Mr. David Patriquin
Conservation Committee of the Halifax Field Naturalists

Dear Mr. Patriquin:

I am responding to the questions you submitted concerning the impact of forestry on conservation of biodiversity. The detailed questions took some time to address and the responses are attached.

Thank you for your interest in the management of our natural resources.

Sincerely,

Margaret Miller
Minister of Natural Resources

Attachment

NSDNR Responses to Questions

from the

Halifax Field Naturalist Submission of April 19, 2017

Question 1:   Does NSDNR have good figures for forest cover over time in Nova Scotia that can be shared with us? Has there been significant loss in total forest cover over the last 50 years? Is deforestation an issue?

The data shows that the area of forest cover has actually increased over the past 100 years, including over the past 50 years. The Fernow (1912) forest inventory report was the first comprehensive inventory of land and forest for Nova Scotia (although it only recorded forest, non-forest and agriculture). In 1958 the Department completed its first full inventory of the province. Department inventories since the 1960's are available on-line. Area estimations have improved over time due to aerial and satellite imagery, and computer geographic information systems technology.

	Fernow 1912 (hectares)	NSDLF 1958 (hectares)	State of the Forest 2016
Forests	2 667 730	3 907 278	4 185 812
Non Forests	1 211 703*	420 139	456 254
Agriculture	919 151	588 412	274 683
Water & Wetlands		485 834	393 812
Urban			155 175
Road and Rail			59 278
Excluded Area		149 668**	
Total		5 551 331	5 525 014

*   Fernow included old burns, barrens and recent burns in this category.

**   Excluded area was Cape Breton H.N.P. and all the area north of the park.

Figures for the area of deforestation – the conversion of forest land to non-forest uses such as agriculture, utilities/transportation corridors and development, in Nova Scotia, has not been calculated.

The table above shows some deforested lands of the past are returning to forested conditions due primarily to agricultural land abandonment and fire suppression.

There is no evidence that deforestation is an issue as a consequence of forest management. Some of the most recent deforestation has occurred in the Cape Breton Highlands ecoregion primarily affecting the National Park and the Pollets Cove Wilderness Area. This resulted from the continuing hyper abundance of moose following the spruce budworm outbreak, which has converted most of the upland balsam fir ecosystems to grasslands. NSDNR has been supporting Parks Canada in restoration initiatives as they seek to address associated biodiversity concerns. Fortunately, this same level of deforestation has not occurred in the region south of the park which is under forest management. It appears that harvesting, silviculture, and reforestation activities along with the logging road networks and associated hunter access has allowed these ecosystems to remain forested, thus maintaining habitat for endangered lynx, marten, and Bicknell's thrush among many other species dependent on these ecosystems. This highlights the potential of integrated planning to direct a variety of land management approaches to achieve balance and optimize the roles that each can play.

Question 2:   Wouldn't it be appropriate to separate out Selection Cuts from Partial Cuts or make the same distinctions as the NFD (Clearcuts 1 and 2 Stage, Total Clearcuts, Selection Cuts), or distinguish between even-aged management and uneven-aged in reporting progress towards reducing clearcutting?

No, it would not be appropriate for the following reasons. There is one set of harvest data for Nova Scotia, produced by NSDNR and submitted to the National Forest Database. NSDNR reports data by actual harvest practices, categorizing the treatments as clearcut or partial harvest based on established definitions (Table 1).

The National Forest Database system categorizes the harvest treatments by the 'intent' of harvesting, whether it is expected to lead to even-aged or uneven-aged management. The difference is in the classification of the first stage of a shelterwood harvest. NSDNR considers it to be a partial harvest because that is what the actual treatment is based on the established definitions, with a large portion of the mature trees left standing to provide shade for the next crop of regeneration. Under the National Forest Database system it is classified as a "shelterwood", and considered a clearcut treatment as the intent is to carry out a final harvest to remove the overstorey."

NSDNR believes that harvests should be characterized as clearcut or partial based on the actual harvest treatment and not the future intent. We categorize the first stage of a shelterwood harvest as a partial harvest and, when the final harvest is carried out it will be categorized as a clearcut harvest. Plans for a multi-stage harvest can, and often do, change in between harvests as forest managers review their plans and the overstorey removal stage may not occur. There is often little difference in the appearance of a shelterwood, commercial thin, and selection harvest – they may all produce a regeneration and overstorey growth response from the intial entry. The difference will occur with the follow-up treatments. None of these initial entries will produce the "regenerating young forest habitat" that a clearcut creates. When accounting and auditing, one is interesting in quantifying what actually exists. Projections of future conditions is a planning exercise.

