



STATE of the FOREST REPORT

for the

Western Newfoundland Model Forest

June 2000

STATE OF THE FOREST REPORT, JUNE 2000



Natural Resources
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Introduction

In its proposal to establish a “Phase II” of the Western Newfoundland Model Forest, in January 1997, the Model Forest made a commitment to identify, measure and report on locally relevant indicators of sustainable forest management. This commitment was consistent with a key strategic direction of the Canadian Model Forest Programme, and reflected the growing interest in using criteria and indicators to assess progress with respect to sustainable forest management.

The Western Newfoundland Model Forest has taken a number of significant steps towards fulfilling the commitments it made in 1997. Some of the highlights include the following:

Fall, 1997: A series of workshops were held, bringing together over thirty people from diverse interests to identify key values, goals and indicators for each of the six criteria originally established by the Canadian Council of Forest Ministers.


January 1998: A “Discussion Draft” was released, summarizing the results from these workshops, and was widely distributed for review.

May 1998: A workshop was held towards the ultimate goal of developing a set of clearly focussed objectives to support each of the values identified in the “Discussion Draft.”

April 1999: The material contained in the “Discussion Draft,” after much discussion and a radical transformation, became the “indicators” section of the new publication *Criteria and Indicators of Sustainable Forest Management: A Practical Guide to Using Local Level Indicators in Newfoundland and Labrador*.

August 1999: A “Data Gathering Strategy” was developed and approved, outlining the key indicators that the Western Newfoundland Model Forest planned to report on for its first “State of the Forest Report.”

This State of the Forest Report, therefore, represents a new stage in an ongoing process that has involved considerable effort from diverse people over a period of more than two years. Nevertheless, it should not be viewed as a finished document, and for this reason it is called a “Rolling Draft.” There are still several gaps that have been identified, which will shortly be filled. More than this, however, it is important to think of reporting on indicators as an iterative process, subject to constant refinement.



Although indicators are intended to answer questions about forestry and forest management, the reality is that more often they at the same time raise new questions, calling for additional indicators. We fully anticipate that this will be the result of the distribution of this first State of the Forest Report. It is our hope that comments on shortcomings, gaps or omissions will be received by the Model Forest, to inform our work in revising and refining the report that you are currently holding.



Criterion One: Biodiversity

Conservation of Biological Diversity

Definition: *The variability among living organisms from all sources and the ecological complexes of which they are part, including:*

- *ecosystem diversity*
- *species diversity*
- *genetic diversity*

Biodiversity refers to the variety of organisms that are found within our forest. In recent years forest ecologists have become increasingly aware that different species do not exist on their own, but rather are part of a holistic web of interconnections. Biodiversity, therefore, is the basic foundation for all life, including human life. The elements of biodiversity - individual plants, animals, species and ecosystems - have been likened to the rivets on an airplane wing. You might be able to lose a few rivets and the plane may still fly, but if enough rivets are lost then the plane and everyone in it will crash.

Values associated with this criterion:

- ◆ Representative landscapes
- ◆ Special places, including
 - ▶ rare plant sites
 - ▶ important nesting or staging areas
 - ▶ areas of particularly high wildlife concentration
 - ▶ pristine areas
- ◆ Wildlife habitat
- ◆ Native and wild species

Indicators:

- 1.1 Area of each forest type, by age class
- 1.2 Protected areas
- 1.3 Forest fragmentation
- 1.4 population levels of caribou
- 1.5 Distribution of Newfoundland marten

Indicator 1.1: Area of each forest type by age class

Lead: Len Moores

Source: NFS forest inventory, GMNP data

Scale: Across the entire WNMF area

Measurement Interval: Five years

Data reliability: Generally good, although there are some gaps (that will show up as “unknown”).

Interpretation: This indicator will show if logging activities or large-scale natural disturbance events are resulting in an increasing percentage of forests in younger age classes, thus lessening the ecosystem (or habitat) diversity of the forest.

Comments: Good opportunities for forecasting. Some efforts will be needed to come up with a simplified set of categories to be used for this indicator. It will be possible to group together many of the codes used in the NFS Inventory, and some simplification of the forest type codes will be needed if we hope to effectively communicate the overall picture to a typical reader of the First C&I Report. In grouping and simplifying these codes, care will be needed to ensure that there is consistency between the definitions used in the NFS inventory and the GMNP inventory, and to ensure that critical detail is not missing.

Indicator 1.2: Protected Areas

Measures:

- Proportion of each ecosystem sub-region that is in a protected status
- Proportion of each sub-region that is barren, bog, forest and water
- Proportion of each protected area that is barren, bog, forest and water

Lead: Len Moores

Source: NFS forest inventory, GMNP data

Scale: This indicator will be applied to the full area of all ecosystem sub-regions found within the WNMF boundaries.

Measurement interval: Information for this indicator should be updated each time a protected area is established or removed from protected status.

Data reliability: excellent

Interpretation: This indicator will show the extent to which it has been possible to address the goal of establishing a representative network of protected areas. It will show not only the area of protected lands relative to the entire area, but will also show if the protected areas are generally representative of the landscape types present in that eco-region.

Comments: The definition of "protected area" used in the WNMF's C&I work is "Any area with legislated restrictions to limit human impact, including prohibitions on logging, hydroelectric developments and mineral and hydrocarbon exploration and development." It does not include riparian buffers (which are regulated, not legislated) or special management zones where logging or mineral activities are restricted, but not prohibited. Included as "protected" in WNMF area: GMNP (except see below), provincial parks (Blow-Me-Down, Richard Squires, Barachois), any Wilderness or Ecological Reserves (including provisional reserves; currently none exist). Not included: domestic cutting blocks within GMNP, any de-gazetted provincial parks (Blue Ponds, Stag Lake). May or may not be included, depending on the specific regulations: Wildlife Reserves (although the proposed Wildlife Reserve in the Little Grand Lake area would not be included, based on the activities that are likely to be permitted). It will be possible to provide this data for 1992 (the first year of the WNMF) and the present.

Indicator 1.3: Forest Fragmentation

Description: Forest fragmentation refers to the extent to which a continuous block of forest has been divided into disconnected units as a result of human or natural disturbances. Fragmentation is a natural and important part of the forest landscape, providing habitat for certain species as well as openings for new forest growth. However, excessive fragmentation can limit the range of interior forest-dwelling species, especially those that are particularly sensitive to human intervention.

There are a number of possible ways to measure forest fragmentation. In the map below we show the density of forest access roads, with the shaded areas indicating land that is within one kilometer of a road. This is in many respects a simple and fairly crude method of measuring forest fragmentation, but an overview of the forest road network is significant for a number of reasons. Roads are just one form of forest fragmentation, but there are some negative aspects about roads that are not shared by other forms of forest fragmentation. For some animals, roads may present obstacles that limit or discourage dispersal and/or genetic mixing. Perhaps most importantly, however, roads provide access for humans and a wide range of activities (logging, hunting, fishing, cabin developments, etc) that have the potential to alter the structure, dynamics and overall integrity of forest ecosystem components. This is the main reason why, for instance, wilderness areas and protected areas have few or no roads in them, in order to help preserve their ecological integrity.

[MAP GOES HERE]

Findings: The relatively high density of roads in this area is a measure of the importance of this region as a source of timber for the paper mills in Corner Brook and Stephenville. Significant “unroaded” areas include the two major protected areas, Gros Morne National Park and the Little Grand Lake Provisional Reserve, as well as the barren regions of the North Arm Mountains, the Blomidon Plateau and the Lewis Hills.

In this map we’ve shown the roads with a 1 km buffer zone. In actual practise, more sophisticated measures are called for, using “Zones of Influence” that are designed specifically for the particular species on interest. One approach that has been used for moose in boreal forests, for instance, is to consider the moose’s habitat suitability to be reduced by 75% within 500 m of roads, and by 50% within 1 km. Different species will call for different Zones of Influence.

Additional Information: Useful information not included in this report would measure the percentage of the map area that is shaded, as well as trends over time.

Source: Department of Forest Resources and Agrifoods, forest inventory data

Acknowledgements: Len Moores, DFRA, and George VanDusen, Corner Brook Pulp

and Paper

Written by Martin von Mirbach, Centre for Forest and Environmental Studies, for
the Western Newfoundland Model Forest, February 2000.

Indicator 1.4: Population levels of caribou

Description: The typical range of the woodland caribou (*Rangifer tarandus caribou*) includes both open barrens and climax boreal forest stands. Worldwide trends since the late 1800s have seen declines in the numbers and distribution of woodland caribou, as well as reductions in the extent of climax coniferous forest, leading to a hypothesis that declines in caribou populations are caused in part by a decline in the availability of suitable habitat. However, caribou populations on the Island of Newfoundland have in general not shown the same long-term decline, and are a bit of an anomaly as a result. Part of the explanation may be due to the absence of wolves on the Island since the extinction of the Newfoundland wolf, in the 1930s, since studies show that calf mortality rates are considerably lower in several Island caribou populations than in other areas subject to wolf predation. Nevertheless, availability of suitable habitat is also considered to be an important factor affecting the population levels of caribou in western Newfoundland.


The habitat needs of caribou tend to shift with the seasons. During spring, caribou feed on greening leaves and flower buds on exposed sites that become free of snow. During fall and early winter they feed on various ground lichens, shifting to arboreal (tree) lichens in late winter when the snow cover deepens. In general, winter survival is seen as the “weak link” in the longevity of caribou populations, so greater emphasis is placed on the management of winter habitat.

There are two populations of caribou that spend more or less their entire lives within the area of the Western Newfoundland Model Forest and have received some attention in recent years. The Corner Brook Lake herd was studied in 1994-95 in an area between Grand Lake and the TransCanada Highway. The Gros Morne herd is based in Gros Morne National Park, and was surveyed in 1995 and 1997. Below is a summary of the estimated population levels for these two herds.

Herd	Year	Number of animals observed	Estimated % of calves	Estimated population
Corner Brook Lake	1994	158	10	345 ± 250
	1995	236	11	440 ± 300
Gros Morne	1995	1889	20	2007-2024
	1997	2512	17	2763-2877

Fig. 1.4.1: Caribou population estimates

Note 1: The estimates for the Corner Brook Lake study show a “plus or minus” range, while the Gros Morne Park study gives two different estimates, based on different assumptions about how to



estimate the numbers of uncounted animals.

Findings: Both studies show a significant increase in populations, although there is not enough time between the census points to draw any long-term trends. There are several points that emerged from the studies that help to expand our understanding of caribou in western Newfoundland.

Gros Morne Park herd: The Gros Morne Park herd showed a consistent trend of high calf production, which can be seen in the relatively high figure of calves as a percentage of the total herd. The chief cause of caribou calf mortality in Gros Morne Park was predation by black bears, although the trends are low enough that calf mortality is not sufficient to depress or stabilize the population.

Corner Brook Lake herd: This study paid particular attention to the habitats selected by the radio-collared animals, and produced the following findings:

- Both males and females selected both barrens and overmature timber (greater than 80 years old)
- Males seemed to spend time in 61-80 year old timber, but not females
- Both males and females avoided timber in the 21-60 year old range.
- Calving location was identified for five females; all calved in mature timber.

Source: Dean Snow and Shane Mahoney, "Habitat Use and Population Ecology of the Corner Brook Lake Caribou Herd," March 1995; and "Demographics of Caribou in Gros Morne National Park, 1995-1997."

Acknowledgements: Stephen Flemming, Gros Morne National Park.

Compiled and written by Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Indicator 1.5: Distribution of Newfoundland marten

Description: The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is a national committee that meets each year to evaluate the status of native wildlife populations in Canada that may be at risk. After reviewing the best and latest scientific information, it assigns one of the following categories to a particular species or population:

- Extinct: a species that no longer exists anywhere
- Extirpated: a species no longer existing in the wild in Canada but occurring elsewhere
- Endangered: a species facing imminent extinction or extirpation
- Threatened: a species likely to become endangered in Canada if limiting factors are not reversed
- Special Concern (formerly "Vulnerable"): a species of special concern because of characteristics that make it particularly sensitive to human activities or natural events
- Indeterminate: A species for which there is insufficient scientific information to support status designation
- Not at Risk: A species that has been evaluated and found to be not at risk.

The two categories for which immediate endangerment is a concern are "Endangered" and "Threatened." There are currently nine Endangered species and three Threatened species with a range that includes Newfoundland and/or Labrador, but only one of these, the American marten, relies on habitat found within the Western Newfoundland Model Forest. The marten - commonly called the Newfoundland pine marten - was first listed as threatened in 1986, and then ten years later it was uplisted to endangered. It favours older mature forests for its habitat. Declining pine marten populations in Newfoundland were first noted in the 1930s, when all commercial trapping was halted. Since then, marten populations have not recovered. Their continued decline is attributed to a number of factors including habitat loss, accidental snaring and trapping, disease and possibly lack of prey.

