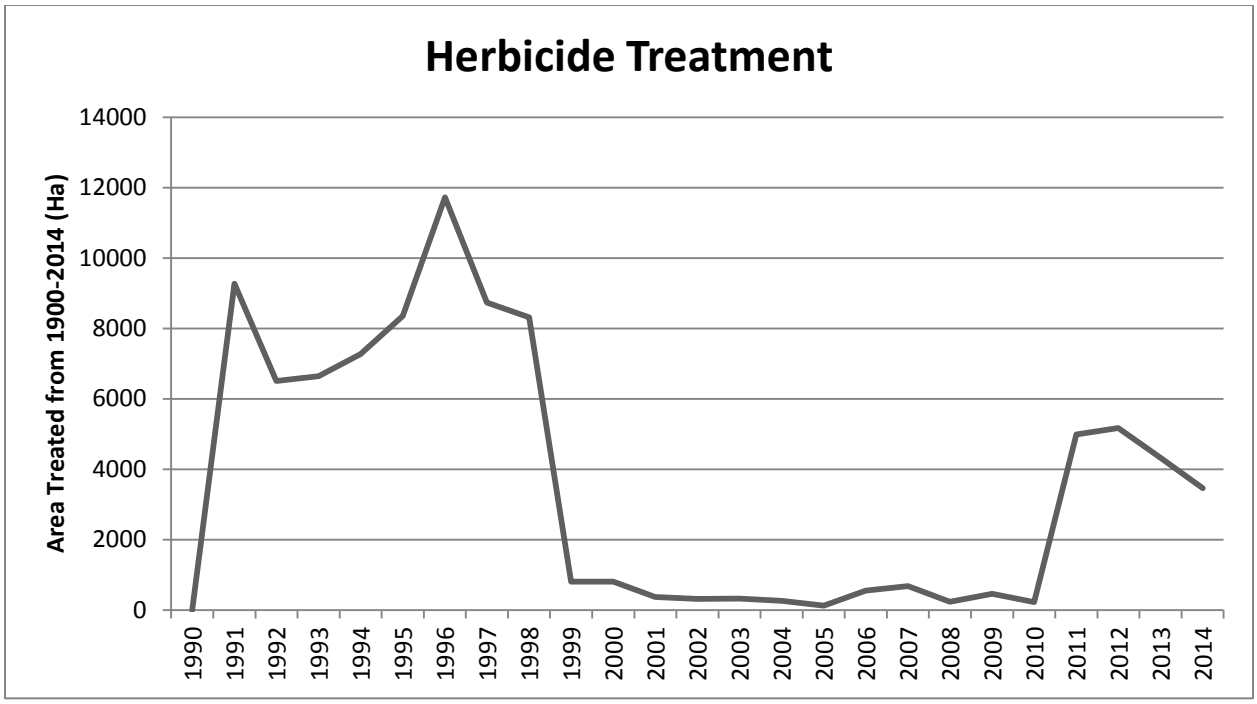

Figure 7. Hectares of Nova Scotia land (private and public [Crown] combined) treated with herbicides from 1990-2014.

When comparing post-harvest treatments for private land in Nova Scotia versus all of Canada, Nova Scotia private lands are also somewhat disproportionate. Nova Scotia private lands account for only 9.1% of total private lands in Canada and site preparation on Nova Scotia private lands averages 7.9% of the total private lands treated with site preparation in Canada. As for stand tending, Nova Scotia averages 22% of the total hectares of private land in Canada (CCFM 2016).

Riparian Management Areas

The *Forests Act*, RSNS 1989, c 179 and accompanying *Forest Wildlife Habitat and Watercourses Protection* regulations (2002) detail depth of buffer zones and permitted activities in or near riparian habitats on all land tenures. Most simply, the Act and regulations stipulate that on any watercourses greater than 0.5 m wide, there must be a 7 m activity-free buffer and a 20 m limited management zone. Since the bulk of private land harvesting is now done by licensed contractors, there are likely few infractions of these regulations, for fear of jeopardizing contracts (P. Neily 2017, pers. comm., 26 January). There are few incidents of significant infractions, and when they occur, they usually expose a loophole in the legislation that is rapidly fixed (K. Easthouse 2017, pers. comm., 8 February). Perhaps one in thirty private landowners (or their contractors) in western NS infringe on riparian zone regulations during harvests (P. Amero 2017, pers. comm., 14 February).