Question 3:   Does NSDNR consider that Crown lands have come under increasing cutting pressure since 2000, or is there an alternative interpretation of these numbers?

The area of Crown land is not directly comparable for the time periods. The trends are primarily the result of the purchase by the province of industrial (private) lands, particularly the Bowater Mersey lands, thereby increasing the area of Crown lands. The table below shows data, both volume and area harvested for Crown, Industrial (private) and the combined data which shows that both the total volume harvested and area harvested has actually decreased for the combination of Crown and Industrial private over the period.

Annual harvests	2000	2010	2015
Crown m3	587,185	777,814	870,944
Industrial m3	2,169,788	670,439	467,860
Crown plus industrial m3	2,756,973	1,448,253	1,338,804
Crown ha	6,820	7,817	11,342
Industrial ha	18,842	9,292	3,881
Crown plus industrial ha	25,662	17,109	15,223

Question 4. Where do landscape connectivity analysis and fragmentation analysis enter planning procedures?

NSDNR is currently undertaking a pilot project on landscape planning that will include multiple ecosystem measures that examine ecosystem condition and productivity, patch composition and configuration, featured species habitat supply, and forest connectivity. Landscape plans will strive for a distribution of stand conditions; spatial pattern, size, type, composition and age, that is representative of the range of local natural variability. Landscape planning will generate tactical level maps of forest planning operations at the 20-year time scale.

NSDNR conducted Ecological Landscape Analysis following the Procedural Guide for Ecological Landscape Analysis. This includes processes to classify the landscape ecosystem structure (ecosections and elements) as "patch, matrix, or corridor" and assess ecological connectivity functions in relation to this structural character. The ELA's provide a consistent base of information to support landscape level planning for multiple values including ecosystem functions like connectivity. The 38 ELA reports are currently in draft with publication expected in 2017.
http://www.novascotia.ca/natr/library/forestry/reports/Procedural%20Guide%20For%20Ecological%20Landscape%20Analysis.pdf.

NSDNR Forestry Division is the province's lead agency in New England Governors/Eastern Canadian Premiers (NEG-ECP) Ecological Connectivity Working Group. The department is working with scientists from the other jurisdictions as well as stakeholders within the province to meet the terms of the resolution and report on connectivity recommendations in 2020.
(http://www.coneg.org/Data/Sites/1/media/40-3-ecological-connectivity-en.pdf).

Question 5.   Does NSDNR have any related specific plans, maps etc. that show the layout of the landscape/forest types/cutting regimes/corridors that is considered sufficient to conserve forest biodiversity over the longer term?

NSDNR has completed Ecological Landscape Analysis (ELAs) for 38 ecodistricts across the province, and plans to release them in 2017. The Ecological Land Classification for Nova Scotia maps and describes the Province's terrestrial ecosystem structure at multiple scales based on enduring physical features. This forms a foundation for ecosystem based planning and biodiversity conservation, particularly at landscape scales. A new edition of this classification will be published in 2017.

NSDNR recently released the Biodiversity Stewardship Guide to help landowners recognize and conserve important biodiversity features during forest operations scale planning.
https://novascotia.ca/natr/library/forestry/reports/Biodiversity-Stewardship-Guide.pdf

The Integrated Resource Management system uses detailed GIS mapping of site features and land use classifications to assist in forest management and land-use planning and review on Crown land.

Strategic Forest Analysis is used to plan and predict forest composition over a 100 year time horizon. It incorporates many habitat related landbase classification layers to support a range of forest sustainability values.

Question 6.   Can any of those documents be shared with the public?

There are plans to release the ELA documents in 2017. The general procedures for how these analyses were completed can be found at:
http://www.novascotia.ca/natr/library/forestry/reports/Procedural%20Guide%20For%20Ecological%20Landscape%20Analysis.pdf.

The other documents are already public in published form, or through the open data portal (https://data.novascotia.ca/). There are some exceptions, such as the Significant Habitats Database which is kept confidential to protect important sites from exploitation.

Question 7.   How do considerations of connectivity and fragmentation enter into the current process for approving forest harvests?

