GPI Atlantic
Website: www.gpiatlantic.org
Box 489, RR#1 • Tantallon • Nova Scotia • B0J 3J0 • 902-489-7007 • colman@gpigatlantic.org

REVIEW OF ELDON GUNN'S COMMENTS ON THE NOVA SCOTIA GENUINE PROGRESS INDEX FOREST ACCOUNTS

Prepared by Ronald Colman, Ph.D
Executive Director, GPI Atlantic

With Minga O'Brien, M.Sc.
and Linda Pannozzo, B.Sc., B.Ed., B.J.

25 January, 2002

TABLE OF CONTENTS

Introduction
Summary
General Characteristics of Dr. Gunn's Comments
Dr. Gunn's comments to The Daily News

Detailed Review of Eldon Gunn's Comments

1. GPI Atlantic's organisational status
2. Dr. Gunn's comments on the Nova Scotia GPI
3. The CCFM Indicator Framework
4. GPI as an Accounting Framework
5. Data sources
6. Causes of age structure changes
7. Causes of beech decline
8. The need for historical perspective
9. NSDNR's Forest Sustainability Regulations
10. Wood supply capabilities and the SAWS model
11. The Case Studies
    a) Windhorse Farm
    b) Jeremy Frith
    c) Pictou Landing
    d) Finewood Flooring and Lumber Ltd.
    Note on Dr. Gunn’s dismissal of the Nova Scotia case studies
    e) Menominee Tribal Enterprises (MTE)
    f) Algonquin Park
    g) Other Case Studies
12. Productivity and employment per unit of biomass
13. Economic assessment of ecosystem service values
14. Carbon sequestration values
15. Potential market losses through change of forest age structure
16. Dr. Gunn's summary and the reviewer's responsibility
17. "Bad and good" - Dr. Gunn's summary remarks
18. What is the reason for Dr. Gunn's complaint?
19. Changes made to GPI Report

Appendix 1: Letter to Eldon Gunn from Jim Drescher, Windhorse Farm

Appendix 2: Comments by Jeremy Frith, woodlot owner

INTRODUCTION

Questions about the future of Nova Scotia forests have been increasing in intensity for some time — whether established harvesting practices are sustainable economically and biologically, and whether they are desirable in several other senses as well. There are public protests over extensive clearcutting, there have been reports warning of impending wood shortages, and there are questions about whether provincial laws are adequate to sustain the forests.

GPI Atlantic's Forest Accounts, released in November, 2001, provided the most extensive look yet at Nova Scotia forests and their future. They applied a broader measure than the standard one of production and biomass, and they found the current industrial model wanting in a number of ways.

This was not meant to be a final word. On the contrary, GPI Atlantic's aim is to provoke debate on the issue in the hope of advancing public policy on this large and increasingly thorny issue.

Thus the response to the GPI report by Eldon Gunn, Ph.D, Department of Industrial Engineering, Dalhousie University, which is intended to defend current practices, should have been a welcome addition to this debate.

Alas, it is the contrary. Dr. Gunn has so misrepresented and trivialized the GPI Forest Accounts, in comments posted on his website and elsewhere, notably in damaging and unsubstantiated remarks published in *The Daily News*, that an elaborate response is required merely to set the facts straight, restate what it is that the report did say, and attempt once again to launch a reasoned debate.

When Dr. Gunn's criticisms are examined closely, they are seen to be full of errors, misrepresentations, and wrong calculations based on his mis-reading of the report. He consistently and repeatedly attributes to the GPI report numbers and statements that appear nowhere in it, and he ignores what the report actually does say.

Dr. Gunn has admitted in a public correspondence that "I don't pretend yet that I've done a thorough job" of reviewing the report. There is no truer statement in his entire review.

And although response to criticism is not normally this long or detailed, in this case it is necessary because Dr. Gunn is prominent in forestry policy circles in various capacities, including being chairman of the multi-stakeholder Nova Forest Alliance (NFA). This is an organization meant to breed consensus on forest issues, but which has seen some defections. Several organizations have suspended their participation in the NFA in protest against Dr. Gunn's approach. Two days after the *Daily News* story, for example, the NFA received a letter from the Nova Scotia Woodlot Owners and Operators Association endorsing the GPI Forest Accounts, disassociating itself from Dr. Gunn's remarks, suspending its participation in the NFA, and noting that Dr.Gunn was ``derelict'' in failing to separate his ideas from NFA in his news interview.

Although he subsequently took pains to point out that his comments were his own, not those of the organization, such a prominent voice is influential, and the flaws in his remarks, if unanswered, will merely have the effect of stifling useful debate over forest policy, which in fact seems to be the motive behind his attack.

Dr. Gunn claims "there are few merits" in the GPI Forest Accounts, and he writes: "Refute my claim." The following notes fulfill Dr. Gunn's request. In order to allow easy cross-checking, these comments primarily follow the order of Dr. Gunn's own paper, posted on his web site. However, they refer also to his public correspondence with me, and to his comments in *The Daily News.*

Dr. Gunn's media comments are posted on the GPI website http://www.gpiatlantic.org/ which also provides the direct link to his paper.

SUMMARY

The problems with Dr. Gunn's critique are many, and are substantial.

For example, despite his sweeping condemnations, he does not take issue with any of the conclusions of the GPI report. Nor does he challenge the main theme of the GPI report concerning the necessity of measuring and valuing the full range of forest functions, including ecosystem services and social benefits as well as timber.

He does not challenge the conclusion that current clearcut levels are excessive, and he does not take issue with key recommendations such as placing greater emphasis on selection harvest methods and restoration forestry. In his own words: "I don't think I have even questioned [the GPI] conclusions."

His criticisms remain mostly shallow and at the margins. He turns minor points (e.g. whether discussion on birds belongs among this or that set of indicators) into sweeping and unsubstantiated generalizations designed to discredit the GPI report as a whole.

Similarly, his claim that the cause of the severe loss of Nova Scotia's old forests ``has little to do with cutting, let alone clearcutting,'' but is almost entirely due to the spruce budworm infestation of the 1970s, is profoundly wrong. Yet he uses it to question the entire foundation of the GPI report. The natural age structure of Nova Scotia forests was declining dramatically before the budworm attack and has continued since. The budworm mostly attacked Cape Breton, Cumberland County, and some other parts of the province, but it cannot account for the province-wide decline in old forests. Spruce budworm primarily attack short-lived balsam fir and white spruce, and cannot, therefore, account for the loss of old forests dominated by other species. Besides, historical indications are that the infestation was so severe in the 1970s because the forest was degraded to begin with. (A complete analysis of this issue is found in Section 6—**Causes of Age Structure Changes).**

Dr. Gunn's sweeping condemnations to the press to the effect that there is "no science" in the report are particularly baseless, and seem to be intended merely to destroy and discredit bona fide research conducted over many years. In fact, all facts and calculations have been meticulously documented, based almost entirely on official, government, and scientific sources, with data referenced to 364 bibliographical sources, including numerous peer-reviewed scientific journals.

The key scientific evidence presented in the GPI report (on issues like the impacts of forest conversion and fragmentation on soils, watersheds, wildlife habitat, biodiversity, etc.) is completely ignored in Dr. Gunn's comments. He never deals with the basic findings of the entire report – that changes in the structure and composition of Nova

Scotia's forests have diminished their value and impaired their capacity to perform their full range of functions effectively, and that restoration forestry (as exemplified in the report's case studies) can help restore these values.

Yet he dismisses the report out of hand. One can only assume that Dr. Gunn feels threatened by the fact that the report findings are now public knowledge and that they challenge a "business as usual" approach to forestry.

Since he accuses the GPI report of having "no science," it is remarkable that he never takes issue with the extensive scientific evidence presented in it (including from peer-reviewed scientific journals). This evidence directly relates excessive clearcutting and loss of natural age and species structure to the degradation of vital forest functions, including provision of habitat for wildlife, soil productivity, resilience, and other functions that, in turn, impact timber productivity and long-term wood supply.

Perhaps even more remarkably, Dr. Gunn never relates to the fundamental questions raised in the GPI report, nor attempts to answer them even on his own terms: Are Nova Scotia forests capable of providing adequate soil and watershed protection, wildlife habitat, climate regulation and carbon sequestration, recreational value, etc? Do harvest practices impact that capacity? Dr. Gunn is silent.

Dr. Gunn's comments also reveal clearly that he does not understand the GPI, or its purpose. Although he admits that "we have not reviewed this larger project…of creating a Genuine Progress Index," he lectures GPI Atlantic about index construction and proper accounting procedures, completely missing the point of the GPI. For example, while the GPI is dedicated to demonstrating the connections between social, economic, and environmental realities, Dr. Gunn insists on keeping these in separate, isolated boxes, and denying the most obvious linkages. His own comments on "profit" and "loss" demonstrate that he adheres rigidly to the conventional accounting systems that have counted natural resource depletion as economic gain, and that bear significant responsibility for the degraded state of Nova Scotia's forests today.

He also cavalierly dismisses the six detailed case studies of best forest practices (including four from Nova Scotia) as irrelevant, indicating that he and Nova Scotians have nothing useful to learn from them, thus putting down some of the most exemplary models of sustainable forestry in Nova Scotia with unsupported, pejorative statements. Interestingly, he never refers to the actual principles and methods of sustainable forestry practised in these case studies, nor to the economics of restoration forestry which they are designed to illuminate. In other words, he does not relate to the substance of the case studies.

GPI Atlantic's real desire is to create a genuine and civil dialogue, based on mutual respect, that serves our common purpose of ensuring healthy forests and a sustainable wood supply for the benefit of future generations of Nova Scotians. GPI Atlantic extended an invitation for such a dialogue directly to Dr. Gunn. However, he ignored the invitation, wrote a disparaging reply claiming to have more experience than us, and decided to take his comments to the press instead. Therefore, GPI Atlantic has no choice but to answer Dr. Gunn's comments here. We hope that we can move quickly to a more civil and constructive interchange.

General Characteristics of Dr. Gunn's Comments

Before responding to specific comments, it is noteworthy that certain key features characterize Dr. Gunn's critique:

1) His criticisms remain at the margins:

- None of them challenges the key findings of the GPI report – namely that the loss of old forests and of natural species diversity, and a long history of land clearing, high-grading, and clearcutting, have seriously compromised the capacity of Nova Scotia's forests to perform their multiple functions effectively.
- Nor do they deny that, as a result, Nova Scotia's forests are considerably less valuable than they were or could be.
- Nor do they challenge the numerous scientific articles cited in the GPI report, which provide strong evidence of the relationships between forest conversion and degradation on the one hand, and soil productivity, carbon sequestration, watershed protection, wildlife habitat, and a range of other forest values on the other.
- Nor do they challenge key recommendations in the GPI report, such as a reduction in the current excessive rate of clearcutting, and the need for investment in forest restoration and uneven-aged management, including selection harvesting.

  Given the marginality of his objections, the question that remains, and is baffling at first glance, is: Why does Dr. Gunn object so vociferously? The reason can only be that the GPI looks at social, economic and environmental realities very differently from, and much more inclusively and comprehensively than, the conventional accounts to which he is attached, and because the GPI suggests a different way of ordering policy priorities.

  But a careful reading of the GPI Forest Accounts will show that there is nothing to fear -- the argument is that the alternatives suggested are economically viable, create more jobs, and can be implemented gradually to allow industry and government the necessary time to make adjustments.

2) Dr. Gunn consistently misrepresents the GPI report.

- Dr. Gunn frequently attributes statements and positions to the GPI report which do not exist anywhere in the report.
- Similarly, statements from the GPI report are taken out of context, ignoring other statements in the GPI report that directly address the issues he raises.
- Dr. Gunn has selectively ignored responses already made to him in correspondence, which directly address issues he has raised, indicating a marked unwillingness to engage in constructive dialogue.

- While GPI Atlantic acknowledged and incorporated several earlier review comments by Dr. Gunn in its report, there is no acknowledgement by Dr. Gunn that there is anything useful, anything he can learn, or anything worthy of further exploration in the GPI approach. The fact that Dr. Gunn totally rejects the GPI report without challenging its basic findings, conclusions and recommendations suggests bias rather than genuine analysis.

3) Dr. Gunn's criticisms are often stated in "either / or" terms that deny subtlety or complexity. For example, he sees an absolute separation between moral and scientific arguments, as though the two can't mix, whereas ethical issues are the subject of hot debate in many fields of science. We need only consider the debate over cloning as a case in point. In the case of forests, the goal of a "healthy forest" is clearly a social value, a moral imperative, *and* a scientific pursuit. This recognition does not compromise any one of those realities.

   Similarly, Dr. Gunn dismisses the six detailed case studies in volume 2 as having nothing practical to offer Nova Scotia. Instead, he proffers, we should have used Stora Enso, the NS Department of Natural Resource's "woodlot owners of the year," and others that he thinks more appropriate. Nowhere does the GPI report state that the six detailed case studies profiled as "best practices" are the *only* relevant ones to the exclusion of any others.

   Finally, Dr. Gunn seems to think that *either* the Nova Forest Alliance approach to the Canadian Council of Forest Ministers criteria and indicators is correct *or* the GPI approach is correct. Since the former (which he represents) is correct in Dr. Gunn's mind, the latter cannot possibly have anything to offer.

   This is most unfortunate, as a dialogue between these two different approaches would be most creative and constructive. The CCFM indicators are public terrain, and are meant for all Canadians. They are no one's turf or territory, and efforts by independent analysts to apply the indicators should be welcomed by a body that claims to have an interest in sustainable forest management.

   Because he thinks in these "either / or" terms, Dr. Gunn accuses GPI Atlantic of "dismissing" the NFA indicators work. This is simply untrue. Nowhere does the GPI report dismiss or criticize the NFA work. GPI Atlantic welcomes all efforts to apply the excellent CCFM criteria and indicators. It is Dr. Gunn who is doing the dismissing.

The Daily News 12/12/01 and 13/12/01

The following comments refer to the article quoting Eldon Gunn, which appeared in The Daily News on 12/12/01 prior to release of his paper.

1. *Daily News:* Dr. Gunn says "there is no science" in the GPI report. In fact, the GPI report uses official government sources for its statistics, is meticulously documented and referenced, and draws evidence from 364 references, including dozens of peer-reviewed articles from scientific journals elucidating the impacts of changes in forest age structure and forest management and harvest practices on forest health and functions.

   Dr. Gunn provides no evidence for his "no science" assertion. It is obvious that what he considers ``science'' in this case is a linear projection of wood supply, as if this were independent of other forest functions. The GPI approach recognizes the dependence of timber productivity on the full range of forest values, including soil quality, resilience, biodiversity, and changes in age and species structure. In the GPI perspective, true science is based on a recognition of the interdependent and interconnected nature of reality.

   Further, Dr. Gunn says the GPI report *"is a moral argument dressed up to look like science."* This is an odd argument, as furious debates over the ethics of some scientific pursuits are reported in the media regularly. It is particularly odd in Nova Scotia, where the international scientists of the Pugwash conference won the 1995 Nobel Peace Prize precisely for recognizing the moral and ethical dimensions of scientific research.

2. *Daily News:* "(Gunn) said GPI dismissed the (Nova Forest) alliance's work developing a multicriteria system of forest management." This is simply untrue. Nowhere does the GPI report dismiss the work of the Nova Forest Alliance in any way, shape or form.

3. *Daily News:* "Gunn said…GPI…blame(s) rapacious forest companies" for the loss of old forests in Nova Scotia. Nowhere does the GPI report say this.

4. *Daily News:* "GPI's report envisions a primordial, pre-contact forest, stuffed with lofty hardwood and towering softwoods, that likely never existed, Gunn said. 'Landscape myths are not helpful,' he said." None of these adjectives appear anywhere in the GPI report. In fact, all historical descriptions in the report are based on either historical records, scientific analyses of the characteristics of the original Acadian forest, or actual descriptions of remnants of that forest in existence today (e.g. Volume 1, chapters 5 and 7; Volume 2, chapter 1, etc.)

5. In a letter to *The Daily News* (13 December, 2001), Dr. Gunn writes that the GPI extrapolation of Windhorse Farm data "would result in 47,272 horses working in the woods of Nova Scotia. This conclusion is silly, but it is the type of extrapolation behind GPI's conclusion." Nowhere does the GPI report suggest that horse-logging is appropriate or possible on a larger scale.

6. In public correspondence following the release of the *Daily News* article, I asked Dr. Gunn *"where in our report you found reference to 'dismissing' the NFA work, or 'rapacious' forest companies, etc. The News article implies these references appear in our report. I cannot find them anywhere, and I wonder if they are your words, since they are certainly not ours."*

   Dr. Gunn replied: *"If these were my words, they weren't my intent. I tried to stick to the material in my critique."*

   I replied: *"If your words do not express your intent, it is up to YOU to correct them publicly. As things stand, your words (all we have to go on) talk of 'rapacious' forest companies, 'dismissing' the NFA work, etc. Since we said none of these things, it would be helpful to the general reader for you to take public responsibility for your own words, and correct them if necessary."*

   In a subsequent letter to *The Daily News*, Dr. Gunn chose not to correct his words, but to let them stand. Since these words have been publicly and incorrectly attributed by him to GPI Atlantic, it is necessary to make that correction here.

Detailed Comments on Dr. Gunn's Critique

Comments are numbered to allow for easy reference. Initial page numbers refer to Eldon Gunn's paper, as posted on his web site. The links both to Dr. Gunn's paper and to this response are posted on the GPI Atlantic web site (www.gpiatlantic.org) to allow for easy cross-referencing. Page numbers in the GPI report are specifically noted as such.

1. **GPI Atlantic** Gunn, Page 2: GPI Atlantic is not a "private" organization, as Dr. Gunn alleges. It is a non-profit research group, registered under the Nova Scotia Societies Act, governed by a 12-person volunteer board of directors elected at an annual general meeting, with membership open to the general public. Distinctions between the "private sector" and the "non-profit sector" are well understood.

2. **The Nova Scotia Genuine Progress Index** (Gunn, pages 1, 2, 4-5, 22-23.)

   On page 2, Dr. Gunn states that he has not reviewed the overall GPI Atlantic project of creating a Genuine Progress Index for Nova Scotia. However, he then goes on to critique the Genuine Progress Index in detail as if he knows all about its intent, history, structure, framework and methods, and he provides a lecture on how to construct an index -- this despite his admission that he has not reviewed the Nova Scotia Genuine Progress Index project. Not surprisingly, his critique is wrong in almost every aspect, and reveals a profound ignorance of the project.

   There are ample publicly accessible materials on the Genuine Progress Index available on the GPI Atlantic web site (www.gpiatlantic.org), including a detailed 135-page document (January, 1998) dealing with all the issues Dr. Gunn raises in his comments. However, even without this extra research, Dr. Gunn could simply have read the Foreword and Appendices B and C in the GPI Forest Accounts themselves, which describe the purposes, principles, history, and methods of the Nova Scotia Genuine Progress Index, including a description of ongoing work. Since his criticism of the Index is such a central part of his critique, it is surprising that he makes no reference even to the description of the project as it appears directly in the Forest Accounts.

   Among Dr. Gunn's many incorrect statements on the GPI:

- "The index claimed for justification is non-existent" (Gunn, page 1). "GPI Atlantic has not attempted to create an index and indicate no intention to do so" (page 2). "Thus the GPI index is used only as a preamble to their documents. It is not the purpose of their study" (page 2).

  These statements are wrong. Both the intention and the process of creating an index are central to every step of the GPI project, as even a cursory reading of pages xxii – xxvi and pages 171-186 in the Forest Accounts indicates. Indeed, the latter section is

clearly entitled "The Nova Scotia Genuine Progress Index: History, Methods, Limitations, and Work in Progress," so that it is difficult to understand how someone who claims to have read the Forest Accounts could make such elementary mistakes.

As these sections and many other GPI materials state clearly, extensive consultations with Statistics Canada in 1997 in the early stages of the Nova Scotia GPI project determined that the most methodologically rigorous way of developing the index was to do so one component at a time. The GPI Forest Accounts are one step in that process. In fact, 13 of 22 components have been developed at this point. Perhaps Dr. Gunn means that the Nova Scotia GPI is not complete. But that is certainly not what he says.

- *"This tool is the Genuine Progress Index, a concept taken directly from the Genuine Progress Indicator conceived by Daly and Cobb, based on earlier work by Nordhaus and Tobin"* (Gunn, page 4).

  Dr. Gunn seems to have all his references mixed up here, and clearly does not understand the history of GPI development. The US Genuine Progress Indicator was conceived and produced by Clifford Cobb, Tom Halstead and Jonathan Rowe in 1995, *not* by Herman Daly and John Cobb. The US Genuine Progress Indicator conceived by Cobb, Halstead and Rowe is specifically referenced in several places in the GPI Forest Accounts (e.g. pages xxii, 154, 171.) Further, the US GPI was based not on Nordhaus and Tobin's work, but rather on the earlier Index of Sustainable Economic Welfare constructed by Daly and Cobb in 1989 in *For the Common Good.*

  The starting point of the Nova Scotia Genuine Progress Index was a Statistics Canada critique of Cobb, Halstead and Rowe's Genuine Progress Indicator, accepting its basic principles and purposes, but detailing its methodological flaws. Unlike Dr. Gunn's total dismissal of the Nova Scotia GPI, the Statistics Canada critique was a highly constructive analysis that pointed a way forward. GPI Atlantic worked closely with Statistics Canada to improve the US GPI methodologies in every respect.

  In fact, GPI Atlantic's Forest Accounts owe much more to the natural resource accounting work of organizations like the World Resources Institute and to the ecological economics literature, than to the original US GPI. GPI Atlantic's relationship to the US GPI, including the inspiration drawn from it, and the principal difference between the two approaches, is described in the Acknowledgements to the GPI Forest Accounts (volume 1, page xiii) as well as in Appendix C (pages 171-186.)

- Dr. Gunn, (pages 4-5 and page 23) implies that GPI Atlantic has given no consideration to the value-setting process underlying an index, or to the social consultation required. This, too, is untrue. Dr. Gunn is referred to the detailed discussion of value setting in *Measuring Sustainable Development: The Nova Scotia Genuine Progress Index: Framework, Indicators, and Methodologies* (135 pages, January, 1998); to the full day consultation with representatives of all Nova Scotia

government departments held in March, 1998; and to the extensive year-long consultation process held with more than 40 community groups in establishing the values and selecting the indicators for the community GPI in *Developing a Community Genuine Progress Index: Materials for Community Development Planners* (276 pages, Feb. 1999 – Mary 2001). All these materials and more, dealing directly with value setting in index construction are available from the GPI Atlantic web site at www.gpiatlantic.org.

There is actually no expectation that Dr. Gunn will have read all these materials. But it is strange that he pretends such expertise in assessing GPI Atlantic's own goals and processes without having examined even the summary contained within the GPI Forest Accounts themselves. Had he read this summary, he would have found there a three-page section entitled "Value-Based Measures" (volume 1, pages 173-175) as part of a clearly marked section entitled "Values, Approach, Methods and Data Sources in the Nova Scotia GPI." The values underlying the GPI Forest Accounts are also explicit in that section, even though Dr. Gunn makes no reference to it at all. Here is a short extract from the "value-based measures" section of the report (pages 173-174):

"Value-Based Measures

"Any index is ultimately normative, since it measures progress towards defined social goals. All asset values can therefore be seen as measurable or quantifiable proxies for underlying non-market social values such as security, health, equity and environmental quality [1]. In the case of this particular component of the GPI, the normative value or goal that serves as the standard for measuring genuine progress is the health of our forests in all their aspects, and their capacity to continue performing a wide range of valuable functions. This includes protection of watersheds and soil quality, timber and recreation for human use, habitat for wildlife, climate regulation and carbon sequestration, and a range of other ecosystem and social functions.

"Indeed, it is demonstrated that these functions are complementary and mutually supportive, and that the commonly accepted notion of "trade-offs" between timber values and other forest functions is illusory when a long-term perspective is adopted. Indeed, the capacity of forests to perform all their functions satisfactorily, including provision of invaluable ecosystem services, actually enhances the timber value of forests as well. If, for example, particular harvest methods deplete soil quality and produce erosion, then future timber productivity will be compromised. Similarly, the loss of age and natural species diversity can diminish supplies of valuable wide-

[1] For the Nova Scotia GPI, these norms are defined in *Measuring Sustainable Development: What the Genuine Progress Index Can Do For Nova Scotia,* pages 12-15: presentation to the N.S. Government Inter-Departmental Consultation, March 3, 1998, World Trade and Convention Centre, Halifax. Available at www.gpiatlantic.org.

diameter and clear (versus knotty) lumber, and it can compromise forest resilience and resistance to disease and pest infestation as noted above.

"These connections are still less well understood in the forest sector than in the fisheries, where it is now fully accepted that a decline in natural resource health (collapsing fish stocks) had devastating effects on the economy and employment. A report on Maritime woodlots by the National Round Table on the Environment and the Economy included specific warnings that current unsustainable harvesting practices could lead to a resource and industry collapse analogous to that in the ground-fishery (NRTEE 1997). It is hoped that the GPI approach and this report in particular can contribute to greater understanding of the potential linkages between ecosystem and economic values in Nova Scotia forests so that the hard lessons learned from the fisheries crisis do not have to be repeated in another resource sector.

"In short, the value of "forest ecosystem health and integrity," as a defined goal in the Genuine Progress Index, is not at the expense of the "timber values" that are currently measured in the GDP. Rather, it is a broader and more comprehensive value that includes the value provided by forests in producing timber for human use and associated employment opportunities, and that demonstrates the linkages between protection of forest ecosystem functions, enhancement of timber values and job creation. Protection of the full range of forest functions is therefore the primary indicator of success in moving towards the goal of "forest health and integrity," and in strengthening a vital ecological and social asset that is essential to human life on earth. Conversely, a decline in the capacity of Nova Scotia's forests to perform their full range of ecological, social and economic functions successfully signifies a depreciation of that natural and social capital and an erosion of its value."

- According to Dr. Gunn: "The basic idea of an index is that we choose a set of indicators that we want to measure, we take physical (or other) attributes of these indicators, convert these to some numerical measure of preference and combine these numerical measures into a single number" (Gunn, page 22). In fact, an index may be a relationship among variables rather than a single number. Statistics Canada experts strongly advised GPI Atlantic *not* to strive for a bottom-line single number, advice that GPI Atlantic has followed assiduously without regret. Again, the GPI Forest Accounts (volume 1, page 186) summarize the rationale behind that decision.

  The purpose of an index is not necessarily to "(replace) a complex system by a simple number," as Dr. Gunn states (page 22.) On the contrary, the purpose of the GPI is to elucidate the complexities that are hidden in the simplistic, conventional accounting mechanisms that exclude social and ecological values.

- On page 22, Dr. Gunn gives "average income levels" as an example of a non-controversial index. In the GPI, this is very controversial, since average income levels provide no information on how income is distributed, and may conceal growing

inequality and poverty. (See *Income Distribution in Nova Scotia,* 59 pages, GPI Atlantic, July 2001).

- Dr. Gunn states that one of the main issues in constructing an index is "deciding how to weight the preference measures." Again, on Statistics Canada's advice, and after a very careful methodological and literature review of the complexities of weighting variables that are not easily compared, GPI Atlantic decided to construct the Genuine Progress Index one component at a time (volume 1, page 187, and elsewhere.) That process is still under way, and is about two-thirds complete.

In short, after admitting he has not reviewed the larger GPI project, Dr. Gunn claims to know GPI Atlantic's purpose and methods, and he proceeds to give GPI Atlantic a lecture on index construction. I would not spend as much time here reviewing these many wrong statements, except that Dr. Gunn makes his criticism of the index a central part of his commentary, and a central premise in his abstract: "The index claimed for justification is non-existent" (page 1). An egg is not less of an egg before it is fully cooked. The Nova Scotia Genuine Progress Index is still under construction. It is not "non-existent." It is just that Dr. Gunn did not bother to look at the publicly available architect's plans, foundation, scaffolding, and rooms already completed – all in full and public view, and summarized in the GPI Forest Accounts themselves.

3. The CCFM Indicator Framework (Gunn, pages 5-7).

On page 5, Dr. Gunn writes: "The GPI Forest Accounts claim to be based on the Canadian Council of Forest Ministers (CCFM) Criteria and Indicators (C&I) framework…. The GPI report acts as if the CCFM framework for sustainable forest management is a new found discovery….GPI clearly do not understand the C&I process….[and] failed to address even these revised indicators properly."

This is simple arrogance. No one has a monopoly on interpretations of the CCFM framework and applications of the CCFM criteria and indicators; nor is Dr. Gunn the arbiter of whether the indicators are addressed "properly." Yes, the GPI approach to the C&I is *different* from that of the Nova Forest Alliance. I happen to think that the GPI use of those indicators gets far closer to their actual meaning, intent, and purpose than Dr. Gunn's obsession with the form of the framework. But the GPI report certainly does not dismiss the NFA process out of hand or say it has nothing to contribute, as Dr. Gunn has done with the GPI approach. I agree with Dr. Gunn that "the process is complicated," but this complexity has certainly led to as many flaws in the NFA process as in any other. A bit of willingness to learn from parallel approaches might help the NFA process.

Nowhere does the GPI report claim that the CCFM indicators are "a new found discovery," or that others are not using the indicators as well, or that they are the sole framework for the GPI Forest Accounts, as Dr. Gunn implies. In fact, the GPI Forest Accounts use *both* the CCFM indicators *and* the Montreal Process indicators. Dr. Gunn

complains (page 6) that: "Under Criteria 2, Maintenance and Enhancement of Forest Ecosystem Condition and Productivity, GPI focus on one indicator that is not from the CCFM suite at all (8.1.1 corresponds to 2.d in the Montreal process.)" What is Dr. Gunn's problem here? If he had read the GPI report properly, he would have seen that the CCFM indicators are never claimed to be the sole framework for the GPI Forest Accounts. (For example, see GPI volume 1, page 8, page 26 and elsewhere on the Montreal Process Criteria and Indicators for Boreal and Temperate Forests.)

See, for example, this opening statement in the indicator section of the GPI report, which are the very first sentences of part II, volume 1, which Dr. Gunn would not have missed had he read the GPI report with due attention:

> *The following six chapters in Part II are adapted from the criteria and indicators of the Canadian Council of Forest Ministers guidelines for sustainable forest practices in Canada, and also the standards of the internationally agreed Montreal Process (the 10-nation Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests that includes Canada.)…. In many cases, data are not currently available to assess the state of Nova Scotia forests according to these criteria and indicators. Nevertheless, GPI Atlantic accepts that these two sets of nationally and internationally agreed criteria and indicators provide a reasonable and adequate description of forest functions and values, and thus provide a suitable framework for any set of physical forest accounts in Canada."*

Dr. Gunn spends a lot of time complaining that GPI Atlantic does not apply the *form* of the indicators with precision. For example (page 6), he says, birds should be discussed in CCFM indicator 1.2.2, *not* in indicators 2.1.1, 2.1.2 and 2.1.3. In fact, the GPI report does discuss birds exactly where Dr. Gunn would like to see them (see GPI volume 1, chapter 7, pages 44-46). But it *also* considers discussion of birds to be relevant to the indicator on insect infestation, because birds play a crucial role in controlling the spruce budworm. GPI Atlantic cites several scientific studies indicating that the softwoods in mixed hardwood and softwood stands have a much lower rate of defoliation due to spruce budworm than in pure softwood stands, in part because the mixed stands provide habitat for birds which are natural predators of the budworm. Can Dr. Gunn conceive that birds might be relevant in more than one indicator? Has he related to the scientific evidence presented on this subject in the GPI report? His accusation of "no science" appears to be a case of the pot calling the kettle black.

Indeed, the narrow obsession with form which is the basis of Dr. Gunn's criticism of GPI Atlantic's use of the CCFM C&I betrays an unwillingness to relate to the substance, intent and content of the indicators, and the actual data and results presented in the GPI report. Perhaps Dr. Gunn is so threatened by what the indicators report that he confines himself almost entirely to small observations on whether the indicators are in the right place. The impartial reader of the GPI report will judge whether the CCFM criteria and indicators are properly and fairly used.

Because the GPI approach is *inclusive* and identifies the connection between indicators that are normally viewed in isolation, Dr. Gunn appears intensely irritated whenever the GPI report notes a cross-over between indicators and does not treat them as isolated boxes. On page 5 of his paper, he is most upset that "the GPI discussion on page 27-28 spends all its time focusing on biodiversity as an economic value" when that discussion should be confined to criterion #5 "multiple benefits to society." He repeats the criticism on page 6, stating that "market value assessments" have "nothing to do with biodiversity."

Many of Dr. Gunn's criticisms on pages 5-7 are of this ilk, and they betray a complete misunderstanding of the Genuine Progress Index as a whole. The GPI approach is always to demonstrate that social and environmental assets do have an economic value. Yes, the GPI report demonstrates that biodiversity has economic value (does Dr. Gunn deny that?), and considers that discussion an appropriate part of the section on biodiversity. However, contrary to Dr. Gunn's complaint implying that biodiversity is not considered in its own right, the GPI discussion is certainly not confined to economic valuations. All of chapter 7 (pages 26-55) is on biodiversity, with ample discussion of the physical indicators. The short discussions of economic valuations do not short-change the physical indicators in the slightest. In fact, the GPI approach is always to base economic valuations on prior physical assessments, which are discussed in much more detail.

Similarly, the GPI report notes that carbon sequestration has an economic value, and it discusses that value as part of criterion #4 ("Forest Contributions to Global Ecological Cycles") as well as briefly in criterion #5 ("Multiple Benefits to Society"). Fully cognisant that economic benefits constitute a key part of "multiple benefits to society," we nevertheless considered that the economic benefits of carbon sequestration could best be demonstrated immediately after the physical valuations on which those economic benefits are based. This rationale is presented explicitly in the GPI report. Even if Dr. Gunn does not like where we place some of the reported facts, this is certainly no reason for sweeping statements that "GPI clearly do not understand the C&I process."

Demonstrating the economic value of ecosystem services does not violate the spirit or intent of the CCFM indicators and criteria in any way. On the contrary, it is the separation of economic realities from social and environmental realities that is at the heart of the GPI critique of conventional measures of progress like the GDP. Perhaps that is why Dr. Gunn is so irritated when the GPI report crosses the sacred boundaries of some of the indicator sets with taboo discussions that he would rather keep confined to separate boxes. The CCFM criteria and indicators do not have to be interpreted in such a restrictive way.