Maximum Patch Cut Areas

No maximum patch cut guidelines or regulations exist for private land. Due to socio-economic pressures, contractors are increasingly mechanically liquidating all merchantable timber (i.e. clearcutting) on participating properties, without any adherence to ecosystem or other natural boundaries, except for riparian buffers (P. Neily 2017, pers. comm., 26 January). In the old *Forest/Wildlife Guidelines and Standards for Nova Scotia* (NSDLF 1987), areas to be clearcut were not to exceed 50 hectares, but these

guidelines have been replaced with the *Forest Wildlife Habitat and Watercourses Protection* regulations (2002) and currently landscape level planning is working towards an ecosystem-based guidance approach to identify appropriate sizes for matrix and patch forests by ecodistrict (P. Neily 2017, pers. comm., 26 January). These *Forest Wildlife Habitat and Watercourses Protection* regulations include detailed requirements for leaving legacy trees and clumps of habitat in clearcuts, although enforcement of these regulations is often lacking (P. Amero 2017, pers. comm., 14 February).

Prince Edward Island

Approximately 87% (217,073 ha) of land on PEI is privately owned, and no industrial private forest land is owned on PEI. Management and harvest rights belong to the property owner, but the provincial government does provide forest stewardship assistance and advice to interested land owners who practice forestry in compliance with standards of the *Ecosystem-Based Forest Management Standards Manual* (CCFM 2017c).

Harvest Rotations

Although landowners are encouraged to manage their woodlots for multiple values, as laid out in the *Ecosystem-Based Forest Management Standards Manual* (PEI DAF 2014), typical management of private forests yields a 40-50 year rotation between harvests (G. Schneider 2017, pers. comm., 16 January). Harvest rotations of 40-50 years are widely known to be the standard for private lands on PEI, and approximately one-sixth of sites are replanted after harvest (K. MacQuarry 2017, pers. comm., 24 January).

Harvest Methods

According to harvesting data for 1990 to 2014 in the National Forestry Database (Canadian Council of Forest Ministers 2016), clearcutting has been consistently the dominant harvesting practice on private lands in Prince Edward Island for the last 26 years (Fig. 8). On private lands in Prince Edward Island, a significantly greater area of land is harvested yearly by clearcutting (mean 2,970 ha) than by selective cutting (mean 244 ha). In 1990, 90% of harvesting on private woodlots was done manually, with power saws, but after several incentive programs were introduced that trend reversed, such that by 2000 mechanical harvesting was responsible for 90% of harvesting on private lands on PEI (G. Schneider 2017, pers. comm., 16 January). Consequently, clearcutting increased as well, because harvesting became easier with mechanized harvesting and was more economically lucrative (G. Schneider 2017, pers. comm., 16 January). There exists a limit in capacity to assist those landowners who want to selectively harvest their woodlots, since contractors are bound by socio-economic pressures to harvest as much and as intensively as possible (K. MacQuarry 2017, pers. comm., 24 January).

According to harvesting data for 1990 to 2014 in the National Forestry Database (CCFM 2016), clearcutting has been consistently the dominant harvesting practice on private lands on PEI for the last 26 years (Fig. 8). On private lands on PEI, a significantly greater area of land is harvested yearly by clearcutting (average 2,970 ha per year) than by selection harvesting (average 244 ha per year). This is also clearly not the case across all of Canada (Fig.2).