Because of the provincial significance of the Newfoundland pine marten, we show the distribution of pine marten across the entire Island. The four maps depict the approximate distribution of pine marten at four different historical periods.

- Map 1: This map shows the distribution of productive forest lands on the Island. It is assumed that at the time of European colonization (ca. 1500) pine marten were found more or less throughout the productive forest.
- Map 2: This map shows the estimated distribution during the decade 1950-60.
- Map 3: This map is based on information prepared in 1979, showing the approximate distribution of pine marten in the 1970s.
- Map 4: This map shows the distribution range in 1997, with areas of higher density shaded more darkly. This information is based upon

extensive field research carried out over several years.

[INSERT MAPS]

Findings: Except for the latest map, these maps should be viewed as approximations only. In particular, different methods were used in each case to assess the distribution of pine marten. Nevertheless, biologists responsible for managing endangered species in the province believe that the maps are useful in that they do accurately portray a general trend of a decline in marten distribution.

Further information: The website for COSEWIC is <http://www.cosewic.gc.ca>.

Source: Department of Forest Resources and Agrifoods, Ecosystem Health, Inland Fish and Wildlife.

Acknowledgment: Joe Brazil, Endangered Species Biologist, DFRA.

Compiled and written by Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Criterion Two: Healthy Forests

Maintenance and Enhancement of Forest Ecosystem Condition and Productivity

Definition: The health, vitality and rates of biological production in forest ecosystems, including:

- *Incidence of disturbance and stress (biotic and abiotic)*
- *Ecosystem resilience*
- *Extant biomass (biota)*

This criterion deals with maintaining the health, vitality and productivity of the forest and all its components. A healthy forest is not a static, unchanging forest - in fact, natural disturbances are a vital part of forest ecosystems, so that while insects, fires and storms may damage or kill some trees, that doesn't necessarily mean that they are harming the forest as a whole. We do know that a healthy forest is a productive forest, with constant new growth of trees, other plants and animals. A healthy forest is also resilient, meaning that it can deal with change and disturbance without losing its fundamental productivity. Human activities, if not carefully managed, can add to the stresses that a normal forest ecosystem experiences, to the point that productivity and resilience starts to decline.

Values associated with this criterion:

- Natural processes
 - succession trends
 - population fluxes
 - natural disturbances (insects, disease, fires, etc)
 - nutrient cycling
 - resiliency
- Natural productive capacity
 - trees and plants
 - animals
- Long-term ecosystem health

Indicators:

2.1 Area of insect, fire and logging disturbance

2.2 Species interrelationships

Case Study: A national program to monitor forest health



Indicator 2.1: Area of Insect, Fire and Logging Disturbance

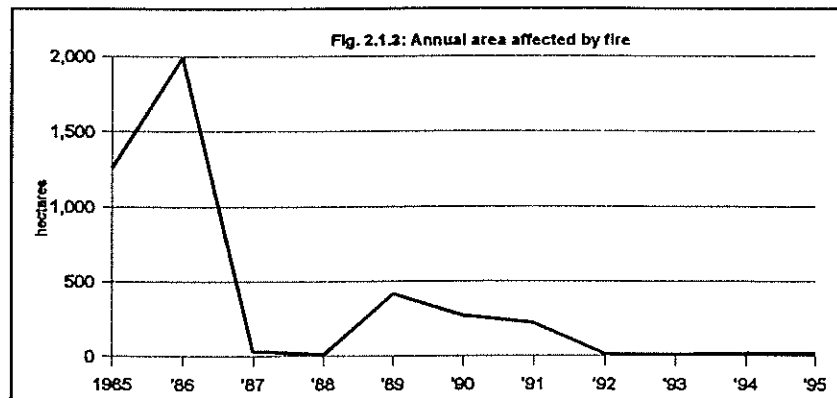
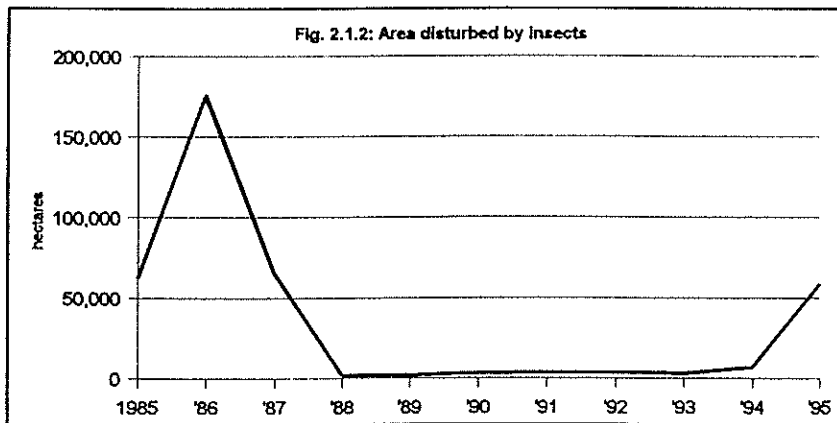
Description: This indicator shows some of the stresses that the forest is under. The disturbances included in the table below involve either the removal of trees (logging, fire) or the death or weakening of trees that remain on-site (fire, insects).


Some stresses - such as fire and insects - are a natural part of the forest ecosystem, and indeed in a “wild” forest these disturbances are necessary in order to promote and allow for new forest growth. Nevertheless, it would not be accurate to say that all fires or insect attacks are “natural,” because there are many complex links with human activities that both lessen and increase the impacts of fire and insects. Firefighting efforts limit the extent and intensity of many fires; but on the other hand most fires are caused by human carelessness, and there is also scientific evidence to suggest that human-caused climate change may be adding to the extent of fire impacts on a national or global scale. Likewise, insect outbreaks are often fought when they occur, but these outbreaks can be influenced by human activities such as the introduction of exotic species or forest management activities that result in large stands of vulnerable species.

The chart (Table 2.1.1) includes combined figures for Forest Management Districts 14, 15 and 16, which encompasses an area considerably larger than the Western Newfoundland Model Forest. It does not, however, include the areas affected by insect, fire or logging that are within the boundaries of Gros Morne National Park. The figures that follow show the same information in graph form, making it easier to see trends over time. As a point of reference, the combined total forested area in these three districts is about 1.26 million hectares.

Table 2.1.1: Area disturbed (in hectares), by cause, Districts 14, 15 and 16

Year	Insect	Fire	Logging	Total
1985	62,087	1,255	3,957	68,019
1986	176,498	1,992	4,187	182,347
1987	65,208	36	4,362	69,606
1988	2,182	9	4,451	6,642
1989	1,823	419	4,035	6,277
1990	3,080	273	4,160	7,513
1991	3,570	222	4,491	8,283
1992	3,896	17	5,067	8,980
1993	2,935	11	4,563	7,509
1994	6,803	19	5,335	12,157
1995	58,891	22	5,235	64,148
Total	387,693	3,945	49,843	441,481





Findings: There are several significant points that can be seen from this information.

- The total area affected by insects is almost 100 times as great as the area affected by fire. It is one of the key characteristics of the western Newfoundland boreal forest ecosystem that forest regeneration is driven by insects rather than fire.
- Insect attacks come in periodic waves that last for several years and then decline to relatively low levels. 1986 was a “peak” year, and 1995 saw the beginning of another outbreak (Fig. 2.1.2).
- Fire also fluctuates in extent from year to year, but the fluctuations tend to be more irregular (Fig. 2.1.3). Bad fire years depend mostly on the weather conditions from early Spring through to late summer, and unlike insect outbreaks are not influenced by the extent of disturbance in the previous summer.
- The area logged annually has risen slowly but steadily over the ten year period shown in the table above, increasing by about a third over the ten year period (Fig. 2.1.4).

Interpretation: For the reasons discussed above, it hard to determine on the basis of these figures whether the extent of fire and insect disturbances are higher or lower than “natural.” In general, the figures are within a broad range of what forest ecologists might consider “normal” for this ecosystem. If there is any anomaly, it might be that the nine-year interval between insect outbreaks is rather short. Insect outbreaks are also of particular concern to the forest industry, since they can have a number of serious economic impacts, but an economic impact (such as the loss of a valuable thinned stand) isn’t necessarily a negative impact on overall forest health.

Source: Newfoundland Forest Service data.

Acknowledgement: Len Moores, DFRA

Prepared by Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

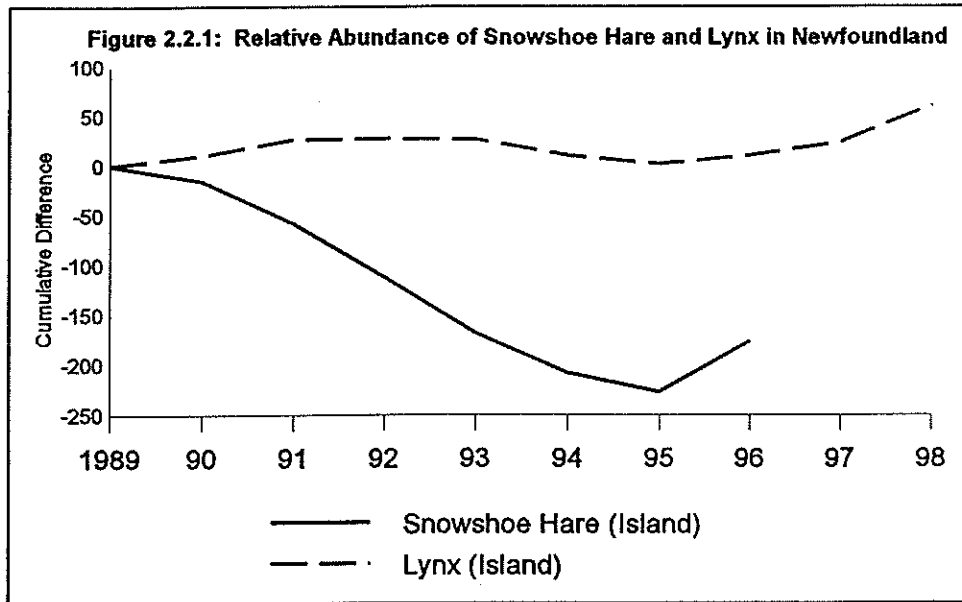
Indicator 2.2: Species interrelationships

Description: Forests are dynamic ecosystems, which means that the population levels of many animal species fluctuate over time. This is a natural and important aspect of population dynamics and ecosystem health, but it makes it difficult to tell right away if our activities in the forest are having a negative impact. It can often be difficult to say for certain whether a particular fluctuation in population levels is part of a natural cycle, or if it is caused or exacerbated by human activities.

One way to try and get a better understanding of ecosystem relations is to compare the population trends in two related animal species. In this indicator we track trends in the apparent abundance of two species that are closely interrelated; snowshoe hare (*Lepus americanus*) and lynx (*Felis lynx*). Although the snowshoe hare is not native to the Island of Newfoundland but was introduced in the late 19th century, it has nevertheless become a significant part of the forest ecosystem. In particular, it is a prey species for a number of carnivorous mammals, especially the lynx. Snowshoe hare populations in almost all regions of the world go through periodic cycles, for complex reasons that are not always fully understood. In general, we would expect to see that in the years following high hare populations there would be an increase in lynx populations, since the abundance of food would improve the survival rates of adult and juvenile lynx, and could also increase the fecundity of the females (with more females in good enough physical condition to bear a litter of kittens. Likewise, a downturn in hare populations would put pressure on the lynx. If the hare and lynx population trends are not in synch - if, for instance, lynx levels stay low while hares show a steady increase - then we might look for human-caused factors to explain this anomaly, such as over-trapping or perhaps disruptions to habitat (since lynx are generally more sensitive than hares to human developments).