Another refrain in Dr. Gunn's comments is that we have "nothing to report" on certain indicators. This "criticism" is repeated often. Had Dr. Gunn read the GPI report with even minimal diligence he would have seen several statements in which we explicitly state that we will list indicators *even* when data are not available to report on those

indicators. We also state several times that there is an explicit purpose to listing indicators when there is "nothing to report," namely to point to data gaps and recommendations for further research. For example, he criticizes the fact that the GPI report mentions indicators 2.1.4-2.1.8 "with nothing to report." He fails to mention that the listing of these specific indicators are accompanied by statements such as:

> *"Unfortunately, there are currently no aggregate provincial data available for these indicators. Field studies in these areas are essential for future updates of this report…. No data were readily available for this indicator. An estimate for this indicator is recommended for future updates."* (GPI, volume 1, page 73).

He also completely ignores the following statement clearly noted in italics in the GPI report. The following statement directly precedes the very indicators that Dr. Gunn accuses GPI Atlantic of having "nothing to report":

> *"NOTE: Because the GPI Forest Accounts are concerned to follow the indicator frameworks of the Canadian Council of Forest Ministers and the Montreal Process, the following indicators are included in this section on disturbance and stress (8.1), even though data are not currently available in several areas. This listing is therefore designed to illuminate data gaps and to suggest areas for further research"* (page 72).

Similarly he complains that the GPI report "failed to address" indicator 7.3.1, while ignoring the statement in the GPI report that "a full assessment and evaluation of existing genetic conservation strategies is not included in this report and should be part of future updates of these accounts" (page 55). It is worth considering why Dr. Gunn spends so much time criticizing gaps and data limitations in the analysis that have already been explicitly and frankly acknowledged by GPI Atlantic, instead of focusing on the detailed results that *are* presented in the GPI report. A scientist truly in search of the facts, one would think, would take every indication of a data gap not as an excuse to dump on the report as a whole, but as a challenge to promote and undertake further research in order to provide the necessary information that is currently missing.

Indeed, Dr. Gunn is generally much more interested in focusing on what the GPI report does not have, rather than relating to what it does report. This 466-page study could not cover every detail, and never pretends to do so. In fact, there are many, many statements to the effect that these Forest Accounts should be seen as a first step in applying the GPI accounting approach to the province's forests, and that it is very much a work in progress. Instead of complaining constantly about what "GPI have left out," he might focus on what *is* reported. If he were to read the GPI report carefully, Dr. Gunn would direct more of his criticisms to the Nova Scotia Department of Natural Resources, for its lack of data on several key indicators, rather than blaming these data gaps on GPI Atlantic (which is not responsible for gathering the data on Nova Scotia forests.)

Here is an example of a statement that Dr. Gunn wilfully ignores: He states, as an example of GPI Atlantic's misuse of the CCFM indicators, "Instead of dealing with fragmentation and connectedness (1.1.4), they introduce their own indicator, road density" (Gunn, Page 6). This is rubbish. We do not "introduce our own indicator." Page 37 of the GPI report (volume 1) clearly lists the indicator as: "Level of fragmentation of forest ecosystem components," and then reports: "The Nova Scotia Department of Natural Resources does not have information regarding fragmentation and/or connectedness of forests…." On the following page we then note that the CCFM itself reports on road density, and we note that: "Because the building of roads inevitably leads to human access and activity, the density of roads is a good indicator of the extent and intensity of human access and potential disturbance." An attentive reader will immediately see that information on fragmentation would be desirable *if* it were available, and will nowhere find a statement that road density is introduced as a new indicator "instead of" fragmentation.

There are other such statements in Dr. Gunn's comments that are wilful distortions aimed only at belittling the GPI report. For example, he writes (page 6): "Indicator 7.2.3 is addressed in table 7 with a small number of species based on some "phone conversations" and ``some studies not based in Nova Scotia."

In fact, Table 7 lists 21 species and 8 sources for the information contained in the table (including two from Nova Scotia). These sources include the Canadian Council of Forest Ministers 1997 Technical Report, COSEWIC's Wild Species 2000, and four scientific articles. The two telephone conversations were with Dr. Tom Herman and Fred Scott, two of the most highly-recognised and eminent wildlife biologists in the province. As well, if Dr. Gunn wants more information on forest-dependent wildlife species threatened by clearcutting and loss of old forests he need only read the detailed descriptions of many species on pages 39-46 of volume 1. That description includes lichens, plants, anthropods, flying squirrels, moose, marten, fisher, trout, wood turtles, salamanders, frogs, hawks, barred owls, thrushes, warblers, and woodpeckers.

Yes, there is a dearth of published Nova Scotia data on forest-dependent species, as the GPI report explicitly recognizes (pages 39-40):

> *"It is difficult to predict the precise effects forestry operations have had on forest wildlife in Nova Scotia, as baseline information about the vast majority of forest species is absent, and complete species lists exist for very few taxonomic groups (Kehler et. al. 1996). We do know, however, that a critical component of the habitat for many old-growth dependent animals is natural or excavated cavities that occur in large-dimension dead snags, in large living trees with heart-rotted interiors, or in logs on the forest floor. All of these habitats are substantially depleted in intensively managed, second-growth forests (Freedman et. al. 1996).*
>
> *"In addition, we know that forest fragmentation and edge effects caused by clearcutting and roads, can have severe impacts on species that require large*

territories, and/or large uninterrupted tracts of forests; that are susceptible to predation and parasitism by edge-loving species; that are sensitive to human contact; that are frequently killed on roads; or that are unlikely or unable to traverse large openings (Schonewald-Cox and Buechner 1992).

"To date, very few studies have examined the biological impacts of forest fragmentation and harvesting of mature forests on wildlife in Nova Scotia. For example, no studies have examined the effects of forest fragmentation on bird populations in Nova Scotia (Staicer pers. comm. 2001).

"Given the paucity of evidence for Nova Scotia, we have to rely, for the most part, on research and studies carried out in other parts of North America. When all the available evidence indicates that a certain species is vulnerable to forest conversion and/or forest fragmentation in other parts of North America, we can only assume that the same applies to Nova Scotia. Without evidence to the contrary, the precautionary principle (adopted as law in this province) would appear to indicate that action must be taken to protect the habitat of these same species in this province:

> *"The precautionary principle will be used in decision-making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation".*
>
> Nova Scotia Environment Act, Part One, Section 2 (b) (ii)

"Currently, however, most species that are sensitive to clearcutting are not considered in decisions that influence land use practices."

In other words, the GPI report explicitly acknowledges the absence of vital Nova Scotia information. In sharp contrast to Dr. Gunn's sweeping dismissal of the extensive GPI evidence on the grounds that "some studies [are] not based in Nova Scotia," the absence of adequate Nova Scotia information on forest-dependent species is surely the signal that more research is needed. A researcher genuinely in quest of the truth would also exercise the precautionary principle in examining relevant evidence from comparable jurisdictions and, given the shortage of published Nova Scotia evidence. Such a researcher would surely welcome the extra efforts of GPI Atlantic researchers to make personal contact with many of the most highly-respected wildlife biologists in the region, rather than to dismiss the evidence as based only on "phone conversations."

Dr. Gunn's sweeping condemnations ("The short message is that GPI have not followed the CCFM framework of indicators" – p.7) are absurd. Such statements are mostly the result of ignoring parts of the GPI report, and a mis-reading of the fact that GPI Atlantic explicitly uses the Montreal Process indicators alongside the CCFM indicators.

Dr. Gunn concludes (page 7) that including economic values in non-economic indicators, and non-economic values in economic indicators, shows that GPI is "sloppy" in its treatment of the CCFM indicators. This again shows a complete misunderstanding of the GPI, the point of which is to demonstrate the linkages among social, economic and environmental values. It is precisely the narrow separation of economic from other values that the GPI challenges. Yes, the GPI report does explicitly point to these linkages, because the world does not operate according to Dr. Gunn's little boxes (*either* economic *or* non-economic). The recognition of these social-economic-environmental linkages elucidates a complexity that Dr. Gunn's single-issue ordering cannot handle, but it is no "sloppier" than the multi-faceted reality of the world itself.

Dr. Gunn complains that *"in the process of reporting on the [CCFM] indicators, there is a tendency to interpret the indicators while reporting on them"* (page 2.) Of course! Unless something is either "meaningless" or holy dogma, then interpretation is an essential part of academic and scientific analysis. The important issue in scientific inquiry is to make the interpretation explicit, transparent, and relevant to the data, which the GPI report attempts to do. If something has meaning, as the CCFM indicators most certainly do, then they are subject to interpretation and discussion. Dr. Gunn seems far more interested in the form of the indicators than in their meaning, and so would discourage interpretation.

One of Dr. Gunn's most persistent and mistaken claims is that the Nova Forest Alliance criteria and indicators process is based on "stakeholder consensus" and "a great deal of consultation," while "GPI have taken it upon themselves to create yet another indicator framework with no consultation with anyone" (page 7.) In *The Daily News,* in the anti-GPI attack on his website, and in his public correspondence, Dr. Gunn claims that the Nova Forest Alliance, which he chairs, represents a broad consensus of university, industry, environmental, government, tourist, and woodlot owner interests. Therefore, he asserts, the NFA indicator process has validity, while the GPI use of the CCFM indicators does not.

GPI Atlantic challenges Dr. Gunn to demonstrate, indicator by indicator, that the NFA interpretation is correct and reflective of stakeholder consensus, while the GPI interpretation is not. For example, how should age structure changes be "correctly" interpreted to reflect "stakeholder consensus" (Gunn page 7)? GPI Atlantic would be willing to bet that the vast majority of Nova Scotians (all of whom are "stakeholders" in Nova Scotia's forests) do not regard the loss of old forests as a positive sign of healthy forests and sustainable forest management. If he disagrees, what is Dr. Gunn's view of the "correct" interpretation of the trend in age class structure that does reflect the NFA stakeholder consensus? If he is uncertain, we could test it out in a public opinion poll.

Dr. Gunn's repeated claim to representativeness and consensus has now been exposed as a sham. The Nova Scotia Woodlot Owners and Operators Association has suspended participation in the NFA, as have environmental groups, in protest against Dr. Gunn's bias and prejudice, and to make clear that he does not speak for or represent them. Some

have called for his resignation. Two NFA participants informed GPI Atlantic that they had stopped taking part in the NFA criteria and indicators process some time ago because their views were ignored. By contrast, many of the groups Dr. Gunn claims to represent in the NFA have expressed their strong support for the GPI report. In short, Dr. Gunn's claim is hollow, and appears to represent his own wishful thinking rather than reality.

Here are just a few examples. This letter was sent by the Nova Scotia Woodlot Owners and Operators Association to the Nova Forest Alliance and distributed to all NFA partners:

> *"The Nova Scotia Woodlot Owners and Operators Association has supported, and continues to support, the work of the Genuine Progress Index - Atlantic, including the recently released Forest Accounts for Nova Scotia. We were deeply upset by the article which appeared in the Halifax Daily News this week, which failed to disassociate Eldon Gunn's opinion of the GPI Report from the Nova Forest Alliance. Eldon is well known as our Chair. He was derelict in failing to ensure that the reporter identified his ideas as his, and his alone, and in particular, that they did not represent the position of the NFA. The potential for misrepresentation should have been obvious to anyone who has previously dealt with the media, as Eldon most certainly has. It is difficult to accept that an innocent mistake was made. The "clarification" of Friday, Dec.14, only added insult to injury.*
>
> *"The Executive of the Nova Scotia Woodlot Owners and Operators Association has decided to suspend, immediately, the participation of the NSWOOA in the Nova Forest Alliance until further notice. We ask that you immediately forward this message to all partners of the NFA."*
>
> Tom Miller, President
> NSWOOA

Here is a statement from Judith Cabrita, Managing Director, Tourism Industry Association of Nova Scotia (TIANS), Halifax, on Wednesday, November 14, 2001:

> *"The Tourism Industry Association of Nova Scotia welcomes the release of he GPI Forest Accounts for Nova Scotia, and we hope it produces positive action to protect a natural resource of vital importance to our industry.*
>
> *"TIANS particularly welcomes the explicit recognition in the Genuine Progress Index that forests have important recreational and tourism values as well as timber values, and that standing forests (as well as cut ones) make a vital contribution to our economic wellbeing and prosperity.*
>
> *"The first paragraph of Volume 1 of the GPI Forest Accounts clearly expresses the concern of the Tourism Industry in that forestry practices of clearcutting and*

poor forest management undermine "the provinces ecological social and economic fabric" "depriving future generations of their natural inheritance."

"TIANS has great concerns regarding the preservation and protection of our natural resources. Visitors come to this province largely because of its extraordinary natural beauty. Tourism is a resource-based industry that depends entirely on the health of our natural resources. Protecting our forested landscapes, including old trees, habitat for wildlife, and a diversity of species, is vital for the continued strength of the tourism industry in this province and for its growing contribution to our provincial economy and employment.

"We firmly believe the Nova Scotia government should establish best practices on crown lands and ensure all stakeholders are at the table in any further forestry related developments on public lands particularly coastal and forest.

"The GPI report reveals the need to immediately take action to ensure the sustainable and prosperous future of the resource and those industries which are directly dependent on it."

Similar statements of endorsement have come from environmental groups, woodlot owners, and other representatives of the university community and tourism industry, the very groups that Dr. Gunn claims are part of the NFA "consensus." Rather than making false claims to represent a consensus that never existed, Dr. Gunn would be well-advised to look more closely at the taxpayer-supported NFA process to ascertain whom it really represents. Without having checked his facts, Dr. Gunn simply asserts that the GPI process is unrepresentative and lacking in consultation. In fact, he will find the reverse.

From the GPI perspective *all* Nova Scotians, and their children and grandchildren are "stakeholders" in the wellbeing of Nova Scotia's forests. If the NFA's own survey results are correct, then 91% of Nova Scotians believe the present rate of timber harvest is too high to sustain the forest for other values or uses. A majority believes that clearcutting should not be used as a harvest method in central Nova Scotia because it harms wildlife, ruins forests, causes erosion, looks bad, and wastes wood. If Dr. Gunn looks carefully, he will find the GPI report far more representative of most Nova Scotians' views than the process he touts.

4) GPI as an Accounting Framework (Gunn Pages 7-8)

As in #2 above (Dr. Gunn's comments on the Genuine Progress Index), Dr. Gunn's comments on GPI as an accounting framework also demonstrate a complete misunderstanding of the GPI. Dr. Gunn states that:

1) the GPI Forest Accounts focus on standing forest volume,
2) this is assessed by increases and decreases in volume,
3) "GPI fails to look at…standing forest volume since the budworm crisis," and

4) there is “no attempt at a reconciliation” between stocks and flows.

All four statements are wrong. For a start, Dr. Gunn is applying conventional accounting mechanisms based on quantity alone to what he thinks (or rather claims to know with certainty) that the GPI is doing. He is ignoring the fact that the GPI measures the value of stocks in terms of *quality* as well as quantity. *Therefore,* the GPI Forest Accounts include age and species composition, as well as other qualitative considerations, in the assessment of stock value. In fact, that is the whole point of the GPI, which Dr. Gunn seems to have missed. As with many issues raised by Dr. Gunn that have nothing to do with what the GPI Forest Accounts say, these appear to be straw men set up to be knocked down.

The following explanation appears at the very start of the GPI Forest Accounts, and it is repeated in various forms throughout the report. It is remarkable that Dr. Gunn missed it:

> *“In short, because GDP statistics make no qualitative distinctions, they do not reveal whether expenditures signify an improvement in well-being or a decline. Standard economic growth measures are simply incapable of sending any signal about actual forest and natural resource health, and of distinguishing gains from losses. Indeed, resource yield statistics, though conventionally used to signal forestry industry health, may well signify the precise opposite.*
>
> *“This flaw is replicated in the conventional resource accounting practices themselves, adopted by departments of natural resources throughout the country. Because they also use quantitative assessments alone to measure the "sustainability" of current harvest practices, they can be as misleading as the misuse of the GDP as a measure of progress. So long as timber "regeneration" (natural growth plus silviculture) equals or exceeds "depletions" due to harvest, fire, insects, and disease, forest practices are conventionally labelled "sustainable." This is why industries that practice extensive silviculture advertise themselves as "sustainable forest companies."*
>
> *“From the perspective of the Genuine Progress Index, this can be a serious misdiagnosis, because the health and depletion of our natural resources cannot be measured in quantitative terms alone. A multi-aged, multi-species old-growth forest can be replaced by a single-aged, single-species plantation, and the qualitative loss will never appear in the conventional resource accounts. The costs of habitat and wildlife loss, of the loss of old-growth or mature forests and natural species diversity, of soil erosion and degraded watersheds, of the loss of carbon sequestration capacity, -- these costs do not show up anywhere in our current resource and economic accounting systems, nor in the measures of well-being and progress based on them.*
>
> *“But the value of natural capital, just like the value of the manufactured capital that is counted in the conventional market statistics, clearly depends on its quality*

> *as well as its quantity, and the costs of its depreciation must be assessed on both quantitative and qualitative grounds. As the World Commission on Forests and Sustainable Development recognized (see frontispiece above), we currently have no adequate measure of forest health, and we urgently need "a measure for the changing value of the forest capital of the world." Without such a measure, forest decline will remain absent from the policy arena, and incentives for potential restorative action will never make it onto the policy agenda.*
>
> *"By accounting for a more complete range of forest values, including qualitative non-timber ecological values, this set of forest accounts is intended to help remedy that serious flaw and to contribute to the World Commission's objective of creating a genuine measure of forest health. The Nova Scotia GPI[2] is by no means the first attempt to do so, but simply applies in a practical, policy-relevant way, the ongoing work in this area by the World Resources Institute and other pioneers in natural resource accounting, and the criteria and indicators already adopted by the Canadian Council of Forest Ministers and the Montreal Process[3]*" (volume 1, pages xxiv-xxv.)

For Dr. Gunn to impute his own narrow, quantitative definition of stocks to the GPI is ridiculous. It is precisely that definition, and the flawed accounting system based on it, that bear some responsibility for leaving our forests in such poor shape. As noted, old-growth forests can be replaced by young single-species plantations, without the difference showing up in the conventional statistics on which Dr. Gunn relies. What the GPI Forest Accounts focus on (contrary to what Dr. Gunn asserts) is the full range of forest stock values, including age and species structure, and the capacity of these standing stocks to protect soils, habitat, and watersheds, to sequester carbon, and to provide high quality timber, recreation and other social and economic values.

Thus, it is simply not true, as Dr. Gunn claims, that "GPI fails to look at…standing forest volume." Pages 47-52, and figures 10, 11, 12, and 13 in the report all look at changes in standing forest volume from 1958 to 1995, but they provide the analysis and examine the volume changes according to species. It is not just the number of trees and the volume of timber that are important in stock assessments or that create value, but rather the changing structure, composition and quality of the forest.

Again, Dr. Gunn's remark that the GPI Forest Accounts make "no attempt at reconciliation" of stocks and flows indicates either that he did not read the report, or that he is wilfully ignoring evidence presented. With no understanding of the GPI method or approach, Dr. Gunn instead prefers to lecture GPI Atlantic on what "accounting is."

---

[2] See Appendix B of the GPI Forest Accounts for a list of the GPI components, and Appendix C for more details on the Nova Scotia GPI.

[3] See volume 1, chapter 1, of the GPI Forest Accounts. The "Montreal Process" refers to the criteria and indicators endorsed in February, 1995, by 10 countries, representing 90% of the world's temperate and boreal forests, as members of the international Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests.

Clearly, Dr. Gunn will not allow actual facts or evidence to stand in the way of his attempt to discredit the GPI report. First of all, although Chapter 7 deals primarily with stocks, and Chapter 8, pages 56-72, deals with flows, the entire GPI Forest Accounts evaluate how flow characteristics (such as harvest volumes *and* harvest methods) impact standing stock values. For example, every analysis of the impact of clearcutting on standing forest values is part of the reconciliation of stocks and flows.

But even using his narrow quantitative definitions, Dr. Gunn will find plenty of evidence on the impact of flow characteristics on stock values. For example, pages 65-67 of volume 1, chapter 8, (and figure 15 and table 8 in particular), examine the growing gap between harvest and clearcut levels on the one hand, and silviculture activities on the other, a gap that threatens to deplete standing stock volumes. The evidence indicates that silviculture (including planting of seedlings) sharply lagged harvest levels in the 1990s. In 1996, for example, only 12.5 million seedlings were planted at a time when clearcut levels were rising sharply, while in 1988 more than 31 million seedlings were planted. This is precisely the issue which the NSDNR's new Forest Sustainability Regulations attempt to address.

5) **Data sources** (Gunn, pages 8-9).

Dr. Gunn criticizes the data taken from the NS Department of Natural Resources' own forest inventories. "The numbers must be wrong," he asserts, even though he and the NSDNR use these same numbers in their own wood supply models and projections. Dr. Gunn should address his complaints about forest inventory data discrepancies to the NSDNR, not to GPI Atlantic. Indeed, if he just looks, he will find detailed explanations in the GPI report of efforts by GPI Atlantic researchers to reconcile these discrepancies and to question DNR staff about them.

For example, one of Dr. Gunn's more gratuitous accusations is that GPI Atlantic was advised to use permanent sample plot (PSP) data rather than forest inventory data to assess changes in ages and species structure, but "chose to ignore this advice." Ignoring the detailed GPI Atlantic explanation for using NSDNR forest inventory data, Dr. Gunn goes on to assert confidently that "the PSP data is clearly the most reliable for these purposes." He takes no issue at all with the GPI Atlantic explanations explicitly given in the text on the unreliability of the PSP data for provincial assessments, but goes on to assert (without any evidence) that the GPI choice "is not supportable." Without challenging the GPI explanations, Dr. Gunn again delivers a lecture to GPI Atlantic that it "should either take the time to understand the issues and get a valid measure, or just report that they were unable to get accurate data."

These statements again indicate either that Dr. Gunn has not read the GPI report, or that he is wilfully ignoring what he did read in his effort to discredit the report. In either case, the accusation is utterly irresponsible. The very section that Dr. Gunn purports to cite (footnotes 43 and 44) refers the reader to section 6.3 in the text. There in a 2-page section

(6.3.1, pages 22-24), clearly titled "A note on conflicting sources for recent volume, age, and species data," GPI Atlantic compares the historical forest inventory data and PSP data in detail by age class, and concludes "that the PSP numbers are likely highly exaggerated." This section also demonstrates that the "the PSP data are contradicted by simple logic: Given the trends in the 80-100 year old age class, it is physically impossible for the over 100 age class suddenly to be five times greater than it was 20 years ago, as the PSP data imply." Page 24 of volume 1 in the GPI report notes:

> *"However, the substantial conflict with historical trends …indicates that PSP data may not be appropriate for estimating province-wide age class distribution. Nor does it currently appear possible to use the PSP data to assess trends over time. In the absence of a reconciliation of the conflicting evidence, or at least a credible explanation of the data disparities, there remain serious doubts on the utility of the PSP data as a reliable source of province-wide volume, age and species projections.*
>
> *"Given the remarkable consistency of the historical inventory data in demonstrating age class trends in sharp contradiction to the current PSP data, it appears much more likely, from the evidence presented above, that the permanent sampling plots are not being cut at the same rate as their adjoining lands. GPI Atlantic strongly recommends that field tests be undertaken by an independent assessor to compare stocking levels, age and species distribution, and harvest dates on permanent sampling plots in relation to nearby lands."*

Though Dr. Gunn does not take issue with the GPI Atlantic explanation, he has no problem simply asserting that "the PSP data is clearly the most reliable for these purposes." While he accuses GPI Atlantic of "uncritical use of data," it is actually Dr. Gunn's blanket acceptance of the reliability of the PSP data, and his failure to examine and reconcile conflicting data sources, that is "uncritical." On several occasions GPI Atlantic researchers asked NSDNR staff whether there was any evidence at all to demonstrate that these "permanent" sample plots were being cut at the same rate as adjoining lands. NSDNR staff was unable to provide any evidence of this. If the plots are not being cut at the same rate, then it is no wonder that higher proportions of older trees are being reported.

In any case, GPI Atlantic is more than willing to be corrected here. We suggest that actual field tests be undertaken to compare stocking levels, harvest dates, and age and species distribution on PSPs and adjoining lands. One would expect that any scientist would welcome evidence that can help reconcile the conflicting data sources. But to state that we have not taken the time to look into this issue, as Dr. Gunn says, is simply dead wrong. It is Dr. Gunn who has either not taken the time to read what the GPI report says, or else has ignored what he read. How odd that he characterizes the GPI reporting of NSDNR forest inventory data as "hardly a responsible approach." In more than 20 years of university teaching and academic service, I do not believe I have ever seen a more irresponsible hatchet job than that of Dr. Gunn in relation to these Forest Accounts.

In any case, the issue is: Where does the responsibility lie for mistakes in the NSDNR's forest inventories, and where does the responsibility lie for providing explanations reconciling conflicting data? On many occasions, GPI Atlantic researchers pointed out these discrepancies to DNR staff and requested explanations. DNR staff suggested that perhaps changes in forest inventory measurement methodologies might be responsible for the discrepancies. In response, GPI Atlantic has recommended that DNR provide a reconciliation of the numbers based on its own assessment of the impact of these methodological changes.

It is particularly important for the NSDNR to reconcile discrepancies in its inventories, since the Department relies on these figures for its own stock assessments, wood supply projections for the province as a whole, and annual allowable cut estimates on Crown land. Dr. Gunn himself uses the forest inventory figures in the Strategic Analysis of Wood Supply (SAWS) model. Both he and the Department would therefore seem to have a vested interest in numbers that are accurate. If we cannot rely on the accuracy of the NS Department of Natural Resources' own forest inventory data, then Nova Scotia may be in much bigger trouble than previously thought. If we do not have an accurate accounting of what we have in the forest, wood supply projections could be highly unreliable, and we could be seriously overcutting without even knowing it.

These observations occur in the GPI report itself. Footnote 46 on page 51 of volume 1, for example, notes:

> *"Despite the fact that these numbers come from the NSDNR's own inventories, some DNR staff question their accuracy, and attribute the change to new inventory methodologies rather than to actual declines (T. Duke 2001.) However, these publicly available inventory data are used by the NSDNR itself to determine the potential wood supply for the province and the annual allowable cut on Crown lands, assessments that should certainly account for changes in species composition. GPI Atlantic therefore urges the department to reconcile inventory data that it considers misleading with other evidence at its disposal, and to publish explanations for these discrepancies. In the meantime, GPI Atlantic has to rely on the NSDNR forest inventory data for its results in this section."*

If Dr. Gunn genuinely shares our own concern on data accuracy, he should perhaps make the same request to NSDNR for reconciliation of data incongruencies . He may be more successful in extracting an explanation than we have been.

In the meantime, it is noteworthy that *all* GPI data sources are meticulously footnoted and referenced, and the methodologies are transparent and explained. Every fact and figure can be checked by independent researchers, and data sources can be easily referenced whenever there are data inconsistencies or incongruencies. For ease of reference, the GPI Forest Accounts include a separate section on "Data Sources" (6.3, pages 21-22), listing the 11 principle official, federal and provincial government sources

used to construct most of the tables and charts in the report. As well, bibliographies list the 364 sources used throughout the report.

If the accuracy of data is an issue for Dr. Gunn, he will find the GPI report a great help in identifying those instances that require reconciliation, and he will find the correct addresses for his inquiries. In complaining to GPI Atlantic about the inaccuracy of government data, he is knocking at the wrong door. If he truly wants to get at the truth, as we do, he knows where to go. It will be interesting to watch the degree of pressure Dr. Gunn puts on the NSDNR in the coming months to get the numbers right. Or is he merely interested in discrediting the GPI?

In the meantime, the GPI report faithfully cites the NSDNR's own explanations on changes in inventory techniques (see, for example, volume 1, page 49). Independent researchers are still, in the end, dependent on the forest inventory data provided by government agencies.

In some cases, the problem may actually have less to do with the numbers being wrong than with Dr. Gunn's own narrow interpretation of them. In fact, GPI Atlantic is by no means convinced that the overall trends indicated by six successive forest inventories are wrong, and, in the absence of other data and explanations, it accepts the inventory figures as fundamentally indicative of reality. Indeed, the consistent and steady trend of old forest decline appears through *all six forest inventories*, making it highly unlikely that changes in particular inventory methods could account for the dramatic shift to younger forests. A change in inventory technique might account for a one-time anomaly in one or more categories, but it cannot account for the long-term patterns of decline that are consistent and ongoing in all inventories.

Dr. Gunn, however, does question the inventory figures, and so it is worth considering whether the problem might have more to do with his analysis than with the statistics themselves. Looking at the figures for loss of older forests, Dr. Gunn questions the official NS Department of Natural Resource forest inventory figures: "How could these numbers possibly make sense?" He argues that Nova Scotia would have had to average more than 63,000 ha of clearcutting every year since 1958 in order for the NSDNR forest inventory figures to be correct, whereas the area clearcut grew from 35,000 ha to 69,000 ha only between 1992 and 1997.

But there is something important missing in Dr. Gunn's analysis. His reason for assuming that the official figures do not make sense is based on an assumption that clearcutting is the only possible cause of old forest loss. While the GPI report is cautious in assigning causes, it does note in several places that the loss of old forests is likely related to more than 200 years of land-clearing, high-grading, *and* clearcutting, thus specifying clearcutting as only one among several causes.

In recent years, clearcutting does appear to be a key factor in old forest loss, with the area clearcut matching the average figures noted by Dr. Gunn. But because data are not

available to do so, GPI Atlantic has not assigned proportional responsibilities for loss of old forests by cause. However, Dr. Gunn's assumption that the clearcut statistics disprove the forest inventory age class statistics is based on a flawed and partial analysis that ignores other possible causes.

5a) "Uncritical" acceptance of data – a double standard

It is noteworthy that government and industry sources regularly cite (without criticism or analysis) a report produced by the Atlantic Provinces Economic Council (APEC), and commissioned by the Forest Products Association of Nova Scotia, although no references or sources are given for any of the statistics provided. Through careful analysis of a wide range of forest industry employment statistics, GPI Atlantic researchers discovered that 3,363 jobs were double-counted in the APEC report, once in the direct employment statistics and again in the indirect employment statistics.

The GPI discovery has been acknowledged as correct by APEC researchers, but no public correction has yet been made, and government and industry spokesmen continue unwittingly and uncritically to cite the report and exaggerate forest industry employment. As recently as 9 January, 2002, the president of the Forest Products Association of Nova Scotia wrote that the industry "provides up to 23,000 direct and indirect jobs to Nova Scotians," a number now acknowledged even by APEC to be wrong and a considerable exaggeration. Errors in the employment numbers also call into question numerous other calculations made in the APEC report that were derived using direct and indirect employment figures. Although these data discrepancies are noted in the GPI report, Dr. Gunn makes no reference to misuse of data by industry and government sources.

6) Causes of age structure changes – spruce budworm as the culprit?

In general, GPI Atlantic researchers have been very conservative in their analysis of causes. Where ready-made explanations are not apparent, the GPI Forest Accounts provide data on trends and changes in descriptive form, based on government sources, as a resource for analytical researchers who may delve further into the causes. Dr. Gunn interprets this conservatism as "uncritical use of data…without thinking why" trends have occurred. (Note that earlier, he criticized GPI Atlantic for providing interpretations!) It is not that GPI Atlantic researchers have not considered the "why" questions, but that they have been careful in not jumping to conclusions unless they have reliable data and a firm basis from which to understand causes. This is more responsible science than Dr. Gunn's approach of being absolutely sure of "the real answer" for the decline.

Dr. Gunn is quite sure he knows the reason for the dramatic loss of old forests in Nova Scotia, and for the increasingly young age structure of the province's forests. "The real answer," he asserts," is that the age class shift has little to do with cutting, let alone clearcutting. The major shift in age class distribution comes from the spruce budworm attacks in the 1970s" (page 8). By not spraying, he says, Nova Scotia allowed the

budworm to eat a lot of trees that could have been kept alive through spraying. He concludes: "The resulting young forest has nothing to do with overcutting. Nova Scotia, with the help of the budworm, planned to create this age class distribution and was successful in doing so!"

Although he is absolutely sure of himself here, a more careful examination reveals both his analysis and his conclusions to be wrong:

1) As pages 29-34 (and figures 1 through 7) of volume 1, chapter 7 of the GPI report clearly show, the decline of older forests began long before the spruce budworm infestation and has continued since that time. In fact, in the last 40 years, the biggest drops in the 81-100 age class, and in the over 100 age class occurred between 1958 and the early 1970s, *prior* to the budworm attack.

   The percentage of forest area over 100 years old shows a decline from nearly 9% of the total in the 1958 forest inventory to less than 2% in the 1965-71 inventory. *Since* the 1979-89 inventory (the inventory that would reflect any budworm-caused decline), the proportion of provincial forest area over 100 years old has fallen further, to 0.15% of the total in the latest (1995) inventory.

   The same trend is true in the over 80 age class (including both 81-100 year old trees and 101+ trees). In the 1958 inventory, forests over 80 years old occupied 25% of the total provincial forest area. In the 1965-71 inventory they represented less than 12% of the total, a decline of more than 50% *prior* to the budworm attack. *Since* the 1979-89 inventory, the over-80 age classes have declined from 4% of the total area to just 1% in the most recent inventory.

   In fact, the decline in the older age classes is steady and consistent through all six forest inventories from 1958 to 1995, whereas the budworm attack would have caused a sharp one-time decline. Dr. Gunn is very sure of himself in asserting that the budworm is responsible for the loss of Nova Scotia's old forests, and he is equally sure of himself in asserting that overcutting and clearcutting have nothing to do with the decline. Had he studied the NSDNR inventory data, read pages 29-34 of the GPI forest report, and studied figures 1-7 on pages 30-33, he would not make such sweeping and unsupported claims.

2) Dr. Gunn cites budworm devastation in Cape Breton and in Cumberland County in the 1970s. However, that is not all of Nova Scotia, and the GPI report presents inventory figures for the province as a whole. The budworm was less devastating in other parts of the province, which also experienced a decline in older forests.

3) Despite his sweeping assertions that the budworm is responsible for the age class decline (both in his paper and in his comments to *The Daily News),* Dr. Gunn provides one sentence that indicates that he knows better. He writes: "The continued existence of the industry required the additional harvesting of trees in the mainland to

replace those lost to the budworm further reducing the average age of the forest." So excess cutting and industry economics *do* seem to have played a role in the decline of the province's older forests. This awareness does not temper Dr. Gunn's assertion that "the resulting young forest has nothing to do with overcutting."