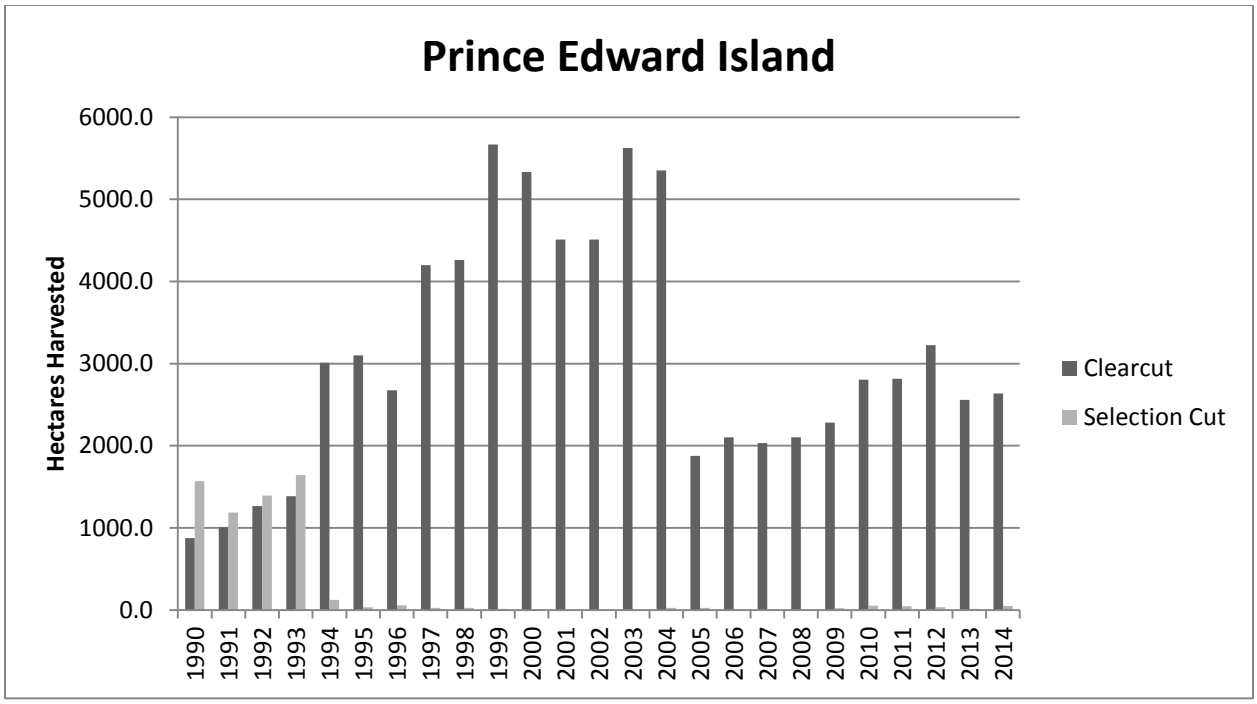

Figure 8. Hectares harvested by clearcutting and selection harvesting on Prince Edward Island from 1990-2014.

Species Harvested & Planted

Much farm land was abandoned on PEI 60-70 years ago (K. MacQuarry 2017, pers. comm., 24 January); therefore, much of what has been harvested on private lands on PEI has been old field white spruce, and some harvesting of plantations that have reached maturity (G. Schneider 2017, pers. comm., 16 January). The 1990s saw the peak of the softwood harvest from private land on PEI, and during the last 10 years the trend has changed to more hardwood harvested than softwood, mostly because low prices for pulp are driving harvests toward fuelwood (K. MacQuarry 2017, pers. comm., 24 January).

On average, 326,593 m^3 of softwood was harvested per year from PEI private lands from 1990 to 2014, which is 1.4% of the average 21,863,791 m^3 of softwood harvested per year from private forest lands across Canada (CCFM 2016). Hardwood harvested from PEI private forest lands represents a slightly larger proportion of the whole: an average of 191,180 m^3 per year, or 2% of the average 10,394,373 m^3 harvested yearly from private lands in all of Canada.