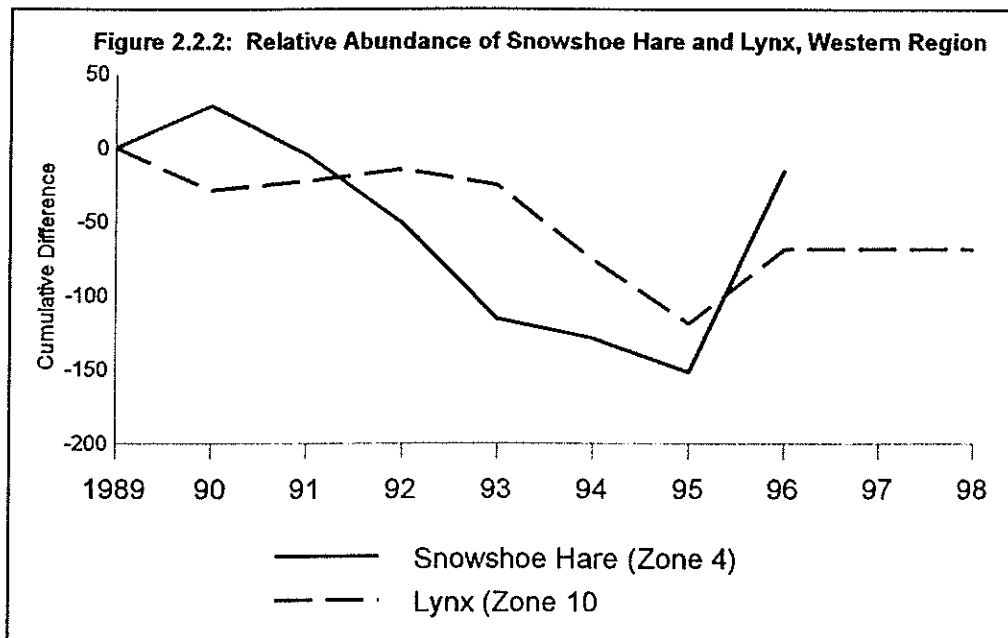
Findings: Figure 2.2.1 shows the cumulative difference in the abundance of snowshoe hare and lynx on the Island, from 1990 to 1998. Figure 2.2.2 shows the same information, but specific to western Newfoundland. (Snowshoe Hare region 4 and Fur Management Region 10 are not identical, but they both cover roughly the same area, and include most of the area of the Western Newfoundland Model Forest.)

It is important to note that “cumulative difference” is not a precise population figure, since it is based not on a census but on what is reported by trappers on the information they return each year to the Wildlife Division. They are asked to report on whether they noticed more, fewer, or about the same numbers of animals as the previous year. If more people report fewer animals, then this is reported as a negative “annual difference.” The annual difference is added to the previous year’s cumulative difference to obtain a new cumulative difference. This is done to help smooth out any arbitrary annual fluctuations, and to show a general trend. What this means, however, is that the cumulative difference may be a negative number even



though the number of animals is on the upswing. What's important is not the number, but the direction the trend is moving. For this reason the figures are put in a graph, making it easy to see trends over time.

Interpretation: Snowshoe hare populations were in a steady decline throughout the early 1990s, but then bottomed out in 1995 and started moving back upwards. We can see that the upswing in snowshoe hare abundance in 1995-96 has been closely followed by an upturn in lynx abundance, which is what we would expect to see. The results for the western region are generally consistent with the results for the entire Island, although the small sampling size makes for more erratic year-by-year fluctuations. In general, the above data represents what might be considered “natural” fluctuations in lynx and snowshoe hare abundance, and also helps to illustrate the important interrelationships between these two animals.



Case Study: Forest Health

A National Program to Monitor Forest Health

Canada has long recognized the need for local, provincial and national reporting on forest sustainability, forest health and forestry practises in general. This is done at the national level through the development of the National Forest Inventory, which each province and territory contributes information to. There are a number of shortcomings with the existing inventory, particularly when it comes to monitoring and reporting on the diverse range of forest values that are understood to be part of Sustainable Forest Management. The coverage is incomplete in some areas, the precision of the information is unknown or inconsistent, and there is inadequate information about non-timber vegetation characteristics.

There is a growing interest in developing a new National Forest Inventory that would be capable of reporting on a broader range of indicators, as outlined in national and international frameworks of criteria and indicators. One proposal is to establish a grid of sample plots covering the entire country. This would allow for the monitoring of forest health in a systematic and consistent fashion in the full range of forest types, including: areas subject to intensive forest management; wilderness, parks and protected areas; "scrub" or non-commercial forest; and plantations.

Twenty-five indicators from national and international frameworks have been proposed as having the potential to be monitored in this fashion (see sidebar). The plots to be measured would be placed in a grid across the entire forested area. By measuring forest health in these plots it will be possible to extrapolate results across the landscape. The plots would not be marked out on the ground, or treated in any way special. They would be subject to all of the normal factors and disturbances affecting forest health, including

Key National Forest Inventory Attributes

- total forest area
- area by forest type
- cover by age class
- forest type by protection status
- other wooded land by protection status and type
- area and percentage of forest land managed primarily for protective functions
- regeneration and afforestation areas by type
- area of surface water in forests
- forests undisturbed by man
- other wooded lands undisturbed by man
- number of forest dependent species
- number of native and exotic species in the forest
- origin of seedlings in regenerating areas
- area available for timber production
- area converted to non-forest use
- area and severity of insect attack
- area and severity of disease infestation
- area and severity of fire damage
- area of forest disturbance
- area and percentage of forest land with significant soil erosion
- total biomass by forest type, age and succession stage
- total volume of all species on timber production land
- area/volume of plantations
- current volume growth

forest succession, fire, insect attack, logging and conversion to non-forest use (deforestation). Information would be gathered by various remote sensing tools (aerial photographs, satellite imagery), with "ground truthing" carried out on enough plots to ascertain the accuracy of the remote sensing interpretation.

The Newfoundland and Labrador Department of Forest Resources and Agrifoods has established a study area in western Newfoundland to determine the feasibility of such an inventory project. One intent of the study is to ensure that any such inventory produces results that are sufficiently accurate to provide meaningful results at the scale of a typical forest management district (several hundred thousand hectares) as well as the provincial and national scales. Four different sampling methods were evaluated in a recently completed study, using different grid intensities and plot sizes. The report recommends the use of a 10 km grid with 1 km plots. This would result in sampling 1% of the total forest area, which would, in the opinion of the authors, meet national requirements as well as providing additional benefits to the provincial inventory program.

Work is proceeding in order to get a better idea of what such an inventory would cost and exactly what information could be obtained from such a sample method. For the new National Forest Inventory to be successful there must be a strong commitment from all provincial and territorial governments, as well as the federal government.

Source: Bryan Oake and Darrell Harris, "Piloting the New National Forest Inventory, in western Newfoundland," 1999

Written by Martin von Mirbach, Centre for Forest and Environmental Studies, for the western Newfoundland Model Forest, February 2000.

Three: Soil and Water

Conservation of Soil and Water Resources

Definition: *The maintenance of soil and water quantity and quality, including:*

- *Physical environmental factors*
- *Policy and forest protection factors*


Soil and water are essential to life. Together they provide the basis from which things grow and develop. The quantity and quality of water and soil particularly affect forests. Maintaining a consistent quantity and quality of these two elements is a sign of sustainable forest management and is necessary if the forest is to continue to provide for current and future generations. Forest practises, including logging and the construction of access roads, may impact on the quantity and quality of soil and water in a number of ways.

Values associated with this criterion:

- Water
 - quantity
 - quality
 - aquatic flora and fauna
- Soil
 - stability
 - nutrients and microorganisms
- Good forest policy and enforcement

Indicators:

- 3.1 Ground disturbance as a result of logging operations
- 3.2 Water quality
- 3.3 Drinking water quality
- 3.4 Forest policy



Indicator 3.1 Ground disturbance as a result of logging operations

Description: Logging activity can have a number of negative impacts on the soil, especially if it is carried out carelessly or with the inappropriate logging method for a particular site, season or weather condition. Heavy equipment can cause soil compaction, which can increase water runoff and the loss of nutrients from decomposing slash, and can make it difficult for new trees to get properly established. There are several practical ways to mitigate these impacts, such as using machines with a lighter “footprint” as well as refined techniques that protect the soil layer from direct contact with heavy equipment. There is always some soil displacement required in the construction of roads and landings, but proper care can be taken to minimize these impacts.

In 1990 the Newfoundland Forest Service began an extensive survey of different logging methods in use across the province, gathering information on utilization rates as well as the degree of soil compaction, bulldozing and excessive slash. Over 2,500 ground plot surveys were carried out over a five-year period. In 1999 the Department decided to repeat the survey in order to assess any changes due to changing trends in logging methods, improved techniques and the like. Preliminary results from the first summer survey season (714 plots) are also included below. All results are based on province-wide results: each “cell” in the table below is based on data from at least 37 sample plots, and frequently much more. The percentage figure indicates the percentage of the area of each plot (exclusive of roads or landings) affected by the disturbance. Averages are weighted averages, with large sample sizes carrying more weight. “Excessive slash” is included as a category because it can interfere with the regeneration of new seedlings.

Table 3.1.1: Ground disturbance, in percent, by logging method and season

Logging Method ¹	Summer logging operations								Winter logging operations			
	Undisturbed		Compaction		Bulldozing		Excessive Slash		Undisturbed	Compaction	Bulldozing	Slash
	95 ²	99 ³	95	99	95	99	95	99	95	95	95	95
SW1	94.8	59.2	4.1	10.3	0.2	0.8	0.9	29.7	100.0	0	0	0
SW2	78.0	78.6	7.6	5.7	8.2	0	6.2	16.4	n/a	n/a	n/a	n/a
SW3	97.8	67.8	2.2	8.4	0	0.4	0	24.4	97.8	0.4	0	1.8
SW4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	87.2	5.1	0.1	7.6
TL1	89.7	n/a	7.0	n/a	2.8	n/a	0.5	n/a	97.8	0.7	0.3	1.2
TL3	92.9	n/a	5.6	n/a	0	n/a	1.5	n/a	90.3	3.0	1.0	5.7
FT1	90.8	n/a	8.6	n/a	0.4	n/a	0.2	n/a	92.1	3.1	3.3	1.6
FT3	97.6	n/a	2.4	n/a	0	n/a	0	n/a	n/a	n/a	n/a	n/a
FT6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	99.0	1.0	0	0
Dom	n/a	79.9	n/a	0.1	n/a	0	n/a	19.9	n/a	n/a	n/a	n/a
Avg.	92.4	66.4	5.8	7.9	1.0	0.5	0.8	25.2	95.1	1.7	0.7	2.5

Notes

- Codes used for logging methods are as follows:
 - SW1 Shortwood length; manual cutting, forwarder to roadside
 - SW2 Shortwood length; manual cutting, skidder to roadside
 - SW3 Shortwood length; cutting by shortwood harvester, forwarder to roadside
 - SW4 Shortwood length; cutting by feller buncher, forwarder to roadside
 - TL1 Tree length; manual cutting, skidder to roadside
 - TL3 Tree length; cutting by mechanical harvester with forwarder and delimeter debarker chipper
 - FT1 Full tree; using feller buncher, skidder, delimeter and slasher
 - FT3 Full tree; manual cutting, skidder to roadside, delimeter and slasher
 - FT6 Full tree; manual cutting, skidder to roadside, shortwood processing
 - Dom Domestic cutting
- "95" refers to the findings that were compiled over five years, from 1990-95, and published in 1996.
- "99" refers to the preliminary results from partial surveys carried out in the summer of 1999.

Findings: In terms of soil disturbance, the most important figures in the above table are those that relate to the extent of compaction and bulldozing. The figures show that there are significant differences in the amount of ground disturbance as a result of various logging methods. Several of the methods that were employed during the 1990-95 survey - the tree length and full-tree methods - are no longer in extensive use today, in part because of concerns about ground disturbance. In general, winter operations result in less ground disturbance on average, due to the protection afforded by the snow layer.

The greatest anomaly between the 1990-95 and the 1999 surveys is in the rate of excessive slash, which rises dramatically in the 1999 survey. The difference is so great (with the average rising from less than 1% to over 25%) that it likely results from differences in the methodologies of the two surveys. Regeneration surveys to be carried out in future years will be able to compensate for any inconsistencies in survey methodologies, since if excessive slash is a genuine problem it will show up as reduced regeneration.

It's important to note that the 1999 survey results are not complete, and data collection is still underway. These preliminary results are provided for information purposes only, and should not be used to make any definitive interpretations.

Source: Eric Young and Paul Hynes, "Evaluation of Logging Systems in Newfoundland: Ramifications To The Timber Supply Analysis," April 1996; and Dan Myles and Sally Kitchen, "Provincial Timber Utilization Survey Results," January 2000.