4) Dr. Gunn is also wrong in his analysis of the budworm infestation itself. *The Daily News* cites Dr. Gunn as stating that the destruction of millions of hectares of forest was due to the province's decision not to use insecticides. In his subsequent letter to that newspaper, Dr. Gunn did not correct or retract this statement, so one assumes he considers it correct. In fact, the budworm infestation in Nova Scotia was more short-lived than in New Brunswick, which *did* spray insecticides.

   Dr. Gunn cannot demonstrate empirically that *not* spraying caused greater destruction, or resulted in the loss of more old trees than spraying would have done. On the contrary, the available evidence indicates that the reverse is more likely true. Dr. Gunn attacks GPI Atlantic's "uncritical use of data…without thinking why or how [the age class shift] could possibly be true," and he claims to know the cause of the shift himself with great certainty. In fact, his failure to examine and compare empirically the actual effects of spraying and not spraying is not only 'uncritical," but well-nigh incomprehensible, since these data are well documented and well known.

5) Perhaps the greatest flaw in Dr. Gunn's analysis is his failure to see that harvest methods and budworm devastation are not separate and unrelated causes, as he repeatedly asserts, but intimately connected. In fact, historical records dating back to the 1800s indicate clearly that spruce budworm outbreaks have long been a natural part of the forest disturbance cycle in the Maritimes, and an integral part of natural forest successional processes. However budworm attacks in the 1800s and early 1900s appear to have been much shorter in duration and to have produced far lower rates of defoliation and loss than the most recent outbreak of the 1970s and early 1980s. The comparative intensity of that recent infestation may well have been caused by past cutting practices, related to declines in old-growth forest characteristics and natural species diversity, including bird populations. This is described in section 8.1.2 (especially page 72) of the GPI Forest Accounts (volume 1), another section Dr. Gunn appears not to have read.

   In other words, the long-term degradation of Nova Scotia's forests, including the loss of natural age and species diversity and changes in forest structure, has likely reduced the resilience of the province's forests and their capacity to withstand insect infestations. Dr. Gunn's failure to see the connections between harvesting practices and susceptibility to spruce budworm and other insect and disease infestations, is indicative of his failure to appreciate the complexities of cause and effect relationships.

6) It is noteworthy that historical budworm infestations did not permanently alter the age structure of the province's forests, but were accommodated within the natural forest

succession cycle. Rather, the long-term and seemingly permanent loss of natural age structure appears much more likely to have been the result of more than 200 years of land-clearing, high-grading, and (most recently) clearcutting. If budworm infestations are the primary cause of age structure shifts, as Dr. Gunn asserts, then there would be historical evidence to support his view. There is not. In fact, the natural age limits for common species in the Acadian forest are 200-400 years for pine, spruce, maple and oak and up to 800 years for eastern hemlock. (See GPI, volume 1, page 34, for natural age limits by species.) The ongoing reduction in Nova Scotia's forest age over more than two centuries cannot be attributed to the recurrent budworm outbreaks.

7) Another reason that Dr. Gunn's budworm theory is flawed is that neither balsam fir nor white spruce are particularly long-lived in Nova Scotia, so that age structure changes in those species during the budworm infestation could not possibly explain the sharp and steady decline of old forests throughout the province. As Dr. Gunn is well aware, balsam fir and white spruce are the most highly suitable nutrient sources for the spruce budworm. The vast majority of white spruce and balsam fir die within 100 years (often decades earlier), so the dramatic loss of the over-100 year age class on a province-wide basis cannot possibly be explained by the budworm infestation. While 'old growth' balsam fir may occur in boreal forests (even in the Highlands National Park for example), that is not the case for the rest of Nova Scotia. It is not enough for Dr. Gunn simply to assert (without evidence) that the spruce budworm is primarily responsible for the loss of old forests in Nova Scotia.

8) Finally, GPI Atlantic requests Dr. Gunn to provide evidence in the form of policy statements to support his assertion that Nova Scotia "planned to create this age class distribution and was successful in doing so" (Gunn, page 8). In *The Daily News,* Dr Gunn asserted that "we planned [today's forest] with an explicit decision. It was not bad management". GPI Atlantic researchers have not seen any document that indicates Nova Scotia deliberately planned a younger forest or has congratulated itself for achieving this policy goal, as Dr. Gunn indicates. This does not mean that such a document or policy statement does not exist. But we want to see the evidence, beyond Dr. Gunn's confident assertion that this is so.

   If Nova Scotia policy makers deliberately reduced the proportion of old forests with the aim of producing a younger forest, then we would challenge Dr. Gunn's assertion that this was "not bad management." We hope the province's policy makers would not have been so foolish. But we maintain an open mind on that question, and simply request to see the evidence.

7) Causes of beech decline

This is yet another example of Dr. Gunn misrepresenting the report. He notes that the GPI report "highlights the decline of tolerant hardwoods such as yellow birch, beech and oak with the clear implication that this is due to mismanagement." He points out, as if we

had no idea, that: "Beech has been just about eliminated by the beech bark disease" (Gunn, page 9.) In actual fact, the GPI report nowhere ascribes this beech decline to "mismanagement", but explicitly refers to beech bark disease as the primary cause of the decline.

The following statement appears in the executive summary of the GPI report, which Dr. Gunn claims to have read, (page vii), and again on page 50 of volume 1:

> *Beech bark disease, caused by the introduced beech scale insect and Nectria coccinea fungus, is responsible for much of the recent decline in beech volume throughout North America (Farrar, 1995; and Ontario Ministry of Natural Resources 1998).*

Dr. Gunn goes on to assert "there is no particular reason to believe in recent years that there is a decline in oak and birch populations." There may be "no particular reason to believe" in such a decline, but GPI Atlantic reports the official NS Department of Natural Resources forest inventory figures that *do* show a decline in shade-tolerant hardwoods (GPI, volume 1, Figure 13, page 51), regardless of Dr. Gunn's "beliefs" to the contrary. Here, as elsewhere, GPI Atlantic notes in the text:

> *"Since almost the entire change in beech and oak volumes is recorded as occurring in the last 10 years, it has been suggested that the reported decline may be an artefact of changes in inventory methodology"* (pages 50-51).

The GPI report further notes on page 51 that:

> *Despite the fact that these numbers come from the NSDNR's own inventories, some DNR staff question their accuracy, and attribute the change to new inventory methodologies rather than to actual declines (T. Duke 2001).*

In case Dr. Gunn missed these references, page 52 once again states in the text:

> *"For shade-tolerant hardwoods, the most dramatic changes in proportion have occurred in the last 10 years. As noted earlier, changes in provincial inventory systems and classification categories may be distorting the trends described here. Because natural species diversity is such a key indicator of forest health and productivity, there is clearly a necessity for better physical accounts of changes in species composition in order to track these trends more reliably."*

It is a distortion of the GPI report to omit any reference to all these statements and caveats, and simply to assert that the GPI report ascribes the decline to mismanagement.

In fact, it *is* likely that the increasing dominance of the softwood industry in Nova Scotia has a role to play in changes in natural species diversity in the province's forests. Does Dr. Gunn deny that there has been a long-term historical decline in the proportion of

shade-tolerant hardwoods? It is irresponsible for him to ignore GPI Atlantic's own analysis of the forest inventory numbers, and the possible explanations for the sharp declines noted.

8) **The need for historical perspective** (Gunn, page 9)

Dr. Gunn makes a philosophical pronouncement that reveals the differences between his own approach and that of the GPI quite clearly. Dr. Gunn notes GPI Atlantic's concern with the current lack of historical perspective in wood supply and harvest volume projections, and states:

> *"GPI claim that in order to establish sustainable levels of PWS [potential wood supply], it in not sufficient to know the current status of the forest and possible alternative futures. This is a strange claim. In life, no matter what path we took to our present position, we still are where we are and entitled to move forward. We can learn from the past but we don't have to be constrained by it"* (page 10.)

This is indeed an interesting philosophical issue. Given the shortness of human memory by contrast to the length of forest succession cycles, it is quite likely that most Nova Scotians regard the forests they observe today as "normal." Without historical perspective, there is no sense of loss, no recognition that today's "norm" in fact represents a severely degraded forest, and also no sense of potential – what Nova Scotia's forests *could* be like. Without historical perspective, the notion of "restoration forestry," as practised in the sustainable forest operations highlighted in volume 2 of the GPI reports, is meaningless. Without historical perspective, there is no meaningful vision of the future, and certainly no incentive to restore the value of the province's forests to what it once was.

That is a most convenient philosophy for industries whose main purpose is to cut the largest volume of timber in the shortest period of time, in order to feed the mills that supply the pulp and paper industry. The pulp and paper industry undoubtedly benefits from a social consensus that assumes our forests are only capable of producing small dimension, knotty wood of low quality, suitable only for pulp and paper.

By contrast, an awareness of the natural age limits of common Nova Scotia forest species gives some indication of the Acadian forest that once existed, and creates an aspiration for the future as well. Indeed, it is impossible to have a realistic sense of future options *without* this awareness. Instead, Dr. Gunn's future towards which we are "entitled to move forward," is a severely constrained future if it lacks historical perspective, and is based only on the false assumption that current conditions are "normal." Although Dr. Gunn argues that "we don't have to be constrained" by the past, a full awareness of past conditions actually removes future constraints, and allows us to move forward with a full understanding of possibilities, *including* forest restoration.

The dimensions of the change that has occurred in relation to the Acadian forest that once existed in Nova Scotia may be realized by comparing the natural age limits of common Maritime tree species with the age structure documented in the most recent forest inventory. Today, according to the NS Department of Natural Resources' own forest inventories, only 1% of Nova Scotia's forest area is still dominated by forests more than 80 years old, and only 0.15% of forest area by forests more than 100 years old. By comparison, we have come a very long way from a "natural" forest. Here are the natural age limits for common species in this region (GPI, volume 1, page 34):

White Ash	100-200	Red Oak	200-350
American Beech	300-400	Red Pine	200-250
White Birch	120-150	White Pine	200-450
Yellow Birch	150-250	Black Spruce	200-250
Red Maple	100-150	Red Spruce	250-400
Sugar Maple	300-400	White Spruce	150-200
Eastern Hemlock	300-800		

In GPI Atlantic's view, a clear historical perspective can also prevent the repetition of past mistakes. Yes, in this case, we fully accept Dr. Gunn's characterization of the GPI position – it is *not* sufficient to know the current status of the forest in order to establish sustainable levels of potential wood supply (PWS). The GPI approach recognizes that a clear awareness and relationship with past, present *and* future is far more responsible *and* more scientific than an approach lacking historical perspective.

9) NSDNR's Forest Sustainability Regulations

Concerning the relationship of sustainable harvest levels to future silviculture projections, Dr. Gunn asserts: "What GPI fail to recognize is that the recent Forest Sustainability Regulations does a great deal to guarantee this future silviculture" (page 10.) Once again, the only possible explanations for this remark are either that Dr. Gunn has not read the GPI report, or that he has ignored what he has read. In *many* places the GPI report acknowledges the role of the new Forest Sustainability Regulations in ensuring future silviculture. To cite just a few examples:

In volume 1, page 58, the GPI report states that: *"…the NSDNR has now introduced Forest Sustainability Regulations that require silviculture to be carried out based on actual volumes harvested from private lands."*

On page 61:

> *The NSDNR concludes from the latest model that present harvest levels are not sustainable for small private woodlots in accordance with the 1996 levels of silviculture inputs.*

> *The Department has therefore implemented new regulations that require wood buyers to carry out silviculture activities in order to earn credits. These new regulations should result in an increase in silviculture activity to at least double the 1996 levels. That in turn is intended to raise the sustainable harvest level to 7.65 million cubic metres for the province from all tenures, with a projected sustainable yield of 4.5 million cubic metres on small privately-owned land. Eventually, the Department projects, the annual cut will be double that in 1996. Under the scenario presented, the softwood net merchantable volume is projected to reach over 11 million cubic metres in 2070, up from approximately 5.5 million cubic metres in 1996 (NSDNR presentation pers. comm. 1999).*
>
> *According to Jorg Beyeler of the NSDNR, "the primary goal of the Regulations is to make the current harvest on small private woodlots for softwood sustainable by requiring enough silviculture to achieve that" (Beyeler 2001).*

On page 62:

> *It must be emphasized that GPI Atlantic does not argue here that its own assumptions and approach are necessarily at cross purposes with the NSDNR's new Forest Sustainability Regulations. On the contrary, the fact that these regulations support selection harvest management that was never previously eligible for support in previous silvicultural programs indicates a potential common ground that can incorporate the results of this study into NSDNR's own policy and planning processes.*

On pages 67-68, the GPI report notes that the Forest Sustainability Regulations *"will encourage higher levels of silviculture."*

And if Dr. Gunn missed all these, and many other, references, then he might at least have looked at the four-page section of chapter 10, volume 2, which is clearly titled "Silviculture Incentives," and which is dedicated entirely to a description of the new Forest Sustainability Regulations. That section includes significant praise for the regulations, including the following:

> *"[T]he most positive and important step in the new silviculture regulations is the fact that, for the first time, selection harvesting and uneven-aged management are actually recognized, acknowledged, and eligible for credits similar to those available for conventional methods. Most importantly, the actual size of credits for different treatments can change over time. The five-year review system therefore has excellent potential to turn the new credit system into a set of strong incentives for sustainable forest management and restoration, and a set of disincentives for those methods that have degraded the province's forests in the past"* (volume 2, page 209.)

It is difficult to believe that Dr. Gunn could have missed all these references if he had actually read the report.

10) Wood supply capabilities and the SAWS model

a) Dr. Gunn describes the Strategic Analysis of Wood Supply (SAWS) computer model, and notes that GPI Atlantic researchers "believe [the model] to be flawed" (page 10.) However he ignores the actual flaws described on page 60 of the GPI report, and does not respond to them. Among other problems is the lack of regard in current quantitative models for structural and qualitative changes in the forest.

b) Dr. Gunn notes that SAWS "takes the current forest as an initial condition" (page 10). As noted in point #9 above, that itself is a major flaw that excludes historical perspective, and gives no place to restoration forestry as an option in securing a reliable, long-term, high quality wood supply.

c) Dr. Gunn states that SAWS "recognizes that the age class distribution and stocking in the older forest is far from ideal" (page 10). Yet he does not specify what that "ideal" is, nor does he address how the wood supply model can help forest policy move the forest condition even slightly towards that "ideal."

d) Dr. Gunn writes "GPI are wrong in their claim that SAWS depends on clearcutting for its results" (page 10.) This is a false statement, and yet again attributes to GPI Atlantic remarks that are never made. Where in the GPI report does GPI Atlantic make this "claim"? In fact, it appears nowhere, and the assertion that it does is simply untrue.

   What the GPI report *does* say is that the SAWS model *"is not designed to calculate volumes under an uneven-aged system. Because 95% of all existing management is even-aged, NSDNR notes that it currently has to use existing data sources like the SAWS model for its analyses"* (page 60). This statement accords exactly with Dr. Gunn's own statement (page 10): "It is true that SAWS is based on even aged management." In short, what is Dr. Gunn's problem with the GPI description?

e) Dr. Gunn states that this even-aged management can be achieved in many different ways aside from clearcutting. Theoretically that is true. But the real question is *whether* it is achieved in other ways in Nova Scotia. The reality in this province is that almost all harvesting is by clearcutting.

f) Other points in Dr. Gunn's SAWS lecture (page 9-12) do not seem to be criticisms of the GPI report at all. In fact, many points he raises are dealt with directly in the GPI report. For example, the GPI report (page 59) cites Dr. Gunn's own arguments on the difficulty of developing good wood supply models for uneven-aged management systems.

g) On page 11 of his comments, Dr. Gunn again ignores what the GPI report actually says and sets up an artificial argument to be more easily knocked down. He writes: "GPI make the argument that the harvest should correspond to the mean annual increment (MAI) from the forest. This discussion of MAI is not correct" (page 11).

What the GPI report (page 67) *actually* says is:

> *"In multi-aged natural forests, the MAI would appear to be a much sounder basis for quantitative assessments of sustainable yield than the PWS, due to the former's consistency and reliability."*

This is not the same as what Dr. Gunn reports the GPI report as saying. Even more disingenuous is the reason Dr. Gunn gives that the GPI report "is not correct," which is that "very young, very old and poorly stocked forests will all have a low current MAI." Yet the above GPI statement is accompanied by the following two footnotes on page 67:

> *"The following definition of mean annual increment (MAI) is from the Ontario Ministry of Natural Resources' Silviculture Guide for the Great Lakes St. Lawrence Conifer Forest in Ontario: "The average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in a tree's life, being highest in the middle years and then slowly decreasing with age. The point at which the MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting" (Ontario Ministry of Natural Resources 1998a).*
>
> *"E. Gunn (2001) points out that the MAI is low in both old and very young forests, and that harvest levels should not therefore be expected to bear a relationship with the current MAI, because that is "a function of the current age class structure." However, the MAI can be calculated as the average yearly growth rate over the life of a stand of trees. Both Pictou Landing (Volume 2, Chapter 2) and the Haliburton Forest in Ontario (both FSC certified) rely on MAI to calculate sustainable yields."*

In other words, the GPI report deals specifically with the issues raised by Dr. Gunn, in one case citing comments made more than a month earlier by Dr. Gunn himself, and incorporated into the GPI report prior to its release. One assumes that Dr. Gunn was well aware of these notes in the GPI report itself at the time that he penned his comments, since he specifically asked GPI Atlantic not to cite him as chair of the Nova Forest Alliance.

Further, all Dr. Gunn's comments refer to the "current MAI," although the GPI report *never* recommends that the current MAI be used to gauge sustainable yields. Using either the peak MAI as defined by the Ontario Ministry of Natural Resources in

footnote 65, or the average MAI over the life of a stand of trees, as described in footnote 66, will yield very different results than the "current MAI." Dr. Gunn himself recognizes this difference when he writes that "harvesting to achieve maximum MAI is preferable to harvesting to maintain current MAI." But nowhere does the GPI suggest harvesting to maintain current MAI, so one wonders with whom Dr. Gunn is having his argument.

h) Dr. Gunn argues that "harvest levels should be part of an overall long term strategy." GPI Atlantic agrees completely with this statement, as Dr. Gunn would recognize by reading the GPI report itself, especially volume 2. It is absurd for him to imply that this is not the position of GPI Atlantic or the clearly expressed conclusion of the GPI report. The question is *which* strategy – a strategy that degrades the forest further, or a strategy that restores forest values?

i) Dr. Gunn writes (page 11): "Productive management of forests means making productive use of the capability of the forest to produce forest products. If the forest products of interest happen to be timber, harvesting to achieve maximum MAI is preferable to harvesting to maintain current MAI." In a subtle way, this statement reveals the fundamental difference between the GPI approach and Dr. Gunn's approach. From the GPI perspective, the "productive management of forests" means ensuring that the forest can perform all its multiple functions optimally, and provide its full range of social, economic and ecological products and services as effectively as possible. Timber harvesting, and harvest method decisions, are not isolated from that context, but should always be conducted and undertaken in such a way as to enhance the productivity of the forest across that full range of values, including soil protection, climate regulation, recreation, and so forth. Whatever "the forest products of interest happen to be," they are not separate from the full range of forest products and services.

j) Dr. Gunn says "the entire discussion in 8.1.1 is very confused," because "the authors contend that unless this indicator takes into account all the other indicators of the suite, it is invalid. This logic is circular and not helpful."

   Once again, as is his pattern, Dr. Gunn misquotes the GPI report, and imputes statements to it that are never made. Actually, the GPI authors never contend that this indicator (annual removal of wood products compared to the volume determined to be sustainable) is invalid unless it takes into account all the other indicators of the suite. Again, these are Dr. Gunn's words and his own straw dog. What the GPI report *actually* says (page 56) is this:

   > *"It should be noted that these quantitative volume data are not meaningful in isolation from the qualitative analysis presented in the previous chapter. For this reason, the assessment in this chapter follows the description of changes in the natural distribution and composition of age and natural species diversity, unlike*

most timber accounts to date that consider quantitative volume data in isolation from changes in species and age composition and other qualitative data."

What seems to confuse Dr. Gunn is the GPI approach, which always recognizes the connection between quantitative and qualitative factors. Thus, it makes no sense, from the GPI perspective, to discuss the quantity of wood removed from the forest in isolation from the age and species of the trees that are cut. So the GPI report points out straightforwardly that discussions on *volume* of wood removed should occur in the context of changes in forest structure. What is Dr. Gunn's problem here?

Further on, (page 64), the GPI report also criticizes wood supply models that essentially see complex forest ecosystems as simple timber input-output machines without considering other forest functions and services. On pages 64-65 of volume 1, the GPI report states:

"...[I]t is not enough for the potential wood supply (PWS) to be determined by quantitative criteria alone. If they are to provide a guideline for forest health and quality in Nova Scotia, and for sustainable forest use that will benefit future generations of Nova Scotians, annual cut estimations will have to include qualitative criteria. They will need to include specifications of forest type, cover, age, species, and condition that consider the range of forest values and indicators specified by the Canadian Council of Forest Ministers."

Perhaps it is the complexity of forest ecosystems itself that Dr. Gunn finds so confusing. He seems to prefer dealing with the simplistic input-output models of wood supply, and appears upset that this chapter takes a bigger view and does not conform to that conventional model.

If this attempt to discern the reasons for Dr. Gunn's confusion is wrong, Dr. Gunn himself does not help to identify the cause of his confusion. Section 8.1.1 is quite long (pages 56-68), and is divided into five separate sub-sections (a) through (e). Exactly what does Dr. Gunn find so confusing here? It is the sweeping generalization that the "*entire*" discussion in section 8.1.1 (all 13 pages?) is "very confused" that is not helpful.

It is his rejection of the "entire" discussion that leads the reader to believe that the source of his confusion is his lack of understanding of the GPI approach altogether, and his adherence to a narrow definition of sustainability dependent on harvest and planting rates alone. Any effort to define sustainability according to broader measures of forest health, including the capacity of the forest to perform all its functions optimally, will inevitably elucidate relationships between quantitative and qualitative factors in assessing forest values. If that complexity is confusing to Dr. Gunn, then GPI Atlantic can only answer that it reflects the nature and reality of what forests are and how they function.

k) Dr. Gunn says of the GPI report: "…why treat forest wood supply and the other benefits as exclusive? If they are economically competitive, then GPI should demonstrate this." Here is yet another straw dog, and Dr. Gunn once again dishonestly imputes statements to the GPI report that are not to be found anywhere. Not only does the GPI report never state that wood supply and other benefits are "exclusive" and "economically competitive," but it actually makes the *opposite* argument. In fact, the whole point of volume 2 of the GPI Forest Accounts is to profile harvest methods and wood supply systems that are highly compatible with other forest values, and that protect and enhance the full range of forest functions.

   Dr. Gunn has obviously misunderstood the argument on page 64 of volume 1, and (once again) ignored what the GPI report actually says. Citing two U.S. economic studies of standing forest values (Talberth and Moskowitz 1999, and Parlange 1999), the GPI report points out (page 64) that a standing forest may already be contributing economic and ecological benefits in excess of what could be realized through clearcutting that forest. This does not mean that logging and other forest values are exclusive, or that sustainable harvest methods cannot fully protect and even enhance standing forest values.

   Dr. Gunn has conveniently ignored the following paragraph on page 64 of volume 1, which *immediately* follows the section he accuses of touting exclusivity and competitiveness.

   > *"Just as the GPI does not deny the legitimate use of the GDP for the purpose that its architects intended, so nothing in the present analysis denies the importance of timber supply as an important function and value of forests. Volume 2 of these Forest Accounts explicitly examines tested methods of ensuring a sustainable timber supply within the context of the maintenance of a full range of forest functions. That analysis, based on actual working models of sustainable timber harvesting in Nova Scotia and elsewhere clearly demonstrates sustainable forest use in a more comprehensive sense of the term, according to CCFM criteria. It also shows how the maintenance of a wide range of forest ecosystem functions can actually enhance timber productivity and unit value."*

   Far from making an argument that wood supply and other forest values are "exclusive," the GPI report makes the opposite case, as any honest reader can see.

l) Dr Gunn writes (page 12): "…what sense does it make to use New York City numbers in Nova Scotia (try comparing land values in Manhattan to peninsular Halifax)?" As usual, Dr. Gunn misrepresents the GPI report, takes statements completely out of context, and imputes meanings that are not stated or intended. Nowhere does the GPI report apply New York City numbers to Nova Scotia or compare land values in Manhattan and Halifax. Even to imply that such a relationship is intended is absurd.

The GPI report cites a U.S. study that demonstrates that forested watersheds have economic value. No such economic study has been done in Nova Scotia (otherwise, rest assured GPI Atlantic would have used it!), so it is completely legitimate to use a U.S. study that shows such value exists. It is a complete misuse and misinterpretation of that example to imply that the dollar values can be transferred to Nova Scotia, and GPI Atlantic never says they can be. This is what the GPI report *actuall*y says (volume 1, page 64):

> *"Another study found that the forested watersheds upstream from New York City, if protected and maintained for forest ecosystem integrity, could save New York City $US9 billion over ten years in avoided water filtration costs, for savings of $21,718/ha over the first ten years (Parlange 1999). After accounting for purchase and restoration costs amounting to $4,826/ha, the net value of that standing forest was estimated at $17,000/ha over those ten years."*

To make the point completely clear, footnote 61 on page 64 then states explicitly:

> *"The example does not imply equivalent dollar values for Nova Scotia, but simply indicates that a standing forest may have considerable economic value providing a non-timber ecosystem service."*

For Dr. Gunn then to assert that we are using New York City numbers in Nova Scotia or implying an equivalence between Manhattan and Halifax land values, when the GPI report contains a specific statement to the contrary, is utterly deceitful.

m) The last paragraph of his wood supply comments is typical of the sweeping, pejorative, and unsupported generalizations that characterize Dr. Gunn's efforts to discredit the report. "The discussion is based more on emotion than analysis," he writes (page 12.) Where is the emotion? He cites no evidence to support this gratuitous accusation. In actual fact, the GPI discussion in this section is supported by extensive descriptions and analysis of annual allowable cut (AAC), potential wood supply (PWS), mean annual increment (MAI), and Strategic Analysis of Wood Supply (SAWS), along with detailed statistics on harvest and silviculture levels in Figures 14 and 15 and Table 8. As Dr. Gunn provides no evidence for his accusation, the objective reader will judge for himself or herself whether the discussion in chapter 8 is based on analysis or emotion.

n) Dr. Gunn's concluding statement contains three untruths in a single sentence: He writes (page 12): "No measures are presented of forest ecosystem health and productivity other than timber yield and no analysis is presented that suggests any basis to calculate timber yield other than GPI's flawed concept of current MAI."

   (i) We have already noted [(g) above] that the GPI report *never* talks of "current MAI." In fact, the opposite is true. The GPI report cites the Ontario Ministry

of Natural Resources definition of MAI, which notes that "the MAI changes with different growth phases in a tree's life."

(ii) Pages 63-65 and page 68 specifically suggest a basis to calculate timber yield, as does the whole of volume 2 of the GPI Forest Accounts. Here is one among many statements that Dr. Gunn has either not read or ignored:

"If they are to provide a guideline for forest health and quality in Nova Scotia, and for sustainable forest use that will benefit future generations of Nova Scotians, annual cut estimations will have to include qualitative criteria. They will need to include specifications of forest type, cover, age, species, and condition that consider the range of forest values and indicators specified by the Canadian Council of Forest Ministers" (pages 64-65).

Volume 2 of the GPI Forest Accounts is dedicated to providing detailed descriptions of actual working methods used to calculate sustainable timber yields in a wide range of different forest operations. (See for example volume 2, chapter 1, section 3, pages 23-26; chapter 2, section 3, pages 49-55; chapter 3, section 3, pages 80-89; chapter 4, section 2, pages 98-113; chapter 5, section 4, pages 138-149). All these descriptions suggest practical bases for calculating timber yield, as actually used in working forest operations.

(iii) The third untruth – that the GPI report presents no measures of forest ecosystem health and productivity other than timber yield – is a complete misrepresentation of the GPI report as a whole, as the *entire* GPI Forest Accounts (volumes 1 *and* 2) are dedicated to providing measures of forest ecosystem health and productivity that go beyond timber yield.

The particular section to which Dr. Gunn refers focuses on indicators of "disturbance and stress" and, in particular, on a key Montreal process indicator – "annual removal of wood products compared to the volume determined to be sustainable." Naturally, that indicator will focus on timber yield issues. But Dr. Gunn need only look beyond that particular indicator to find measures of soil quality, watershed protection, habitat provision, carbon sequestration capacity, and many other measures of ecosystem health and productivity. For example, chapter 9 is titled: "Conservation of Soil and Water Resources." Chapter 10 is titled: "Forest Ecosystem Contributions to Global Ecological Cycles." All of Part II of volume 1 (pages 25-94) is entitled "Nova Scotia Forest Ecosystem Values." To state, as Dr. Gunn does, that "no measures are presented of forest ecosystem health and productivity other than timber yield" is untrue and deceptive.

Instead of such sweeping and misleading generalizations, Dr. Gunn might have made a much more modest and constructive suggestion – to re-title chapter 8, a suggestion that GPI Atlantic would willingly embrace. The

current chapter title ("Maintenance and Enhancement of Forest Ecosystem Health and Productivity") goes beyond the indicators presented in chapter 8, and refers also to materials covered in chapters 7, 9 and 10. For example, the current title of section 8.1 ("Incidence of Disturbance and Stress") would probably be a more suitable title for chapter 8 as a whole. But Dr. Gunn is less interested in making constructive suggestions to improve the report (*many* such possibilities exist) than to disparage the report as a whole. To make a sweeping generalization that GPI Atlantic presents no measures of ecosystem health, when the very next chapters do precisely that, is misleading.

Finally, Dr. Gunn is fond of asserting that there is "no science" in the GPI report. He provides no evidence for this assertion. The objective reader will judge which is more scientific – Dr. Gunn's simplistic linear projections of wood supply as if these were independent of other forest functions, or the GPI approach, which recognizes the dependence of timber productivity on the full range of forest values, including soil quality, resilience, biodiversity, and changes in age and species structure. In the GPI perspective, true science is based on a recognition of the interdependent and interconnected nature of reality, and will seek out the linkages among the full range of forest functions. Readers of the GPI report will notice the numerous scientific and peer-reviewed articles, books, and theses cited in the report, supporting various statements, facts, and statistics.

11) The Case Studies (Gunn, pages 12-16)

Volume 2 of the GPI Forest Accounts presents six detailed case studies of "best practices," all of which can provide models for sustainable forestry in Nova Scotia. With astounding arrogance, Dr. Gunn dismisses these case studies out of hand, indicating that he and Nova Scotia have nothing to learn from these examples: "Good case studies must be persuasive examples of what is possible. These fail that test" (Gunn, page 12). It would benefit Nova Scotians more if the chair of the taxpayer-supported Nova Forest Alliance had a more open mind, willing to learn from outstanding working examples of sustainable forestry operations both within and outside the province.

The case studies may not fit the current mould of a forest industry that relies almost entirely on clearcutting, and they do examine production possibilities beyond the pulp and paper market that dominates the industry in Nova Scotia.

If Dr. Gunn defines what is "possible" according to the dominant current model, then he will certainly find no inspiration in the case studies presented in the GPI report. But the whole point of volume 2 is that we do *not* need to be locked into such a narrow perspective. In fact, all the case studies are working, operational examples of what is actually "possible," and all of them demonstrate the potential for diversifying current practices and industry opportunities, restoring forest values, and producing high quality wood for value-added manufacturing.

Indeed, two case studies (Pictou Landing, and Jeremy Frith) are highly typical and representative of the actual, current state of most Nova Scotia woodlots. If successful restoration forestry can be practised on those woodlots, then it can be practised anywhere in Nova Scotia. They are not simply atypical "niche operations" (in Dr. Gunn's dismissive phrase), but outstanding working models of best forest practices that can be emulated by other woodlot owners in the province.

It is even more absurd to dismiss the two large-scale case studies of industrial forestry in the GPI report as "niche operations." Indeed, the entire purpose of including them in the GPI report is to show that good forestry *can* be practised on a large scale that is relevant to the large industrial operations in Nova Scotia. The Menominees' 58 million board foot annual harvest (volume 2, chapter 4) and the Algonquin Park's 70 million board foot annual harvest (volume 2, chapter 5) are hardly "niche operations."

Interestingly, Dr. Gunn never refers to the actual principles and practices of sustainable forestry practised in these case studies, nor to the economics of restoration forestry which they are designed to illuminate.

No case study can or should be uncritically applied without regard to the particular land and forest conditions pertaining to a given area, nor is any single method workable in all circumstances. As Jim Drescher of Windhorse Farm points out, that is "one of the reasons mono-method industrial forestry is failing to protect biodiversity and the socio-economic fabric of our rural communities." Important aspects of each of these case studies *can* be adapted, with appropriate modifications, to many of the different circumstances and conditions that actually apply in Nova Scotia.

Although each of the six case studies is quite different, and range from small woodlots to very large operations, they do share common principles and ecoforestry approaches, along with a common appreciation of the full range of forest values. It is sad that Dr. Gunn fails to understand these principles. If he did, he would see that there is a tremendous amount for Nova Scotia woodlot owners and the forestry industry to learn from the six case studies. Anyone who reads volume two of the GPI Forest Accounts with an open mind will find many practices that can be very creatively and constructively applied in Nova Scotia to increase the value of the province's forestland.

After dismissing the case studies as irrelevant to the Nova Scotia forest industry, Dr. Gunn goes on to make "some very brief observations" about each one:

a) Windhorse Farm (Gunn, pages 12-13.)

(1) Dr. Gunn begins: "The numbers in this case example are hard to fathom. Sometimes the woodlot is 55 ha. (Part 1.1, page 4) and in other places it is 50 ha (Section 3.1, page 23.)"

Here are the two sections to which Dr. Gunn refers:

Volume 2, Section 1.1, page 4:

> *"Of the 60 ha. Windhorse Farm property, 36 ha. has never been cleared. Tall, old trees dominate 100% of that parcel. The remaining 24 ha. had historically been cleared for pastureland. Of that, 5 ha. remains today in crops, vegetable gardens, farmland, living quarters, and space for a sawmill and other facilities. The remaining 19 ha. of woodland is in active forest restoration, with trees over 80 years already dominating 71% of that previously cleared parcel."*

Volume 2, Section 3.1, page 23:

> *"On the 60 ha home woodlot, 5 hectares consist primarily of a house and gardens/pasture, and another 5 ha of recently abandoned pasture (1988) are occupied by young stands with no merchantable timber. Therefore, in total there are approximately 50 ha of operable forestland."*

What is so hard to fathom here? It is simple arithmetic. The Windhorse Farm property is 60 ha. Subtract 5 ha. for the house, gardens, farm. That leaves 55 ha. of woodland. Of these 55 ha., 5 ha. consist of young stands that are not merchantable, leaving 50 ha. of "operable" forestland, (with trees old enough to be harvested.) Of the 55 ha. of woodland, 36 ha. have never been cleared, and 19 ha. were previously cleared and are now under active restoration.