For tree planting, more than 50% of plantations are white spruce, since PEI sites are mostly full sun on sandy soils, and the rest typically a mix of black spruce, larch, and white pine (G. Schneider 2017, pers. comm., 16 January). Since 2008, although establishment plantations continue to be dominated by white spruce and other softwoods, the choice of species for spot or fill planting on forested sites has expanded to include yellow birch, red oak, white ash, and other species (S. MacDonald 2017, pers. comm., 1 February). An average of 693 ha was planted per year on PEI private lands from 1990-2014, which represents 2% of the private land that was planted (32,543 ha) in all of Canada during that time (CCFM

2016). This means that an average of 1,670,922 tree seedlings were planted per year on PEI private lands from 1990-2014.

Post-Harvest Treatments

As in New Brunswick and Nova Scotia, common treatments after harvest on private land are site-preparation (i.e. mechanical or chemical treatments to improve conditions for seed or seedling establishment), and following tree planting or natural regeneration, herbicide applications and stand tending (i.e. thinnings and improvement cuttings). In PEI, insecticide applications were nonexistent on private land from 1990-2014, since aerial spraying is prohibited by the *Pesticides Control Act*, R.S.P.E.I. 1988, Cap. P-4.

Herbicide treatments in PEI on private and public lands from 1990-2014 have been disproportionately higher than the Canadian average, but have showed a clear decline over that time (Fig. 9). PEI represents 0.1% of Canada's total forests (private and public lands combined) and the hectares treated with herbicides in PEI are about double that (on average 0.2% of the total forest lands sprayed in Canada; CCFM 2016). The downward trend for herbicide applications has been directly related to the decreasing number of harvest sites over the same period (K. MacQuarrie 2017, pers. comm., 24 January).