~~Acknowledgement: Eric Young, Department of Forest Resources and Agrifoods-~~
Written by Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

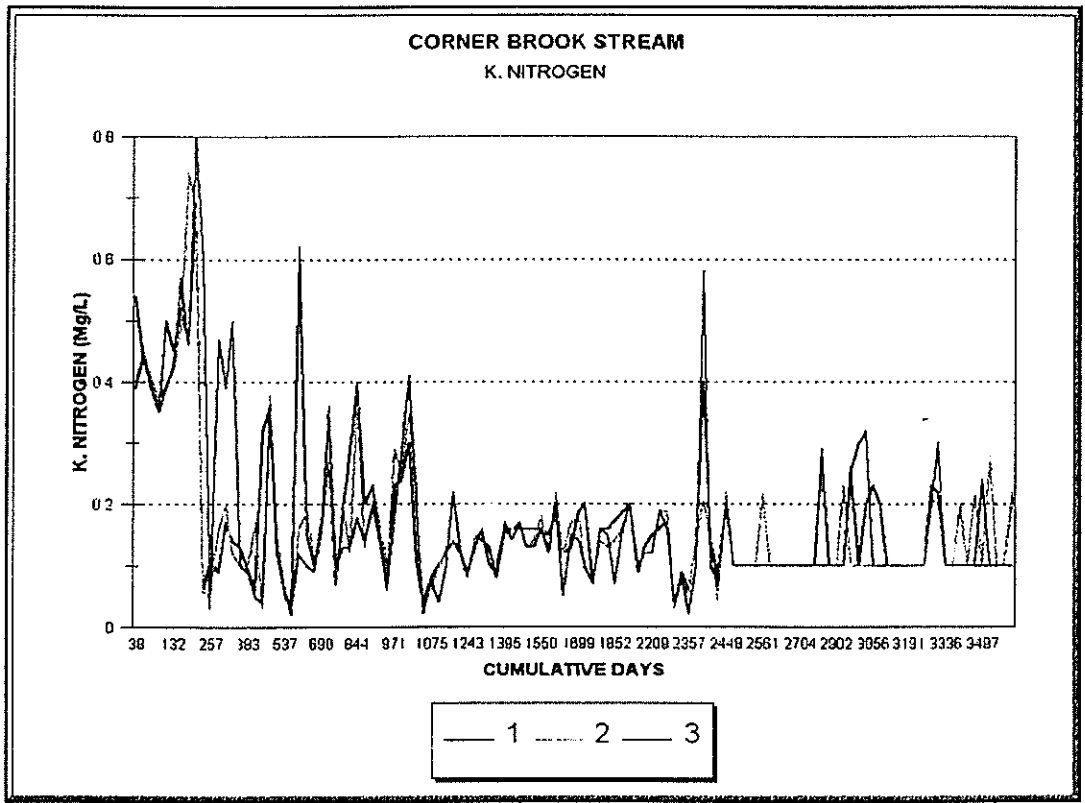
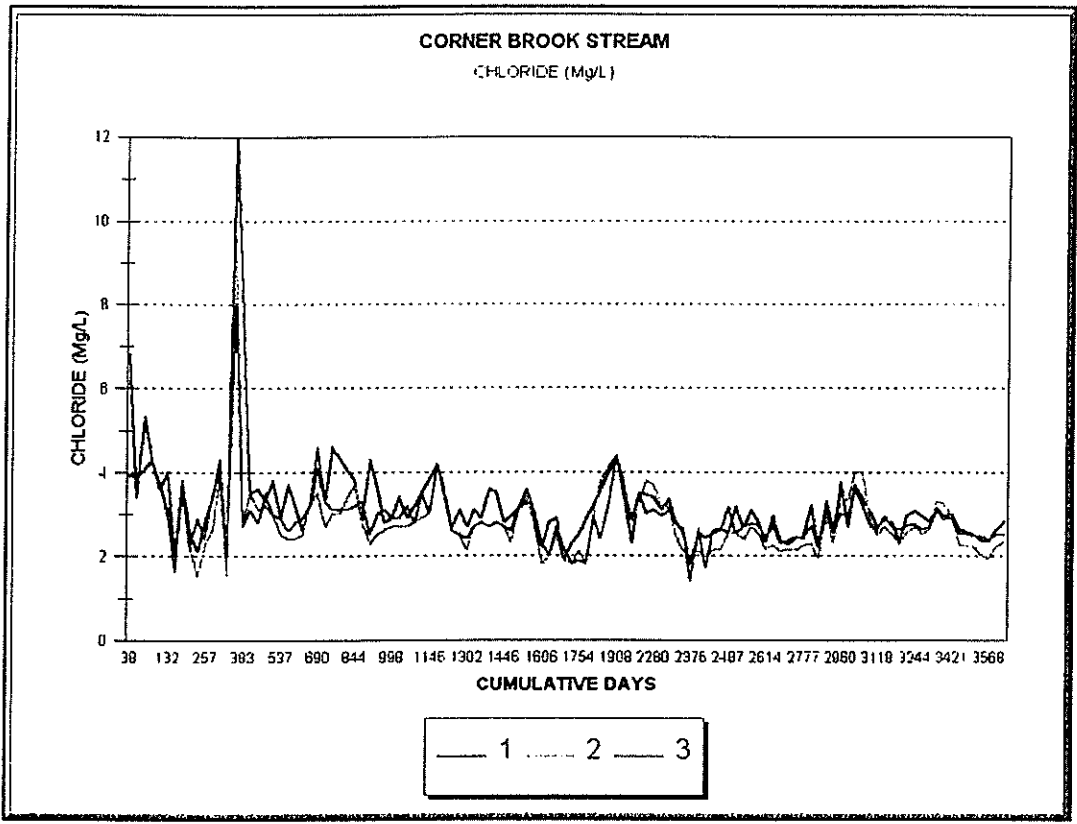
Indicator 3.2 Water Quality

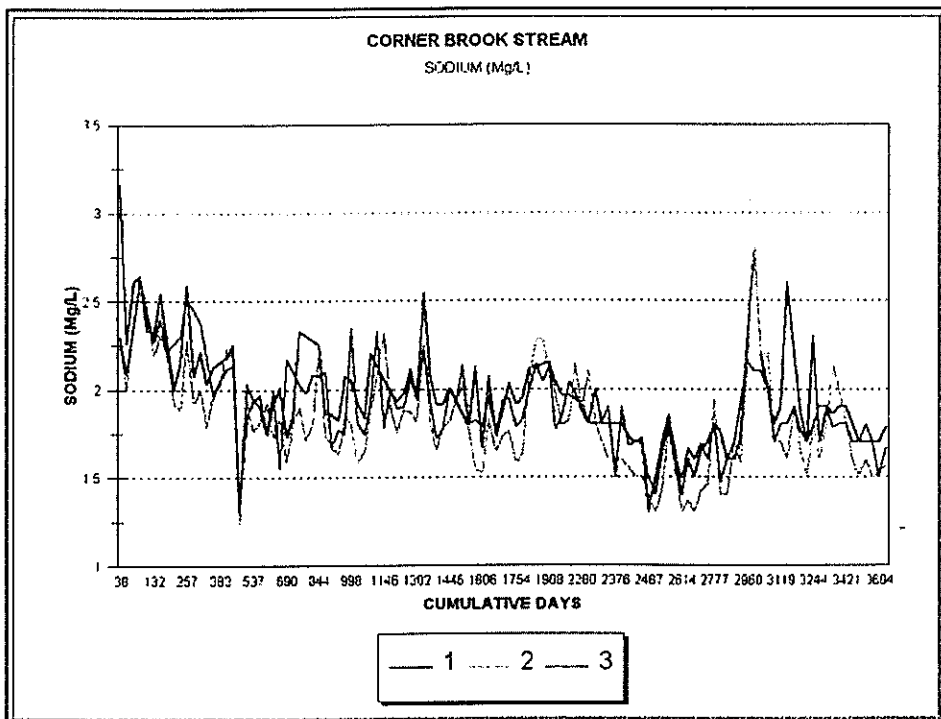
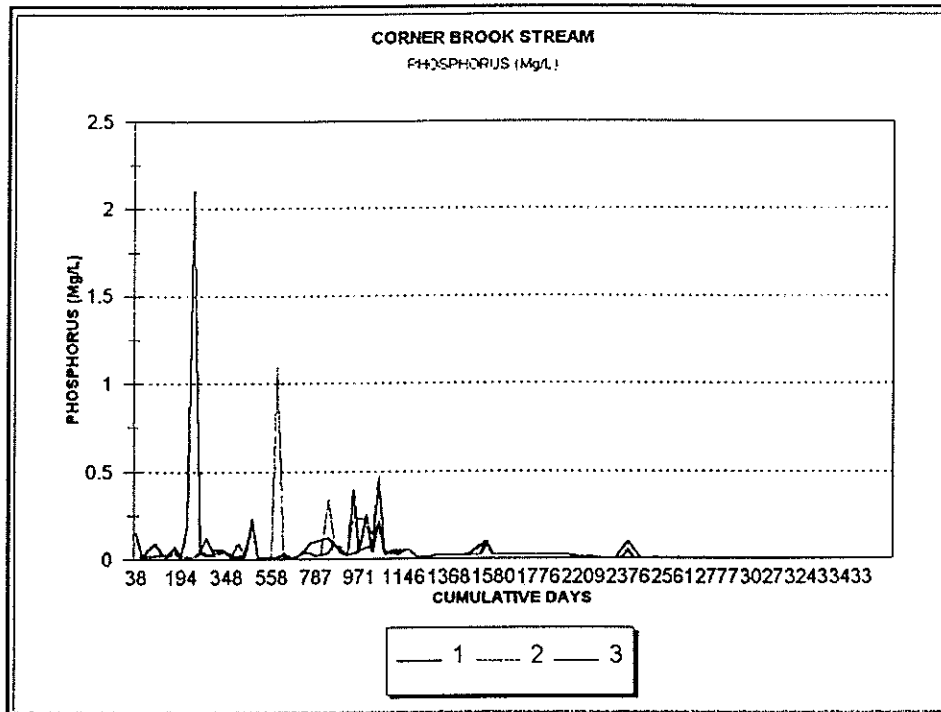
Description: Water quality analysis is the most reliable method of determining the level of impact upon a water body by adjacent activities. Once a control area has been established to record naturally occurring levels for several parameters, a monitoring program will provide scientifically defensible datum on the state of that waterbody. It is important to note that fluctuations in data are not always caused by human intervention; peaks with certain parameters occur frequently under the stressors of high water levels, soil erosion, high temperatures, and animal intervention. When interpreting results, we always compare the anomalies in data with the possibility of a natural occurrence. Field data must be accompanied by weather conditions, rate of precipitation, and major landscape events such as landslides or wash-outs.

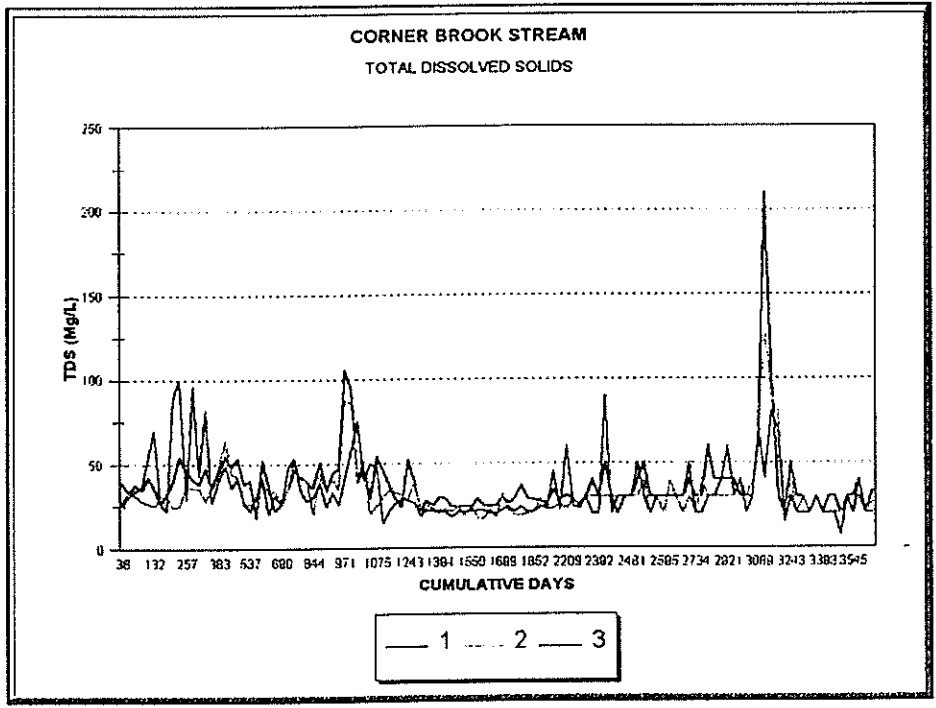
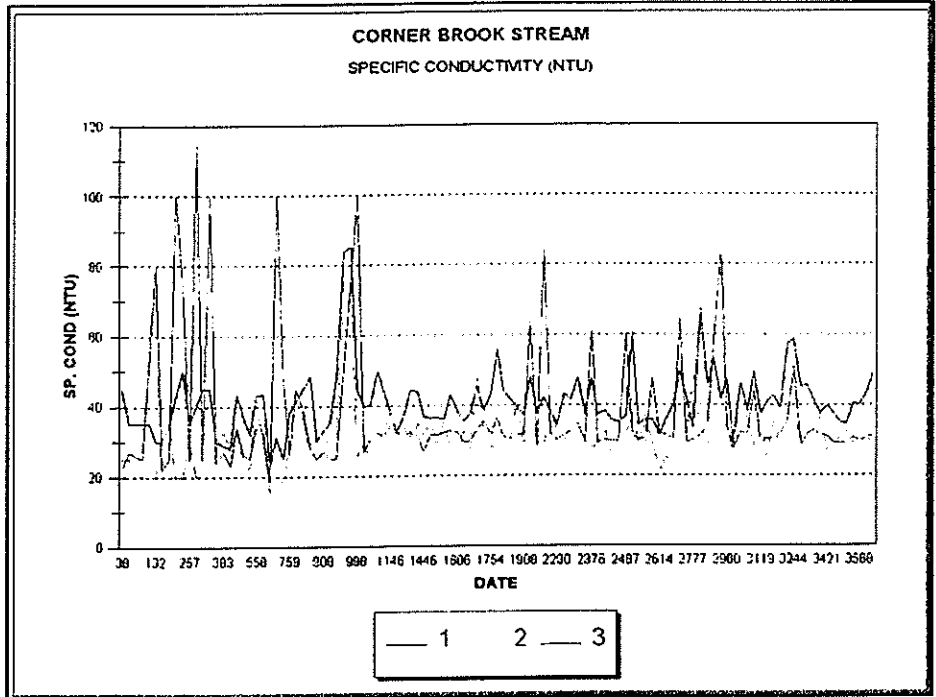
The Corner Brook Stream is the major tributary of the Corner Brook Lakes Watershed. Data has been gathered on this system between 1989 and 1998 under the following conditions:

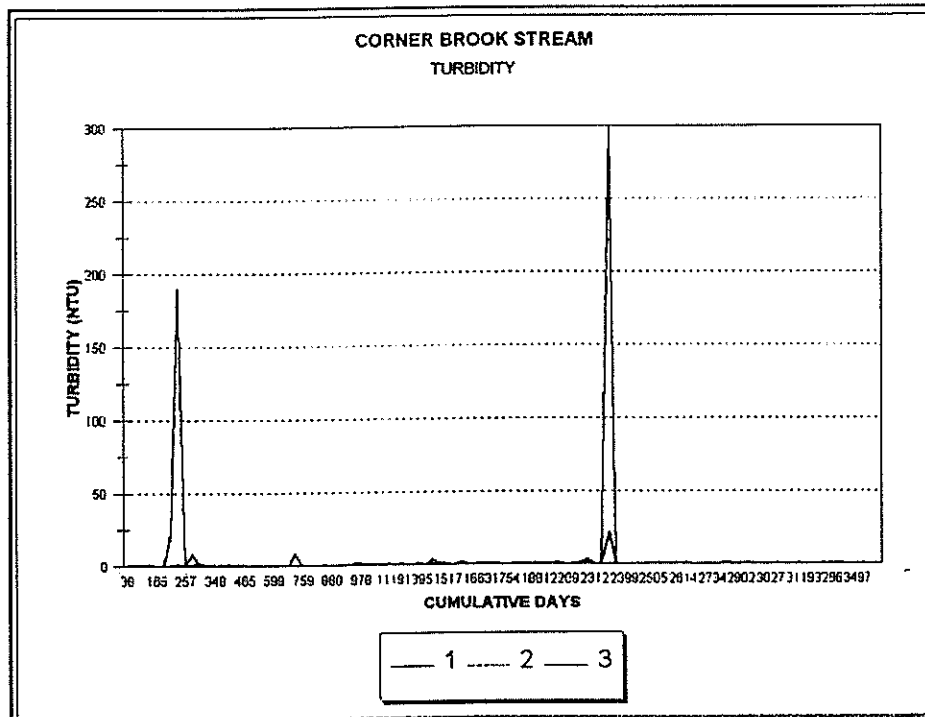
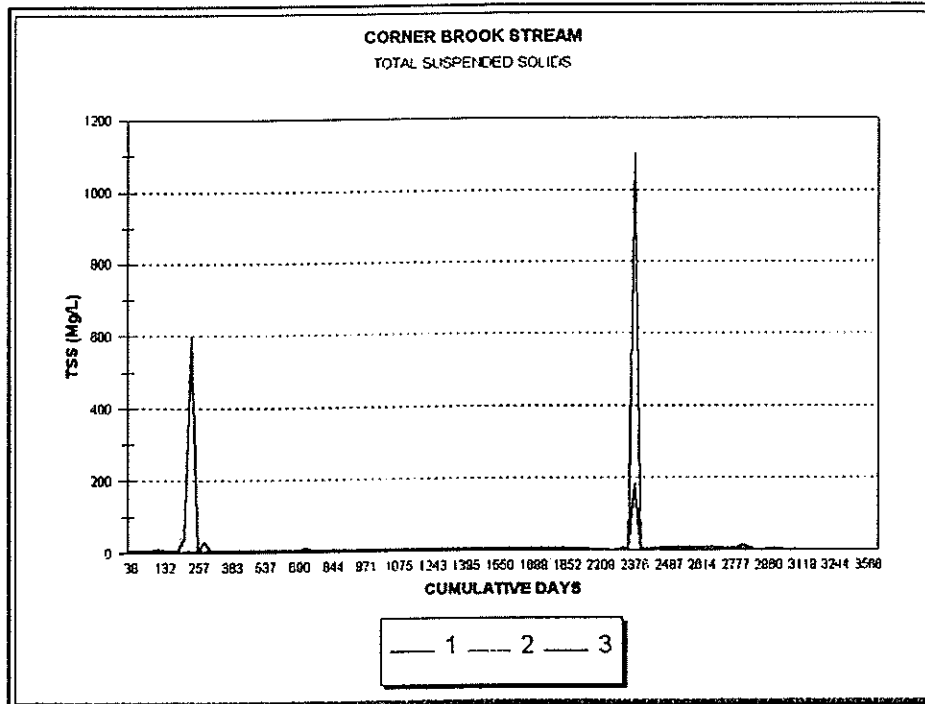
- **timber harvesting within the watershed:**
 - Corner Brook Pulp and Paper harvested in the region of Red Indian Lake under a strict regulatory agreement between the City of Corner Brook and the Department of Environment and Lands. The data that has been collected by the Department of Environment and Lands was a result of this preliminary agreement to monitoring the impacts of harvesting on this system;
- **recreational activities year round:**
 - Even though the Corner Brook Stream is a protected water supply, the area is highly utilized by the community for recreational activities: walking/hiking, mountain biking, fishing, snowmobiling, and cross-country skiing are just a few of the activities that take place in this region.

Figures 3.2.1 through to 3.2.8 allows for a comparison of eight parameters under the standards for water quality provided under the Canadian Water Quality Guidelines:









Interpretation of Results:

According to Ian Bell of the Department of Environment and Labour, directly responsible for water quality monitoring in this area, the data collected from February 1989 to 1998 concluded that there has been minimum impact on water quality by harvesting or recreational activity. The results were compared against the Canadian Water Quality Guidelines (national standards) and all parameters tested were within 100% compliance with the exception of colour (not included in the figures), which is typical for Newfoundland.

There were a couple of incident related events that affected water colour through siltation. The important fact to note is that colour has been consistent over the ten years of testing which leads the Watershed Monitoring Committee of the City of Corner Brook to believe that careful adherence to harvesting guidelines had taken place.

Other points regarding testing included: a drop in nitrogen all over the watershed which is a natural fluctuation and not related to cutting; no variation in turbidity from February 1989 to October 1996 during harvesting; and sodium fluctuations have occurred within both the watershed and undisturbed areas and are considered normal.

Source:	Department of Environment and Lands, Water Resources Division
Acknowledgement:	Ian Bell, Regional Watershed Officer, Corner Brook
Written by:	Sean Dolter, Western Newfoundland Model Forest, February 2000.

Indicator 3.3 Drinking water quality

Description: In many parts of the province logging activities are carried out in the watersheds that supply drinking water to communities. Logging is often governed under special regulations in these cases, such as the Watershed Harvesting Guidelines developed for use in the City of Corner Brook's water supply areas. Maintaining the quality of that water is always a prime concern, and of course any changes that lessen the quality is grounds for concern.

One indicator of drinking water quality is the incidence of giardiasis in a particular region. This is a disease carried by a waterborne micro-organism, and transmitted by mammals through their feces and feces-contaminated water. It is sometimes called "beaver fever," since beavers are often the animal that are the immediate cause of a particular outbreak. However, beavers are not normally responsible for bringing the disease into a watershed in the first place. Humans, and their pets, are often responsible for introducing giardiasis into a particular watershed. Logging is one of the possible factors that can potentially contribute to the spread of the disease. This is because logging can result in increased runoff into a water body, as well as because the roads that are built result in a higher degree of human activity, by both loggers as well as recreational users.

For this reason it can be helpful to monitor trends in giardiasis. Figure 3.2.1, shows the number of cases of giardiasis reported each year in western Newfoundland, compared with figures for the entire province.

We can see from this chart that there were two major outbreaks of giardiasis in the 1990s. (Outbreaks in smaller communities might not show up on this chart, because the populations affected are relatively low.) In 1991 there was an outbreak in central Newfoundland, and the following year an outbreak occurred that was traced to the City of Corner Brook's water supply. A number of measures were taken in response to that outbreak, including trapping the beavers living near the intake area, improving the water treatment methods and installing latrines on logging sites. There has not been a significant re-occurrence of giardiasis in Corner Brook since then.

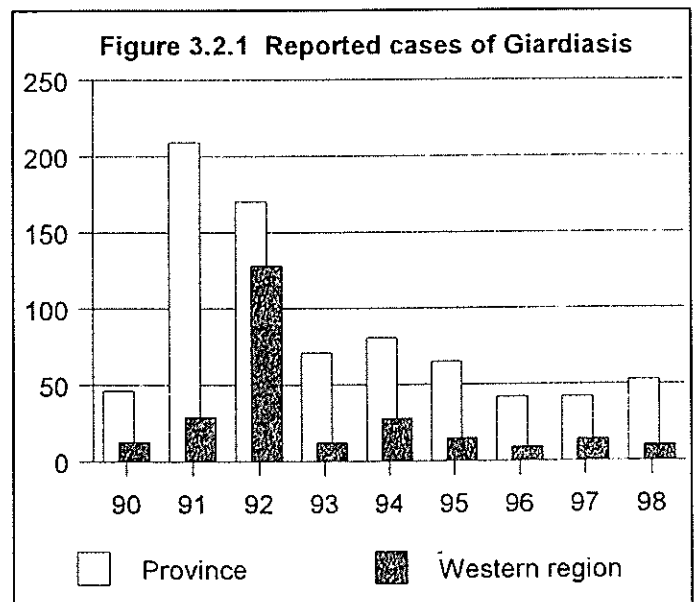


Figure 3.2.2 allows for a comparison of the relative frequency of giardiasis in

Newfoundland, when compared with the national average.

Here we can see that, except for the two years during which there were major outbreaks, the rate of reported cases of giardiasis in Newfoundland is considerably lower than the national average. This would suggest that the drinking water supply in Newfoundland is relatively good. However, while the national average shows a steady decline, the general trend in Newfoundland does not show a similar decline.

Source:	Western Memorial Regional Hospital
Acknowledgement:	Ike Anderson, Environmental Health Coordinator, WMRH
Written by:	Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Indicator 3.4 Forest policy

Description: Forestry in Newfoundland is carried out under a variety of laws, regulations and policies. The Forestry Act calls for a number of different types of plans to be prepared, all the way from annual operating plans to 20-Year Strategic Plans. The District Five-Year Plans are perhaps the most significant, since they describe how much timber will be cut in each district in the coming five years, as well as the general areas where logging will take place and the guidelines and restrictions that will be put in place to recognize and allow for other forest values.

Five-Year Plans are required for each Forest Management District. There are eighteen districts on the Island and five in Labrador, although for administrative purposes some districts are combined. Responsibility for developing and submitting the Plans falls to whoever has ownership or tenure of the land. This means that in several districts there are up to three plans; one prepared by the Department of Forest Resources and Agrifoods for unalienated Crown land, and plans developed by Abitibi-Consolidated and Corner Brook Pulp and Paper for lands that they own or lease.

These plans are important for several reasons:

- Five-Year Plans must be developed in a consultative process, with all interested parties having an opportunity to be involved.
- These plans - and any significant amendments to them - must be registered under the Environmental Assessment Act; this allows for further opportunity for public comment and, if warranted, further review and assessment.
- All plans are public documents and are available for review at any time.

Below is the current status of Five-Year Plans and amendments for the three Districts that comprise and surround the Western Newfoundland Model Forest.