Another section (volume 2, pages 9-10), to which Dr. Gunn does not refer, provides the breakdown of the 55 ha. of woodlands by age class, and should thus clarify any remaining confusion in his mind.

> *Within the 60 ha "home" woodlot (of which 5 ha is gardens/pasture), the greatest proportion of the 55 ha woodlands (65% or 36 ha) is dominated by trees older than 101 years…. In the remaining 19 ha of woodlot at Windhorse Farm, 71% of the forest area is dominated by trees 81-100 years old; 20% is dominated by trees in the 41-60 age class; and 9% is dominated by trees 20 years and younger. In Figure 2, these age classes represent 25%, 7%, and 3% respectively of the total 55 ha wood lot…. [I]n the 0-20 year age class stand, the pasture was abandoned in l988. In the 41-60 year age class, the pasture/field was abandoned 45 years ago. And in the 81-100 year age class, pasture was abandoned more than 80 years ago."*

In other words, the 0-20 year age class represents the 5 ha. of non-merchantable timber in the recently abandoned pasture. There is no inconsistency in any of these statements, and it is unclear why Dr. Gunn finds these numbers so "hard to fathom." Again, it appears that Dr. Gunn is much more concerned to disparage and dismiss

both the case study and the GPI report as a whole than to attempt to understand one of the most important models of good forestry in the province today.

The Windhorse Farm example is important precisely because the outstanding condition and beauty of the woodlot, and the high quality wood it produces, show the potential of Nova Scotia's forests. The example punctures the myth that our current degraded forests are "normal," or that we should accept the current forest condition as our baseline. It shows what our forests might look like and what they might produce, had they been harvested and managed sustainably over 161 years like Windhorse Farm. As an example of what is "possible," Windhorse Farm provides important inspiration for restoration forestry practices that can begin to restore the full range of forest values.

(2) Dr. Gunn finds the current annual growth reported by Mr. Drescher at Windhorse Farm (100,000 board feet per year) to be "extraordinarily high," twice the average site capability in the province as a whole. If actual harvest estimates are used, the results would be almost identical to the average provincial site capability. The current harvest at Windhorse Farm is 30,000 board feet per year, down from 60,000 board feet per year in the 1990s, with the average annual harvest over the past 161 years estimated at 50,000 board feet per year.

Mr. Drescher, a forest manager for more than 30 years, ascribes the relatively high site capability at Windhorse Farm in part to the "intact forest conditions" prevailing there. This reported difference in site capability demands field research to ascertain the degree to which timber productivity and site capability could be enhanced by long-term sustainable harvest practices. The difference in site capability may be an important example of the lost value of Nova Scotia's forests described in volume 1 of the GPI Forest Accounts.

(3) Dr. Gunn challenges Mr. Drescher's estimates for the volume of timber that would have been harvested from the Windhorse Farm woodlot in four successive clearcuts. Dr. Gunn estimates a total of 9.2 million board feet based on average provincial site capability of 5 m^3 per hectare per year. Mr. Drescher estimates between 5.75 and 6.5 million board feet, because he takes into account possible nutrient depletion and other site degradation resulting from successive clearcuts. He also points to other unknowns, such as stocking estimates and bole size distribution, which could lower standard estimates based on quantitative site capability models. According to Mr. Drescher: "The main point is that the quality/value of the timber cut during the clearcutting sequence (except the first cut) would have been much lower than in the slow grading selection method that was used" (pers. comm. December, 2001.)

(4) On pages 12-13, Dr. Gunn states:

> *"On page 38, the Windhorse example is extrapolated to just 1/2 of the 2.6 million ha of Nova Scotia's operable forest. The claim is we would have 40,000 board*

*feet per ha with 3% harvested annually. This would give a total of (2.6*40000*.03/177) = 17.6 million m^3/year, about triple N.S. annual current harvest from 1/2 of the land base. To do this sustainably implies a site capability of 13.6 m^3/ha/year, about 270% higher than the NS average of 5 m^3/ha/year."*

Once again, Dr. Gunn has completely misread and misinterpreted what the GPI report actually says, and, as a result, has his numbers all wrong. The illustration is not applied to *half* of the 2.6 million ha. of operable forest but to *all* 2.6 million ha., as the GPI report clearly states. The "one-half" referred to in the GPI report concerns an assumption that one-half of the harvest fetches a premium price, as Windhorse Farm timber does. The "one-half" has nothing to do with the total harvest volume *or* the land base, as Dr. Gunn claims. So Dr. Gunn's statement that the projected harvest comes "from ½ of the land base" is simply wrong.

Therefore, all his next figures are also wrong. The harvest figures imply a site capability of 6.8 m^3/ha/year *not* 13.6 m^3/ha/year, as Dr. Gunn states. That implied site capability is 35% higher than the Nova Scotia average, *not* 270% as Dr. Gunn absurdly claims. A 35% higher site capability at Windhorse Farm is certainly possible, given the outstanding condition of the woodlot. Again, Dr. Gunn seems much more concerned to discredit the report with false numbers than to check his own calculations.

Beyond the wrong numbers, there is also a logical flaw in Dr. Gunn's presentation, because he implies that site capability estimates for Windhorse Farm and the province are comparable. It is absurd to think that Nova Scotia's current, degraded forest can match the per hectare productivity or harvest volume of Windhorse Farm, and the GPI report nowhere implies that this is so. On the contrary, the illustration is given to indicate the *potential* that Nova Scotia's forests might have if they had been harvested sustainably for 161 years, as Windhorse Farm has been. The illustration also indicates the potential productivity of Nova Scotia's forests in the distant future, if they are restored to the condition that Windhorse Farm is in today.

There is no logical way that *current* Nova Scotia harvests could compare on a per hectare basis with that of Windhorse Farm. Consider age-class distribution alone. Forests more than 100 years old dominate 65% of Windhorse Farm woodlands, compared to just 0.15% of Nova Scotia forests. Forests more than 80 years old dominate 90% of Windhorse Farm woodlands, compared to 1% of Nova Scotia forests. This enormous difference is reflected in very different rates of standing volume per hectare, which in turn yields very different harvest volumes. In sharp contrast to Dr. Gunn's expression of surprise, it is therefore not at all surprising that the actual harvest volume per hectare at Windhorse Farm is very much higher than the provincial average. In Mr. Drescher's own estimate, the Windhorse Farm woodlot has yielded far more timber in the last 161 years than would have been produced in successive clearcuts.

(5) Immediately following his wrong numbers, Dr. Gunn goes on as follows (page 13):

> *"Continuing with this extrapolation, translate the numbers of 7 people and 2 horses per 55 ha to this half of the operable forest of Nova Scotia, we would need 165,452 people and 47,272 horses. Where would we you* [sic] *find that number of skilled people or horses. The problem of finding skilled labor is one of the forces that have motivated the forest industry to mechanization. Finding trained horses and teamsters is likely to be even more of a problem."*

Here he is wilfully misrepresenting the GPI report, engaging in what he himself admits is a "cheap shot," and attributing his own absurd argument to GPI Atlantic. This is Dr. Gunn's own extrapolation and appears nowhere in the GPI report. Nowhere in the GPI report is there any indication that horse logging is appropriate in other parts of Nova Scotia, and the numbers Dr. Gunn gives are entirely the fruit of his own imagination.

Even Windhorse Farm harvesting is not dependent on horses, as Mr. Drescher himself comments:

> *"This forestry is not dependent on horses. Other extraction methods may work as well or better in other situations. We use horses here because, in our particular circumstances this is the most cost effective of the various low impact solutions"*
>
> (Jim Drescher, letter to Eldon Gunn, December, 2001)

None of the other case studies cited in volume 2 of the GPI Forest Accounts use horses for logging. Two of those case studies are large-scale industrial forestry operations. A wide range of sustainable harvest methods and techniques is described. None of them are dependent on horse logging, and there is no implication anywhere in the entire report that it should be applied uncritically on a large scale, as Dr. Gunn implies.

As for the employment extrapolation, Dr. Gunn ignores what the GPI report actually does say. On page 38 of volume 2, which Dr. Gunn purports to be quoting, the following statement appears:

> *"It should be noted that the 50% reduction in harvesting proposed by Dr. Freedman does not mean a 50% reduction in employment. On the contrary, because selection harvesting is far more labour intensive, Drescher suggests that a 50% reduction in harvesting, along with the adoption of selection methods on the remaining 50%, could more than double forest industry employment."*

In case Dr. Gunn missed this reference, it is repeated in other places. On pages 5 and 33 of volume 2, Mr Drescher is quoted as stating:

> *"If Nova Scotia were to move toward an ecoforestry paradigm, we could double the employment on half the harvest."*

Translated into actual numbers, this would mean about 20,000-25,000 forestry industry employees and a harvest of 3.2 million cubic metres annually. The ridiculous figure of 165,452 "skilled people" (7-8 times the number that Mr. Drescher is quoted as estimating in the GPI report) is a purely a fiction, and appears nowhere in the GPI report.

As noted earlier, Dr. Gunn had already admitted in his public email correspondence with me that (in his own words) "the 47,000 horses and the logging the parks was a cheap shot" (28 November). Yet he had no hesitation repeating this "cheap shot" two weeks later both in a public letter to the press, and in the comments posted on his web site. This admitted and wilful "cheap shot" is typical of Dr. Gunn's attempt to discredit the GPI report and to taint and dismiss its important findings as a whole.

11) Aside from the wrong and misleading numbers cited by Dr. Gunn, he has also ignored the entire context of the illustration that appears in the GPI report. Approximately one-half of Windhorse Farm timber fetches premium market prices because of its high quality. The sole purpose of the illustration, therefore, is to indicate the potential economic value of high quality timber that might be realized by the province *if* forests were in a similar condition to Windhorse Farm, and if half the timber harvest, in that hypothetical situation, also fetched premium prices. Thus the section cited by Dr. Gunn on page 38 of volume 2 actually begins with this sentence:

> *"Imagine for a moment that Nova Scotia's forests were still in their natural state, or at least had been logged sustainably since European settlement. Now apply Windhorse Farm data to Nova Scotia's forests…."*

And it draws this conclusion from the illustration:

> *"[A] degraded forest is already foregoing significant potential revenues, but these foregone revenues remain hidden because our current economic growth statistics account for neither natural capital depreciation nor long-term benefits, costs or values."*

Never does the GPI report imply that this illustration can be extrapolated to *current* Nova Scotia forests. On the contrary, it is explicitly provided as "an exercise in imagination" that assumes Nova Scotia forests had never been degraded and had always been harvested sustainably. The exercise of some imagination is both reasonable and necessary in order to overcome the tendency to see today's forests as "normal" or as representing optimal value or productivity. If direct measurements were available, extrapolations would be unnecessary. But because foregone revenues remain hidden in the conventional accounting mechanisms, potential or optimal values must be demonstrated in other ways.

Dr. Gunn has ignored the explicit disclaimers in the GPI report, and turned the illustration to a use for which it was never intended. Where the illustration is first introduced on pages 141-142 of volume 1 of the GPI Forest Accounts, the following statements are made:

> *"However the comparative market prices given here, and the Windhorse Farm data on the percentage of wood from a sustainably logged multi-species multi-aged forest fetching premium prices, allow a further illustrative extrapolation here. Nova Scotia forests vary widely, and no claim can be made that the Windhorse Farm soils, species composition, and other conditions apply to the rest of Nova Scotia, even if forests were still in their natural state….*
>
> *"While this is only an exercise in imagination and omits many important elements in the equation, it nevertheless serves to illustrate the enormous magnitude of market value potentially lost from the conversion of Nova Scotia older natural forests to young, even-aged stands….*
>
> *"While no claim at all can be made for the provincial numbers derived from the overly simple Windhorse Farm illustration, the illustration nevertheless indicates that Nova Scotia forests are contributing very much less to the provincial economy than they would be if they had been managed sustainably."*

In short, the example is not a direct measurement, and cannot be used as one. But there *is* no direct measurement for the potential value of high quality timber from Nova Scotia forests. Therefore it is reasonable to use the actual yields of a relatively unspoiled and sustainably harvested woodlot, including the actual market prices fetched for its high quality timber outputs, to indicate what the potential value of Nova Scotia's forests might be *if* they had always been harvested sustainably or *if* they were restored to their full potential. It is unfortunate that Dr. Gunn ignored this basic context for the Windhorse Farm illustration, and thereby distorted its purpose and results.

12) The next paragraph in Dr. Gunn's analysis once again indicates that he has not read the GPI report, or that he is ignoring what he read. On page 13, he writes:

> *"If we examine the Windhorse employment, the claim is Mr. Drescher is employing seven full time people with a total annual volume of wood of 150 MFBM (thousand board feet)…. Why you would need seven workers to harvest 150 MFBM (this is about 850 m3 or approximately 425 cords) is hard to imagine. Even with horse logging, this could be accomplished fairly easily with two people if they are working in the type of large timber that is described on Mr. Drescher's lot. The only possible conclusion is that Mr. Dresher is engaged in a manufacturing operation (or education/tourism operation) of some sort, not a forestry operation and that the value added and employment comes from the manufacturing, not the forestry."*

Nowhere does Mr. Drescher claim (or the GPI report state) that seven people are required to *harvest* 150 MFBM. One wonders where Dr. Gunn gets the information that he attributes to the GPI report. In the very section Dr. Gunn appears to be citing, the GPI text clearly says that these workers "harvest …*and* process" 150,000 board feet of wood. For the record, here is the text from page 33 of the GPI report, volume 2:

> *Windhorse Farm's forest operations employ the equivalent of seven full-time people, not including Drescher. In total, these workers harvest (using the slow-grading method) and process a total of 150,000 board feet of wood per year from the total area of lands managed by Drescher (190 ha.)*

Page 32 states that the Windhorse Farm woodlot *and* workshop provide year-round employment for local community members. Page 5 states that Drescher "employs the equivalent of 7 full-time people at his sawmill and in the woods." The Executive Summary (page vi) repeats that statement that he "directly employs the equivalent of 7 full-time people at his sawmill and in the woods." In short, in several places, the GPI report makes quite clear that the 7 employees are engaged in more than harvesting.

As if he did not have the actual text of the GPI report to help him, Dr. Gunn then employs his detective skills to work out, as if by himself, that Mr. Dresher must be *"engaged in a manufacturing operation (or education/tourism operation) of some sort."* Dr. Gunn could have made this discovery simply by reading the GPI report. For example, volume 2, page 42 of the report states that "processing and value-added activities occur on-site" at Windhorse Farm. These value-added activities are specifically listed:

> *"The following activities add value to wood at Windhorse Farm:*
> * *felling, limbing, bucking (cutting tree into log lengths), yarding and browing (piling logs ready for mill);*
> * *sawing, stacking and stick, air drying;*
> * *kiln drying;*
> * *jointing and planing;*
> * *trimming and grading;*
> * *manufacturing of flooring, wainscoting and moldings;*
> * *marketing and retailing; and,*
> * *delivering to site."*

Other sections of the GPI report describe the other activities of the Windhorse Farm operation. Page 39 of volume 2, for example, states:

> *"A diversified business like Windhorse Farm will almost always work best for an ecoforestry woodlot. In addition to a variety of wood products, Windhorse Farm*

sells cut-flowers, native plants, reforestation services, dairy products, organic food, and a wide range of educational services including ecoforestry course. This economic diversity can improve resilience and help cushion the business against fluctuations in the market price of particular forest products.

"As noted above, in addition to harvesting and selling wood and wood products, the ecoforestry business at Windhorse Farm includes a full-fledged training and internship program with an average of 12 students per year. Seventy-two students a year also participate in 1-2 week courses in ecoforestry (6 courses offered per year), and there are woodlot tours for tourists and visitors which cost $50 for a two-hour tour.

The manufacturing, education, and tourism/recreation activities at Windhorse Farm, as well as the jobs they create and the revenue they generate, are all completely dependent on the primary forestry operation. Dr. Gunn would do well to refer to the speech delivered by Judith Cabrita, executive director of the Tourism Industry Association of Nova Scotia, at the Harvest Practices Forum in Truro on November 29, in which she described tourism as a "forest-dependent industry." It is time for Dr. Gunn to broaden his horizons and to appreciate the wide range of activities and jobs that can potentially be created by sustainable forest operations.

13) Employing his usual "either / or" style of thinking, Dr. Gunn, however, proclaims that Windhorse Farm is *"not a forestry operation and that the value added and employment comes from the manufacturing, not the forestry."* It seems that Dr. Gunn has really missed one of the main points of the entire GPI report here, emphasized not only throughout volumes 1 and 2, but also in the executive summary and press release. Value-added wood manufacturing operations are strongly recommended as one of the main ways to create more employment while harvesting less timber (and thus protecting the resource more effectively.)

In fact, one of GPI Atlantic's six profiled case studies is Finewood Flooring and Lumber Ltd. in Cape Breton, presented as an example of a successful value-added wood manufacturing enterprise that provides 10 times more employment per unit of biomass harvested than standard industrial forestry operations. What is Dr. Gunn's problem with the fact that some of the seven employees at Windhorse Farm are engaged in woodshop and wood manufacturing activities? These are jobs entirely dependent on timber harvesting, are officially classified as " wood industry" jobs, and are counted as part of "forest industry" or "forest sector" jobs.[4]

[4] The APEC (2000) report and the National Forestry Database use the term "forest industry" to include the logging and forestry industries; pulp, paper and allied manufacturing industries; and wood industries. According to Statistics Canada, "Logging and Forestry Industry" jobs include logging and all the activities associated with that activity as well as forestry patrol, fire inspection, reforestation, forestry farms and timber crop operations. "Wood Industry" jobs include the shingle and shake industry and the sawmill and planing mill products industry (including drying lumber). The Standard Industrial Classification (SIC) has been replaced by the North American Industry Classification System (NAICS). This change over has

In fact, both timber processing and wood manufacturing operations are officially part of the forest sector . This is not a GPI Atlantic artefact, but is Statistics Canada's own definition of the forest sector. This definition is also used in the National Forestry Database and by Nova Scotia's Department of Finance. The APEC (2000) report on the Nova Scotia forest industry, widely cited by government and industry sources, includes employment in value-added wood manufacturing industries in its definition of "forest industry". Only Dr. Gunn's definition seems to be so narrow as to exclude the manufacturing jobs at Windhorse Farm from the forest sector . Without the timber harvested from Windhorse Farm, none of these seven jobs would exist!

Nevertheless, it must be acknowledged that the official terminology itself may create confusion, and GPI Atlantic has therefore revised its Forest Accounts to adhere strictly to the official usage. In order to clarify this point, therefore, "forest industries" and "forestry industries" are now carefully distinguished throughout the GPI report.

The term "forest industries" is used in accordance with usage by the Canadian Forestry Service (CFS), Natural Resources Canada, and in the APEC (2000) report, to refer to all forest sector industries, including the logging, pulp and paper, and wood industries. See the CFS website at: http://www.nrcan.gc.ca/mms/efab/mmsd/forest/pdf/IV4E.pdf. "Forest industries," in this official designation, therefore include the wood industry operations at Windhorse Farm.

"Forestry industries" are more narrowly defined in the official sources, and are reported with the logging industry numbers only, exclusive of the pulp, paper and wood industries. "Forestry Industry" or "Forestry Services Industry" is therefore used, in accordance with the Statistics Canada definition to refer to those establishments that are primarily engaged in gathering forest products, forestry patrol, fire inspection, fire fighting, forest nurseries, reforestation and other forestry services (Statistics Canada, l980 SIC; NAICS.)

resulted in some changes in classifications. For instance, the wooden kitchen and bathroom vanity industry, the coffin industry and the asphalt roofing industry are no longer part of the wood or paper industrial groups (under SIC) while the mobile home industry has been added to wood industries under NAICS. Another category called "Finish Carpentry" which is not part of the Forest Sector includes establishments primarily engaged in on-site cabinetry, millwork installation, pre-fabricated sash and door installation and garage door installation. Windhorse Farm jobs clearly fall under the categories of either "Logging and Forestry Industry" or "Wood Industries." In should also be noted that the APEC report and estimates by Ian Spencer were quite flexible with what they included under the broad heading of Forest Sector jobs. Unlike either the SIC or NAICS classifications of Statistics Canada, they included maple syrup and government jobs as forest sector jobs.

b) Jeremy Frith

1) With remarkable alacrity, Dr. Gunn dismisses Jeremy Frith's outstanding woodlot management as *"more of a hobby than a working woodlot…. At a provincial scale,"* Dr. Gunn concludes, *"there is little to be learned here."* It is difficult to know how to respond to such closed-mindedness, except to say – let other woodlot owners read the chapter on Jeremy Frith's woodlot, and let *them* decide whether there is anything to be learned. Certainly it is irresponsible and insulting to trivialize some of the best forest practices currently available in Nova Scotia.

   Of all the case studies presented, this is the one that provides the most detailed financial breakdown of the costs of restoration forestry, and the clearest assessment of the cost-effectiveness of current restoration investments in yielding higher quality and higher value wood in the future. This not only allows woodlot owners to assess the affordability of restoration work for themselves, but *at the provincial scale,* provides government officials with the information they need to determine the financial incentives necessary to encourage restoration forestry on a wider scale.

   Since Dr. Gunn makes no reference at all to the economics of restoration forestry in his dismissal of the Frith case study, one can only conclude either that he did not read it, or that he ignored what he read in concluding that there is "little to be learned here." Here are just two sections from the GPI report text with specific references as to what woodlot owners and government officials might learn, specifically "at the provincial scale."

   > *"Over the past eight years, the costs of restoration have exceeded revenues from the sale of wood (as well as non-cash savings from the use of firewood in the home) by $10,965 (Tables 3.3 and 3.4 above). On a per hectare basis, restoration forestry has cost Frith roughly $18/ha/yr between 1993 and 2000. When government grants for employment, roadwork, and the firepond are factored into this calculation, the total cost of restoration activities on Frith's woodlot is $35/ha/yr…. In the absence of a strong government commitment to support active restoration forestry in the form of tax and financial incentives, Frith's example provides real inspiration to woodlot owners of limited means who are nonetheless ready to take personal responsibility for improving the health and value of their forests"* (volume 2, pages 88-89)
   >
   > *"Frith's very careful detailing of all costs and expenditures is an extraordinary resource for woodlot owners and government officials. It also provides an excellent template for government to assess the precise social investment (in the form of tax breaks and financial incentives) that is required to make restoration forestry economically viable for Nova Scotia woodlot owners. Frith's accounts also allow one of the most detailed assessments to date of the cost effectiveness of*

investing in restoration forestry for future generations of Nova Scotians" (volume 2, page 92.)

It is noteworthy that others do not share Dr. Gunn's assessment that there is "little to be learned" from Mr. Frith's example. When Jeremy Frith spoke last winter at the woodlot owners' workshop sponsored by the Nova Forest Alliance (which Dr. Gunn chairs), his presentation was greeted with overwhelming interest and applause. His sessions were by far the best attended of any at the workshop, with participants inspired by and fascinated with his approach. Mr. Frith was nominated for the Woodlot Owner of the Year award. Dr. Gunn appears entirely unaware of what participants in the NFA's own activities have learned from Jeremy Frith.

2) Even more interesting is the reason Dr. Gunn gives for dismissing the Frith case study – namely, that Mr. Frith has spent just 452 hours actively working on his woodlot since 1993. As usual, Dr. Gunn quotes selectively, ignoring any piece of evidence that does not suit his effort to disparage the case studies and the GPI report. Here is what the GPI text actually says:

"The vast amount of restoration work to be carried out on Frith's woodlot takes many hours of manual labour. Since 1993, Frith has put 452 hours of his own time into pruning, spacing, felling, bucking, thinning, marking, cutting, and clearing trails. Since 2000, he has also hired labourers for a total of 490 hours at $7.50/hr, under a federal employment program that covered half the labour costs" (volume 2, page 91.)

The total labour hours (942) are referenced in several other sections of the chapter, so it is hard to see how Dr. Gunn could have missed all these in selectively citing only Frith's own time as evidence of how little work has gone into the woodlot. For example, on page 84 of volume 2:

"Since 1993, Frith has invested a total of 942 hours of manual labour in his woodlot. This includes 452 hours of his own time, and 490 hours of hired work, paid at $7.50/hr (worth $3,675), half of that covered by a government grant. Fifty-five percent of the total paid and unpaid hours worked were spent pruning.

"To date, Frith has invested 280.5 hours of his own time plus $900 in paid labour (half of his own contribution to the paid labour hours) to prune the young softwood and hardwood stands on his land (Table 16). Because one half of total paid labour costs were covered by a government grant (Table 17), an additional $900 in government money went towards the pruning.

"The following expense and revenue statements may again be useful to woodlot owners contemplating a shift to sustainable harvesting practices, and to government officials assessing the extent of financial incentives or tax breaks

necessary to encourage woodlot owners to restore the province's natural forested wealth" (volume 2, page 84.)

The fact that Mr. Frith has provided local employment is of no interest to Dr. Gunn. Since he wants to minimize the hours devoted to the woodlot in order to dismiss it as nothing more than a "hobby," Dr. Gunn simply ignores more than half the hours actually committed to improving the woodlot. Detailed financial statements provide the exact costs of each activity, including pruning, spacing, bucking, treemarking, harvesting, forwarding, planting, road improvements, and other work-- all carefully detailed in the case study.

3) Dr. Gunn's remarks also reveal his lack of understanding of restoration forestry altogether. Volume 2, chapter 1, section 7 (pages 34-37), entitled "Restoring the Acadian Forest," details the many alternative restoration options, which include the option of simply "leaving the forest alone" (page 34.) After the collapse of the Atlantic cod fish stocks, a moratorium on harvesting was deemed to be the best way to allow the fish stocks to recover. Similarly, *not* harvesting for a period of time could be part of a highly responsible, aware and sustainable management regime. A small number of hours invested is not incompatible with intelligent and sustainable management. In other words, from the perspective of restoration forestry (the main subject of volume 2 of the GPI Forest Accounts), Dr. Gunn has picked entirely the wrong indicator to dismiss the case studies. Among the five restoration options outlined in chapter 1, section 7 is the following (page 37):

"In the best circumstances, the only cost a woodlot owner would have is the cost of the land itself. If the woodlot owner chose not to intervene, and made no attempt to hasten the restoration process, but instead decided to wait for the restoration to occur naturally, then it would take 100 years before a very careful selection harvesting system (removing <20% of the Annual Growth Increment each year) could be started."

Of course, non-interventionist strategies also require the longest wait. Mr. Drescher estimates that it takes at least 300 years to restore a forest to its natural state following a clearcut. More active intervention can hasten the restoration process somewhat, for example by creating gap openings to increase light on the ground, planting trees that have been lost from the site and have no local seed source, and by selection harvesting, thinning, pruning, and building of structural diversity through brush and slab walls.

In dismissing the 452 hours of Mr. Frith's work, and ignoring the additional 490 hours of paid labour time, Dr. Gunn has made no attempt to assess whether Mr. Frith's actual hours correspond to the restoration needs of his woodlot. As far as Dr. Gunn is concerned, the 452 hours simply indicate that "this is more of a hobby than a working woodlot." If this is the case, there are very many "hobby" woodlot owners in

Nova Scotia, and many more who would be most interested in adopting Mr. Frith's approach if it were taught and promoted, rather than dismissed as irrelevant.

The NS Department of Natural Resources' own survey reveals that most woodlot owners in Nova Scotia did not purchase and do not maintain their woodlots primarily for timber harvesting. So there may be a very large number (perhaps even a majority) of "hobby" woodlot owners, whose production and the health of whose forests are nevertheless vital both to the forestry industry and the wellbeing of Nova Scotia forests as a whole.

Given these realities, GPI Atlantic remains convinced that the Frith case study is highly relevant to Nova Scotia *on a provincial scale*, and that there is a lot to learn from it for any reader with an objective and open mind. In light of the fact that a decision *not* to cut for a period of time may denote highly responsible and professional forestry practice and management, Jeremy Frith may actually have much more to offer Nova Scotia than Dr. Gunn's model of "working woodlots" that clearcut their land.

4) A subsidiary reason that Dr. Gunn gives for dismissing the Frith case study is that few of Nova Scotia's 30,000 woodlot owners have the knowledge to do what Mr. Frith has done (page 13.) This knowledge, Dr. Gunn opines, is a "scarce resource" that may reward Mr. Frith, but makes his example irrelevant to those who don't have the knowledge. This is odd reasoning. Surely, education and knowledge dissemination on good forestry practices is something that should be encouraged. Why assume that ignorance and lack of knowledge should last? The very purpose of these case studies is to contribute to the pool of practical knowledge on sustainable forestry practices. In fact, the GPI report repeatedly stresses the importance of education if forest practices are to improve.

   If Dr. Gunn is genuinely concerned about the lack of knowledge among Nova Scotia woodlot owners, he will promote study of Mr. Frith's example (and others in the GPI report), not dismiss the example because other woodlot owners don't currently have the same degree of knowledge. Dr. Gunn's argument here is oddly circular: He acknowledges Mr. Frith's superior knowledge, but then says he is irrelevant because others don't have his degree of knowledge. Does Dr. Gunn favour maintaining the current state of ignorance?

In response to Gunn's statement on this issue, Jeremy Frith writes: "I too manage other woodlots and am willing to SHARE my "knowledge" with others including the government. In fact have offered to do field days etc. with little or no response." Indeed, we have remarkable expertise in this province, and several woodlot owners with considerable knowledge and experience in restoration forestry methods. Rather than dismiss Mr. Frith's knowledge as irrelevant because it is atypical, a forward-looking strategy would call on his and others' expertise, willingly offered, to train other woodlot owners.

Interestingly Dr. Gunn also argues that Nova Scotia's 30,000 woodlot owners don't have the "time and physical conditioning to do their own work on the land," thus rendering Mr. Frith's example irrelevant to them. This is in total contradiction to his previous sentence, where he dismisses Mr. Frith's 452 hours ("little more than an hour per week") as indicative of the fact that it is "more of a hobby than a working woodlot." Which argument would Dr. Gunn like to use – that Mr. Frith's hours are too few or too many to be relevant to other woodlot owners?

As for "physical conditioning," Jeremy Frith states: *"They also require really only sufficient physical conditioning to walk their woodlot regularly with a measuring tape, clipboard and perhaps pruning saw. This would* ***improve*** *their physical condition and give them an intimate knowledge of just what it was that they owned."* As Statistics Canada data show declining levels of physical activity among Nova Scotia men, with consequent adverse health impacts, Dr. Gunn might see Mr. Frith's physical activity (like his knowledge) as a model for other woodlot owners, rather than dismissing it as irrelevant to them.

Finally, even if all Dr. Gunn's statement were completely true, and even if Nova Scotia's 30,000 woodlot owners do not have the "knowledge, time and physical conditioning" to follow Mr. Frith's example personally, this certainly does not render this case study irrelevant. As Dr. Gunn would know if he had read the Windhorse Farm case study, Jim Drescher manages and provides restoration forestry consulting for other woodlots *aside* from his own. Any woodlot owner who finds the Drescher or Frith case studies compelling and is inclined to restore and increase the value of his or her woodlot, but who does have the personal time or knowledge to do so, can contract out that work to foresters like Mr. Drescher.

There are many outstanding Nova Scotia foresters managing their woodlots in a truly sustainable way, including Drescher, Frith, Wade Prest, Bill McKay, Alton Hudson (all cited in the GPI report) and others, who can assist fellow woodlot owners in moving towards more sustainable management methods. In other words, lack of personal "knowledge, time, and physical conditioning" does not *ipso facto* make any model of good forestry irrelevant or inapplicable on a provincial scale.

5) The contradiction in Dr. Gunn's own argument comes just three sentences further along, where he writes (page 13:)

> *"How many others have the patience and financial wherewithal to wait 10-20 years to realize a return when they are paying taxes throughout this time. More to the point do we want to build a forest economy that cannot financially support a trained, skilled, fully employed workforce."*

There are four problems with this argument:

a) Dr. Gunn *does* after all seem to favour a "trained, skilled" workforce. Why then would he regard the dissemination of knowledge about Mr. Frith's methods as a problem? He should favour it, if he acknowledges Mr. Frith's own knowledge.

b) The main purpose of the Frith case study is to provide a very detailed breakdown of the costs of restoration forestry, with all financial statements included. As noted in the case study, Mr. Frith regards his investment in restoration forestry as "a better investment than his RRSPs" (GPI, volume 2, page 90.) He has made his investments in a highly cost-effective way, and calculates that restoration work has cost him personally $18/ha/year between 1993 and 2000, or $35/ha/year when government grants for employment, roadwork and a firepond are factored into the calculation.

   Rather than assume such a negative viewpoint and decide a priori that the Frith case study is irrelevant to woodlot owners, Dr. Gunn might instead considering encouraging owners to study Mr. Frith's financial analysis to determine for *themselves* whether the restoration investment is within their means. Dr. Gunn doesn't think people will wait 10-20 years to realize their return. But people wait longer than that to collect on their RRSPs, which are the benchmark for Mr. Frith's assessment that woodlot restoration is a better investment.

c) As Dr. Gunn would realize if he had read the GPI report attentively, the case studies, and particularly the restoration cost estimates, are not directed only at woodlot owners, but at government officials. As the GPI report argues repeatedly, restoring the health of our forests is a *social* investment that will benefit future generations of Nova Scotians. It is not appropriate, therefore, for woodlot owners to carry the entire costs of restoration investments that will have greater benefits for future rather than current generations .

   The point of the detailed financial breakdowns is also to provide information *"to government officials assessing the extent of financial incentives or tax breaks necessary to encourage woodlot owners to restore the province's natural forested wealth"* (page 84.) Therefore, the point is not, as Dr. Gunn asserts, whether woodlot owners have the "financial wherewithal" to make the entire investment themselves, but whether governments will partner with them in making this investment. That message comes across loud and clear throughout the GPI report (both volumes 1 and 2).