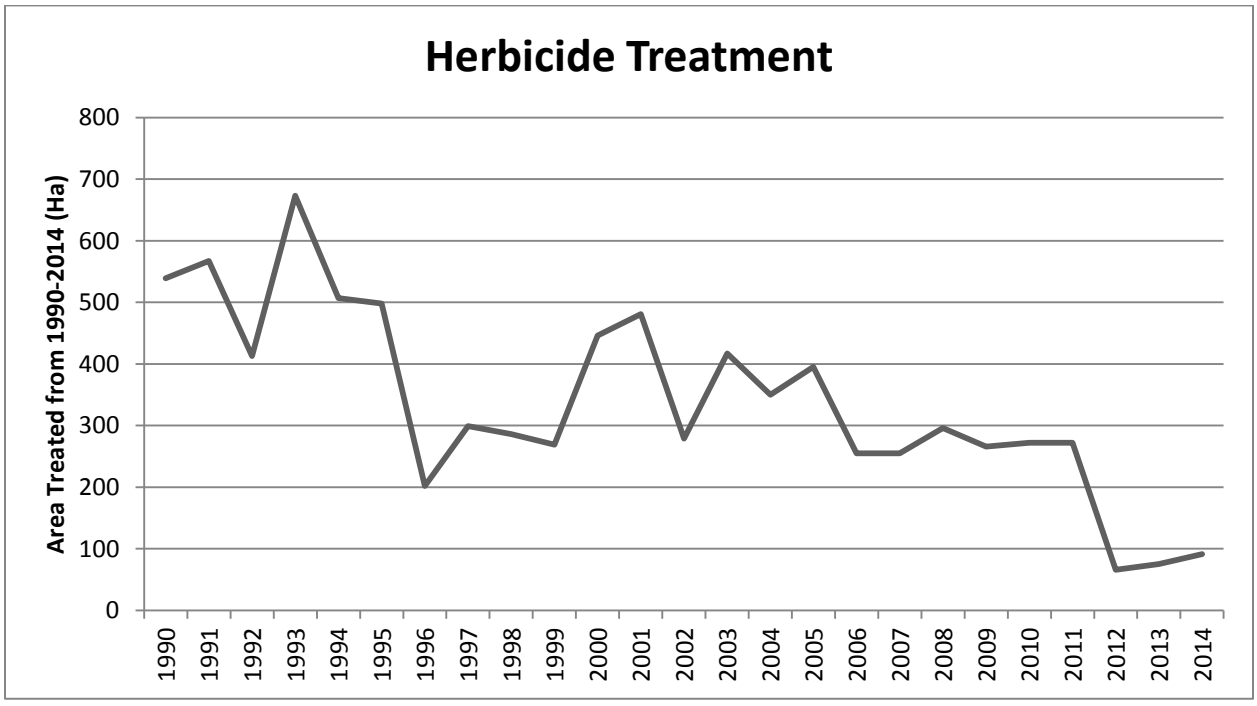

Figure 9. Hectares of PEI land (private and public [Crown] combined) treated with herbicides from 1990-2014.

When comparing post-harvest treatments for private land on PEI versus all of Canada, PEI private lands account for a disproportionate amount of the whole. Despite PEI private lands accounting for only 0.9% of total private lands in Canada, site preparation on PEI private lands averages somewhat more (1.2%) of the total hectares treated with site preparation on private lands in Canada. For stand tending PEI averages 3.4% of the total hectares of private land treated in such way in Canada (CCFM 2016). As most

of the older plantations have been reaching maturity over the last 20 years, and declining wood prices yielding fewer harvests on PEI, more stands are being pre-commercially and commercially thinned (S. MacDonald 2017, pers. comm., 1 February).

Riparian Management Areas

Pursuant to section 25 of the *Environmental Protection Act* R.S.P.E.I. 1988, Cap. E-9, harvesting near watercourses and wetlands is regulated by the Watercourse and Wetland Protection Regulations.

According to the *Ecosystem-Based Forest Management Standards Manual* (PEI DAF 2014),

> "A landowner who wishes to manage the 15m buffer zone adjacent to a watercourse or wetland is required to obtain a [Watercourse or Wetland Activity or a Buffer Zone Activity] permit from the Department of Environment, Labour and Justice. Forested buffer zones cannot be converted to any other land use… If a permit is obtained to work inside the 15m buffer zone, in addition to complying with all permit conditions, all cut trees or tree parts must be removed beyond the flood line of a watercourse or at least 5m from the boundary of a watercourse or wetland. They must be deposited where run-off will not move them into the watercourse."

These guidelines, however, are weakened by there being no fee to apply for a permit, and very few regulation enforcement officers employed on PEI (G. Schneider 2017, pers. comm., 16 January).

Changes to riparian zone permitting were made in May 2016 as PEI Department of Natural Resources revised Departmental policy to deal with requests for tree cutting in a buffer zone - a Buffer Zone Activity Permit is required and applicants will be dealt with in one of two ways (S. MacDonald 2017, pers. comm., 1 February):

> Applicants with a current Forest Management Plan and planning to carry out buffer zone work in accordance with the plan will be eligible for a 5 year Buffer Zone Activity Permit. Applications will be referred to Forestry for recommendations and confirmation of work in accordance with the Forest Management Plan, the fee will be waived, and a PEI Woodlot Owners' Association membership will not be required.
>
> Applicants without a Forest Management Plan will be informed of the benefits of having a Forest Management Plan, if applicable, permits will be issued for 1 year only, and there will be a $50 fee. Where required, applications will be referred to Forestry for recommendations (the proposed work must be necessary and beneficial to the health of the forest in the buffer - other proposed work will be denied).
>
> As agreed, [PEI DNR] will allow a snowmobile to operate in the buffer for extraction (only under ideal conditions - frozen ground and adequate snow cover) and allow a harvester positioned outside the buffer zone to reach into the buffer to harvest selected trees (potentially safer for operators and less disruptive to the forest than winching/cabling trees out).

Maximum Patch Cut Areas

Restrictions on maximum patch cut areas only apply to private landowners on PEI if they wish to access public funds or post-harvest subsidies, in which case the maximum patch cut size is 2 ha (K. MacQuarrie 2017, pers. comm., 24 January).