District	Tenure	Approved Five-Year Plans	Approved Amendments	Amendments Under Review
14	Crown	April 1997-March 2002	7	none
	CBPP	under development	n/a	n/a
	Abitibi	January 1997-December 2001	4	none
15	Crown	April 1998-March 2003	none	none
	CBPP	January 1998-December 2002	3	none
16	Crown	April 1997-March 2002	3	none
	CBPP	January 1997-December 2001	3	1 (EPR)
	Abitibi	January 1997-December 2001	1	none

Table 3.4.1: Current status of Five-Year Plans, Districts 14,15,16 - February 2000

Findings: Of the eight Five-Year Plans called for in these three districts, only one has yet to have been prepared. With that exception, all Five-Year Plans were submitted to Environmental Assessment and released (approved) without any further review. Twenty-two amendments have been submitted to these plans; twenty-one were approved without further review and one triggered a requirement for an Environmental Preview Report. This is basically a request for further information, in order to enable the Environment Department to better determine whether or not a full Environmental Impact Statement is warranted. The EPR was requested in early February, 2000.

Source:	Department of Forest Resources and Agrifoods
Acknowledgement:	Kevin Sutton, Regional Ecosystem Planner, DFRA
Written by:	Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Criterion Four: Global Impacts

Forest Ecosystem Contributions to Global Ecological Cycles

Definition: *The impact of the forest and forest activities on global ecosystem functions, including:*

- *Contributions to global carbon budget*
- *Forest land conservation*
- *Forest sector CO₂ conservation*
- *Forest sector policy factors*
- *Contributions to hydrological cycles*

It's been said that forests help the planet to "breathe." Forests play a vital role in helping to regulate global biological cycles related to carbon and water. Forests store carbon in the trees and in the soil, and release carbon as the trees decompose, are burnt or get manufactured into products that later decay. Carbon is the most significant of the so-called "greenhouse gases." These gases are essential in order to keep the earth's temperatures within a liveable range, but there is growing concern that human activities are causing too much carbon to be released into the atmosphere. Healthy forests can help to store some of that carbon, and therefore remove it from the atmosphere. At the same time, significant climate change might weaken the forests of Newfoundland and Labrador, with potentially serious consequences for everyone.

Values associated with this criterion:

- Stable climate
- Forests as carbon sinks

Indicators:

Case Study: Measuring forest biomass with remote sensing

Case Study: Global Impacts

Measuring forest biomass with remote sensing

The global climate is being altered as a result of human activities, primarily the release into the atmosphere of carbon stored in fossil fuels. As a result of international agreements intended to limit human impacts on the atmosphere, there is a growing interest in better understanding the role of forests in storing carbon (called “carbon reservoirs”) as well as the potential for growing trees to sequester carbon (called “carbon sinks”). Our knowledge at a national scale of the total amount of carbon stored or sequestered in forests still has some significant gaps. Forest inventory information, from which information about biomass can be derived, is not sufficient because it does not encompass the entire forest area. In Newfoundland, for instance, detail about areas of scrub forest is not included in the forest inventory. What is needed, therefore, is a reliable but practical method for measuring and monitoring the total volume of forest biomass at a large scale.

A team of researchers with the Canadian Forest Service is addressing this challenge, by developing a series of procedures to measure forest biomass from information extracted from satellite digital imagery and other sources. Some of the challenges will be to:

- identify the optimal spatial resolution;
- resolve various technical problems with how to extract accurate stand-level information from satellite imagery;
- consolidate various methods of analysis to develop a complete method for measuring biomass from remote sensing and available data; and
- test and compare the results of different methods of estimating biomass.

This work is being tested out at pilot sites in British Columbia, Québec and Newfoundland, where Joan Luther of the Canadian Forest Service is working with the provincial Department of Forest Resources and Agrifoods to develop, test, refine and hopefully apply this important new tool for measuring the role that forests play in the global carbon cycle.

Source:	R.A. Fournier, J.E. Luther, M. Wulder, C-H. Ung, and S. Magnussen, “A Spatially-Explicit Method to Monitor Forest Biomass from Digital Remotely Sensed Images Using Forest Structural and Inventory Parameters.”
Written by:	Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Criterion Five: Benefits to Society

Multiple Benefits to Society

Definition: *Sustaining the flow of benefits from the forest for current and future generations:*

- *Productive capacity*
- *Competitiveness of resource industries*
- *Contribution to the economy (timber/non-timber sectors)*
- *Non-timber values (including option values)*

Forests are important to people for a wide variety of reasons. There are many different ways to describe and categorize the multiple benefits of forests: timber and non-timber values, consumptive and non-consumptive values, and so on. In this section we've tried to group those benefits into seven values that have been identified as being of particular importance in Newfoundland and Labrador, where forests are relied on to provide commercial timber, employment, other revenue, recreation, goods for personal use, heritage and spiritual values. The order in which they're listed is not meant to imply anything about the importance of these values relative to each other: a good forest management plan is one that accepts the validity of all of values, and balances the sometimes competing visions of the forest in a way that tries to accommodate all values.

Values associated with this criterion:

- Commercial timber
 - pulp and paper
 - sawlogs
 - value-added products
 - commercial fuel
- Employment
- Non-timber forest products and services
 - forest-based tourism and craft sales
 - furs
 - berries
 - Christmas trees
- Recreation
 - hunting and fishing
 - adventure recreation (hiking, canoeing, etc)
 - casual recreation (walking, berry and mushroom picking, etc)
 - motorized recreation (snowmobiling, ATVs, etc)
 - cabins and cottages
- Forest products for personal use
 - meat and fish

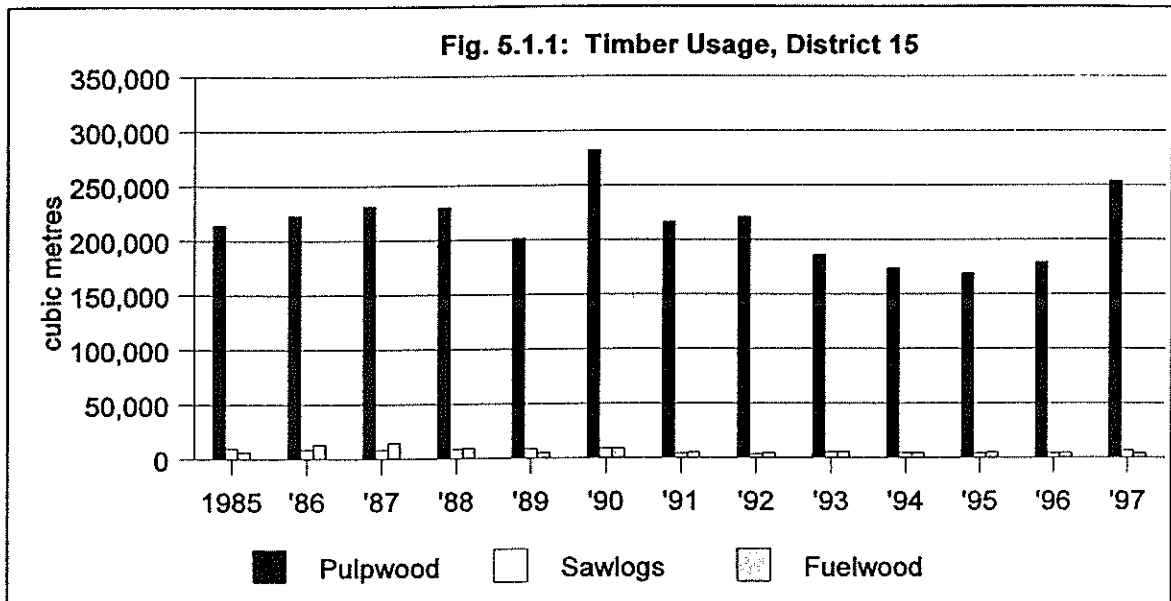
- domestic fuel
- domestic lumber
- berries
- gardening and landscaping materials
- Heritage
 - traditional activities
 - culture and the arts
 - pristine areas (natural heritage)
 - historic and archaeological sites
- Spiritual values
 - beauty and landscape aesthetics
 - peacefulness (solitude, quiet, wilderness)
 - inherent natural values

Indicators:

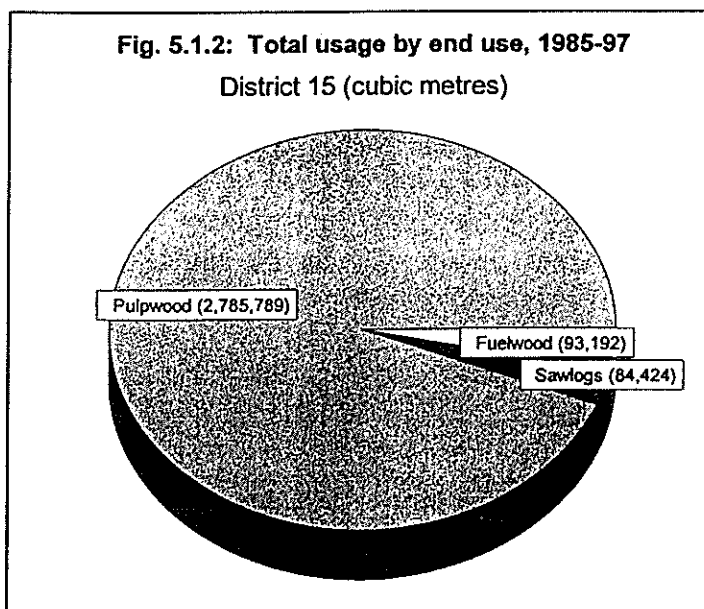
- 5.1 Timber usage
- 5.2 Employment in the forest industries
- 5.3 Outfitting revenue
- 5.4 Usage of forest access roads
- 5.5 Domestic use of products from the forest

Indicator 5.1 Timber usage

Description: The figure below shows trends over the past ten years in the volume of wood harvested in Forest Management District 15 for pulpwood, lumber and firewood. The Annual Allowable Cut during this entire period remained constant at 349,250 m3.



Findings: Timber use has been generally stable over the period of time covered in this chart. The widest fluctuations appear in the use of domestic firewood, which ranges from a high of 14,850 m³ in 1987 to a low of 4,030 m³ in 1997. In general, the extent of fuelwood use is affected by the price of oil, so the increase in the price of heating oil in the winter of 1999/2000 may be expected to result in a rise in fuelwood use. As is shown in Figure 5.1.2 below, the dominant use of timber in District 15 is for pulpwood use, comprising 94% of the total volume logged over this thirteen year period.



Source: Newfoundland Forest Service data.
Acknowledgement: Len Moores, DFRA
Written by: Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Indicator 5.2: Employment in the forest industries

Description: The forests are an important source of employment in a wide variety of timber and non-timber activities. Employment earnings provide both economic benefits as well as social benefits, by fostering community sustainability. It is difficult to obtain a comprehensive figure on employment in the non-timber sectors, because some while some activities (such as outfitting) are very closely related to forests, others (such as tourism) are only partially related. For this report, then, we provide employment figures only for the timber industries, and rely on other indicators to learn about some of the non-timber benefits that forests provide.

Findings: Table 5.2 is based on information obtained through a survey conducted by the Department of Forest Resources and Agrifoods in 1997.

Table 5.2.1: Employment in the Forestry Industries, 1997

	Number of Employees			Person-Years
	Mill	Woods	Total	
SAWMILL INDUSTRY				
Western region	318	318	636	230
Central/Eastern region	1,265	1,021	2,286	677
Labrador	55	51	106	39
Provincial total (sawmill industry)	1,638	1,390	3,028	946
NEWSPRINT INDUSTRY				
Corner Brook Pulp & Paper	762	750	1,512	1,142
Abitibi-Consolidated	975	625	1,600	1,158
Provincial Total (newsprint industry)	1,737	1,375	3,112	2,300
PROVINCIAL TOTAL (timber sector)	3,375	2,765	6,140	3,246

Source: Department of Forest Resources and Agrifoods, 1997 survey

Interpretation: Although the numbers of people employed in the sawmill industries are roughly equal to the numbers of people employed in the newsprint industries, the total number of person-years is less, due to a greater use of part-time and seasonal employment in the sawmill industries.

Information compiled by Statistics Canada shows information on total employment, total weekly payroll and average weekly earnings in the logging and forestry sectors.

The latest available information (Table 5.2.2 below) allows for comparison of figures compiled in November 1997 and November 1998.