   Dr. Gunn also wonders whether woodlot owners have the "patience" to wait 10-20 years to realize a return. In many places in volume 2, the GPI report specifically addresses this issue. For example, Wendell Berry is cited twice as follows:

> *"A forest makes things slowly; a good forest economy should therefore be a patient economy. It would also be an unselfish one, for good foresters must always look toward harvests that they will not live to reap."*
>
> - Wendell Berry, (GPI, volume 2, page xxviii)

Forests that have been degraded through centuries of land-clearing, high-grading, and clearcutting will not be restored overnight. Mr. Drescher argues that it will take a minimum of 300 years to bring a forest back to a semblance of its natural state after it has been clearcut. It might even be argued that it is *impatience* that has degraded the value of our forests. Once the damage has been done, the only question is *when* the bill will be paid, unless we are to reconcile ourselves to living with a severely degraded forest that has lost much of its original and potential value.

If we have a sense of responsibility to future generations, then, yes, patience is indeed required, and some measure of sacrifice as well. This is not an unusual concept. Governments in the 1980s over-spent greatly. The last eight years have seen reduced services, fiscal restraint, declining real wages, and considerable social sacrifice in order to reduce deficits and pay down debts so that we do not pass on this burden indefinitely to future generations. The same patience and restraint will be necessary to restore the value of our forests. In Mr. Drescher's words (volume 2, page 34):

> *"Unfortunately, most purchasers of woodland do not understand that they have bought a severely overdrawn bank account. In most cases, the initial cash investment to purchase the land is just the tip of the iceberg. At some point the overdraft will have to be covered. Now or later are the only alternatives."*

The "patience" required is best illustrated by the tradition among some First Nations groups of always having present at important council meetings an elder representing the interests of the seventh generation hence. If we had followed that practice in relation to our forests, they would look very different today, and we would have forests of considerably greater value.

In sum, Dr. Gunn's argument is seriously flawed on all counts. He is mistaken in:

a) misrepresenting the actual number of labour hours invested in restoration forestry on Mr. Frith's woodlot;
b) misunderstanding the requirements of restoration forestry; and
c) dismissing the relevance of Mr. Frith's knowledge and financial assessments both to other woodlot owners and to government officials.

Objective, impartial, and open-minded readers will find both inspiration and a lot of practical information to learn from Jeremy Frith's example and from other case studies in volume 2 of the GPI Forest Accounts.

c) Pictou Landing

Pictou Landing is another case study that fails Dr. Gunn's test of being useful for Nova Scotia. It is noteworthy that Dr. Gunn never relates to the actual forestry practices used in these case studies, and never discusses the actual management and harvest practices. Rather he is concerned to find any hook he can to disparage and dismiss the case studies as irrelevant. In this case, Dr. Gunn has two ways of disparaging the Pictou Landing example:

1) "*It would have been interesting to learn why this example is not more widespread within the other First Nations reserve landholdings in Nova Scotia"* (page 14.) (Innuendo: There must be something wrong with Pictou Landing that other First Nations haven't followed the example.)

2) *"The expenditures and revenues reported for the period 1994-2001 are gross revenues of $73,836 and forest management expenses $370,042 for a net loss of $296,656 (a loss of approximately $50,000 per year for 6 years). Few other groups in Nova Scotia would have the luxury of operating with these economics"* page 14.)

    1) Point # 1 is a subtle put-down. Any historian knows that, by definition, nothing in the pioneering stage is "widespread." The Pictou Landing woodlot is the *first* forestry operation in Nova Scotia to be certified by the international Forest Stewardship Council (FSC) for best forest practices. It only embarked on its new restoration forestry course in 1993, and produced its first Forest Management Plan in 1999. (Eight years is a *very* short time span in the history of a forest!) Among First Nations in Atlantic Canada, the Pictou Landing experiment is the first of its kind – starting a new trend. That is the very definition of a pioneer on the leading edge of a new development. How could it possibly be "widespread" at its inception? This criticism is especially ridiculous.

In fact, it is remarkable that in such a very short period, Pictou Landing has already aroused tremendous interest among other First Nations communities, particularly as a result of its black ash project – a species of great importance to First Nations communities (GPI, volume 2, pages 64-65.) Had Dr. Gunn read the Pictou Landing chapter closely, he would have found statements like this:

> *"Perhaps most importantly, Pictou Landing is now the envy of First Nations bands across the province, some of which have expressed their intent to emulate the Pictou Landing example. As the first FSC certified operation in the province, the first First Nations certification in Canada, and only one of a handful of woodlots across the country holding this distinction…[etc.]."*(volume 2, page 47).
>
> *"Being the first and only FSC-certified forest operation in Nova Scotia has created a sense of accomplishment among band members. Another Mi'kmaq Band*

> *has expressed envy and interest in emulating the Pictou Landing example, and has become much more open to sharing management of an additional, co-owned property"* (page 57.)

Rather than wondering why a remarkable experiment that has just begun is not already "widespread" (an absurdity by definition), Dr. Gunn might marvel at what has been achieved at Pictou Landing in eight short years, and note the interest that it has already aroused. Dr. Gunn never mentions the fact that Pictou Landing is the first FSC-certified forestry operation in Nova Scotia, a fact that in itself is rousing tremendous interest among foresters, if for no other reason than that Pictou Landing can charge a 10% premium for its certified wood. Nor does Dr. Gunn seem to have any interest in what is actually happening at Pictou Landing.

It should be noted that Pictou Landing forest manager, Bill McKay, is soon to become a SmartWood certified resource manager, and will soon be adding other forest operations to his pool of certified lands. He has pursued this operation precisely because other First Nations Bands as well as individuals have approached him to manage their lands using the same techniques applied to Pictou Landing.

2) Dr. Gunn's second put-down about "luxury" economics completely misses the point in three fundamental ways, *and* again he misreports what the GPI actually says.

a) First, he has translated what he read in the GPI report into his own conventional accounting language. The GPI report and Pictou Landing itself never report the $296,656 as a "loss." That is Dr. Gunn's word, and it does *not* appear in this context anywhere in the GPI report. Again, Dr. Gunn is attributing statements to Pictou Landing and to the GPI report that are actually his own. What the GPI report says is that the $296,656 represents the "net cost of forest restoration," averaging about $110 per hectare per year. That is a very different statement, because forest restoration is viewed as an investment that will yield a significant return in the future.

Business people investing in new capital equipment do not write that investment off as a "loss" at the time of expenditure. Dr. Gunn's use of the word "loss" actually betrays his complete lack of understanding of the GPI accounting approach, which is based on a capital (or investment-oriented) approach to accounting that views forests as natural capital. (That, by the way, is also the approach adopted by the National Round Table on the Environment and the Economy, and by Statistics Canada, in developing new sustainable development indicators for Canada.)

Thus, investments in restoration forestry are, in effect, investments in natural capital that will yield a future flow of benefits and services. Dr. Gunn has completely misinterpreted this vitally important concept (which lies at the core of the GPI approach) and translated it into the language of current income accounting (the GDP approach.) In other words, Dr. Gunn misrepresents and misunderstands the financial statements in tables 12 and 13 (pages 71 and 72), and misconstrues the entire approach of the GPI Forest Accounts.

b) Secondly, Dr. Gunn's simplistic statement about "net loss" further indicates that he has not read the Pictou Landing chapter with any care, nor even examined the expenditure statements to find out on *what* the money was spent. The objective and open-minded reader will quickly see that the investment and expenditures at Pictou Landing have not been only in restoration forestry from an ecological and economic perspective, but also in *social* development. An entire section (section 4, clearly entitled "Social Benefits," pages 55-60) details the importance of the restoration forest project for the development of the Pictou Landing *community.* In Dr. Gunn's simple equation, these benefits appear nowhere, and he mentions only the harvest and firewood revenues, as if they were the only "gains" from the forest project. He has taken the economic section of the chapter (section 7) totally out of the context of the chapter as a whole, and he has completely ignored the wide range of benefits described in other sections of the chapter.

Here is a summary of some benefits of the restoration forestry project at Pictou landing that Dr. Gunn seems to have missed in his equation. Following this point form summary, each of these benefits is then described in detail in the succeeding pages. From volume 2, page 55 of the GPI report:

> *"Following is a description of these social benefits, which are a key goal of the restoration forestry plan. These benefits include:*
>
> - *community control of forest management operations;*
> - *optimizing hunting and wildlife-viewing opportunities for band members;*
> - *improved relations with neighbours;*
> - *a good rapport with trusted contractors;*
> - *restoring a sense of pride and accomplishment among community members;*
> - *re-introduction or promotion of culturally valuable species, like black ash;*
> - *promotion and education regarding non-timber forest products;*
> - *training and employment opportunities in the woods;*
> - *partnerships with local universities; and*
> - *provision of basic supplies important to the community, such as firewood and poles."*

Sections 5 and 6 then describe the ecological benefits of the Pictou Landing forest restoration efforts, including conservation of biological diversity, maintenance and enhancement of wildlife habitat, improvement of soil conditions and restoration of healthy soil, conservation of water resources, and enhancement of other ecosystem functions like carbon storage. None of these benefits appear in Dr. Gunn's simplistic equation either, but they are central to the GPI accounting approach

c) Thirdly, of course, restoration forestry costs money (although Mr. Drescher does argue that simply leaving the forest alone and foregoing any harvest revenues for 100 years can also achieve some restorative effects without intervention). But, generally, when something has been damaged, it needs to be repaired or restored. Similarly, active restoration efforts can hasten recovery, and more quickly restore the full range of forest

values. That is the whole point of volume 2 of the GPI Forest Accounts, which Dr. Gunn seems to have missed in his snide remark about "luxury" economics.

Volume 2 repeats this point endlessly. But since Dr. Gunn missed it, we will say it again here. One of the main purposes of the case studies in volume 2 is to ascertain the cost of restoration forestry investments, and thus to indicate the degree of *social investment* necessary to restore the province's forests. Volume 2 repeatedly acknowledges that most woodlot owners cannot afford to undertake restoration forestry investments on their own without any incentives or support.

If good forestry practices (including restoration forestry) are to become mainstream, then tax breaks, enhanced silviculture credits, and other financial incentives must encourage that action. Since future generations of Nova Scotians will be the primary beneficiaries of this investment, a social contribution is more appropriate than expecting the woodlot owner to carry the entire cost him or herself. The whole of chapter 10, volume 2, pages 199-211, is devoted to outlining the specific types of tax reforms and other financial incentives that would be required to encourage restoration forestry on a widespread scale.

As usual, Dr. Gunn ignores half the story. Of course, as the GPI report repeatedly states, few groups have the financial means to make the necessary investments in restoration forestry on their own. But the tax system could most certainly be structured, in the ways suggested in chapter 10, to encourage the best forestry practices and penalize the worst, without any net cost to the taxpayer, and with substantial benefits for future generations. Such reforms would quickly bring the Pictou Landing example into the mainstream, not only among First Nations communities, but far more widely.

Rather than dismissing as irrelevant the ground-breaking economic understanding of the Pictou Landing First Nations community, which recognizes the social, ecological and economic value of genuine investments in restoration forestry, Dr. Gunn should take issue with the conventional economic formulae that have counted the depletion of natural capital as economic gain. Sadly, Dr. Gunn's own simplistic formula shows that he adheres firmly to the latter system and fails to understand the former.

d) Finewood Flooring and Lumber Ltd., Cape Breton (Gunn, page 14; GPI, volume 2, chapter 6).

1) Again, Dr. Gunn is concerned to make "either/or" distinctions here: *"Finewood Flooring… is a wood product business but not a forest product business,"* he writes (page 14). As noted above, "wood industries'' are dependent on timber production, and they are officially listed (Statistics Canada, National Forestry Database, NS Finance Department, APEC 2000, etc) as part of the "forest sector" in both employment and GDP statistics. The APEC (2000) report on the Nova Scotia forest industry, widely cited by industry and government, includes the following "wood products" jobs in its forest industry employment estimates: sawmill products, wood

preservation, veneer and plywood, windows/doors and other millwork, wood containers and other wood products. Wood is quite clearly a forest product.

As the GPI report states repeatedly, support of value-added wood manufacturing enterprises is an excellent way to increase forestry industry employment per unit of resource harvested. As the GPI report also points out, Nova Scotia currently has one of the lowest rates of value-added product per cubic metre of wood harvested in Canada – less than one-third the Ontario rate; less than one-half the Manitoba rate; and one-third less than neighbouring New Brunswick. (See GPI report, volume 1, page 131; volume 2, pages 164-165 and all of section 9.5 in chapter 5; volume 2, pages 157-158; etc.)

In other words, there is ample scope for increasing forestry industry employment in Nova Scotia without cutting down more trees. This issue makes the Finewood Flooring case study *very* relevant to Nova Scotia, and an outstanding example of the type of value-added industry that could be supported and fostered as part of a sustainable forestry strategy.

2) Dr. Gunn attempts to ridicule the Finewood value-added case study, and thereby to minimize its importance, by defining the concept of value-added out of existence:

> *"Some manufacturers in Nova Scotia produce their final product with no wood (adding an infinite value added per m^3"* (page 14.)

By contrast to this ridiculous and meaningless use of the term, GPI Atlantic uses the standard definition of forest sector value-added used by Statistics Canada and the Canadian Council of Forest Ministers (in the National Forestry Database). See the following references cited in GPI, volume 2, table 27, page 165, and in the bibliography:

Minister of Industry. 2001. *Manufacturing Industries of Canada: National and Provincial Areas, 1998*. Statistics Canada – Catalogue no. 31-203-XPB. Ottawa.

Minister of Industry. 2000a. *Manufacturing Industries of Canada: National and Provincial Areas, 1997*. Statistics Canada – Catalogue no. 31-203-XPB. Ottawa.

Minister of Industry. 2000b. *Logging Industries, 1997*. Statistics Canada – Catalogue no. 25-201-XIB. Ottawa.

Canadian Council of Forest Ministers. 2001. National Forestry Database.

3) Again concerned only to find a reason to dismiss the case study as irrelevant, Dr. Gunn writes (page 14): *"This example says very little about forest management…."*

This statement is untrue and indicates, once again, either that Dr. Gunn has not read the GPI report, in which case the comment is careless and irresponsible, or that he is wilfully ignoring what he read. The whole of volume 2, chapter six, section 5, part 1, pages 172-173 deals specifically with the impact of forest management on Finewood's wood supply.

Proof that Dr. Gunn is not relating to what the GPI report actually says comes in the following sentence, when he opines that GPI Atlantic should have looked at *"whether or not current forest management in Nova Scotia is imposing significant limitations on the B.A. Fraser wood supply."* (B.A. Fraser supplies 95% of Finewood's raw wood.) Volume 2, pages 172-173 deal specifically with the fact that current forest management imposes significant limitations on wood supply for Finewood Flooring.

For example:

> *"Finewood Flooring has not been able to lease a sufficiently large tract of land to manage on a sustainable basis for hardwood sawlogs"* (page 172).
>
> *"Finewood anticipates that current harvest practices, driven by the requirements of the local pulp mill, will further diminish the available forest area that could potentially be suitable for its own products"* (page 173).

Further references to the impact of forest management on Finewood's wood supply are found in volume 1, pages 137-138, of the GPI report: For example, page 137 reports that:

> *"Finewood has found that clearcutting converts the existing mixed and hardwood stands to even-aged softwood stands of fir and spruce that are only suitable for pulp."*

In other words, the GPI report deals specifically with the very question that Dr. Gunn indicates we have not dealt with, and which he lectures us as being a "truly interesting question" that should be addressed.

4) Concerned once again to draw meaningless "either / or" distinctions, and to put everything in unconnected little boxes, Dr. Gunn writes that:

> *"The interface with the forest occurs not in the Finewood Flooring mill but in that of their supplier, B.A. Fraser Lumber Ltd."* (page 14.)

This is like saying that the interface between the smoker and the health care system has nothing to do with his smoking cigarettes, but concerns only the funding that the hospital receives after the smoker has lung cancer. It is this kind of thinking, and its complete lack of understanding of the chain of cause and effect, that the GPI is designed to overcome.

Proof that the Finewood Flooring / B.A. Fraser Lumber interface with the forest is inseparable is given in volume 1, page 138 of the GPI report, which reports that:

> *"B.A. Fraser Lumber and Finewood Flooring jointly proposed a selection harvesting plan for lease of Crown forest land in Cape Breton."*

Clearly Finewood Flooring not only interfaces directly with the forest, but probably has a *greater* interest in forest management than its supplier. To manufacture its products, Finewood Flooring is directly and completely dependent on a particular type of forest product (such as high quality hardwood sawlogs), whereas the supplier has the option of marketing whatever happens to be grown (e.g. softwoods for the pulp mill.)

Dr. Gunn's failure to acknowledge these obvious connections, and to dismiss the Finewood Flooring case study as "*not a forest product business"* that *"says very little about forest management"* also betrays his lack of understanding of the GPI as a whole. Indeed, the entire purpose of the GPI is to elucidate these very connections, to demonstrate the interconnected nature of reality, and to allow our accounting systems to reflect that reality more accurately.

5) Dr. Gunn writes (page 14): *"Although wood may (or may not) be scarce, the really scarce resource is the business acumen and initiative to create a manufacturing business like Finewood."* What is Dr. Gunn's evidence for this statement? GPI Atlantic takes a completely different view and values the resourcefulness, creativity, and initiative of Nova Scotians very highly. There is no shortage of Nova Scotian talent, capacity, and business acumen.

   As the Finewood Flooring case study clearly demonstrates (volume 2, chapter 6, section 5, titled "Challenges," pages 172-174), the obstacle to forest sector value-added has nothing to do with lack of initiative and business acumen, but is due to structural impediments. These impediments include:
   a) current forest management techniques, including the Nova Scotia forest industry's current "addiction to softwood" and the consequent lack of access to sufficient quantities of high quality hardwood sawlogs (pages 172-173);
   b) the fact that small value-added production is excluded from many forms of government support available to larger-scale operations (pages 173-174);
   c) access to financing.

   The GPI report recommends actions by government that can remove some of these impediments to value-added manufacturing, and thereby allow the natural resourcefulness of Nova Scotians to flourish (see particularly volume 2, chapters 5, 6, and 10.)

Note on Dr. Gunn's dismissal of the Nova Scotia case studies:

What is most remarkable in Dr. Gunn's treatment of all the four Nova Scotia case studies above is his consistent negativity. He can only find reasons for declaring that these examples of best practices have little to teach us, that they have no relevance for Nova Scotia as a whole, that value-added operations are not relevant, that Nova Scotians are short on initiative, and so on, ad nauseam. Nowhere does he relate to the success of these remarkable and dedicated home-grown forestry models in creating employment, in practising sustainable harvest techniques and responsible management, in restoring the full range of forest values, in protecting and enhancing forest ecosystem services, in creating social benefits, and so on.

Rather than celebrating these Nova Scotian initiatives, at least acknowledging their successes, and urging us to learn from them, he only wants to diminish them, belittle their outstanding contribution, and declare them irrelevant. This kind of negativity does not serve either our forests or the province of Nova Scotia.

e) Menominee Tribal Enterprises (MTE)

Although Dr. Gunn makes sweeping generalizations that all the GPI case studies "fail the test" of being useful models for Nova Scotia (page 12), he does not seem to find fault with the Menominee example. In fact he contradicts his earlier assertion by stating (page 14) that MTE *"may well be an example of what can be achieved by intensive management in the forests of Nova Scotia."*

Dr. Gunn goes on to list challenges in implementing the MTE model in this province. GPI Atlantic agrees completely that there will be major challenges in switching from the current clearcut / pulp and paper paradigm to a more sustainable system. As stated earlier, no single model should be uncritically applied without regard to the particular conditions existing in Nova Scotia, including different soil and forest types, land ownership patterns, and socio-economic circumstances. But, for once, it is heartening to the GPI Atlantic researchers that Dr. Gunn describes the MTE application issues as "challenges" rather than as reasons to dismiss the model. GPI Atlantic welcomes any point at all that could create the starting point for a genuine dialogue, and if MTE is Dr. Gunn's favourite example in the report, we would most certainly agree to start there in initiating change.

There are a few mistakes in Dr. Gunn's description of the MTE case study, however. He says that *"every piece of land is accessed on a 15 year rotation."* In fact, the 15 year rotation applies only to selection harvested stands (about 50% of the total.)

He also states that: "*Many of the elements of their (MTE) management planning process are very similar to those used by Stora and Irving."* That statement can be misleading without reference to the very significant differences that also exist. For example, one major difference (which Dr. Gunn does not mention here) is that 50% of harvesting at MTE is done through selection harvest methods using uneven-aged management, cutting

only single trees or small patches of trees. By contrast, Nova Scotia relies almost entirely on clearcutting, with less than 1% of harvesting done through selection methods. Dr. Gunn is correct that MTE uses "*a combination of even-aged and uneven-aged management,"* but the current Nova Scotia system is so skewed to even-aged management (95%) that even Stora and Irving have a long way to go before a genuine "combination" of methods exists in this province.

There are other major differences between management methods used by MTE on the one hand, and by Stora and Irving on the other. By volume, 50-60% of the total Menominee harvest is cut by hand (GPI, volume 2, page 106), while Stora, Irving, and the other large companies operating in Nova Scotia rely almost entirely on mechanized cutting. In addition, the average age of harvested trees is significantly older in the MTE forests. Maples at MTE, for example, are typically harvested at 140-180 years, compared to 75 years in Nova Scotia. As a result of the MTE management methods, 65% of the Menominee forest is still an old forest, while less than 1.2% of Nova Scotia's forest area is still dominated by trees more than 80 years old.

How "very similar" the MTE management methods are to those of Stora and Irving in Nova Scotia is, therefore, questionable. Nevertheless, GPI Atlantic would welcome further movement by large industry in Nova Scotia towards the MTE model, as one of the best examples of intensive-management industrial forestry in existence. If we can reduce clearcutting in Nova Scotia to 25% of the total harvest, as in the Menominee forests, we will most certainly have made significant "genuine progress." We are delighted that Dr. Gunn considers this outstanding model worthy of further exploration.

f) Algonquin Park

Sadly, the one moment of potential dialogue in Dr. Gunn's comments (concerning the MTE case study) quickly gives way to his usual disparagement and misrepresentation.

Dr. Gunn uses the fact that Algonquin Park permits timber harvesting, while Nova Scotia prohibits timber harvesting in parks, in order to dismiss the model as irrelevant. *"I am not sure why this is then a good example,"* he writes. This totally misses the point. First of all, there is never any implication in the GPI report that Nova Scotia parks should be logged. On the contrary, there are many statements in the GPI report on the importance of protected areas. In his public email correspondence with me two weeks before he posted his comments on his web site, Dr. Gunn had already admitted that (in his own words) "the 47,000 horses and the logging the parks was a cheap shot" (28 November). Yet he has no hesitation repeating this admitted "cheap shot" in his publicly posted comments.

The point of the Algonquin Park model, as clearly stated in the GPI report, is that it represents an outstanding example of sustainable, economically viable timber harvesting on an industrial scale. Completely regardless of its park status, there is a tremendous amount to learn from the actual harvesting and management practices at Algonquin Park.

If it were not a park, the lessons would still be completely valid. The park status is a red herring that Dr. Gunn uses to dismiss the case study and declare it irrelevant. In fact, the introduction to the Algonquin Park chapter specifically affirms that it is being examined not because of its park status, but because of its *"management approach that embodies ecologically, socially, and economically sustainable forestry practices"* and because its scale is comparable to many large forestry operations in Nova Scotia (GPI, volume 2, page 132.)

But secondly, and even more to the point, all of Nova Scotia can in fact be seen as a "nature tourist" destination, in the words of the executive director of the Tourism Industry Association of Nova Scotia (TIANS), Judith Cabrita. The overwhelming majority of visitors to this province are attracted by its natural beauty, and Algonquin Park happens to offer a first-rate model of the compatibility of tourism and protection of ecosystem integrity with excellent forest management practices and a profitable forestry industry.

For Dr. Gunn, however, there is nothing to learn here. He writes (pages 14-15):

> *"The main claim out of the Algonquin example is that tourism and logging have survived jointly. This is not news. Although there are abundant opportunities for improvement, the NS tourism industry and the forest industry has also co-existed."*

First of all, the GPI report never states that tourism and logging have simply "survived" jointly at Algonquin Park, as Dr. Gunn asserts. The claim goes far beyond that, to demonstrate that careful planning at Algonquin Park has ensured the maintenance and enhancement of the full range of forest values, in part to ensure the compatibility of the two industries. Careful planning has actually strengthened the forest's tourism and recreational values, while at the same time maintaining the economic viability and profitability of the timber operations. (See volume 2, pages 148-151; 159-160; and 167, for examples of that planning.)

That claim cannot presently be made for Nova Scotia, as the examples on pages 159-161 of Volume 2 make clear. One wonders whether Dr. Gunn listened to the speech of the TIANS executive director at the Forest Harvest Practices Forum in Truro on November 29, whether he read her strong statement endorsing the GPI report, or whether he has followed tourism industry statements on Nova Scotia's Integrated Resource Management process. "Co-existence" is as generous a term as is possible for the current relationship between the tourism and forestry industries in Nova Scotia.

It would be much more accurate to report that the tourism and logging industries are increasingly at odds with each other over land use practices in Nova Scotia. The Algonquin Park model shows a way out of that growing conflict towards much greater compatibility and harmony. A modicum of humility would allow any impartial observer to admit that Nova Scotia has plenty to learn about how good planning can enhance the compatibility of the two industries.

It is also not accurate for Dr. Gunn to assert that the joint survival of tourism and logging is "the main claim" of this case study. That allows him to dismiss it out of hand. In fact, this is only *one* of the major points of this chapter. Dr. Gunn conveniently ignores the other vital points. He makes no mention, for example, of the actual harvest, silviculture, and restoration forestry practices at Algonquin Park, nor of the contribution of these practices to conservation of biological diversity, and soil and water resources. Nor does he refer to the remarkable governance structure that ensures active citizen participation in forestry management and planning. There are *many* important lessons to be learned from the Algonquin model by observers with open and impartial minds.

Finally, Dr. Gunn quotes selectively from the "employment" section of the Algonquin Park chapter, ignoring detailed evidence actually presented in the report, and misrepresenting normal and accepted methods of scientific investigation. Let us examine the second issue first, as this is the one case where further investigation has led GPI Atlantic researchers to revise estimates, following Dr. Gunn's comments. As no honest researcher claims infallibility, and must always be prepared to revise errors, the issue here has to do with the *method* of inquiry.

Scientists and investigators frequently do not have available to them all the data they need to reach their conclusions. In such cases, they provide the direct measurements that they do have, and they make *assumptions* about the missing pieces, based on their best assessment of the evidence that is available. The issue has to do with making those assumptions *explicit* and not concealing them. If Dr. Gunn were to eliminate all scientific studies based on assumptions about key elements of the evidence, he would have to abolish science as a discipline. There would, for example, be no science of climate change at all, nor any computer modelling. True scientists take these assumptions as a challenge for further research, attempting to find direct data and evidence to substitute for the prior assumptions. Contrary to Dr. Gunn's assertion, assumptions do not, by definition, "create facts."

In the employment section of the Algonquin Park chapter, GPI Atlantic was completely explicit about its assumptions, and welcomed the provision of direct evidence and data that could eventually replace the assumptions. The GPI report (volume 2, page 157) cites the Algonquin Forest Authority (2001) website that explains that 12 processing plants are either wholly or partly dependent on Algonquin Park as a source of wood. It cites employment statistics from that same AFA website, which states that 1,800 people are employed in the 7 sawmills, 2 veneer plants, one pole plant, one pulp mill, and one oriented strand board mill that receive wood from Algonquin Park. The GPI report notes that Algonquin Park also provides periodic supplies of wood to another 5-10 mills, for which employment figures are not available.

GPI researchers' assessments of the evidence in the AFA report led them to draw the following tentative conclusion (preceded by a clear "if" statement):

> *"If we attribute 80% of the 12 mills' 1,800 jobs to Algonquin Park, and do not count the jobs from mills that receive wood on a periodic basis, then, per unit biomass harvested, AP produces 4.39 jobs per 1000 cubic metres of wood harvested. This estimate does not include all the jobs involved with the manufacture of secondary and tertiary products. For example, the two veneer plants and seven sawmills supplied by Algonquin Park sell their wood products to other manufacturing facilities for use in furniture, flooring, cabinets, and other products"* (GPI, volume 2, page 157.)

Dr. Gunn conveniently ignores the fact that GPI Atlantic researchers were being conservative in their estimate by excluding *all* jobs at the 5-10 mills that received periodic supplies of wood from Algonquin Park, and excluding *all* secondary and tertiary manufacturing jobs. Those exclusions are nowhere mentioned in Dr. Gunn's criticism, so his citation of the 80% attribution is selective.

The assumption of an 80% attribution of jobs to Algonquin Park at the 12 mills that are wholly or partly dependent on Algonquin Park wood is also completely explicit in the GPI report, and is based on the description of the 12 plants on the AFA website. In this case, GPI Atlantic completely acknowledges that the Algonquin Park employment statistics were tentative, and that the most recent AFA website itself provided insufficient evidence to reach a more definite conclusion. When direct evidence becomes available to replace any assumption, GPI Atlantic will be the first to substitute those data for the assumptions previously used. No true researcher has a greater attachment to assumptions than to direct data.

In the last two months, GPI Atlantic researchers have investigated all substantive and data issues raised by Dr. Gunn. In this particular case, as good fortune would have it, direct statistics have been published that were not available at the time the original Algonquin Park research was conducted. These new numbers allow us to substitute the previous estimates with more accurate data.

Since the completion of the Algonquin Park case study (GPI volume 2, chapter 5), the Ontario Ministry of Natural Resources (OMNR) has released a new publication entitled "Central and Eastern Ontario: Healthy Forests, Healthy Business." Released in late 2001, this report profiles the forest industry in central and eastern Ontario, and provides direct employment statistics for the forest industry in five sub-regions, one being Algonquin Park.

Although providing a much more direct and accurate source of employment statistics than those previously available, there are challenges even in using this source. Because there are no towns in Algonquin Park itself, there are no jobs attributed to the Algonquin Park sub-region. Instead, the jobs produced by the Algonquin Forest Authority, by the forest operations within the park, and from the wood produced within the park, are included in the employment statistics of the surrounding regions.

What makes it possible to attribute jobs to Algonquin Park more directly than before is the estimate that up to 39% of the total volume of timber harvested in these five sub-regions is from Algonquin Park. Thus, even though the information in the new OMNR report is not specific to Algonquin Park, it has allowed GPI Atlantic researchers to estimate employment per unit of biomass harvested based more on actual statistics than on the earlier assumptions.

Using the OMNR statistics, GPI Atlantic has revised the calculations in that chapter, and substituted an estimate of 4.1 direct jobs per 1000 cubic metres of timber harvested for the previous estimate of 4.39 direct jobs per 1000m^3. Like the earlier estimate, GPI Atlantic still regards this estimate as conservative, and has revised that section of the GPI Forest Accounts to explain exactly the origins of the estimate, and what it does and does not include.

It should be noted that the value added estimates in volume 2, chapter 5, section 9.5, indicate that Ontario generates three times more value-added production in the forest sector per cubic metre of wood harvested than Nova Scotia. Hence it is no surprise that the estimate for jobs per unit of biomass harvested is much less for Nova Scotia than it is for central and eastern Ontario.

GPI Atlantic expresses its appreciation to Dr. Gunn for provoking this further inquiry into an admittedly tentative assumption. GPI Atlantic welcomes close scrutiny of all the calculations, estimates, and assumptions in this 466-page report, that can lead to improvements in accuracy, methodology, and conclusions. It is for this reason that GPI researchers have been explicit in their assumptions (as in this case) and will continue to welcome the substitution of direct data for all such assumptions.

The key issue here has to do with method of inquiry. As noted, assumptions never create facts. Constructive critique does not throw the baby out with the bathwater, but seeks to improve each element of the analysis through deeper and further investigation. Even when comments are not constructive, GPI Atlantic welcomes any opportunity to improve methods and substitute new data sources for outdated or less accurate ones. Changes made to the GPI Forest Accounts as a result of Dr. Gunn's comments are summarized at the end of this review (section 19). GPI Atlantic looks forward to a continuous process of revision and improvement of the GPI Forest Accounts in the coming months and years.

g) Other Case Studies

After disparaging and dismissing the case studies in the GPI report, Dr. Gunn proceeds to tell us which case studies we "should have" used (page 15.) First of all, GPI Atlantic never claims anywhere that the six case studies selected for volume 2 are the only ones that could have been profiled. In fact, GPI Atlantic explicitly acknowledges that many other case studies could have been selected. Chapter 7 of volume 2 is actually entitled "Other Notable Case Studies," and it briefly profiles five more case studies, each of

which could have been presented in much more detail. Section 13.1 in volume 1 briefly profiles yet another excellent model. And there are many more. The fact that there are other good case studies does not invalidate the six outstanding ones selected by GPI Atlantic.

GPI Atlantic chose to present a small number of studies, representing a wide range of forest types, sizes, and locations, in considerable detail, in order to provide practical information on actual harvest and management practices, and to explore the actual costs and job creation potential of restoration forestry. This was considered to be more useful to woodlot owners, industry, and government than presenting "dozens" of "examples of good practice," which Dr. Gunn asserts that "GPI should have been able to come up with." But in his typical "either / or" style, Dr. Gunn indicates that the choice is between *his* idea of suitable case studies and those mentioned in the GPI report.

1) He does not like the GPI case studies because they are "atypical" (page 15.) Of course, pioneering efforts to reverse centuries of forest degradation, and that are on the leading edge of new approaches to sustainable forestry, will be "atypical." It is the "typical" forestry currently practised in the province (99% through clearcutting) that continues to degrade the province's forests. Obviously, by definition, the 1% that does things differently (and pioneers of all kinds), will not be typical. What Dr. Gunn seems to want is more of the same. For the sake of the province's forests, GPI Atlantic hopes that the case studies presented in volume 2 will become "typical" practice very soon.

2) Dr. Gunn opines that the six case studies presented by GPI Atlantic cannot be "profitably emulated" (page 15.) In the conventional definition of "profit," which excludes all ecological and social benefits, he may be right. But that conventional definition of profit, which measures natural resource depletion as economic gain, bears considerable responsibility for the current state of our forests, as it does for the collapse of our Atlantic groundfish stocks.