The Code of Forest Practice Principles and Guidelines provide direction for managing ecosystems at landscape and stand scales, as well as guidelines for wildlife habitat management at coarse and fine scales. The guidelines are supported through a variety of technical references, guidebooks, procedures and research projects. Many of these have been released and are in use, while others are still under development. Some of the key attributes that influence connectivity include the continuity and composition of mature forest, the overall intensity of land use, and the density of transportation networks. Although less well understood, the natural arrangement and structure of ecosystems has a fundamental influence on connectivity and fragmentation. Linear ecosystems like rivers and associated riparian systems provide the natural corridors, as do ridgelines and eskers. Patch ecosystems support a

"stepping stone" type of connectivity with very different attributes and vulnerabilities, while matrix ecosystems support "percolation" and are most vulnerable to fragmentation. Much of this data (including Development Classes, Ecological Emphasis Classes, Road Index, Seral Stage, and Ecosystem structure) is reported in the Ecological Landscape Analysis and is currently available through the Provincial Landscape Viewer: https://novascotia.ca/natr/landscape/

Some of this information is used during IRM decision making at the operational plan level, and is reflected in policies like the Forest Wildlife Guidelines and Standards. Some aspects are incorporated as values and landbase themes in longterm strategic level forest analysis. However, connectivity and fragmentation will become most relevant during landscape level planning. Currently, a landscape level planning pilot project is underway which is expected to lead to planning procedures available for broad implementation in 2018.

Question 8:   Does NSDNR have supporting scientific evidence or its own observations to support the contention that at 60% minimally stocked and above, a site "does not act like a clear-cut"? Can we see the evidence?

The 60% threshold was drawn from Percolation Theory, which provides a mathematically based method for quantifying connectivity. Generally, the theory indicates that connectivity begins to erode at the 60% level and hits a critical threshold of fragmentation at 40%.
The clearcut definition, and its 60% threshold, is not intended to define appropriate harvest techniques - it provides a quantifiable means to identify clearcuts in a consistent way in order to measure and audit harvest activity. It is in no way a recommendation for harvest prescriptions. Prescriptions are made through the Province's Forest Management Guides, which are designed to achieve specific desirable results. In practice, most "clearcut" type prescriptions retain well below the definition threshold, while the various partial harvest prescriptions are usually well above. This contrasts, for example, with Maine's clearcut regulation, which typically results in harvest prescriptions based on the regulatory standard with little consideration for silvicultural objectives.

Question 9:   Can NSDNR justify the claim that: "all harvest treatments *are* aligned with the naturebased requirements of Nova Scotia's lands" or should that be stated as a goal?

The statement in the update is that "We have now developed tools that ensure that all harvest treatments are aligned with the nature-based requirements of Nova Scotia's lands." Those tools have been developed and have been implemented on Crown lands and recommended for use on private lands. All harvests on Crown land are aligned with nature-based requirements of Nova Scotia's lands through the requirement that Pre-Treatment Assessments (PTA) and Nova Scotia's Forest Management Guides (FMG) be used when prescribing harvest treatments. This also includes use of the Forest Ecosystem Classification guides to determine the Vegetation Types, Soil Types, and Ecosites to describe the natural ecosystem conditions and make management recommendations. The Forest Management Guides are designed to favor partial harvesting methods wherever the Vegetation Type, Soil Type, and stand conditions indicate probable success.

Question 10:   Has the proportion of landscape that NSDNR would assess as subject to infrequent and/or gap disturbance regimes using the same criteria as applied by Neily et al., 2008 [21] declined since the assessments for that report were conducted (or conversely, has the proportion subject to frequent disturbance regimes increased)?

No additional analysis has been done since the 2008 report was published, thus there has been no change.

During the preparation of the Ecological Landscape Analyses no changes were proposed pertaining to NDR descriptions at the ecosection level. The development of the ecosite layer for the Nova Scotia Ecological Land Classification (ELC) is nearing completion and when completed will enable an analysis of NDR using the same criteria at a finer scale of mapping. However, the ELC is based on enduring physical features and does not take into account current forest characteristics. Use of the PTA and FMG takes both factors into consideration. Harvest prescriptions are based on assessment of existing conditions at the site level, and do not use the Natural Disturbance Regime information from the Ecological Land Classification – that is used more for landscape level planning, prediction, and assessment of forest composition. Areas that have been mapped as infrequent/gap may not support partial harvesting today due to current forest characteristics but, by following the recommended ecosystem-based management approach, these areas will be able to support partial harvesting in the future. A common example of this are the stands of "old field white spruce forest". Many of these short-lived, even-aged, conifer stands have naturally succeeded following farmland abandonment on formerly "tolerant hardwood hill" ecosystems.