References

Canadian Council of Forest Ministers. 2016. National Forestry Database. http://nfdp.ccfm.org/index_e.php.

Canadian Council of Forest Ministers. 2017a. Sustainable Forest Management Factsheet for New Brunswick. Retrieved January 18 from http://www.sfmcanada.org/images/Publications/EN/New_Brunswick_info_Provinces_and_territories_EN.pdf

Canadian Council of Forest Ministers. 2017b. Sustainable Forest Management Factsheet for Nova Scotia. Retrieved January 18 from http://www.sfmcanada.org/images/Publications/EN/Nova_Scotia_info_Provinces_and_territories_EN.pdf

Canadian Council of Forest Ministers. 2017c. Sustainable Forest Management Factsheet for Prince Edward Island. Retrieved January 18 from http://www.sfmcanada.org/images/Publications/EN/PEI_info_Provinces_and_territories_EN.pdf

Clean Water Act, SNB 1989, c C-6.1, http://canlii.ca/t/51vhg, retrieved January 16, 2017.

Davis, M., L. Gratton, J. Adams, J. Goltz, C. Stewart, S. Buttrick, N. Zinger, K. Kavanagh, M. Sims, and G. Mann. 2001. New England-Acadian Forests. World Wildlife Fund. Retrieved February 3, 2017, from http://www.worldwildlife.org/ecoregions/na0410

Endangered Species Act, SNS 1998, c 11, http://canlii.ca/t/lc22, retrieved on February 15, 2017.

Environmental Protection Act, RSPEI 1988, c E-9, http://canlii.ca/t/52k24, retrieved January 27, 2017.

Forest Products Act, RSNB 1973, c F-21, http://canlii.ca/t/52001, retrieved January 20, 2017.

Forests Act, RSNS 1989, c 179, http://canlii.ca/t/lc25, retrieved February 3, 2017.

Loo, J., and N. Ives. 2003. The Acadian forest: Historical condition and human impacts. Forestry Chronicle. 79(3): 462 – 473.

Loucks, O.L. 1962. A forest classification for the Maritime Provinces. Canada, Department of Forestry, Forest Research Branch.

Mosseler, A., J. A. Lynds, and J. E. Major. 2003. Old-growth forests of the Acadian Forest Region. Environ. Rev. 11: S47 – S77.

Nadeau, S., Beckley, T., McKendy, M., and Keess, H. 2011. A Snapshot of New Brunswick Non-Industrial Forest Owners in 2011: Attitudes, Behaviour, Stewardship, and Future Prospects. New Brunswick Department of Natural Resources. ISBN 978-1-55471-964-8.

Natural Products Act, SNB 1999, c N-1.2, http://canlii.ca/t/527bp, retrieved January 16, 2017.

Nova Scotia Department of Lands and Forests. 1987. Forest/Wildlife Guidelines and Standards for Nova Scotia. http://novascotia.ca/natr/wildlife/habitats/terrestrial/pdf/NS-Forest_Wildlife_Guidelines_and_Standards.pdf

Nova Scotia Department of Natural Resources. 2008. State of the Forest report 1995-2005: Nova Scotia Forests in Transition. https://www.novascotia.ca/natr/forestry/reports/State-Of-Forest-Report-April-2008.pdf.

Pesticides Control Act, R.S.P.E.I. 1988, Cap. P-4, http://www.canlii.org/en/pe/laws/regu/pei-reg-ec761-05/63068/pei-reg-ec761-05.pdf, retrieved February 1, 2017.

Prince Edward Island Department of Agriculture and Forestry. June 2014. Ecosystem-Based Forest Management Standards Manual. https://www.princeedwardisland.ca/sites/default/files/publications/technical_version_forest_management_manual.pdf

Rowe, J.S. 1972. Forest regions of Canada. Department of the Environment, Canadian Forest Service. Catalog no. 24040.

Wildlife Habitat and Watercourses Protection Regulations, NS Reg 138/2001, http://canlii.ca/t/jnq5, retrieved February 3, 2017.