   It is the entire purpose of the GPI to produce a more accurate and comprehensive accounting system, in which the definition of profit includes the health of our natural capital assets. Just as a factory owner would not assess the economic health of his enterprise without regard for the state of his equipment and machinery, so "profit" in the forestry industry cannot be separated from the health of the standing forest. If the value of the latter is diminished, then the future flow of goods and services, and the profits they will produce, are imperilled. Record levels of fish catches and sales prior to the collapse of the groundfish stocks were not an indication of economic health.

   Dr. Gunn's remark that these six case studies cannot be "profitably emulated" indicates once again that he has not understood the point of the GPI at all. Just as he completely ignores the social benefits of the Pictou Landing forest project, and just as he labels a major investment in forest restoration as a "loss," (section b above), he is adhering here to the old resource accounting mechanisms that have become widely

discredited, and that continue to send perverse messages to foresters and policy makers alike.

3) A key reason that current unsustainable practices remain "typical" and "profitable" is that they are they are enabled and perpetuated by huge subsidies, particularly for roads (see GPI Forest Accounts, volume 2, chapter 9). Subsidies also extend to spray programs, nurseries, NSDNR extension programs and employees who teach and advise even-aged management (see volume 2, chapter 3), and so on.

   As noted in volume 2, chapter 9, Stora would have had to pay $275/cord, had government monies not paid for the road and bridges into the clearcut. GPI Atlantic did not explore the issue of subsidies at all in its report. Had it done so, the "profitability" that Gunn touts as typical of current practices would have appeared highly questionable.

   This is very good news: If Nova Scotians are already subsidizing current profit levels, particularly for the largest companies, then no new taxpayer monies are needed to support a shift to restoration forestry practices. All that is required is a re-allocation of existing government funds from unsustainable practices that continue to devalue the province's forests to sustainable practices that can begin to restore forest values for the benefit of future generations. Such a shift would begin to make the case studies in the GPI Forest Accounts far more attractive and profitable to Nova Scotian woodlot owners and could quickly make them typical.
   In short, the economics of restoration forestry that currently produces "losses" in Dr. Gunn's conventional balance sheet and puts it out of the reach of most woodlot owners is largely an artefact of government policy rather than an immutable consequence of market forces.

4) But maybe Dr. Gunn does not want to see too much change. After all, he writes:

   > *"We have been harvesting timber in this province for almost 400 years and we still have a forest cover that would be the envy of many European nations in terms of diversity"* (page 15).

   In one sense, Dr. Gunn is correct. It is not too late to make the necessary changes here, and to protect and restore our natural forested wealth in this province. This too is good news. But that is no reason for complacency. The window of opportunity may be narrower than Dr. Gunn's statement implies. In the last 40 years alone, Nova Scotia has lost almost all its remaining old forests. In 1958, forests more than 100 years old still dominated nearly 9% of provincial forest area, and forests more than 80 years old dominated 25% of the forest area. Today, according to the latest forest inventory, forests more than 100 years old occupy only 0.15% of the forest area, and forests more than 80 years old dominate only 1% of the forest area.

As Kehler et al. point out, “It is difficult to predict the precise effects forestry operations have had on forest wildlife in Nova Scotia, as baseline information about the vast majority of forest species is absent, and complete species lists exist for very few taxonomic groups”. It may actually be too late for various species: It is not uncommon today for species to go extinct before they have been known and documented. So the current advantage we currently hold over "many European nations" may be short-lived if current forest practices are not changed.

Using increasingly mechanized harvest methods, and machinery that fells several trees at once, harvest volumes have doubled since the 1980s, and the area clearcut has doubled since 1992 alone. At current rates and methods of harvest, we may not be able to boast of our forest superiority over "many European nations" for very much longer. (Incidentally, there are some European nations that could currently boast far superior practices to our own).

The point here is that many of the case studies that Dr. Gunn would have liked GPI Atlantic to profile as models still rely largely (even overwhelmingly) on clearcutting as their primary harvest method. Hopefully we will make the necessary changes *before* we degrade our forests to the state of the "many European nations" to which Gunn refers.

5) Dr. Gunn suggests that GPI Atlantic should have profiled winners of the “Woodlot Owner of the Year” program. We have no desire to disparage any Nova Scotia woodlot owner. So all that will be said here is that the title alone does not necessarily qualify as an example of “best practices” from the perspective of the restoration forestry described in volume 2 of the GPI report. Who selects the Woodlot Owners of the Year? According to what criteria are they chosen? Which practices do the organizers of that program want to profile? These questions bear investigation, and the credentials of the program organizers (the NS Department of Natural Resources) are not irrelevant to the equation.

6) Finally, Dr. Gunn suggests that GPI Atlantic could profile Mr. Wade Prest as one of the case studies. *“It would have been interesting to learn how he and other large landowners manage their holdings.”* Here, GPI Atlantic agrees heartily with Dr. Gunn. Wade Prest’s example would have made an outstanding case study completely consonant and in accord with the principles of sustainable forestry profiled in the GPI report. Unfortunately the case study volume (volume 2) is already more than 250 pages long, and there was simply not space for all the excellent available models, Mr. Prest’s included.

However, Dr. Gunn *will* find some information in the GPI report on how Mr. Prest manages his holdings. Chapter 10 of volume 2, pages 208-209, describes how Mr. Prest is the first forester and landowner in Nova Scotia to avail himself of the new selection harvest credits that are available for the first time under the NSDNR’s Forest Sustainability Regulations. In addition, Mr. Prest is featured and cited extensively in

chapter 2 of volume 2, as the author of the Pictou Landing Forest Management Plan (1999.) Mr Prest, incidentally, is also past president of the Nova Scotia Woodlot Owners and Operators Association (NSWOOA) that has welcomed and supported the GPI report that Dr. Gunn disparages. NSWOOA has recently suspended participation in the Nova Forest Alliance in protest over the bias of the NFA chair, Eldon Gunn.

12) Productivity and employment per unit of biomass (Gunn, page 15, and Appendix II: Theories of Value, pages 24-25).

Dr. Gunn writes (page 15):

> *"One major problem throughout these case studies is an emphasis on employment per m^3 of harvest. This is an anti-productivity focus. The entire focus of manufacturing progress in the past half century is an improvement in productivity. This has the effect of reducing the labour content of all goods."*

This statement is wrong for several reasons:

- Dr. Gunn defines productivity too narrowly and ignores a key Statistics Canada definition of productivity;
- He misunderstands and misinterprets the indicator per se, and its purpose;
- He confuses means and ends; and
- He turns a highly questionable hypothesis into dogma.

1) Multifactor productivity is a far broader, more accurate and more comprehensive measure of productivity than the conventional labour productivity measure used by Dr. Gunn. It measures outputs in relation to a wide range of inputs, including capital inputs for example, and not just the labour inputs considered by Dr. Gunn. According to Statistics Canada:

   > *"Multifactor productivity growth - the growth of output minus the growth of the combined inputs - is designed to measure the joint influences on economic growth of technological change, efficiency improvements, returns to scale and other factors. Multifactor productivity, therefore, differs from the labour productivity (growth of output minus growth of hours worked)."*

   Without considering this broader range of inputs, Dr. Gunn has no ground to label the GPI measure "anti-productivity." On the contrary, consideration of capital inputs (including natural capital inputs) will produce a far more accurate assessment of long-term productivity. From that perspective, a measure relating employment to the long-term capacity of the resource to sustain that employment is "pro-productivity."

   Long-term resource depletion imperils not only future employment but also industry output. Dr. Gunn's short-term view of productivity fails to account for the fact that long-term outputs (and therefore productivity) are dependent on resource health. The

Nova Scotia Department of Natural Resources itself considers current harvest levels on private woodlots to be unsustainable. If jobs are assessed without regard to the volume of timber harvested, then excess harvests now will threaten future productivity.

2) Dr. Gunn's blanket statement that the GPI emphasis on employment per unit of biomass harvested is "anti-productivity" is nonsense, therefore, not only because he ignores multifactor productivity entirely in his assessment, but also because he misunderstands and misinterprets the purpose of the indicator altogether. As the GPI report states this purpose and use explicitly, one can only conclude, once again, that Dr. Gunn has not read the GPI report with any care, or is ignoring and misrepresenting what he has read. In volume 1, pages 129-130, the GPI report introduces the assessment of employment in relation to volume of biomass harvested:

> *"From the perspective of sustainability and long-term job security, employment depends on the health of the resource. If timber is harvested at an unsustainable rate, or if any natural resource becomes depleted or degraded over time, future employment prospects are threatened, as occurred with the catastrophic collapse of Atlantic ground fish stocks which put 40,000 out of work."*

Page 131, immediately following, goes on to demonstrate in considerable detail that employment per unit of biomass harvested is also a useful indicator to assess the degree of value-added in the industry. As noted, Nova Scotia currently has one of the lowest rates of value-added in the country, less than a third the Ontario rate, less than half the Manitoba rate, and one-third less than in New Brunswick. A higher degree of value-added means that each unit of resource harvested produces greater value to the Nova Scotia economy. This is a "pro-productivity" position, because each cubic metre of timber harvested is more productive. Conversely, as noted on page 131:

> *"[A] continuation of the current trend may produce an increasing reliance on poorer quality stock with ever less value-added job creation potential, a downward spiral that serves neither the province's natural wealth nor the important goal of job creation."*

In other words, Dr. Gunn is not only wrong in his productivity assessment, but he actually misses both primary purposes served by this important indicator – its function both as a measure of resource health, and as a measure of industry value-added.

3) Dr. Gunn then states that the "entire" focus of manufacturing progress in the last half century is an improvement in productivity that reduces the labour content of goods. Leaving aside the narrow definition of productivity used by Dr. Gunn (above), he also confuses means and ends in this statement, and reveals a short historical memory. He speaks of a "half century" of "progress," but forgets that until 25-30 years ago, it was assumed that higher rates of labour productivity would produce increased leisure

time. Economists speculated about shorter workweeks that would give workers much more free time. The opposite has occurred. Canadians are not only working longer hours, but have also seen their real wages decline in the last 10 years.

In other words, it is meaningless to speak of "productivity" without relating it to the social benefit it is supposed to produce. Productivity is a means not an end, just as economic growth is not a goal in its own right. (If Dr. Gunn has taken the time to review the GPI as a whole, or even to read the GPI overview in the Forest Accounts, he would understand this basic critique of conventional growth measures.) To take just one obvious example, if reducing the labour content of goods simply produces higher unemployment, then is it necessarily desirable?

4) This leads to the fourth reason that Dr. Gunn's blanket statement is completely off the mark. There are a lot of "ifs'', and a lot of assumptions in his productivity pronouncements. His statement assumes a complex theory – that reducing the labour content of goods reduces input costs and thus increases competitiveness and profitability, which in turn lead to increased investment, production and employment. There are many complex intervening variables, including the potential for over-production, declines in demand due to falling real wages, fluctuations in the business cycle, and possible resource collapses. What Dr. Gunn states as unquestioned dogma is no more than a hypothesis that has actually been seriously challenged on many fronts. His statement on the "entire focus of manufacturing progress" is highly simplistic, and requires proof rather than assertion.

   Dr. Gunn follows this statement with a complete non-sequitur – that we do not want a forest with low-productivity jobs, and that a productive, sustainably managed forest will require highly skilled people (Gunn, pages 15-16.) GPI Atlantic completely agrees with this statement. In fact, the case studies in volume 2 demonstrate the skill levels needed for sustainable forest management. If Dr. Gunn believes his own statement here, it is puzzling why he so cavalierly dismisses the knowledge component in the Jeremy Frith case study, which demonstrates exactly the kind of skills we should be cultivating and propagating if we want a highly skilled forest industry work force. One of Dr. Gunn's primary reasons for dismissing the Frith model and stating that "there is little to be learned" from it, is that few Nova Scotian woodlot owners have the knowledge to do what Jeremy Frith has done. There seems to be a serious contradiction in Dr. Gunn's argument here.

   For the record, GPI Atlantic agrees fully with Dr. Gunn's statement that *"a productive, sustainably managed forest will require highly skilled people"* (Page 16), and notes here that its case studies are dedicated to that goal and to the skills training required for sustainable forest management. If Dr. Gunn genuinely shares this aspiration, as his own statement implies, he should welcome the case studies in volume 2, rather than dismissing them as irrelevant.

5) In his Appendix on "Theories of Value," Dr. Gunn continues missing the point of this important indicator. He states that reference to employment per unit of biomass harvested is *"one of the disturbing tendencies throughout the GPI Atlantic report"* and he comments *"this is getting awfully close to the Labour Theory of Value which is usually thought of as discredited"* (page 24).

   As already noted in section 12(2) above, this indicator has nothing to do with the labour theory of value. It has to do with valuing the *resource* on which forest industry jobs depend, and describing employment and GDP value in relation to the health of the resource. The labour theory of value has nothing to do with natural resource values. In fact, it was propagated at a time when natural resources were widely and implicitly assumed to be limitless. More recently, there has been an appreciation that resources have finite limits and cannot be used up faster than they are depleted without serious threats to the human economy and to employment (as the groundfish collapse demonstrated). The GPI indicator of employment per unit of biomass harvested has to do with that understanding.

   Because he completely misses the point of the indicator altogether and confuses it with a completely different theory and concept, Dr. Gunn goes on to make nonsensical statements (page 24):

   > *"Even those economists who would support a Labor Theory of Value would find the productivity assumptions behind the GPI arguments unattractive; essentially more productivity bad, less productivity good."*

   There is nothing anti-productivity in the GPI argument. On the contrary, the emphasis on the importance of value-added manufacturing is a pro-productivity argument, when considerations of resource capacity are included in the equation. However, Dr. Gunn is less concerned to read what the GPI report actually says than to impose his own distortions and confused understanding on the GPI results.

   If Dr. Gunn really wants to engage in a "productive" discussion on productivity, he should first familiarize himself with Statistics Canada's definition and use of multifactor productivity. That is a far more sophisticated, comprehensive, and accurate measure of productivity than the labour theory of value to which he devotes so much space in his comments.

6) In his Appendix on "theories of value," Dr. Gunn then goes on to make the following statement that contains at least five identifiable errors:

   > *"The problem that GPI claimed to be solving is how to monetarize or index those non-market inputs and outputs so that proper decision making can be made. Instead they completely abandoned this effort and have resorted to these highly simplistic measures, and single input models, applied in many cases outside the domain of discourse of the report, which is supposed to be the forest."*

(i) GPI Atlantic *never* claims to "solve" this highly complex problem, and *continually* makes that point clear. As just one example see volume 1, pages 177-181, entitled "What the GPI is Not," which includes an extensive discussion on the challenges and limits of monetization, and on the valuation of non-market variables. Since Dr. Gunn claims such expertise on what GPI Atlantic's purposes and claims are, it is remarkable that he missed this section, and that even the title did not catch his attention. Once again, he either did not read what he claims to be commenting on, or else he is wilfully ignoring what he read and deliberately distorting and misrepresenting the GPI.

Further on in Appendix II, Dr. Gunn gives a lecture on the limits of monetization, as if he is introducing the subject to GPI Atlantic. This homily makes it very clear that Dr. Gunn did not read volume 1, pages 178-179 of the GPI report, which deals specifically with the limits of monetization.

(ii) GPI Atlantic never "completely abandoned" this effort. Again, there are many sections of the GPI report that make this clear. Monetization is attempted where possible, subject to the strict limitations and provisos described in the report, and only in cases where adequate physical data underlie the economic valuations. Where physical data are lacking or in short supply, the derivative economic valuations in the GPI methodology are not possible, and the GPI report focuses on assembling whatever physical data exist. The considerable work on trends in age structure is an example.

If Dr. Gunn really wanted to understand what the GPI report does and does not claim to do in this regard, he could have referred to the Preface (volume 1, page v); volume 1, chapter 2 (particularly pages 10-11); Appendix C, and other places. Here is another example that Dr. Gunn either missed or ignored (volume 1, page 10):

"A fundamental principle of GPI full-cost accounting methods is to recognize that non-market economic valuations are secondary or derivative processes, that require a firm foundation in physical evidence. After two years of investigation, the GPI Atlantic researchers concluded that the basic physical data for a full-fledged economic valuation of Nova Scotia's forest services were not yet available. For that reason, this first iteration of the Nova Scotia forest accounts focuses on assembling baseline physical data that can provide a basis for a more complete economic valuation at a later stage. Nevertheless, this study points towards pieces of the economic valuation puzzle wherever possible.

"While basic physical data are lacking for many indicators of forest quality and health, attempts at economic valuation are also very difficult. Nevertheless, non-timber forest functions clearly do have economic value. For example:

** Species and genetic diversity can increase forest resilience and provide protection against spruce budworm and other infestations, producing direct economic savings as a result of lower rates of defoliation and loss.*
** Mixed age forests ensure a higher proportion of wide-diameter and clear lumber that can fetch higher market prices than lumber from younger managed single-age forests.*[5]
** Overall forest biodiversity and habitat protection enhance forest recreational values and tourism opportunities, providing economic benefits.*
** Protection of good soil quality ensures future timber productivity.*
** Forested watersheds protect against excess runoff and sedimentation, providing protection for fisheries.*
** Forested watersheds also protect the quality of drinking water, and save expensive filtration costs.*[6]

"In short, non-timber values clearly include benefits not only for the environment, but for the human economy. Despite the acknowledged lack of precision that accompanies such economic valuations, this study attempts to recognize economic values wherever possible, because even imprecise valuations of non-timber forest values are more accurate than assigning them an arbitrary value of zero, as is the case in our current accounting mechanisms.

"Money will always be an extremely limited and imperfect tool for such non-market valuations, as explained in Appendix D. Nevertheless GPI Atlantic recognizes that monetary valuations are necessary at the present time in order to bring the full range of forest values into the policy arena and to ensure their maintenance and protection. Preliminary economic estimates of forest values have therefore been made wherever possible, while acknowledging that these do not yet constitute a comprehensive valuation of all Nova Scotia forest values. As noted above, the most important prerequisite for such a comprehensive valuation is an improvement in the physical accounts and the databases for the physical monitoring of forest health".

If Dr. Gunn wants to interpret this as either "solving" the economic valuation problem or "completely abandoning this effort," then he must have read a different report, or else deliberately tried to misrepresent this one.

In response to the accusation that the GPI measures are "highly simplistic," we will have to leave the reader to judge. We might, however, offer the following questions: Which of the following alternatives is more simplistic? –

- A simple, *quantitative* wood supply model, such as that touted by Dr. Gunn, or an approach to wood supply that also includes *qualitative* criteria such age and species structure, and other forest values?

[5] See Volume 2, Chapter 8, for this analysis
[6] See Wilson, Sara J., *The GPI Water Quality Accounts,* GPI Atlantic, Halifax, NS, July, 2000, Section 9.2, pages 115-117. This provides a concrete example of net savings to New York City estimated at $9 billion over 10 years as the result of forested watershed restoration in the Catskill Mountains.

- An approach to forest stocks that considers only quantitative depletion and regeneration, or one that additionally explores degradation (*qualitative* decline) and restoration of the full range of forest values?
- A definition of "sustainability" based on timber alone, that allows diverse, old forests to be replaced by young even-aged forests, or a definition of sustainability based on the capacity of the forest to perform *all* its multiple functions optimally?
- A measurement system that ignores all forest functions aside from timber production as if they had no value, or one that attempts to value the full range of forest functions, including ecosystem values and non-market services.

For any reader of the GPI Forest Accounts, the GPI approach is obvious and explicit. The GPI understands that capital and stocks can decline in value due to degradation as well as depletion. Just as a factory owner's capital assets can depreciate if his machinery deteriorates or falls into disrepair (as opposed simply to being sold or destroyed), so a forest can depreciate in value when it can no longer perform its various functions effectively (as opposed simply to being cut down.)

Changes in age and species structure, for example, can impair the capacity of a forest to protect soils, watersheds, wildlife, and habitat; to sequester carbon; regulate the climate; and provide recreational opportunities. In the GPI, depletion and degradation are both aspects of depreciation, in contrast to the conventional wood supply models promoted by Dr. Gunn, which count the former and not the latter. As noted, the reader can judge which approach is more "simplistic."

Conversely, the GPI considers not only quantitative "regeneration" (natural and through silviculture) as in the conventional wood supply models touted by Dr. Gunn, but *also* the quality and type of regeneration. In the former models, an old growth forest can be replaced by a young single-species plantation, and the difference will never show up in the conventional statistics, so long as the amount of regeneration matches the amount of depletion. The result is called "sustainable." No wonder that policy makers and foresters have been getting the wrong messages all along from our flawed conventional accounting systems, and no wonder that our forests are in such a sorry state. Not surprisingly, forest "restoration" is barely in the lexicon of the conventional analysts. By contrast, forest restoration is the core theme of volume 2 of the GPI Forest Accounts. Again, the reader can judge which approach is more "simplistic."

The question of which approach is more simplistic can also be asked in relation not just to the overall approach but in relation to the specific issues Dr. Gunn raises. The GPI report attributes the loss of old forests primarily to more than two centuries of land clearing, high-grading, and clearcutting. Dr.

Gunn attributes the same phenomenon to the spruce budworm attack of the 1970s. The reader is encouraged to examine the evidence for himself or herself, and to decide which conclusion is more "simplistic."

(iii) It is hard to fathom what Dr. Gunn means by a "single input model" in this context, unless he is simply fishing for more pejorative phrases to discredit the GPI report. If he considers an approach that evaluates forest health according to the full range of forest values a "single input" approach, he must be using a different definition than any I have seen in the literature. If he is referring to employment as the single input, then he is revealing his complete misunderstanding of the indicator altogether (section 12, 5, above) and confusing his own references to the labour theory of value with what the GPI report is actually saying. He is also ignoring the fact that employment per unit of biomass harvested (volume 1, section 12.4.1, pages 129-131) is only one among a very large number of indicators (and inputs into forest health) presented in the GPI Forest Accounts. Either way, his reference to single inputs makes no sense at all.

(iv) *"applied in many cases outside the domain of discourse of the report, which is supposed to be the forest."* It is hard to fathom what Dr. Gunn means by this gratuitous statement. It seems to be just another throw-away line. One assumes that he is referring to the fact that linkages are sometimes made between the forest report on the one hand and the methodologies and purposes of the Genuine Progress Index (GPI) as a whole, on the other.

Dr. Gunn admits he did not review the GPI project as a whole (page 2.) If he had, he would have understood that the GPI Forest Accounts are one of 22 components of the Nova Scotia GPI, and that the linkages of this report with the GPI as a whole, and with the methods of natural resource accounting, are natural and necessary. The way the Forest Accounts fit into the GPI as a whole is explicitly explained in the Foreword in volume 1 (pages xxii-xxvi); in chapter 1 (pages 2-6); and in Appendix C (especially pages 182 – 185.) As usual, one suspects the problem is Dr. Gunn's preference to put everything into discrete little boxes, rather than to explore economic-social-ecological linkages and relationships, which is the entire purpose of the GPI.

7) Further in Appendix II, Dr. Gunn provides another homily on market failures and economic externalities, and notes that: *"Overcoming problems of market failure is perhaps the single greatest challenge to conventional economics"* (page 24.) One wonders, as in many other places, whom Dr. Gunn is lecturing here. If he had read the GPI report with any care, he would see that the GPI approach recognizes the failure to value natural capital and social capital as a primary reason for market failures.

8) Continuing this lecture (page 25), Dr. Gunn goes on at length about financial incentives and constraints. It appears that Dr. Gunn has failed to read chapter 10 of

volume 2, which deals specifically and wholly with tax reforms and financial incentives. If he did read it, he is wilfully ignoring it in this lecture, since he nowhere acknowledges the discussion. In many other parts of the GPI Forest Accounts, particularly in volume 2, the role of financial incentives to encourage restoration forestry is discussed.

Dr. Gunn opines that "incentives are very hard to control" and "often have the habit of overshooting the mark." Yet we use them all the time to encourage and discourage behaviour, offering investment tax credits, for example, and tax breaks for companies that create jobs in Nova Scotia, and raising cigarette taxes to discourage smoking. They are also used in the silviculture credits that are part of the NS Department of Natural Resources' Forest Sustainability Regulations, which Dr. Gunn praises, and they are now being proposed as a key tool to reduce greenhouse emissions ("emissions trading"). The evidence shows that in a market economy, financial instruments work, however imperfectly, and they can be used effectively to encourage restoration forestry, as volume 2 of the Forest Accounts recommends. In his theoretical homily, Dr. Gunn presents no empirical evidence to support his apparent case against financial incentives.

In this lecture, Dr. Gunn lists the advantages of constraints, citing their advantages over financial incentives. It is the usual "either / or" syndrome. In the GPI perspective, one usually needs a combination of *both* regulations *and* financial incentives in order to accomplish policy goals effectively; and both are proposed in the GPI report.

It is noteworthy that Dr. Gunn draws his inspiration for his Appendix II lecture on Theories of Value largely from Samuelson's 1967 *Economics* textbook, written at a time when the dependence of the human economy on ecosystem services was only dimly understood among western academics. The problems with Samuelson's conventional economics are well known and widely acknowledged. In the 34 years since Samuelson's 7th edition was published, the human economy is, increasingly, less often viewed as a closed box, independent of natural resource flows and waste production. Yet, what is most notable about Dr. Gunn's Appendix II lecture is that the dependence of the human economy on natural resource capacity is nowhere acknowledged. Dr. Gunn is stuck in the closed box syndrome, completely misses the point of the GPI, and offers a lecture in conventional economics that has no apparent relationship with what the GPI report actually says.

13) Economic assessment of ecosystem service values

The next section of Dr. Gunn's comments (pages 16-19) represents a serious distortion and misunderstanding of accepted scientific method and process. The basic issue is straightforward: Researchers should always use direct local measurements whenever they are available. Extrapolations from other sources and other regions are only used where local data are unavailable. Genuine scientists take extrapolations as a challenge for further research – to develop reliable local measurements that can eventually provide more accurate assessments and replace the extrapolations.

To throw the baby out with the bathwater, so to speak, by denying the value of extrapolations per se, actually hinders the process of scientific investigation by preventing the formulation of important hypotheses that can then be empirically tested. The basic rule to which researchers have to adhere in making extrapolations is to be explicit about the assumptions and limitations underlying them. If that is done, then there is no obstacle to promoting field research that can test the assumptions, overcome the limitations, and make the calculations ever more accurate.

GPI research always gives preference to local Nova Scotia data whenever they are available. But GPI researchers frequently rely on extrapolations from other studies when local data are not available. For example, GPI Atlantic used all 16 existing North American peer-reviewed studies of hospitality industry sales tax receipts to assess the likely impacts of smoke-free legislation on business sales in Nova Scotia. It used epidemiological studies from the United States and New Zealand, published in respectable medical journals, to assess likely mortality and morbidity rates due to second-hand smoke in Nova Scotia.

Similarly, Nova Scotian data currently do not exist to assess the economic value of forest ecosystem services in this province. The situation is more serious than that. Economic valuations are always based on prior physical assessments. In Nova Scotia, even the physical data do not exist for most ecosystem service assessments. For example, very little is known about the impacts of harvest practices like clearcutting on wildlife habitat in Nova Scotia. As the GPI report states (volume 1, pages 39-40):

> *"It is difficult to predict the precise effects forestry operations have had on forest wildlife in Nova Scotia, as baseline information about the vast majority of forest species is absent, and complete species lists exist for very few taxonomic groups (Kehler et. al. 1996)…. To date, very few studies have examined the biological impacts of forest fragmentation and harvesting of mature forests on wildlife in Nova Scotia. For example, no studies have examined the effects of forest fragmentation on bird populations in Nova Scotia (Staicer pers. comm. 2001)."*

Therefore GPI Atlantic had to use studies assessing impacts on forest-dependent species in comparable situations outside the province. As stated in the GPI report (volume 1, page 40), and also as noted above:

> *"Given the paucity of evidence for Nova Scotia, we have to rely, for the most part, on research and studies carried out in other parts of North America. When all the available evidence indicates that a certain species is vulnerable to forest conversion and/or forest fragmentation in other parts of North America, we can only assume that the same applies to Nova Scotia. Without evidence to the contrary, the precautionary principle (adopted as law in this province) would appear to indicate that action must be taken to protect the habitat of these same species in this province:*
>
> > *"The precautionary principle will be used in decision-making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation".*
> >
> > *Nova Scotia Environment Act, Part One, Section 2 (b) (ii)*
>
> *"Currently, however, most species that are sensitive to clearcutting are not considered in decisions that influence land use practices."*

Similar statements appear in relation to the absence of soil studies, and the lack of data on many other vital ecosystem functions. Because ecosystem values have not been considered in conventional assessments of progress, such studies have had low priority on the research agenda, and have hardly been missed by forestry officials and policy makers. The GPI report demonstrates that they are, in fact, vitally important to assessments of natural resource health. But such demonstrations can only come by indicating their importance in other jurisdictions where studies *have* been done.

A true scientist, reading the above statements in the GPI report, as well as the six pages of relevant data from other, comparable jurisdictions (volume 1, pages 40-46), will encourage the more systematic assembly of baseline information for Nova Scotia forest species. He or she will also promote studies on the impact of forest fragmentation and harvesting on Nova Scotia species. While a New Brunswick study comparing amphibian populations in natural forests and plantations (pages 43-44) may not be entirely applicable to Nova Scotia conditions in all respects, for example, no responsible scientist would dismiss its relevance in the absence of comparable Nova Scotia data.

Wherever possible, the GPI Atlantic researchers made every effort to assemble the existing Nova Scotia data for ecosystem indicators. For example, the 40-year trends in Nova Scotia forest age class – a key indicator for many ecosystem functions, have never before been compiled in a single chart, and systematically presented to the Nova Scotia public. However, the GPI Forest Accounts are the first attempt to assess the economic value of forest ecosystem functions in Nova Scotia, and much basic field research

remains to be done before the full range of physical indicators are available to make these economic assessments accurately. It is hoped that every succeeding update of the GPI Forest Accounts will see more local data available that can improve the accuracy of existing assessments.

In the meantime, it is both irresponsible and unscientific for Dr. Gunn to assert that data should not be presented because they are incomplete or cannot be fully verified at this stage. What he proposes would literally kill scientific endeavour altogether. No new hypotheses would ever be proposed. Data gaps would never be illuminated. New and necessary studies would never be suggested. And, most importantly from a policy perspective, critical values would be ignored and policy distortions promoted, by ignoring or keeping invisible vital issues on which insufficient data are currently available.

In effect, Dr. Gunn's method would promote only the most simple-minded solutions for which current data are fully available, would distort research priorities, and would keep vital scientific information off the policy agenda. In effect, forest ecosystem services have hitherto been assigned an arbitrary zero value in conventional economic accounts, resource assessments, and measures of progress. That is *much* more inaccurate than attempting to assign values according to the best available (though limited) data.

Scientific progress occurs because tentative conclusions are drawn from limited existing data sets, which in turn leads to further research aimed at testing those conclusions and improving the accuracy of the data. If limited data sets were not presented, if extrapolations were not attempted, and if no conclusions were drawn from the limited available data sets, there would be no provocation for further investigation. The responsible way forward is to be as explicit as possible about the limitations and assumptions that accompany existing data sets and extrapolations in order to elucidate the data gaps that exist, to point to real values that have been hidden, and to encourage further research where it is most needed.

How do these theoretical and conceptual observations apply to the valuation issues raised by Dr. Gunn? Non-market services are extraordinarily difficult to value in monetary terms, precisely because they are not traded in the marketplace. Because our conventional measures of progress are based on market-based economic growth statistics, non-market social and ecological values have remained invisible. This has led to major accounting inaccuracies, because unpaid work, natural resource stock values, and other social and environmental assets are essentially priced at zero. This has led to serious policy distortions. The problem exists in Dr. Gunn's wood supply model and in conventional timber accounts that fail to include non-timber values and ecosystem services. It is that failing that the GPI seeks to remedy.

Appendix C of volume 1 of the GPI Forest Accounts, and pages 177-182 in particular, which Dr. Gunn appears not to have read, describes in more detail the challenges of valuing non-market services, and the limitations of monetization altogether. See page

179, for example, which specifically states that *"money is a poor tool for assessing the non-timber values of a forest."* However, pages 177-182 also indicate that efforts at monetization are essential in a system dominated by market statistics, financial incentives, and budgetary considerations, as a temporary strategy designed to point to the actual economic and social value of these non-market services. Here is what the GPI report actually says (pages 178-179). (Had Dr. Gunn read this section, it would be unnecessary to cite it here, but his remarks indicate that he has ignored it completely.)

> *"Second, the GPI assesses the economic value of social and environmental assets by imputing market values to the services provided by our stock of human, social and environmental capital. But this imputation of market values is not an end in itself. It is a temporary measure, necessary only as long as financial structures, such as prices, taxes and monetary incentives, continue to provide the primary cues for the actual behaviour of businesses, consumers and governments…. {I]n a world where "everything has its price", monetizing social and environmental variables assigns them greater value and provides a more accurate measure of progress than excluding them from our central wealth accounts.*
>
> *"Monetization is only a tool to communicate with the world of conventional economics, not a view that reduces profound human, social and environmental values to monetary terms. It is a necessary step, given the dominance of the materialist ethic, in order to overcome the tendency to undervalue the services of unpaid labour, natural resources and other "free" assets; to make their contribution to prosperity clearly visible; and to bring these social and environmental assets more fully into the policy arena.*
>
> *"Monetization also serves to demonstrate the linkages and connections between non-market and market factors, such as the reality that depletion of a natural resource will eventually produce an actual loss of value in the market economy. But monetary values should never be taken as a literal description of reality….*
>
> *"As the grip of market statistics on the policy arena is gradually loosened, the desired direction for the GPI is to return to the direct use of time, environmental quality and social indicators in decision making. This will also allow for greater accuracy and precision than relying on derivative economic values.*
>
> *"Eventually, therefore, the Genuine Progress Index itself should give way to multi-dimensional policy analysis across a number of databases. New Zealand economist Marilyn Waring suggests a central triad of indicators – time use studies, qualitative environmental assessments and market statistics – as a comprehensive basis for assessing well-being and progress (Waring 1998).*
>
> *"In the meantime and only so long as market statistics dominate our economic thinking and our policy and planning processes, the GPI can provide a useful tool for communication between the market and non-market sectors. By pointing to*

important linkages between the sectors, the GPI itself can provide a means to move beyond monetary assessments towards a more inclusive and integrated policy and planning framework."

If Dr. Gunn had even an elementary understanding of the GPI, or had read this Appendix explaining the GPI framework, methods, concepts and assumptions, this long explanation would not be necessary here. But his misuse of the Costanza ecosystem service valuations (pages 16-17) demonstrates such ignorance of the GPI, and such a failure to read what is actually written in the GPI report, that there is no choice but to repeat those sections here.