Question 11:   How are the percentages in these decision diamonds identified? Can NSDNR explain the 60% criterion as an example?

The 60% threshold and other criteria in the FMG's are based on the scientific literature and NSDNR's trials. Forestry Division's research and planning section has conducted many research trials over the past 30 years to explore many aspects of forest management and silviculture across a wide range of Nova Scotia ecosystems. Data from these efforts is stored in a database system accessible to the current science staff for analysis at any time. The results of many of these trials are published in the Forest Research Report series (https://novascotia.ca/natr/library/publications/forestry-research.asp), as well as in scientific journals. This research forms the backbone of the various management guides, manuals, and decision support tools the province produces. DNR also consults scientific literature, subject experts, and participates in collaborative teams. The FMG's are based on the best knowledge obtained from these sources.

However, we work in an adaptive environment that seeks new knowledge and is open to change and continual improvement. As an example, the 60% threshold referred to above has recently been changed to 50%. The Pre-treatment Assessment – Forest Management Guide decision system includes a "variance" procedure in which suggestions for novel approaches are identified and put forward for further research. NSDNR has a responsibility to provide sound advice to recommend activities that have a high likelihood of success. The FMG thresholds are set to identify situations where the prescribed treatment would be successful based on existing stand characteristics.

Question 12:   How is NSDNR adopting research suggesting some partial and selection cuts be conducted within systems dominated by frequent disturbance regimes; is any consideration being given to such strategies?

NSDNR carries out research on partial and selection cuts. These trials, up to now have concentrated on infrequent and gap disturbance forest types as these would most closely match the natural disturbance and successional process supporting those communities. Trials are currently in place to test partial and selection cuts in frequent disturbance forest types as well as restoration techniques in intolerant hardwood stands. Harvest prescriptions are based on assessment of existing conditions at the site level, and do not use the Natural Disturbance Regime information from the Ecological Land Classification – that is used more for landscape level planning, prediction, and assessment of forest composition.

Question 13: What was (is) NSDNR's response to the critiques of the 2007 Natural Disturbance document?

The 2007 document was a draft prepared for review and feedback with the intent to aid DNR as it incorporated an ecosystem-based approach for forest resource management. Feedback from various sectors identified a need for further research. DNR agreed to publish the 2008 document showing how Natural Disturbance Regimes were assigned to the ecosection level of the ELC. Presently DNR is funding disturbance research with Dr. Ponomarenko of the University of Ottawa, continuing along with the earlier work she had done with Kejimkujik National Park.

Question 14: Can NSDNR put the question of whether or not NSDNR's estimate that Frequent Disturbance regimes are dominant on 43% of the land base is highly inflated to rest, e.g., by having it impartially and professionally reviewed by recognized experts in the U.S. and Canada?

The 2008 report documents how NDR was applied to the ELC to provide an estimate of the area influenced by the NDR categories and this document is available for all to review (data layers used in the analysis are available (https://novascotia.ca/natr/landscape/). The terms "frequent" and "infrequent" are defined using longevity of the potential climax species – this allows separation of short lived species from species of greater longevity. During the review of the 2007 draft it was realized by most participants that Nova Scotia had a unique climatic situation compared to the rest of the Acadian Forest (Northern Appalachian Forest) and that made-in-Nova Scotia research would be more appropriate. While some critics expressed a general sentiment that 43% is too high there have been no spatially explicit suggestions submitted to DNR, and it should be noted that 23% of the frequently disturbed ecosystems occur in the maritime boreal ecoregions of the Highlands and Atlantic Coast.

The Nova Scotia ELC defines and maps ecosystems based on enduring physical features to assist in determining the natural ecological structure of the province (as opposed to the "current" condition). The assignment of interpretations like NDR and Climax Forest to the ecosystem mapping provides a coarse scale tool for understanding aspects of natural forest composition and landscape dynamics, which are fundamental for landscape level planning and biodiversity conservation. Unfortunately, there is a common misconception that frequent disturbance is a prescription for clearcutting. NSDNR forest ecosystem scientists have developed a progressive planning tool based on the best available information. It is built on an adaptive management platform that is responsive to new information, which the science team continues to research.