Table 5.2.2: Employment and payroll in logging and forestry sectors in Newfoundland

Employment		Total weekly payrolls (in thousands of dollars)		Average weekly earnings (including overtime)	
Nov. 1998	Nov. 1997	Nov. 1998	Nov. 1997	Nov. 1998	Nov. 1997
1,800	2,700	\$1,051	\$1,859	\$573.17	\$728.55

Source: "Employment, Earnings and Hours," Statistics Canada, November 1998, pg. 49

Interpretation: The figures in Table 5.2.2 do not include mill employment, but include both logging and forestry services, which may not be identical to the "woods" category in Table 5.2.1. The major cause for the significant one-year drop in employment levels as well as average weekly earnings was the strike that affected Abitibi-Consolidated in 1998.

Additional information: Information that is not shown in the above table, but would provide significant additional detail, includes the following:

- Long-term trends: In general, employment figures have been declining, primarily as a result of mill modernization, mechanization, and increases in production efficiencies. We do not have figures that would compare declines in the sawmill industries with declines in the newsprint industries.
- Wages: The above tables do not allow for a direct comparison of wages within the forestry sector. In general, however, wages are higher in the newsprint industry, for a number of reasons: a greater percentage of workers in the newsprint sector fall under collective agreements; the skills levels are higher, especially inside newsprint mills; and the operating season is longer (typically 360 or more days in a newsprint mill as opposed to 160-260 days per year in sawmills). One indication of this wage difference can be seen in Table 5.2.2 above, when the Abitibi-Consolidated strike resulted in not only a drop in numbers of people working but also a drop in average weekly earning. In other words, the workers who were on the job in 1997 but on strike in 1998 had earnings that were above the provincial average, so their absence in the 1998 figures resulted in an overall drop of the average weekly earnings figure.
- Employment Insurance: Seasonal employees often draw on employment insurance, which in some families and communities provides a significant income supplement that is not reflected in these figures. Whether or not employment insurance is a genuine community benefit is a matter of considerable controversy.

Indicator 5.3: Outfitting Revenue

Description: Big game hunting provides several benefits to the people of Newfoundland and Labrador. Many provincial residents participate in the hunt, which is important both as a form of recreation and as a supply of meat. In this indicator, however, we focus on the benefits from the sale of out-of-province licenses. Here the benefits to the province are in the form of revenue and employment. The financial benefits to the province come in a variety of forms:

- licenses and fees to government
- fees to outfitters
- other expenditures by visiting hunters; and
- spin-off expenditures and employment generated by outfitters and businesses that benefit from the direct expenditures by hunters.

An analysis of the outfitting industry that was carried out in 1994 estimated the following direct expenditures generated by out-of-province hunters:

Direct Government revenue (licenses and fees)	\$1,150,000
Outfitters' revenues	\$10,000,000
Other expenditures by hunters	\$3,491,000
Total	\$14,641,000

When combined with indirect benefits (including an estimated \$2 million spent in 1994 by outfitters on capital expenditures), the total net economic benefit for 1994 was over twenty million dollars. When divided among the 2,946 hunts that were sold that year, the economic impact of each non-resident hunting license was estimated at \$6,864.

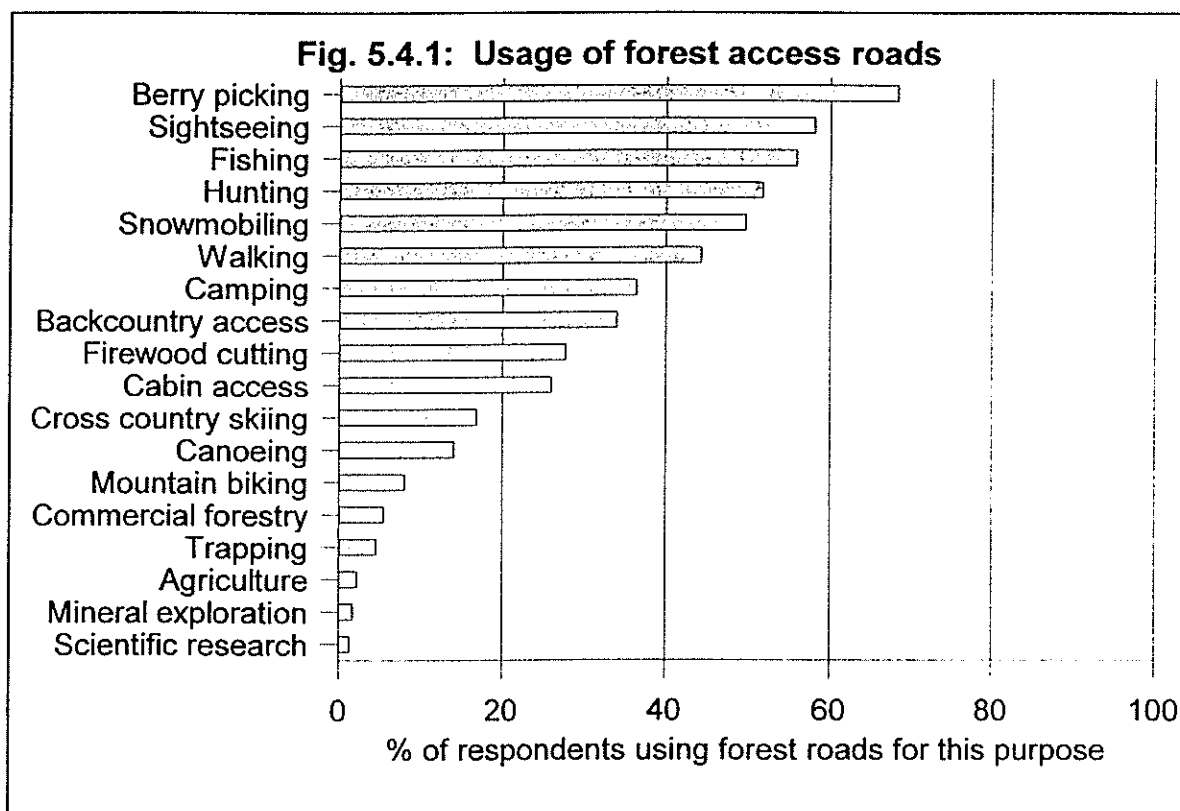
Although this analysis has not been updated since 1994, officials in the Department of Tourism and Culture believe that the value per license has increased by - at a conservative estimate - 15%, due both to inflation and to the increase price and quality of hunting packages being offered.

Year-by-year figures on the number of out-of-province licenses sold has not yet been made available to the Model Forest, but the current number of licenses is about 4,400. Using the estimated current multiplier effect of \$7,893, the total annual revenue generated by the big game outfitting industry is estimated at \$34,730,000.

Source:	"Economic Impact Analysis of the Newfoundland Big Game Outfitting Industry," April 1995.
Acknowledgement:	Dan Chaisson, Department of Tourism and Culture
Written by:	Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Indicator 5.4: Usage of forest access roads

Description: There are several hundred kilometres of forest access roads within the Western Newfoundland Model Forest. These roads, although built in order to access stands of timber, frequently are heavily used by people for a wide variety of recreational and other purposes. In a survey conducted in 1999 about three quarters of the respondents indicated that they regularly use forest access roads. The table below lists in ranked order the most popular uses of forest access roads. The percentage figure indicates the percentage of all respondents that said they use forest access roads for this purpose.

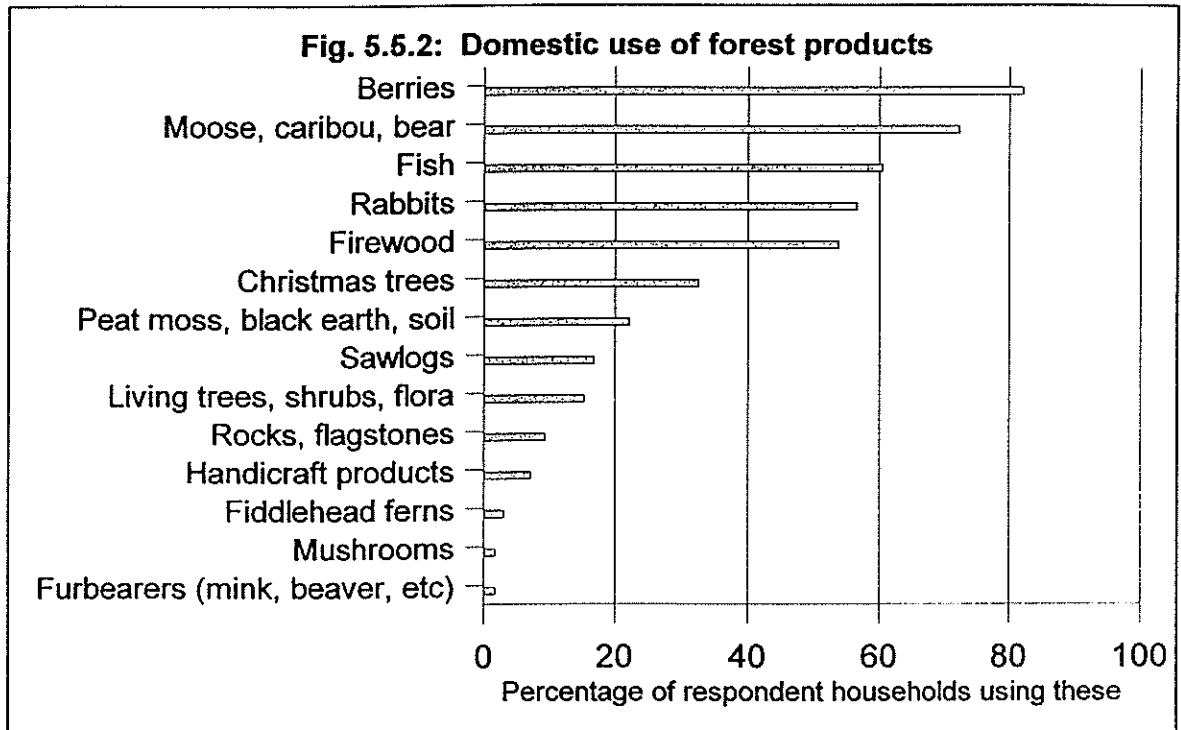


Findings: With each of the top ten uses shared by more than a quarter of the population, it's easy to see how important the forest access roads are for the residents of western Newfoundland.

Source: Brian Bonnell, "Assessing Public Opinion on Sustainable Forest Management in Western Newfoundland," January 2000.
Written by: Martin von Mirbach, CFES for the Western Newfoundland Model Forest, February 2000.

Indicator 5.5 Domestic use of products from the forest

Description: in its 1999 survey, the Model Forest asked participants to indicate which forest products either the respondent or someone from the respondent's household had used in the previous three years. The results are listed below in ranked order, with the percentage figure giving the percentage of total respondents that indicated a use of that product.



Findings: The top five uses (berries, big game, fish, rabbits and firewood) are hardly a surprise. What is noteworthy is that each of these products was used by over 50% of the respondents or members of their households. These figures clearly indicate that traditional subsistence activities are still very much a part of the lifestyle of residents throughout western Newfoundland.

Source: Brian Bonnell, "Assessing Public Opinion on Sustainable Forest Management in Western Newfoundland," January 2000.

Written by: Martin von Mirbach, CFES for the Western Newfoundland Model Forest, February 2000.

Six: Public Involvement and Commitment

Accepting Society's Responsibility for Sustainable Development

Definition: *Fair, equitable, and effective resource management choices, including:*

- *Aboriginal and treaty rights*
- *Participation by Aboriginal communities in sustainable forest management*
- *Sustainability of forest communities*
- *Fair and effective decision-making*
- *Informed decision-making*

There has been increasing recognition in recent years that resource management decisions should be made with the informed and active participation of all affected people. Experience has shown time and time again that active involvement from interested groups can result in better decisions, and decisions that are more fully accepted by all. Private citizens, non-governmental organizations and communities all have important roles to play. Along with the right to be involved, of course, they also have the responsibility to exercise that right in an informed and accountable manner. In the case of forests there is a special obligation to acknowledge and respect the established rights and interests of Aboriginal people, since Aboriginal livelihoods have often been inseparably intertwined with the forests, and certain Aboriginal rights are given unique consideration in Canadian law.