All of these conceptual caveats on valuation of non-market services are repeated in specific relation to the Costanza ecosystem service valuations. Dr. Gunn has ignored all these explicit statements in the GPI report. For example, the first paragraph introducing the Costanza estimates read as follows (volume 1, pages 99-100):

"In the Foreword and Appendix C, the limitations of monetized valuations of ecosystem services are discussed in some detail. Money is acknowledged as generally a poor tool to describe non-market values. However, it is also recognized that monetary valuations are temporarily and strategically necessary, because market considerations currently dominate the policy agenda, and non-monetary assessments therefore command insufficient attention in the policy arena. The following valuations should be considered with these limitations in mind."

This introduction is followed by further caveats relating to the extrapolation to Nova Scotia. After describing the Costanza study, and before applying any Nova Scotia data, the following statements appear in the GPI report, (pages 100-101):

"Although these calculations were not explicitly designed to be extrapolated for environmental valuation purposes at the regional level, the benefits valued in these assessments are nevertheless indicative of the values and the vital information missing from conventional resource accounting systems.

"Until there is adequate information on the wide range of non-market forest values at the provincial level, and until there are consistent data measured and monitored on a regular basis to value Nova Scotia's forest goods and services fully, the assessments and methods used by Costanza et. al. (1997) can provide a temporary valuation substitute.

"For the reasons noted above, the estimates in Table 9 should not be taken as literal values for Nova Scotia forests, but are given to demonstrate how vast, extensive and valuable forests goods and services are to the province."

The GPI report then deals specifically with the issues raised by Dr. Gunn. (He has either not read or ignored what the GPI report says.) For example, on page 17 of his comments, referring to the $1.68 billion estimate of Nova Scotia forest ecosystem function values, Dr. Gunn writes:

> *"While this figure may be an interesting number, it gives no policy insight. As calculated by GPI it applies to forested land no matter what condition it is in."*

Here is what the GPI report says (volume 1, page 102):

> *"A proper regional valuation would need to examine each of the assumptions in Costanza et. al. carefully, and to make the appropriate adjustments…. There are many other methodological issues raised by such valuations. While the Costanza estimates are averages, and thus take into account different productive capacities of different forest segments, a more careful analysis would consider the different marginal values of different forest areas. For example, one particular hectare may have a very high recreational value, while another may have a minimal recreational value.*
>
> *"Further, a careful provincial analysis would also consider the comparative ecosystem values of Nova Scotia forests over time. In other words, if the $1.68 billion estimate given above represents the current value of forest ecosystem functions in the province, what would these services have been worth 40 years ago or 100 years ago when our forests had a very different age and species structure. To answer this question, the assumptions of Costanza's scientific team would have to be closely analyzed to assess the quality, structure and composition of the forests to which each estimate applies. Clearly a degraded forest provides less ecosystem services than a healthy forest. Again, this study simply uses the final results of the Costanza team without adjusting the estimates for the quality of the forests at a particular point in history."*

The GPI report then affirms the purpose of giving the Costanza extrapolation, and reiterates its limitations (volume 1, pages 102-106):

> *"A more serious criticism of monetary valuation altogether is that it implicitly assumes the substitutability of ecosystem services, when in fact many such services are irreplaceable and thus "invaluable." As noted both in these accounts, and in the GPI framework as a whole, GPI Atlantic completely acknowledges that money is a very poor tool to value non-market services altogether. However, current policy frameworks are so dominated by market considerations and budgetary constraints that lack of valuation has resulted in an implicit devaluation of non-market services, and a de-linking of human well-being from its environmental roots.*

> *"For strategic reasons, therefore, in order to acknowledge and recognize the vital importance of these hidden values, GPI Atlantic recognizes that monetary valuations are temporarily necessary. Even approximate estimates of the value of ecosystem functions are an essential antidote to their current zero valuation in the conventional accounts. Ideally, and hopefully eventually, the conservation of vital ecosystem functions will be a priority in its own right, with physical assessments of ecosystem functions sufficient to prompt policy makers to value environmental quality and natural resource health equally with market and social values….*
>
> *"No claim is made for the precision or comprehensiveness of these estimates, and they are universally acknowledged to err on the side of conservatism. Nevertheless such monetized estimates are useful as an interim strategy to encourage concerted efforts towards improved natural physical accounting at the provincial and national level, including the internalizing of costs through full-cost accounting mechanisms.*
>
> *"However imprecise current monetized estimates of ecosystem services may be, assigning economic values to non-timber forest functions still provides a far more accurate assessment of forest value than existing conventional accounting mechanisms that in effect assign an arbitrary value of zero to these non-market services.*
>
> *"At a minimum, these estimates acknowledge the vital contribution of these forest functions to economic and social well-being, and show that we neglect forest non-timber values at our peril. If natural asset depletion and a decline in ecosystem services remain invisible in our assessments of wealth and in our economic accounting mechanisms, we will very likely leave future generations fewer resources and resources of lower quality."*

In sum, the Costanza extrapolation is presented in order to demonstrate that non-market forest functions *do* have economic value. While the $1.68 billion estimate is only an extrapolation, as the GPI report openly acknowledges, it is much more accurate than the current assignment of a zero value to these ecosystem services.

Finally, Dr. Gunn notes some of the problems with contingent valuation estimates (Gunn, page 16). As usual, Dr. Gunn's statement is a half-truth based on selective quotations. He states (page 16):

> *"The methods in Costanza et al. are based on contingent valuation methods and willingness to pay criteria."*

This is what the GPI report actually says (volume 1, page 103):

> *"The estimates of Costanza et. al. (1997) are based on replacement value and contingent valuation estimates derived for temperate forest ecosystems.*

> *Replacement values can include the costs of human engineering construction to replace lost equivalent ecosystem services, such as the cost of a water filtration plant that replaces functions once performed by a healthy forested watershed. Contingent valuations include estimates of what individuals are willing to pay beyond what they may already contribute in market expenditures, to ensure ecosystem services continue, or to ensure that wilderness is protected. For example, surveys on how much national park visitors are willing to pay beyond their entrance fee, can be used in assessments of forest values to reflect the non-market value of an experience and/or the non-use value of wilderness.*
>
> *"Specifically, Costanza et. al. (1997) used the following priority order to assess proxies for the economic value of ecosystem values, representing declining levels of methodological rigour: 1) the sum of consumer and producer surplus; or 2) the net rent or producer surplus; or 3) price times quantity, with preference being given to the first of these whenever possible."*

The international group of scientists in Costanza's research team clearly used replacement values and contingent valuation methods to estimate ecosystem values. Replacement values seek to assess what it would cost to replace nature's free services with human engineering or other works. Contingent valuation methods are used to assess people's "willingness to pay" for these services" (For the Costanza article, see *Nature*: Volume 387 no. 6230.)

In short, Costanza's valuations are based on *both* replacement values *and* contingent valuation. It is a distortion to ignore one, and imply that the Costanza article is based only on the other. But Dr. Gunn's concern is only to discredit both the Costanza methods and the GPI report that cites them.

The limitations of contingent valuation estimation are also acknowledged in the GPI report, but Dr. Gunn also ignores the other side of the equation – that critics have argued that Costanza's estimates are actually a vast underestimate, and understate ecological service values by several orders of magnitude. (See for example, P. Bein reference, GPI, volume 1, page 100).

In the absence of prior estimates of the economic value of Nova Scotia forest ecosystem services, the Costanza extrapolation should be seen as a provocative start to further investigation. What is now needed are Nova Scotia-specific studies of each element of the extrapolation (climate regulation, soil formation, waste treatment, biological control, recreation, etc.) so that direct valuations based on Nova Scotia data can gradually be substituted for the extrapolations in this first set of provincial Forest Accounts.

14) Carbon sequestration values

Two weeks before he posted his comments, as part of our public email correspondence, I had already replied to Dr. Gunn on his "concern" about carbon sequestration values. As in many other cases, he ignored my reply and did not respond to it, but simply repeated his original criticism two weeks later as part of what he calls his "critique," as if presenting it for the first time. This is a strange way to carry on an actual dialogue, and indicates that Dr. Gunn has little or no interest in actually exploring the issues and ascertaining the truth. It is not surprising that Dr. Gunn also ignored my invitation to meet with him personally and to sit down, examine, and discuss each of his criticisms.

For the record, here is what I wrote to Dr. Gunn on November 28 concerning the carbon sequestration comments (pages 17-18) that he later posted on his web site on December 11:

> *"Concerning the substantive comments you have on carbon sequestration, I must say you are mixing up stocks and flows here - a very fundamental issue in natural resource accounting. You will notice two distinct sections in our carbon discussion. In one we discuss the difficulties of constructing a carbon budget, and the reasons we began but did not complete that task (because of the extraordinary data limitations and methodological difficulties we encountered.) The $1.3 billion estimate refers to stocks alone, and specifically to carbon storage capacity (not to rates of sequestration).*
>
> *Concerning the scientific studies on rates of carbon sequestration and carbon loss (including from forest soils) which you cite, and which are discussed in our own report -- that would certainly be a subject MOST worthwhile pursuing if we can establish the ground of mutual respect to which I refer above. For example, I have looked again at materials from the Science journal article to which we both refer, and it is clear to me that the additional sentence to which you refer most certainly does not invalidate the portions of that article which were cited. Again it seems to be a case of your focussing so heavily on what is missing rather than what is there, which characterizes so many of your remarks. From my side, this is an invitation to open a dialogue between GPI Atlantic and the NFA on all these subjects, if we can establish the tone and atmosphere of mutual respect that can move this dialogue forward in a positive way."*

Since he ignored it previously, it has to be repeated here. Dr. Gunn is violating the most basic principle of natural resource accounting by mixing up stocks and flows. To repeat: The GPI estimate of a 38% loss in carbon storage capacity since 1958 is a stock estimate, and is separate from the discussion on *rates* of carbon sequestration (flows). The GPI report explains in detail (volume 1, chapter 10) why a flow account and carbon budget for Nova Scotia are not currently possible, due to data limitations and methodological difficulties.

GPI Atlantic also recommends (volume 1, page 84) that the Nova Scotia Department of Natural Resources requests the application of the Kurz and Apps carbon budget model to Nova Scotia. The Canadian Forest Service has informed GPI Atlantic that an official request from NSDNR is necessary for that application. Kurz and Apps report that Canadian forests as a whole have become net carbon emitters rather than sinks, and it would be most important to ascertain if this holds true for Nova Scotia as well.

Dr. Gunn writes (page 17):

> *"In dealing with carbon accounting, GPI takes a highly simplistic view of a complex subject. The report is based on the well known study by Harmon."*

As already noted, it is the failure to separate stocks and flows that is highly simplistic. This statement is absurd in light of the fact that the GPI report explicitly acknowledges the complexity of the issues as the primary reason that a carbon budget for Nova Scotia forests is not presented in the GPI report. It is also wrong in stating that the GPI report "is based on" Harmon, when many other sources are used and cited in the chapter on carbon sequestration. In fact, the estimates to which Dr. Gunn objects (the 38% loss in carbon sequestration capacity, valued at $1.3 billion) are not based on Harmon at all, but on other sources explicitly cited in the GPI report.

Since Dr. Gunn either did not read the carbon section attentively or ignored what he read, let us look at each of these issues. First, the issue of complexity: the following statements are from volume 1, pages 91-92, in the GPI report:

> *"The total carbon storage value of Nova Scotia forests is analogous to stock estimates of the total standing timber value in Nova Scotia forests, while carbon loss estimates are analogous to the annual contributions of the forest industry to the provincial GDP based on timber harvests. This distinction between stocks and flows is crucial in the construction of a carbon budget or in any estimate of non-timber forest values.*
>
> *"Due to methodological challenges and additional data needs, GPI Atlantic has decided not to present these carbon loss (flow) estimates in this first iteration of the GPI Forest Accounts, but to hold them until more information is available. Some of these difficulties arose in estimating the amount of carbon that remains in the wood fibre used for products after harvest, which is not lost to the atmosphere (K. Snow 2001). There is considerable potential for including these assessments in a future carbon flow model for Nova Scotia's forests, as Stinson (1999) demonstrates.*
>
> *"Stinson (1999) extended his own forest carbon model to include forest products, based on the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS) (Kurz et. al. 1992). Stinson (1999) demonstrates that most pulp products are not*

long-lasting. In his model, 50% of the carbon in pulp products is lost in the first year, 15% remains after five years, and only 10% remains after 10 years. The remaining 10% of forest carbon decomposes more slowly, reflecting the longer life of products such as books, which can last up to 100 years.

"Sawlog products are also longer-lasting. In the construction lumber category, 5% of the forest product carbon is lost in the first year due to fitting and shaping, 50% is lost after 60 years, and 95% after 100 years. Other lumber use results in a carbon loss of 40% in the first year due to non-reusable products, 95% after 50 years, and 100% after 100 years. Future forest carbon budget work should include these forest product carbon loss estimates in a simulated computer model.

"Needless to say, a full carbon budget would also need to estimate changes in the annual uptake of carbon dioxide by newly regenerating biomass, as well as the loss of carbon through decay processes which produce carbon dioxide while the new stand is still establishing (K. Snow 2001). For all these reasons, flow estimates of carbon release and uptake are complex, and have therefore not yet been presented here for Nova Scotia forests. GPI Atlantic would welcome a partnership with scientists interested in further development of a full carbon budget for the province's forests."

Dr. Gunn totally ignores this discussion in his comments. The objective reader can judge which treatment of carbon sequestration is actually "highly simplistic." In fact, the issues that Dr. Gunn raises to justify his accusation are all actually dealt with in the carbon sequestration section (volume 1, pages 83-92) of the GPI report itself. Since he misrepresents the GPI report by implying that the GPI report does not deal with these issues, it is necessary to repeat them here.

1) Stating that the GPI "report is based on the well known study by Harmon" is less than a half-truth, particularly since the 38% and $1.3 billion loss estimates are not based on Harmon at all. Harmon deals with flows. The 38% and $1.3 billion estimates are stock estimates that have nothing to do with the Harmon article.

   As Figure 21 (page 90) and the following section makes clear, the sources for these estimates are Kurz and Apps' (1999) estimates of the average tonnes of carbon storage by age class, as reported in "Canadian Council of Forest Ministers (CCFM). 2000. *Criteria and Indicators of Sustainable Forest Management in Canada: National Status 2000*. (Natural Resources Canada - Canadian Forest Service) Ottawa, Ontario"; available on the Internet at www.ccfm.org/pi/4_e.html. In addition the estimates use the Nova Scotia Department of Natural Resources' own forest inventories. The monetary valuations are based on the conservative per tonne estimates in Pimentel, D., Wilson, C., McCullum, C., Huang, R., Dwen, P., Flack, J., Saltman, T., and Cliff, B. 1997. "Economic and Environmental Benefits of Biodiversity." *Bioscience*. 47: 747-757. To demonstrate the range of monetary estimates that are possible, based on alternative assumptions of avoided climate

change damage costs, the GPI report (page 90) also cites the literature review in Walker et. al. (2001).

Dr. Gunn is so confused here, or has read the GPI report so carelessly, that he suggests in his public correspondence (December 13) that we should have sent our report to Harmon to ask him if we used his numbers correctly. How inappropriate it would have been to ask Harmon about numbers that have nothing to do with his paper, but that are based on other sources. Fortunately we did not follow Dr. Gunn's advice.

2) Needless to say, Dr. Gunn cites none of these sources, and he misleadingly attributes the carbon estimates to Harmon. He cites a web site that contains "much more comprehensive economic viewpoints" than Harmon, but he has ignored the actual sources for the GPI estimates. In fact, it is utterly deceptive to state that the GPI report "is based on" Harmon, when several other studies are also used and cited, including Schulze et. al. (2000), Fleming and Freedman (1998), Kurz et. al. (1992), Stinson (1999), Pimental et. al. (1997), Canadian Council of Forest Ministers (2000), Walker et. al. (2001), Myers (1997), Dixon et. al. (1994), Kurz and Apps, cited in CCFM (1997).

3) As if the GPI report does not mention it, and as if he is providing this information, Dr. Gunn notes that Harmon's carbon loss estimates "are due to the release of carbon from the soil in the ancient forest floor." He states that "if the issue were only bole carbon storage," then carbon dioxide uptake in young forests would exceed the carbon losses of old forests. But no one claims that the issue is only bole storage, so it is unclear with whom Dr. Gunn is arguing. Forest soils are clearly a major part of the equation. In fact, volume 1, page 86 of the GPI report deals specifically with the issue of carbon losses from forest soils, citing the study by Schulze et. al. (2000) in *Science* 5487: pages 2058-2059.

4) Dr. Gunn's next statement is typical of his distortion of the GPI report. He states (Gunn, page 17), that: *"Neither Harmon nor Sedjo and his colleagues would have supported the methods used by GPI"* because these authors *"do recognize the continued sequestration of some portion of the harvested forest."* In other words, without asking them, Gunn not only pretends to know what Harmon and Sedjo et. al. "would have" thought of the GPI report, but, much worse, implies that the GPI method is wrong because it does *not* recognize the continued sequestration process. This is a flagrant misrepresentation.

   Volume 1, page 89, of the GPI report notes that *"younger trees have a more rapid rate of carbon uptake from the atmosphere"* than older trees. And page 92 notes: *"Needless to say, a full carbon budget would also need to estimate changes in the annual uptake of carbon dioxide by newly regenerating biomass, as well as the loss of carbon through decay processes which produce carbon dioxide while the new stand is still establishing."*

To imply, therefore, that the GPI report does not recognize this issue is a straight fabrication. In fact, the opposite of Dr. Gunn's allegation is much more likely the case. Harmon, Sedjo and his colleagues would almost certainly agree with the reasons given in the GPI report for not constructing a carbon budget, and they would certainly separate stock estimates from flow estimates, looking askance at Dr. Gunn's confusion of these issues. If he wants to test this out, he should ask Harmon, Sedjo and his colleagues this question directly rather than purporting to know what they think of the GPI methods.

5) Dr. Gunn notes that the GPI report includes "a long quote" from the scientific paper by Schulze et. al. (2000), on the fact that carbon losses from old-growth forests will likely exceed the carbon gains from planting "young Kyoto stands." Dr. Gunn states that the omitted last sentence of the paragraph "changes the conclusion." That is nonsense. The last sentence does not change the conclusion at all, and its assumptions are already included in the first sentence of the paragraph. The planting of "young Kyoto stands…as part of the Clean Development Mechanism" is cited in the first sentence and refers to the "afforestation and reforestation" cited in the last sentence.

   As Dr. Gunn notes, the quote is already "long," and the conclusion remains the same – that planting young forests cannot be counted on to provide the sink capacity anticipated in the Kyoto protocol. However, since Dr. Gunn feels that the last sentence adds something important, GPI Atlantic has no objection to making the existing quote on page 86 of volume 1 slightly longer, and adding the extra sentence. Doing so will not change the GPI commentaries before and after the quote. If Dr. Gunn claims the additional sentence invalidates the conclusions that the GPI report draws from the Schulze et. al. (2000) paper, he will have to prove it. For the record, here is the actual citation from the GPI report, volume 1, page 86, *with* the additional sentence added:

   "According to Ken Snow, Manager, Forest Inventory, NSDNR:

   > *"The new growing forest may take up more carbon annually than does an old growth forest which is in a maintenance stage and does not sink large amounts of carbon compared to younger vigorously growing stands. Until the new stand is established however there is some loss of carbon through decay processes which produce carbon dioxide" (K. Snow 2001).*

   "However, recent scientific evidence published in Science, indicates that this conversion from old-growth to young forests still produces a "massive" net loss of carbon to the atmosphere, even when the carbon uptake of new forests is taken into account:

> *"... [R]eplacing old-growth forest by young Kyoto stands, for example, as part of a Clean Development Mechanism or during harvest of previously unmanaged old-growth forest stands as part of forest management (the latter does not gain credits under the Kyoto protocol), will lead to massive carbon losses to the atmosphere mainly by replacing a large pool with a minute pool of regrowth and by reducing the flux into a permanent pool of soil organic matter. Both effects may override the anticipated aim, namely to increase the terrestrial sink capacity by afforestation and reforestation"* (Schulze et. al. 2000).

> *"The authors explain that huge amounts of carbon are stored in tree trunks and branches, and, most importantly, in the soils. Much of the carbon stored in forest soils for hundreds and even thousands of years is released when the forest is harvested, and newly planted forests would take centuries to store up such a large reservoir again."*

6) Perhaps the ultimate irony in Dr. Gunn's attack is that he rails about the GPI estimates of carbon storage loss being "simplistic," while he himself attributes the loss of Nova Scotia's forested carbon storage capacity mainly to *"a one time event, the spruce budworm infestation of the 1970's."* If this is not simplistic, then it is hard to imagine what is. Even more astonishing is that Dr. Gunn speaks of "scientific debate" on carbon storage issues, while presenting his own spruce budworm conclusion as if it is a given, not subject to dispute. Readers are referred to the 3-page discussion earlier in this review (see #6 above) that disproves Dr. Gunn's attribution of the loss of old forests to the spruce budworm. What is truly simplistic is Dr. Gunn's own failure to recognize the impact of forest harvesting and management practices on the age structure of Nova Scotia's forests, and consequently on their carbon storage capacity.

7) Even more significant is Dr. Gunn's violation of basic principles of scientific inquiry and investigation. No estimate has ever been made, prior to the GPI report, of the potential economic value of Nova Scotia's forested carbon storage capacity or of the loss in this carbon sequestration capacity due to changes in forest structure. A scientist not interested only in disparaging and dumping on new evidence would surely take the GPI effort as a contribution and a challenge, and would seek to improve on the GPI methodologies to derive more accurate estimates. In fact, GPI Atlantic would fully support any effort by Dr. Gunn, the Nova Forest Alliance, or by any scientist, to take the analysis to the next step of complexity and sophistication, and to include a wider range of variables in the carbon storage estimates.

   What is not helpful at all is simply to dismiss this first effort to make such an estimate. In fact, the only conceivable reason to dismiss it out of hand is to divert attention from this vitally important issue. At the very least, a scientist interested in the facts would acknowledge the importance of such an estimate, and would

hopefully accompany a methodological critique with a description of more appropriate methodologies and data sources that could be used to improve the estimate. Sadly, there is nothing constructive in Dr. Gunn's attempt to dismiss the effort altogether, and nothing that actually advances the scientific debate or takes the research a further step.

15) Potential market losses through change of forest age structure (Gunn, pp. 18-19)

a) It is necessary to begin by correcting two misquotes in Dr. Gunn's comments on this section: Dr. Gunn quotes the GPI report as stating that "clear wood is worth two to four times the value of knotty wood" (page 19). In fact, the GPI report states "two to three times" (volume 2, page 180). It appears that Dr. Gunn is working from an earlier version of the GPI report here, prior to the one that was actually posted on the web site. Dr. Gunn also quotes the GPI report as stating that prices for "clear spruce were unavailable." What the GPI report actually states is not that *prices* were unavailable, but that "clear spruce was often unavailable or 'hard to come by'" (page 180). Dr. Gunn's misquote substantially changes the meaning of the text on page 180. Since this statement did not change from earlier versions of the report, this misquote appears to be due to carelessness.

b) Dr. Gunn's criticism here essentially repeats his earlier complaint about extrapolating the Windhorse Farm example to Nova Scotia. This has been dealt with in large part in the Windhorse Farm portion of the Case Studies section (#11a) above. The fundamental premise of Dr. Gunn's argument is wrong, and he (as usual) attributes statements to the GPI report that appear nowhere in the report. He writes (page 18):

> *"The essence of the argument is that management of the forest like "Windhorse Farms" will produce large clear lumber that will command premium prices."*

As the earlier discussion makes clear, it is absurd to argue that current Nova Scotia forests, with a completely different age and species structure than Windhorse Farm, could be managed like a woodlot that has been logged sustainably for 161 years, and the GPI report does not say this anywhere. Most Nova Scotia forests have been cleared, high-graded, and clearcut over more than two centuries, and have lost almost all their old forest areas. At Windhorse Farm, 65% of the forest area is dominated by the over-100 age class (compared to 0.15% in Nova Scotia as a whole), and 90% of the forest is dominated by the over-80 age classes (compared to 1% in Nova Scotia.) How could they possibly be managed in the same way?

In short, Dr. Gunn is comparing apples and oranges here, and attributing to the GPI report an intention and analysis that are simply not there. In particular, see the comments in section 11a (4) above, on the fallacy of comparing harvest rates at Windhorse Farm with provincial harvest rates (as Dr. Gunn does again on page 19 of his comments.) See also

comments in section 11a (12) above that clarify Dr. Gunn's distortion of the actual context for the Windhorse Farm illustration as clearly stated in the GPI report.

As the GPI report makes abundantly clear (see references in section 11a above), this illustration has nothing to do with managing Nova Scotia forests like Windhorse Farm. It is about the proportion of clear, large dimension wood that would likely exist today *"if Nova Scotia forests were still in their natural state, or at least had been logged sustainably since European settlement"* (volume 2, page 38). The point of the Windhorse Farm case study is not only its long-term sustainable harvest methods over 161 years, but that it is a rare, remaining example of the value that Nova Scotia forests once had, and of the potential future value of their products if they were restored. Gunn is distorting what the GPI report says by taking an historical illustration that indicates a long-term loss of valuable lumber, and turning it into an impossible present-day management issue.

b) The need for a real market study

He goes on (page 18):

> *"It is true that a market study to indicate the market demand and premium for large dimensioned timber would be valuable. However no such study is done here."*

That is right. The GPI report does not purport to do everything. It is already 466 pages, was completed with a budget of $27,000, and covers a lot of ground. There is a lot more that could and needs to be done. GPI Atlantic is not a marketing firm, and I have already previously agreed with Dr. Gunn in our correspondence that a marketing study would be most valuable. Needless to say, he has not acknowledged my earlier response on this issue (on which there could have been friendly agreement), but simply repeats his line that "no such study is done here" as a way of invalidating the GPI report. Such a marketing study would be a perfect job for the Nova Forest Alliance, which Dr. Gunn heads, to commission. We will see in the coming months whether Dr. Gunn and the NFA do so. Certainly GPI Atlantic would welcome such a study.

Once again, Dr. Gunn's approach is antithetical to the spirit of scientific inquiry. He is much more interested in finding hooks to discredit the GPI report than in exploring ways to take the GPI conclusions and analysis further, and in testing and refining the GPI results through actual field studies. The GPI report points to a potentially important relationship, not previously explored in Nova Scotia, between change of forest age structure and market value of forest products. An interested scientist would welcome this provocative linkage and accept it as a challenge for further exploration. To dismiss and disparage the findings because they do not do the whole job at once is irresponsible.

As GPI Atlantic has said over and over again, both in this report and in all its publications, there is nothing that we welcome more than an improvement of our own methodologies and the use of better and more accurate data sources as they become

available. In the GPI Forest Accounts, volume 1, pages 179-180, (as elsewhere), GPI Atlantic states:

> *"Third, the Genuine Progress Index is not designed to be a final product, but it is a significant step in the direction of more comprehensive measures of progress than are currently in use. The GPI itself should be seen as a work in progress subject to continuous revision, improvement in methodologies and inclusion of additional variables. It will continue to evolve in form and content with further research, the development of new methods of measurement and the availability of improved data sources. Given these caveats, all interpretations and viewpoints expressed in this and other reports are designed to raise important issues for debate and discussion rather than as definitive or final conclusions or prescriptions….*
>
> *"Rather than offering any pretence of definitive answers to these challenging questions, GPI Atlantic hopes that its natural resource and environmental quality accounts stimulate further productive debate among researchers that will provide ever greater clarity and accuracy in future updates of the GPI work. In sum, GPI Atlantic is not wedded to any particular method of measurement or to any final assessment of results, but seeks to improve both its accounting methodologies and the accuracy of its results over time in accord with the constructive feedback its work receives."*

It is remarkable that Dr. Gunn missed such statements. In short, by all means improve on our methodologies and data sources – we have always welcomed a constructive approach that improves the work. But that is not Dr. Gunn's approach. He denies that there is anything useful to learn or look at in the GPI report. He knows it all already. There is *no* acknowledgement on his part that the relationship between age class structure and the proportion of large dimension, clear wood could have any validity or relevance to the economic value of Nova Scotia's forests. This is a remarkably closed-minded attitude for one who claims to represent the tradition of academic analysis.

Dr. Gunn goes on and on about what "a real market study" would have done (such as identifying a demand curve – page 19), by contrast to the GPI report. The GPI answer here is very simple: "Be our guest. Do it! We are 100% behind 'a real market study.'" We have said this before to Dr. Gunn, and he has ignored it. Let us hope that he and the NFA undertake such a study as soon as possible.

Most certainly, there is a very practical reason to take the GPI findings further. There is considerable potential long-term gain to Nova Scotia and to the forestry industry from increasing the proportion of high quality timber in our forests. As large dimension wood and clear lumber are directly related to age class and to older trees, further exploration of the potential market for such wood could help strengthen the case for restoration forestry and for incentives to bring back our older forests. If higher proportions of such wood can increase the economic value of our forests, then this knowledge can bring economic

benefits to the timber industry at the same time that it enhances the capacity of our forests to perform their other ecosystem, social and recreational functions more effectively. In short, a full-fledged market study would be an excellent next step in exploring the GPI findings further.

c) Sales prices

In his usual pejorative style, Dr. Gunn states, in order to "prove" that large, clear wood is worth more than knotty small wood, GPI Atlantic made "phone calls" to "sales employees" at retail outlets to determine prices. The quotation marks are all Dr. Gunn's, and are designed to disparage the method. He repeats that the data were gathered "over the phone," implying that the method is invalid, though he never explains why telephone surveys (often used by Statistics Canada) are invalid. GPI Atlantic is always completely transparent about its methodologies and data sources, and we never pretend to have done other than what we have. In this case, GPI Atlantic researchers called seven different lumber dealers to find out their prices for wood of different dimensions (2x4, 2x6, 2x8, and 2x12 pine and spruce), and for clear and knotty white pine. Prices were then adjusted for volume, so that identical volumes of lumber were being compared.

The results of that telephone survey are produced in Tables 29, 30, and 31 on pages 181 and 182 of volume 2. Statistics Canada and other reputable survey agencies commonly use telephone surveys. The results of the GPI survey can be easily tested, and there is no obstacle to other researchers testing the GPI results by obtaining the prices in other ways. If he has a problem with the method for gathering these data, Dr. Gunn is welcome to test them himself. The GPI materials and methods are transparent.

Dr. Gunn finds another reason to invalidate the results – the fact that prices differ widely between retailers. That is true, and the price differences among retailers are displayed clearly in the GPI results. *But* it is also noteworthy that in every single case, without exception, each retailer reported significant price differences between large, clear wood on the one hand, and small, knotty wood on the other, with substantial premiums for the larger dimension, clear wood, when identical volumes were compared. Is that significant? The GPI researchers thought so. But Dr. Gunn is very sure of himself in declaring that the results could not possibly have any importance for anyone:

> *"No one could possible attach any meaning to these numbers as a measure of the premiums on high quality lumber"* (page 19), he declares.

This is typical of Gunn's blanket dismissal of all he finds in the GPI report. He may be speaking for himself in not attaching any importance to anything in the GPI report, but he is definitely wrong about "no one" attaching importance to the fact that clear, large-dimension wood fetches premium prices. Woodlot owners, like Jim Drescher, who actually get top dollar for their high quality wood, attach quite a lot of importance to these numbers. The numbers are also Jeremy Frith's main motivation for his restoration

forestry work. These woodlot owners have checked out the prices for themselves. Dr. Gunn would be advised to do so himself before dismissing them so casually.

Again, it is the "quality" of Dr. Gunn's response that reveals his real motives. It is not the need for a marketing study or for further investigation that is at issue, but the method of inquiry. In fact Dr. Gunn dignifies his misrepresentations and disparaging comments with the term "critique." This is no more a critique than a novel would be. Let me try to rephrase Dr. Gunn's *substantive* points in a constructive way. A genuine critique might state:

> *"It is interesting that merchants currently place such high premiums on clear, large dimension lumber, and remarkable that such a substantial price difference exists in the prices of every retailer investigated in the GPI report. The GPI findings require further investigation into demand curves and into the relationship between roundwood prices and retail prices for dimensional lumber. Because the pricing of logs takes into account the breakdown of large logs into smaller dimension lumber during roundwood processing, and because premium prices are not necessarily maintained over the full range of potentially available large dimension lumber, the current retail price premiums may not be maintained if supply increases.*
>
> *"Such an investigation is necessary in order to assess the actual gains that might accrue to woodlot owners and industry by increasing the proportion of clear, large dimension lumber they send to market. This investigation also has important implications for current management techniques, that might be adjusted to maintain a higher proportion of old trees that yield clear, large dimension lumber if the demand can be shown to exist. A full marketing study is an essential next step to determine the potential rate of return from such management shifts."*

If a constructive critique had been offered in this way, Dr. Gunn's substantive points could have been made without any of the pejorative or dismissive comments that lace his entire presentation. The "either / or" quality is missing, and the GPI results are constructively used as the basis for further analysis. GPI Atlantic would agree fully with the statement offered above. Indeed, if such a scientific approach had flavoured a genuine critique, the GPI Atlantic responses would probably have occupied 10 or 15 pages rather than 100 pages, and saved us all a lot of time that could better be expended in constructive research. Unfortunately, as noted earlier, destructive comments designed to tear the whole house down require much more extensive rebuilding.

The substantive reality is that retail prices do have considerable significance, even if they do not tell the whole story. The fact that mills have adjusted to the loss of old forests and to their gradual degradation by gearing their processing techniques to accommodate ever smaller dimension wood does not dispute the higher value that large dimension wood currently has in the market place. To dismiss or ignore that reality is to deny the actual potential of our forests, and to settle for lower value, degraded forests as the norm.

16) Dr. Gunn's summary (pages 19-20) **and the reviewer's responsibility**

1) Dr. Gunn's comments and his earlier public correspondence are laced with negative and pejorative statements about GPI Atlantic's responsibilities, and his opinions that the GPI Forest Accounts should not have been released. Nowhere, however, does Dr. Gunn show any awareness that a reviewer, too, has responsibilities. It is a very serious business, intellectually and ethically, to attempt to destroy bone fide research. It does not seem to occur to Dr. Gunn that it is highly irresponsible to misrepresent and ignore what the GPI report actually states, or else to be so careless as to comment on what he has not properly read. Nor does he seem to require evidence for his sweeping and baseless generalizations, or feel any responsibility for constructive commentary. Without taking issue with or relating to the main points in the GPI analysis at all, he prefers to throw out scornful statements and use any hook he can find to throw out the whole report. There is an intellectual dishonesty that pervades Dr. Gunn's comments that is the antithesis of responsible review.