There are no plans for an external review of the 2008 report as other newer management tools are used instead.

Question 15: Does NSDNR accept the concept that clear-cutting has effectively "borealized" [29] a lot of what was once multi-aged Acadian forest, and that this reduces adaptation to climatic warming?

No. The native biodiversity of Nova Scotia's forest has adapted to a range of disturbance regimes that have created forest patches of various sizes and configurations. An ecosystem approach that strives to provide suitable habitat conditions for all native species is preferred. The more that managed forests resemble the forests that developed under natural disturbances such as wind, fire, diseases and insect epidemics, the greater the probability that biodiversity and ecological processes will be maintained.

NSDNR does not complete forest management for just one disturbance regime across the province. Review of inventory reports spanning the past century do not indicate a borealization of the region (https://novascotia.ca/natr/library/publications/forestry-inventory.asp#inventory). In fact, there has been a substantial increase in forest overall, primarily as a result of farm abandonment and fire suppression, and the proportions of softwood and hardwood have remained relatively stable, as has the composition of the major species. The diversity of species and genes in our forests, stands, ecosystems, and landscapes is very broad such that most of the capacity to adapt to future climate change already exists within our forests. Regarding the concept of borealization, the boreal forest is more dependent on climate than it is on disturbance, thus it appears that the distribution of our boreal communities may decline in the future and present associated conservation challenges.

Forest harvesting is the first stage in regeneration. NSDNR has conducted decades of research to understand the relationship between harvesting, regeneration, early stand development, tending, and growth & yield. Much of this is published in forest research reports (https://novascotia.ca/natr/library/publications/forestry-research.asp), and reflected in management guides. This includes an extensive regeneration survey of 5 year old clearcuts, which indicated that almost all forest stands, with the exception of pasture spruce, regenerate rapidly with high density, stocking, and tree species diversity. (https://novascotia.ca/natr/library/forestry/reports/REPORT66.PDF)

Question 16:   How is NSDNR incorporating needs to *adapt* to climate change in the forestry sector into its overall planning?

One of the ways NSDNR incorporates the need to adapt to climate change is in the design and selection of a large protected areas network. Climate change adaption values were considered, along with other ecological and social values, in the recent (2014, 2015, 2016) and upcoming protected areas expansions.

The tree improvement program that provides the seed for reforestation began 30 years ago with the selection of plus trees from across the Maritimes. In addition to growth and form traits, one of the primary objectives was to develop broad genetic diversity. These populations have been extensively tested across a broad range of climatic zones exceeding the predicted range of climate change in this

area. The data bases from these testing programs will provide a basis for assessing climatic adaptability both in these populations as well as the natural forest ecosytems from which they were collected. NSDNR has participated in a number of climate change modelling projects and will continue to raise capacity in this area. Forest Research Report 2003-4 "A discussion paper on climate change and forestry in Nova Scotia: Ecological Implications and Management Options" can be found on our publications page: https://novascotia.ca/natr/library/forestry/reports/REPORT71.PDF

Question 17: **Has NSDNR conducted forest carbon budget modeling, e.g. using the fed's** *Carbon Budget Model* **[32] or as applied to Protected Areas [32b] to examine the implications of various harvesting scenarios for GHG emissions/sequestration? (Or are there federal data for NS?) Can you share some of the results with us**?

NSDNR works with the CFS carbon accounting team to carryout carbon budget model (CBM) runs for NS. NSDNR provides inventory and harvest information and the actual running of the CBM model is done by CFS staff. The most recent work was completed by CFS staff in 2015 and these results are included in section 8.2 of the recently published 'State of the Forest' report (https://novascotia.ca/natr/forestry/reports/State_of_the_Forest_2016.pdf) .

Question 18: **Does NSDNR have any strategies/plans for increasing carbon sequestration by our working forests, e.g. to offset GHG emissions from coal powered electricity generation?**

Currently, carbon sequestration specific strategies are not directly incorporated into strategic forest planning. Adaptive management may lead to incorporating specific objectives in future modeling. NS strategic forest planning does incorporate ecosystem objectives on the working forest. Modeling of ecosystem objectives maintain natural ranges of species mixes and age class structures that provide diversity and resilience as a form of risk mitigation for climate change.