Values associated with this criterion:

- Forest contribution to community sustainability
 - health
 - stability
 - equity
 - empowerment
- Fair decision-making
 - public involvement
 - shared responsibility
 - accountability
- Informed and responsible decision-making
 - knowledge and awareness
 - education
 - research and technology transfer
 - environmental citizenship and responsible behaviour
- Aboriginal perspectives and involvement

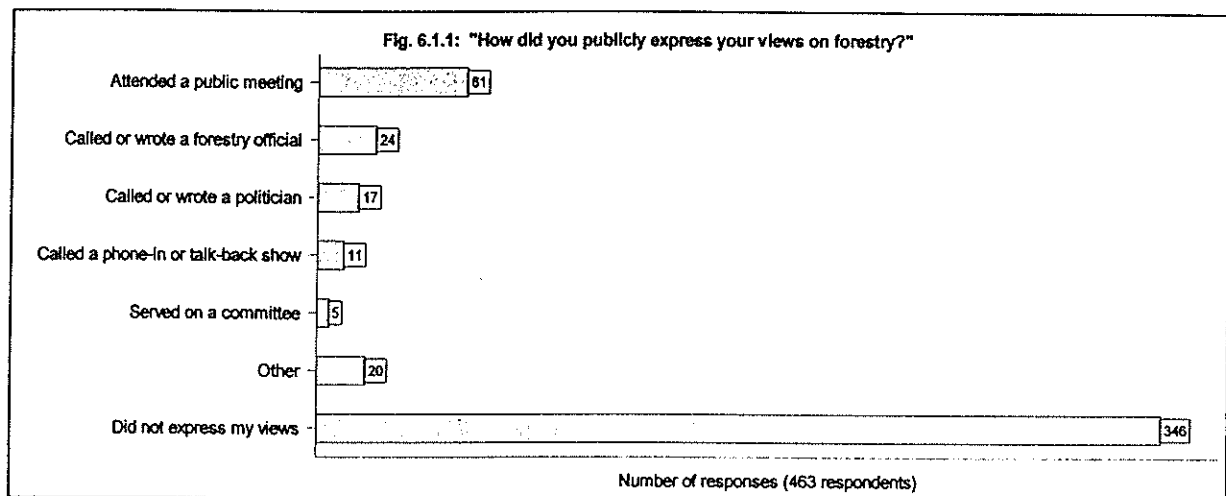
Indicators:

- 6.1 Extent of public involvement in forestry issues
- 6.2 Level of satisfaction with how forestry concerns have been addressed
- 6.3 Sources of information on forestry issues
- 6.4 Level of awareness about the Western Newfoundland Model Forest

Case Study: Measuring “community capital”

Indicator 6.1: Extent of public involvement in forestry issues

Description: In 1999 the Western Newfoundland Model Forest commissioned a detailed attitudinal survey, with over 450 residents of western Newfoundland providing their views on a wide range of topics having to do with their knowledge, attitudes and opinions about sustainable forest management and various forest-related issues. One question that respondents were asked was if or how they had publicly expressed their views on forests or forest management in the previous year. The responses are tabulated below.



Findings: The above chart shows that while the majority of survey respondents did not express their views on forestry in a public fashion, there was nevertheless a significant interest. About a quarter of the respondents indicated that they did express their views in some format or another, with some using more than one option. Among the options available, public meetings are the most commonly used means of public expression.

The Model Forest plans to carry out this survey again in several years time, and will be very interested in monitoring changes to these and other figures that show how citizens are currently involved in forest management.

Interpretation: There is no simple relationship between the extent of public involvement and sustainable forest management. Active public participation is a healthy and essential component of good forest management, since it is an effective way for forest managers to hear from the citizens in whose trust they are making decisions about lands that are for the most part publicly owned. That's why the Model Forest has from its inception tried to encourage more widespread participation in various aspects of forest management. Of course, many people prefer only to get publicly involved if there is a controversy that they feel strongly about, so a dramatic increase in involvement may simply indicate a pressing controversy rather than an increased public commitment to playing a more active

role in forest issues.

In general, the Model Forest seeks to expand the number of people who serve on some form of committee related to forestry or forest management. This kind of involvement demonstrates an ongoing commitment on the part of citizens, and provides perhaps the best opportunity for private citizens to have a meaningful impact on forest management decisions and practises. Five of the 463 respondents in the 1999 survey said that they had served on a committee dealing with forestry. The Model Forest aims to see this figure increase, which will require that effective committees are established and maintained, and citizens receive information, encouragement and support to enable them to participate effectively.

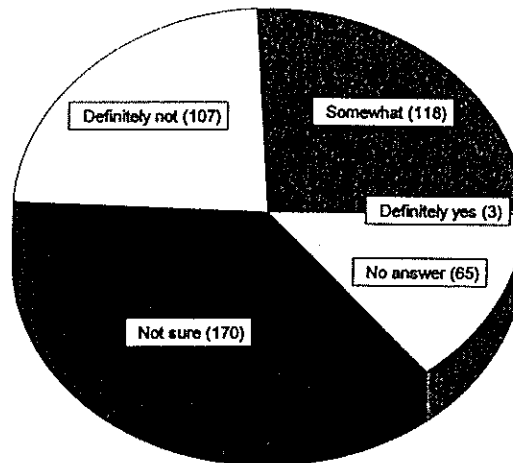
This chart does not tell us very much about those people who did not express their views in the previous year. Several explanations are possible: they may be silent because they don't know about the opportunities for involvement; because they don't feel comfortable with the opportunities they are offered; because they don't believe it will make any difference; or because they are generally satisfied with how forests are currently managed and don't feel a need to express their views publicly. That's why this figure should be viewed in conjunction with Indicator 6.2, which shows the general level of satisfaction about forest management.

Source:	Brian Bonnell, "Assessing Public Opinion on Sustainable Forest Management in Western Newfoundland," January 2000.
Written by:	Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Indicator 6.2 Level of satisfaction with how forestry concerns have been addressed

Description: The attitudinal survey carried out in 1999 asked respondents the following question: "Over the past year, do you think that your concerns about forest management issues were addressed?" The results are tabulated below.

Fig. 6.2.1: Level of satisfaction with how forestry issues are addressed



Findings: These results are somewhat inconclusive, with the vast majority of respondents choosing relatively non-committal answers ("somewhat," "not sure" or no answer). This result may be a characteristic of how the question was posed, since the question presumed that respondents did have concerns about forest management. Respondents without significant concerns were given no clear option for their response.

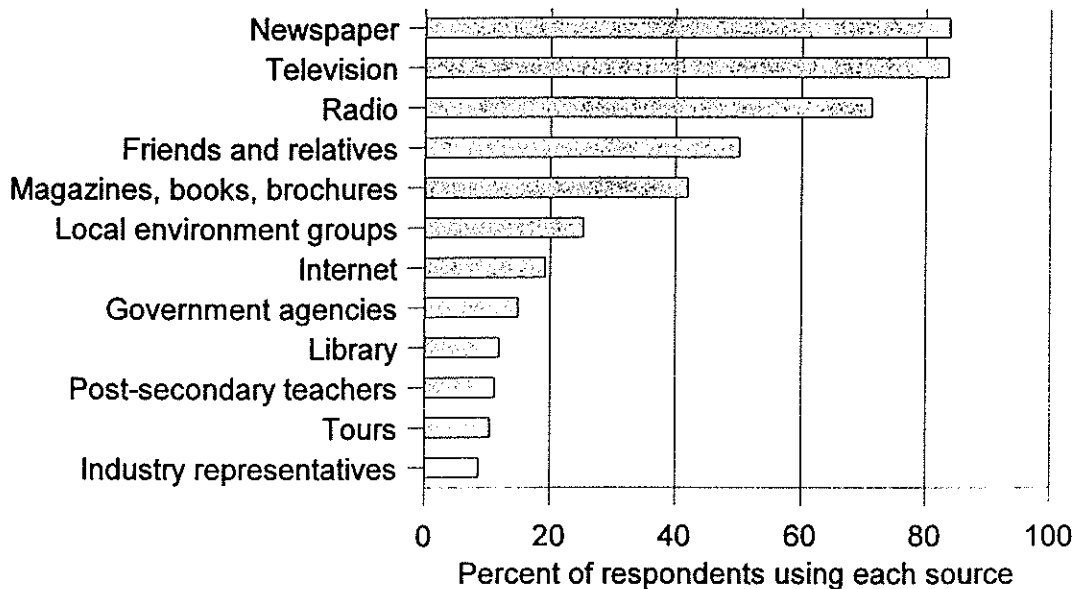
Likewise, the very small number of "definitely yes" responses may also be a result of the way the question was posed. Strictly speaking, one would only expect people to answer in this way if they had once had concerns about forestry, but these concerns had subsequently been addressed to their satisfaction. It does not necessarily include all the people who feel generally positive about forestry, since they may never have had concerns in the first place.

Source: Brian Bonnell, "Assessing Public Opinion on Sustainable Forest Management in western Newfoundland," January 2000.
Written by: Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Indicator 6.3: Sources of information on forestry issues

Description: One thing the Model Forest was interested in learning about in its 1999 attitudinal survey was how people obtain the information that shapes their knowledge, attitudes and opinions about forestry issues. The particular question we asked was “Which of the following sources are important to you for obtaining information on forestry issues? (Check all that apply.)” The results are tabulated below.

Fig. 6.3.1: Sources of information on forestry issues



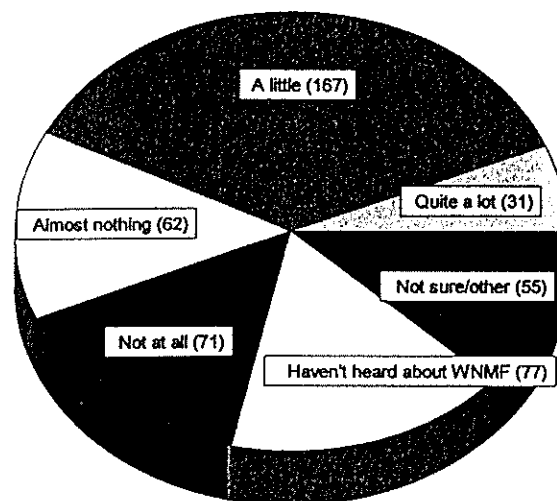
Findings: It is evident from this chart that the traditional news media (newspapers, television and radio) continue to be most important. There is some duplication among the categories included in the survey, since environment groups, government agencies, post-secondary teachers and industry representatives are all sometimes quoted or interviewed in newspaper, television or radio stories on forest management and forestry issues.

Source: Brian Bonnell, “Assessing Public Opinion on Sustainable Forest Management in Western Newfoundland,” January 2000.
Written by: Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

Indicator 6.4: Level of awareness about the Western Newfoundland Model Forest

Description: One indicator that is important to the Model Forest is the extent to which people are familiar with the Model Forest and feel that the Model Forest contributes to their knowledge of sustainable forest management. Two questions in the 1999 attitudinal survey touched on the profile of the Model Forest, and the results are summarized below.

Fig. 6.4.2: "Has the WNMF contributed to your knowledge of SFM?"



Findings: The Model Forest plans to repeat this survey in 2001 or 2002. At that time, it is hoped that efforts by the Model Forest and its Education, Outreach and Involvement Committee will result in substantial increases to the "Quite a lot" category in both of the above charts.

Source: Brian Bonnell, Assessing Public Opinion on Sustainable Forest Management in Western Newfoundland," January 2000
Written by: Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest

Case Study: Measuring “community capital”

What is the relationship between forests, forestry and community sustainability? In order to provide a thoughtful and informed answer to this question, we need to better understand some of the ways that forests contribute to the health and well-being of people living in communities within or close to the forest. The benefits from forests include:

- economic timber benefits;
- economic non-timber benefits;
- environmental benefits (clean water and air, habitat for wildlife, etc);
- the subsistence economy (direct personal use of firewood, game, etc);
- the barter economy (goods and services traded for subsistence products);
- cultural, historical and traditional values; and
- intangible benefits (space, appreciation of nature, etc)

All of these have some impact on the health and well-being of people in communities, but it is not always easy to measure their impacts or to distinguish between these factors and a great many other factors that also influence community sustainability in complex ways.

Efforts are underway within the Western Newfoundland Model Forest to get a better understanding of at least some of these complex relationships. Canadian Forest Service researchers Tom Beckley and Michael den Otter have started to pull information available from recent national censuses carried out by Statistics Canada, seeking to highlight information that is relevant to the health and well-being of people in communities, and therefore presumably relevant to community sustainability, however we might define that concept. Three communities in western Newfoundland (Cox’s Cove, Steady Brook and Rocky Harbour) were examined according to a number of factors, including the following:

- 1.1 Population (percentage change)
- 1.2 Income (median household income)
- 1.3 Poverty (percentage of low-income families)
- 1.4 Employment (unemployment and labour participation rates)
- 1.5 Human Capital (level of education attained)

These figures relate to what some call “community capital,” which refers to a broad range of factors that contribute to the overall health, stability, well-being and “liveability” of a particular community. Wherever possible, figures from the last three national censuses is included (1986, 1991 and 1996), allowing for some record of recent trends. As well, figures for each community are compared with national averages. Below, by way of example, are some of the results for one of those communities, Rocky Harbour.

[INCLUDE CHARTS HERE FOR THE ABOVE 5 INDICATORS]

Source: Tom Beckley and Michael den Otter, "Monitoring Community Sustainability in the Western Newfoundland Model Forest."
Written by: Martin von Mirbach, Centre for Forest and Environmental Studies, for the Western Newfoundland Model Forest, February 2000.