 Question 19: **Has NSDNR conducted calculations of GHG emissions from forest bioenergy and anticipated biofuel plants for different mixtures of waste wood and primary forest biomass? Can some of the results be shared with us?**

NSDNR did not model plant specific GHG emissions. NSDNR and NSE have worked with CFS carbon accounting team to extend carbon budget model (CBM) runs to a larger lifecycle analysis (LCA). The LCA looked at atmosphere carbon emissions under various primary forest product life cycle scenarios (lumber/pulp and paper/biomass). This was a CFS led project and we do not believe it has been published to date.

Question 20: **Why has NSDNR not taken a much more precautionary approach to clear-cutting in SW Nova Scotia, given the evidence from aquatic sciences and NSDNR's own work that SW Nova Scotia is particularly vulnerable, and that clear-cutting may increase losses associated with acid rain by as much as 50%.**

Since trees contain nutrients, it is recognized that periodically harvesting them by clearcut or selection will remove nutrients, which has potential to increase nutrient deficiencies on some sites over time. NSDNR is working to integrate nutrient management into regular forest management planning so that this potential can be assessed and avoided through good planning. This is being accomplished (in part) through use of an ecologically based nutrient budget model (NBM-NS) and collection of more current soil, tree, and atmospheric chemistry data to increase confidence in model outputs. Use of this model will aid decision-making with respect to harvest levels in SW Nova Scotia and across the province.

NSDNR is also working with Dr. Paul Arp at UNB to synthesize, publish, and integrate results from the Pockwock Watershed (NS) and Hayward Brook (NB) research projects related to forest management and water quality.

NSDNR is using the latest inventory technologies, including Lidar, to produce better soils mapping and other decision support tools as part of continual improvement.

Regarding precautionary approaches, NSDNR employs a wide range of policy, analysis, research, regulation, planning, inventory, guidelines, manuals, training, and audit systems to ensure resource and environmental sustainability.

Question 21:   When will nutrient budgeting be incorporated into the PTAs?
We have still not seen in NSDNR literature on its website, or even in the Keys et al. 2016 paper, comments or highlighting of the links between acidification of forest soils and the health of aquatic systems, and effects of calcium deficiencies on the forest biodiversity (trees and associated species) at large. There is still no mention of the Keys et al. 2016 paper on the NSDNR website.

Since the nutrient budget model (NBM-NS) can be applied at different scales (each with its own set of limitations and assumptions), we are currently evaluating how best to integrate the model into forest management planning and are looking at both stand and landscape level approaches. Part of this involves assessing whether sustainable Mean Annual Increment (SusMAI) estimates are best generated at an ecosite level to be used as a reference value for PTAs, or whether these should be generated within the PTA program itself (or a combination of both). We are conducting a pilot study on this using western region PTAs from 2016.

We are currently working on a new section of the DNR website to highlight Technical Reports.

Question 22:   What is NSDNR doing to promote understanding within the forest community more broadly about the adverse effects of acid rain/clear-cutting on aquatic systems, forest health and biodiversity? Has the WestFor group been well advised about these issues?

NSDNR was a lead partner in the Pockwock – Bowater Watershed Research Project. Other partners included the Halifax Water Commission, Environment Canada, Nova Scotia Environment, University of New Brunswick, Bowater Mersey Paper, and Canadian Forest Service. Under this program 8 watersheds in the Saint Margaret's Bay ecodistrict were selected for comparative study to quantify the effects of forest harvesting on water quality and quantity with the specific goal of calibrating the UNB ForHym model to support broad scale predictions across a range of soil and ecosystem conditions. It is important to recognize that forest harvesting can have both positive and negative effects. The goal of management

is to understand the relationships and optimize the positive through good planning. Halifax Water Commission was a lead partner in this research project since they manage their watershed forests by periodic harvesting in order to maintain young, healthy forests that provide optimum water quality. The clearcut method has been preferred since they have experienced blowdown problems with both partial harvests and overmature stands.

NSDNR is a supporting partner in the recently announced research project: "forWater:NSERC Network for Forested Drinking Water Source Protection Technologies". This is a five-year initiative with partners from Nova Scotia, British Columbia, Alberta, and Ontario. Results will provide important knowledge of forest – water interactions, and will help Nova Scotia build on the Pockwock Bowater Watershed project research results.

The Nutrient Budget Model and Soil Disturbance research will provide future guidelines to help minimize the impacts of acid rain and harvesting on site productivity.

WestFor and all forest licensees are continuously kept informed of all management directives.