2) Here are just a few phrases from Dr. Gunn's summary (pages 19-20): In a single sentence he says:

> *"Instead of dealing with substantial issues of the management of Nova Scotia's forests, [the GPI report] has substituted contrived numbers that have little meaning and suggested simplistic examples as case studies for the way forward."*

a) The insinuation that the GPI report does not deal "with substantial issues of the management of Nova Scotia's forests" is the most flagrant nonsense. Most of volume 1 and almost all of volume 2 deal with "substantial issues of the management of Nova Scotia's forests." Dr. Gunn does not seem to feel that such sweeping statements require any justification or evidence. This is simply unworthy of an academic review.

b) "Contrived numbers that have little meaning": *Which* numbers does Dr. Gunn refer to? The age class and species numbers (volume 1, figures 1-8 and 10-13) that are taken straight from the Nova Scotia Department of Natural Resources' official forest inventories? The employment and GDP numbers (volume 1, chapter 12) that are taken from Statistics Canada? The harvest volume, silviculture, and budworm defoliation numbers (volume 1, figures 14-16) that are taken from the National Forestry Database? Etc. etc. What is contrived about these numbers? Why do these numbers have "little meaning?" Since Dr. Gunn's statement refers to the GPI report as a whole, it is his responsibility to prove his assertion.

c) "Simplistic examples as case studies": This is a direct insult to some of the most advanced, outstanding examples of sustainable forestry currently in operation both in Nova Scotia and beyond. Why dismiss the first Forest Stewardship Council certified forestry operation in Nova Scotia as "simplistic?" Why dismiss models that are acknowledged as being on the leading edge of the best management practices

currently available? There is a tremendous amount that any open-minded person can learn from these examples, and it is highly irresponsible and insulting to dismiss them as "simplistic." What is "simplistic" is uncritical adherence to a standard industrial model of forestry that is reliant almost entirely on clearcutting, and that has significantly degraded our forests.

3) Dr. Gunn carries on in the same pejorative vein, and then adds the following self-justification:

> *"Note that this document has not attempted to correct any of the GPI analysis. Calculations shown here are aimed at pointing out errors"* (page 20).

This reveals how un-constructive Dr. Gunn's comments are, and how unscientific his approach to inquiry. Leaving aside the fact that many of Dr. Gunn's calculations are wrong (see, for example, 11a, 4, above), a constructive analysis and review would provide at least a little "value-added" in the form of alternative data, methodologies, or analysis. For the true scientist, "pointing out errors" is simply a starting point for a positive contribution that can advance the state of knowledge. It is not an end in itself. In Dr. Gunn's case, the claim is even more absurd, as his consistent misreading and misrepresentation of what the GPI report actually says leads to a pointing out of "errors" that are not actually in the GPI report, but that are of his own manufacture.

By contrast to the negativity of Dr. Gunn's comments, a committed scientist will accept the challenge of research that identifies important trends, and will encourage further research designed to test the results and refine them. Dr. Gunn is entirely welcome to take *all* the GPI results, without exception, as hypotheses subject to further investigation. No reader should accept the GPI report as the final word on anything. Indeed, the GPI report explicitly makes that point several times, and it encourages further research in a wide variety of areas. Many of the trends and linkages identified in the GPI report are presented for the first time in a Nova Scotia context. There is now a pressing need for local field studies to verify or modify the conclusions. GPI Atlantic is confident of the importance of each of the trends, relationships, and conclusions presented in the GPI Forest Accounts.

4) Dr. Gunn's next paragraph is very revealing (page 20): He lists the various official documents that *"all include the requirement to measure and manage on much more than the costs and revenues associated with timber."* These documents include the National Forest Strategy, the Canada Forest Accord, the Nova Scotia Forest Accord, the Convention on Biodiversity, and the Canadian Council of Forest Ministers (CCFM) Criteria and Indicators of Sustainable Forest Management. That is true. All these documents do call for such measurements, and GPI Atlantic has taken up this aspiration and challenge by actually plugging in the Nova Scotia numbers as far as possible, and by pointing to the data gaps that remain. That effort, which is certainly not the only one, should be welcomed.

One suspects, however, that many people, including Dr. Gunn, feel much more comfortable by keeping these official documents as *aspirations* for measurement, or at most, as listings of indicators. Perhaps they are scared of what the results actually show, and therefore prefer to keep the measurement requirements as theoretical constructs rather than to analyze actual results and to turn these results into practical policy tools.

In GPI Atlantic's perspective, there has been enough theorizing and conceptualizing on the "need" for good indicators, and even on endless lists of what those indicators might or might not be. It is time to ask what the numbers actually show, and how they might influence policy. Once we have concrete data to work with, we can always go back to further refinements of the theory and concepts, but it is high time to make the abstract concrete. That major step, attempted in the GPI report, appears to be highly threatening to Dr. Gunn. In fact, it helps explain why he confuses the NFA and GPI use of the CCFM criteria and indicators.

5) Dr. Gunn concludes his summary with this sentence, implying that the GPI report fills none of these requirements:

> *"Good science, sound economics and social consensus are the ways forward."*

Needless to say, GPI Atlantic agrees fully with that statement.

- "Good science" first and foremost requires an open and inquiring mind. Secondly, it requires an actual examination of the evidence presented. As noted, the key scientific evidence presented in the GPI report (on issues like impacts of forest structure change and management on soils, watersheds, wildlife habitat, biodiversity, etc.) are completely ignored in Dr. Gunn's analysis, yet he dismisses the report out of hand. Thirdly, it requires ruthless intellectual honesty, not the misrepresentation of actual evidence presented.

- "Sound economics" requires going beyond the simplistic quantitative accounting that has hitherto counted natural resource depletion as economic gain. It requires including a full range of social, economic, and ecological values that can provide a more accurate and comprehensive understanding of forest health.

- As for the "social consensus" that Dr. Gunn claims to represent, the Nova Scotia Woodlot Owners and Operators Association and several other groups have suspended or reconsidered their participation in the Nova Forest Alliance in protest against his own bias. Based on the NFA's own survey of Nova Scotians, the GPI results and conclusions are far closer to the understanding and views of most Nova Scotians than the views Dr. Gunn represents.

6) The following remarks are a repetition from section 12 above, where the same issue is raised in relation to the indicator on employment per unit of biomass harvested.

Concerning Dr. Gunn's constant refrain that the GPI report is "simplistic," we will have to leave the reader to judge. We might, however, offer the following questions: Which of the following alternatives is more simplistic? –

- A simple, *quantitative* wood supply model, such as that touted by Dr. Gunn, or an approach to wood supply that also includes *qualitative* criteria such age and species structure, and other forest values?
- An approach to forest stocks that considers only quantitative depletion and regeneration, or one that additionally explores degradation (*qualitative* decline) and restoration of the full range of forest values?
- A definition of "sustainability" based on timber alone, that allows diverse, old forests to be replaced by young even-aged forests, or a definition of sustainability based on the capacity of the forest to perform *all* its multiple functions optimally?
- A measurement system that ignores all forest functions aside from timber production as if they had no value, or one that attempts to value the full range of forest functions, including ecosystem values and non-market services.

For any reader of the GPI Forest Accounts, the GPI approach is obvious and explicit. The GPI understands that capital and stocks can decline in value due to degradation as well as depletion. Just as a factory owner's capital assets can depreciate if his machinery deteriorates or falls into disrepair (as opposed simply to being sold or destroyed), so a forest can depreciate in value when it can no longer perform its various functions effectively (as opposed simply to being cut down.) Changes in age and species structure, for example, can impair the capacity of a forest to protect soils, watersheds, wildlife, and habitat; to sequester carbon; regulate the climate; and provide recreational opportunities. In the GPI, depletion and degradation are both aspects of depreciation, in contrast to the conventional wood supply models promoted by Dr. Gunn, which count the former and not the latter. As noted, the reader can judge which approach is more "simplistic."

Conversely, the GPI considers not only quantitative "regeneration" (natural and through silviculture) as in the conventional wood supply models touted by Dr. Gunn, but *also* the quality and type of regeneration. In the former models, an old growth forest can be replaced by a young single-species plantation, and the difference will never show up in the conventional statistics, so long as the amount of regeneration matches the amount of depletion. The result is called "sustainable." No wonder that policy makers and foresters have been getting the wrong messages all along from our flawed conventional accounting systems, and no wonder that our forests are in such a sorry state. Not surprisingly, forest "restoration" is barely in the lexicon of the conventional analysts. By contrast, forest restoration is the core theme of volume 2 of the GPI Forest Accounts. Again, the reader can judge which approach is more "simplistic."

The question of which approach is more simplistic can also be asked in relation not just to the overall approach but in relation to the specific issues Dr. Gunn raises. The GPI report attributes the loss of old forests primarily to more than two centuries of land clearing, high-grading, and clearcutting. Dr. Gunn attributes the same phenomenon to the

spruce budworm attack of the 1970s. The reader is encouraged to examine the evidence for him or herself, and to decide which conclusion is more "simplistic."

17) "Bad and good" – Dr. Gunn's summary remarks (pages 3-4.)

1) Dr. Gunn's introduction is full of sweeping and unsupported generalizations, presented in a highly unprofessional way, and simplifying the GPI results in a "bad" / "good" casting. We have waited to the end of this report to comment on these introductory generalizations (pages 3-4 of his comments). By first looking at his detailed comments, we have examined whether he has provided any support for his introductory generalizations. We can now return to the introduction.

Here is Dr. Gunn's over-all interpretation of the 2-volume GPI report (page 3 of his comments):

> *"The themes that run through the report are that clearcutting is bad, old growth forests are good and that Nova Scotia need more protected areas set aside. In order to prove these themes, much of the economic analysis seems aimed more at proving the following logic:*
>
> *I Current practice is bad*
>
> *II Current practice uses clearcutting and relatively few protected areas*
>
> *Therefore*
>
> *III. NS needs less clearcutting and more protected areas*
>
> *Whatever one's view is on the merits of any of these three statements, this is not a logical argument."*

The "good" / "bad" language is Dr. Gunn's own. As usual, he is attributing statements to the GPI report that appear nowhere in it.

What the GPI report demonstrates is that centuries of land clearing, high-grading, and clearcutting have *devalued* the province's forests. That is demonstrated by actually looking at the capacity of those forests to perform their multiple functions effectively, including protection of soils, watersheds, wildlife, and habitat; climate regulation and carbon sequestration; and provision of high quality timber and recreation. Whether the loonie's loss of value against the US dollar in the last 20 years is "good" or "bad" is subject to considerable debate. Suffice it to say that a loss of value is different from an imputation of "good" or "bad."

If Dr. Gunn wants to debate "good" and "bad," then he is debating with himself only. The moralistic overlay is Dr. Gunn's and Dr. Gunn's alone. If he wants to engage GPI Atlantic in an actual dialogue, then he will have to argue *empirically* using the terms in which the results are actually presented – namely have Nova Scotia's forests depreciated in value. GPI Atlantic has presented evidence to indicate that they have. If Dr. Gunn has contrary evidence – either to show that Nova Scotia's forests are worth more than they

were historically, or that their value has remained constant, then let him present that evidence. Notably, he has not done so anywhere in his comments. But if he did, we would at least have a common language.

2) Dr. Gunn's outline of the supposed GPI logic uses only the term "*current* practice," thereby ignoring completely the historical context of the GPI report. Even the opening paragraph of the Executive Summary, which Dr. Gunn could hardly have missed, talks of *"a long history of high-grading (removing the best trees), land clearing, and clearcutting over more than two centuries…."* Many other sections of the GPI report also make patently clear that long-term historical trends, not just "current practice," are responsible for the loss of value of Nova Scotia's forests. Clearcutting is only the most recent way in which forest functions have been impaired.

3) Dr. Gunn's glib summary here also totally mis-states and misrepresents the primary recommendations of the GPI report, by listing a prescription for "more protected areas" as *the* GPI answer. The *actual* GPI Atlantic recommendations (versus Dr. Gunn's interpretation) are listed in the Executive Summary, and are also the theme of the whole of volume 2. The primary recommendation is *"investment in forest restoration and uneven-aged management, including selection harvesting."* Another key recommendation is *"a gradual industrial shift from volume-based to value-added forest products."* Both recommendations are explicitly linked to providing more jobs. (See Executive Summary, page xi, and elsewhere).

Each of these themes is explored in considerable detail in the GPI report, and volume 2 is entirely devoted to case studies of forest management practices that demonstrate these recommendations in actual practice. In fact, volume 2 is entitled "A Way Forward: Case Studies in Sustainable Forestry." The sixth and last GPI recommendation is *"an adequate network of representative protected areas in Nova Scotia,"* (note the marked difference in phrasing from Dr. Gunn's language), but it actually receives *far* less attention in the GPI report than sustainable forest management. Indeed, there is only one short section (volume 1, section 7.1.3, pages 34-37) in the entire GPI report that deals explicitly with an indicator of protected area representation. In any case, to describe a prescription for "more protected areas" as the core GPI recommendation is a fabrication.

4) It is also a misrepresentation of the GPI report to imply that a focus on "old growth forests" is one of three core themes, as identified by Dr. Gunn. In fact, this is absurd by definition, since old growth forests exist *"only in very small, scattered, isolated pockets in the province."* For this reason there is very little discussion in the GPI report on "old growth forests," although Dr. Gunn asserts that this is one of the GPI report's three main themes. Perhaps Dr. Gunn is mixing up older forests with old growth forests. To see what the GPI report actually says about old growth forests, he could refer to the definitions and descriptions of old growth forests in the very brief section (7.1.1) in volume 1, pages 28-29, and the somewhat longer section in volume 2, chapter 1, pages 10-12.

It would be more accurate to refer to changes in forest age class structure as one of several key themes in the GPI report. For example, volume 1, pages 29-34, deals with changes in "provincial forest age class distribution" in the last 40 years. That has nothing to do with old growth forests. If that is the theme to which Dr. Gunn refers, then he should say so, and not falsely attribute some other theme to the report. In any case, Dr. Gunn's facile summary of the GPI themes is dishonest, misleading, and unprofessional.

6) Dr. Gunn continues in his introduction as follows (page 3):

"Most of the statistics cited are not relevant to the management of forests."

What utter nonsense! Has Dr. Gunn understood nothing he has read? *All of the statistics in the entire GPI report, without exception, are highly relevant to the management of forests.* That is what the whole GPI report is about from start to finish, and the connections of the data to forest management are explicit in every chapter.

Dr. Gunn presents no evidence at all for these sweeping and unsupported generalizations. Either Dr. Gunn cannot understand the most elementary linkages explained in the GPI report, or else he simply did not read what he purports to be reviewing. Are the statistics on changes in age class structure, on harvest and silviculture levels, on harvest practices, on forest ecosystem values, on carbon sequestration, on proportions of large dimension and clear lumber and so on, not relevant to the management of forests? How about the statistics on the economics of sustainable forest management in the case studies? If Dr. Gunn, as chair of the Nova Forest Alliance, really thinks that none of these statistics are relevant to the management of forests, then our forests are in worse trouble than the GPI Atlantic researchers ever realized.

7) Dr. Gunn's next sentence:

"There is considerable focus on the tourist industry without any discussion as to whether or not tourism is incompatible with forest management."

Not true. Chapter 5 in volume 2 deals specifically and explicitly with the compatibility of tourism and forest management, as do several other sections of the GPI report. The whole point of the GPI report is that the forest *can* be managed so as to protect and enhance the full range of forest values, including timber use, recreation and tourism use, and the optimal performance of ecosystem functions. As usual, either Dr. Gunn didn't read the GPI report (certainly he cannot have read chapter 5 in volume 2), or he is deliberately misrepresenting and ignoring what he claims to have read.

See for example, section 8.2, pages 159-161, in volume 2, which describes how *"Algonquin Park has managed to sustain both a vibrant tourism industry and a healthy forest industry."* The chapter describes in detail how this has been accomplished. For example, the forest managers there *"have avoided potential clashes between logging operations and recreational park users through careful planning. Roads that infringed*

*unnecessarily on recreational values, like canoe crossings, have been eliminated…."*The chapter goes on to cite specific Nova Scotia examples *"where the tourism and logging industries are increasingly at odds with each other over land use practices."*

The question, therefore, is not what Dr. Gunn asks – *"whether or not tourism is incompatible with forest management."* The question is a typical example of Dr. Gunn's exclusionary "either / or" approach. Instead, the question asked in volume 2, chapter 5, is *which* kinds of forest management are compatible with tourism interests, and which kinds are not. It is a question of types and methods of forest management. In fact, this entire chapter is introduced as a model of how forest management *can* be fully compatible with tourism interests. See for example, volume 2, page 131:

> *"Algonquin Park is a potential model for Nova Scotia resource managers. By following the Algonquin example, Nova Scotians would see their timber resources managed more effectively and profitably, the health of the province's forests improved, tourism industry interests protected, and a wide range of forest services and functions maintained. The Algonquin example demonstrates that it is possible to increase the timber value of forests in a way that is compatible with the importance of forests for the province's burgeoning eco-tourism industry."*

What a flagrant misrepresentation of the GPI report to claim that the issue is not discussed!

8) Dr. Gunn goes on, in his introduction, to dismiss the case studies in volume 2 as not relevant to Nova Scotia. We have already dealt with this issue earlier. Suffice to say here that the three Nova Scotia woodlot operations that Dr. Gunn claims *"are not scalable to the provincial level"* actually have a tremendous amount to offer to Nova Scotian woodlot owners and to government officials. As nearly 70% of Nova Scotia forests are privately owned, with most of that ownership (52%) in the hands of 30,000 small, private landowners, the woodlot models are eminently "scalable" to the provincial level.

   In addition, the wood from small private woodlots accounts for the majority of what ends up at sawmills and pulp mills. (See Table 35 in chapter 10 of volume 2.) Seventy-five percent of Bowater Mersey's wood comes from private woodlot owners, as does 60% of J.D. Irving's, 70% of Stora Enso's,and 50% of MacTara's.

9) Dr. Gunn's next statement once again completely misrepresents the GPI report and is in direct contradiction to what the report actually says. He dismisses the two case studies that present outstanding models of forest management at the large industrial scale by saying: *"The clear lesson seems to be that commercial forestry is bad."* Where does Dr. Gunn derive that conclusion? The GPI report never says it, and the two chapters to which he refers directly contradict the conclusion he claims to have drawn.

10) The Menominee and Algonquin Park case studies (volume 2, chapters 4 and 5) are specifically presented as outstanding models of sustainable forestry practised on a commercial/industrial scale. The 89,000 hectare Menominee forest (equivalent to 3.4% of Nova Scotia's operable forestland) produces an annual harvest of 58 million board feet, or 328,000 cubic metres (volume 2, pages 95 and 99). Algonquin Park has yielded an average annual harvest of about 400,000 cubic metres for the last 25 years (page 143.) Both are obviously very large operations on a commercial/industrial scale.

    For the record, here is a statement from the Executive Summary for Volume 2:

    > *"Algonquin Park is an example of a large-sized forest management operation on a scale comparable to many in Nova Scotia, but with a management approach that embodies ecologically, socially and economically sustainable forestry practices. As large operations, both the Algonquin Park and Menominee forest management systems provide a potential model for Stora Enso, J.D. Irving, Bowater Mersey, Kimberly Clarke, MacTara, and other large companies operating in Nova Scotia"* (page ix.)

Here is the conclusion of the Algonquin Park case study (volume 2, page 167):

> *"While most case studies in this report provide excellent models for small, private woodlots and small businesses, the Algonquin experience is particularly relevant for large forest operations in Nova Scotia.*
>
> *"Both the large industrial operations (Stora, J.D. Irving, MacTara, Bowater, Kimberly Clark, Ledwidge Lumber, Harry Freeman & Son, and BMPC Oakhill Sawmill), and the Nova Scotia Department of Natural Resources have much to learn from the experience of the Algonquin Forest Authority – in land use management, harvest methods, community involvement in decision-making, and enhancement of forest values in Nova Scotia. Just as the Algonquin authorities faced the challenge of reversing 150 years of destructive high-grading, so the challenge in Nova Scotia will be to restore age and species diversity and the value of a growing stock that has been badly depleted and degraded by a long history of high-grading, clearcutting, and overharvesting.*
>
> *"After only 25 years of careful and responsible management, Algonquin Park is already producing higher-grade lumber, while continuing to enhance the value of the park's standing timber. Even more significant is the example of the park in providing stable and sustainable logging and timber employment for local communities, while at the same time strengthening the forest's tourism and recreational values."*
>
> The Menominee model in Wisconsin (volume 2, chapter 4) is likewise an application of sustainable forest management principles and practices at a

commercial, intensive-management level. Where does Dr. Gunn get the notion that the GPI report regards commercial forestry per se as "bad?" Quite the opposite is the case. The GPI report explicitly asks the question whether sustainable forestry practices are applicable at the commercial level, and it answers that question resolutely in the affirmative.

It is the *type* of industrial forestry conventionally practised, heavily reliant on clearcutting and the pulp and paper industry, which has resulted in overharvesting, unsustainable use, and the loss of important forest values in Nova Scotia and elsewhere. But commercial forestry *can* be practised in a responsible and sustainable way, as the case studies convincingly demonstrate. That the chair of the Nova Forest Alliance dismisses these case studies as irrelevant to Nova Scotia is beyond belief and does not portend well for our forests.

11) Then follows a string of pejorative statements that again indicate that Dr. Gunn has no interest in what the GPI report actually says, but is concerned only to dismiss and discredit it, in complete disregard of the actual evidence. What is remarkable in the following statement is its complete negativity. Even though Dr. Gunn never mentions or takes issue with the key findings in the GPI Forest Accounts (such as impacts of harvest practices on soils, watersheds, wildlife, habitat, timber quality and productivity, and other forest values), he wants to destroy the whole report.

. The following is from page 4 of his comments:

"A refrain throughout the report is that GPI didn't have the resources to do the job properly. This raises the question why they took on the task and why an incomplete and poorly written report was released at this time. The report contains no new data that hasn't been widely available in Nova Scotia for some time. It creates no new framework. There has been no original research. The large numbers reported are just simplistic extrapolations using data published in well-known papers. The authors claim to have spent four years on this study. It is unclear why."

The first sentence is a misquote, and (once again) represents Dr. Gunn's own projection, rather than what the GPI report says. Nowhere does GPI Atlantic state that it did not do the job "properly." We believe the job was done completely "properly" and, moreover, according to "proper" standards of research that Dr.Gunn seems unable to fathom. This is what the Preface to the GPI Forest Accounts *actually* says (we assume this is the statement to which Dr. Gunn refers):

"There is no pretence that these accounts, nor the Genuine Progress Index as a whole, are a final product in any way. GPI Atlantic welcomes improvements in data sources, methodologies, analysis, and interpretation that will allow corrections and more accurate updates and assessments in the future" (page iv.)

There are other statements identifying data gaps, and areas that require further research. All honest research, including that in the most respectable peer-reviewed scientific journals, identifies data gaps, limitations, and areas requiring further research. Yes, we received total funding for this work of only $27,000 over four years, which inevitably created some limitations that are explicitly and honestly acknowledged in the report. But there are no statements anywhere in the report that we didn't do the job properly.

With such limited resources, Dr. Gunn wants to know *"why they took on the task."* Simple answer: Because the NS Department of Natural Resources and other bodies that *do* have sufficient resources (including taxpayer money) have *not* taken on the job, and because the job needs to be done. Incidentally, those organizations with sufficient resources have the same data problems and data gaps that GPI Atlantic does!

The data gaps are partly explained because forest accounts have not previously included data on soil quality, watershed protection, wildlife habitat, carbon sequestration, provision of recreational opportunities, and other forest values. No wonder there is a shortage of local data in these vital areas. Genuine scientists take extrapolations from other regions and comparable studies not as a reason to dismiss vitally important connections, but as a stimulus to collect local data. An example of a vital data gap noted in the GPI Forest Accounts is the need for soil field tests to assess the impact of different harvest practices on soil quality and long-term timber productivity. Certainly, no research will use extrapolations when direct local data are actually available.

To turn researchers' own up-front and honest statements about the limitations of their own research into an argument against releasing their research altogether contravenes the most basic norms of scientific inquiry. According to Dr. Gunn's criteria, there would literally be no published scientific research. In genuine scientific inquiry, the expressed limitations of all scientific research become the challenges for the next generation. As usual, Dr. Gunn is much more interested in what is *not* there than in actually examining what is presented.

Are the GPI Forest Accounts *"incomplete"* as Dr. Gunn alleges (page 4)? Of course they are, as the statement above fully acknowledges. So is *all* scientific research incomplete. There is always more to discover and more to learn. Think of cancer research, climate change research, archaeological research, or any scientific research at all. The one that claims to be "complete" is a fraud, almost by definition.

The GPI Forest Accounts are 466 pages. That is what GPI Atlantic was able to accomplish in this first modest effort to assess the health and value of our provincial forests. Much more still needs to be done. The report could be 1,000 pages and still be incomplete. In fact all GPI reports explicitly state that the GPI will *never* be a final product, but will always be improved with new data sources and methodologies.

"Poorly written"? (Gunn, page 4). This is such a cheap shot that it is hardly worth a comment. Dr. Gunn might begin, with a little humility, to examine his own writing style. Dishonest writing is the poorest writing of all.

"No new data" (page 4). True. The Nova Scotia GPI always uses existing data, from official, government sources wherever possible. Had Dr. Gunn reviewed the GPI project, he would know that this is true for all GPI reports. As the GPI Forest Accounts explicitly state (page 176):

> *"The Nova Scotia GPI uses existing data sources in its valuations and applies the most practical and policy-relevant methodologies already developed by the World Resources Institute, the OECD, the World Bank, national statistical agencies and other established research bodies. In particular, the Nova Scotia GPI relies on published data from Statistics Canada, Environment Canada, the NS Department of Natural Resources (DNR), Department of Fisheries and Oceans (DFO) and other government sources where ever possible, to ensure accessibility and ease of replication by other jurisdictions.*
>
> *"In this report, DNR forest inventories and the Canadian Forest Service's National Forestry Database are the principal data sources, with supplementary information gathered from DFO Recreational Fishing Surveys, the Nova Scotia Department of Finance, Statistics Canada, the province's Wildlife Advisory Council, and several other sources."*

In addition, volume 1, section 6.3, pages 21-22, entitled "Data Sources," lists the principal data sources in detail, and the bibliographies contain the 364 references used throughout both volumes. But the fact that existing data are used does not mean they cannot provide new information to Nova Scotians.

To give just one example (and there are many in the GPI Forest Accounts), the change in age class structure can be found in NSDNR forest inventories. But these data have never before been compiled into a 40-year trend line that enables Nova Scotians to track the loss of old forests over this time span. That is vitally important information, and it has remained hidden from view. These data were then combined with other "existing data" on carbon storage by age class and on estimates of avoided climate damage costs to produce the first economic valuation of the carbon storage value of Nova Scotia's forests.

This is why Dr. Gunn is dead wrong in stating there is *"no original research"* (page 4). Drawing new connections, linkages, and relationships between existing data sources, and presenting, interpreting and understanding existing data in new ways most certainly qualifies as "original research" by any standards. Many of the case studies in volume 2, and the economic costs of forest restoration have never before been assembled, described, and presented to the Nova Scotia public. It is obviously

not research in which Dr. Gunn has any interest. But there are other Nova Scotians who are very interested in the GPI results.

However, the "no new data" assertion is lacking from another perspective as well. It is not the job of an index or measure of sustainable development to do, for example, field tests on soil quality (which we strongly recommend in the GPI Forest Accounts.). The job of an index is to integrate existing data sources. The GPI report contains numerous recommendations for new data, which are needed for the development of an index of forest health. Most measurements to date have ignored qualitative considerations, which have conventionally been considered of much lesser importance than quantitative projections of wood supply. The Nova Forest Alliance and academic researchers could play a very important role in the coming years in collecting the new data needed for updates of the GPI Forest Accounts.

What Dr. Gunn completely fails to mention in any of his comments are the numerous references in the GPI report that identify data gaps and that specifically mention the need for research and data collection in vital areas. For example, the GPI report notes the need for assessments of soil quality, particularly organic matter and nutrient content, and their relationship to harvest methods. These data are important for wood supply models in order to assess potential timber productivity on different types of land and according to different management systems. For example, do successive clearcuts gradually degrade soil quality and thereby imperil future timber productivity by comparison with selection harvest methods?

The Preface to Volume 1 (page v) of the GPI Forest Accounts explicitly states:

> *"Some important data are simply not available, and will require field and laboratory tests before any assessments – physical or economic – can be made. For example, soil tests are needed to assess the impacts of different harvest methods on soil organic matter and nutrient content, and on erosion, over successive harvest cycles, knowledge which is vital to estimate impacts on timber productivity, future wood supply, and forest health."*

If Dr. Gunn were genuinely interested in "new data," he would welcome these recommendations, and argue strongly for such studies to be done. It is absurd to dismiss the GPI report for not actually having such "new data," when the report is full of the identification of data needs that currently do not exist. A scientist genuinely concerned about new data would take up the challenge of these data recommendations and acknowledge the GPI report's contribution to identifying such data needs.

Notwithstanding all the above, there is actually a very substantial quantity of new information and new data in the GPI Forest Accounts that show Dr. Gunn's statement about "no new data" to be simply wrong. If he had read the sections on employment per unit of biomass, on clear and large diameter wood, on costs of mechanization, and on many other subjects, he would have found many previously unpublished numbers

derived directly from the interviews and investigation conducted by GPI Atlantic researchers.

To take just a few examples among many, the estimates of the costs of restoration are new data, based on detailed financial statements from Jeremy Frith, the Pictou Landing records, and other sources. In other cases, important new information and calculations are presented for the first time, based on data assembled from reliable sources. The value-added calculations for each province are new. Documentation of research pertaining to flora and fauna vulnerable to clearcutting in the Maritimes is a first. To the best of our knowledge, this and much other information in the GPI Forest Accounts has never previously been published.

"No new framework" (Gunn, page 4.) In one sense this is correct. The GPI Forest Accounts do use and apply the frameworks of the Canadian Council of Forest Ministers and the Montreal Process. Neither the GPI, nor any other respectable research, has to reinvent the wheel when there are excellent frameworks and indicator sets already in existence.

On the other hand, the GPI itself is quite a new and potentially useful framework for this province and for Canada, and it has aroused considerable interest at the national level. Dr. Gunn admits he has not reviewed this framework, and his own comments show that he adheres rigidly to conventional (and deeply flawed) accounting frameworks, so he clearly does not recognize the GPI framework, even when it is right before his eyes. The Nova Scotia GPI natural resource accounts are the first of their kind in North America. There is an opportunity here for Nova Scotia to take the lead in adopting and using them. If they are not wanted here, they will certainly be used elsewhere.

12) On page 3, Dr. Gunn lists three sets of statistics and concludes, with his usual sweeping generalizations: *"None of these statistics hold up on closer examination."* Gunn's claim on these three sets of statistics is examined in detail in sections 13, 14 and 15 above, and requires no further comment here, beyond noting again the extreme negativity of his statements, and his tendency to dismiss all the findings out of hand.

13) In the same section, Dr. Gunn states: *"The authors claim to have spent your years on this study. It is unclear why."*

Of course it is difficult for Dr. Gunn to understand why it took GPI Atlantic researchers four years to complete these Forest Accounts. If we had been as sloppy and careless in our use of the 364 sources consulted as Dr. Gunn was in reading the GPI report, and shown as little regard for fact, evidence, and accurate attribution, then we could certainly have completed the work in much less time.

It took four years because:

- all sources were carefully read and studied;
- methodologies were extensively tested;
- facts, calculations, spreadsheets, tables, and charts were meticulously checked and re-checked;
- experts were consulted,and their feedback, advice, and suggestions for further research were incorporated;
- strenuous efforts were made to reconcile conflicting data sources (e.g. permanent sample plot data with forest inventory data); and so on. (By contrast, as noted above, Dr. Gunn simply asserts without any evidence that the PSP data are far more reliable, -- a much quicker, but hardly more academic and professional path.)

All these efforts to conduct research according to the highest standards do not mean that there are not still some mistakes, which GPI Atlantic will correct as they are discovered. But it does mean that the research was undertaken with integrity. Given his own consistent and deliberate misrepresentation of the GPI report, it is not surprising that Dr. Gunn does not recognize that integrity, and we appreciate that it is difficult for him to understand just how long such genuine research can take. Given the shortage of external funding available for this entire project ($27,000 in total), there were also gaps during these four years.

Taking random, baseless, and ill-aimed pot-shots with no regard for fact or accuracy, as Dr. Gunn has done in his comments, would certainly have speeded up the production process. But this approach is not the GPI lexicon, and the trade-off between speed and integrity was not one that GPI Atlantic was willing to make. We opted for the slow path, and in the end, we are completely confident in the results, findings, conclusions, and recommendations of the GPI Forest Accounts.

14) Finally a technical detail. Dr. Gunn claims to be referring to the draft version of the GPI Forest Accounts released on the GPI web site and to the press on November 14. He fails to note that the front cover of volume 1 clearly stated in red type that corrections were still being incorporated into the text, and that the final version of the report would be released one week later. This was also clearly stated on the web site. In fact, the final version of the report was posted on the GPI web site three weeks before Dr. Gunn released his comments. So he had ample opportunity to check any attributions against the final, corrected version. Most of the corrections were minor, so this technical detail does not affect the vast majority of Dr. Gunn's comments.

18) So what is the reason for Dr. Gunn's complaint?

The preceding pages have demonstrated that Dr. Gunn's comments are based on careless or deliberate misrepresentations of what the GPI report actually says, on an ignorance of the GPI, and on wrong facts and numbers. In most cases, Dr. Gunn has either not read what he purports to comment on, or else ignores what he has read. Although he takes no

issue with the key findings, analysis, and conclusions in the GPI report, Dr. Gunn is determined to dismiss the entire report, including the six case studies.

So, what is behind his negativity? Why does he appear so threatened by the GPI report, and why is he so intent on destroying it? Clearly his anger and emotional reaction to the report has nothing to do with its quality or substance, or with the validity of its findings, results or conclusions.

GPI Atlantic suggests that there is another reason for Dr. Gunn's anxiety that is stated explicitly in the GPI Forest Accounts:

> *"Despite the inclusiveness of the GPI approach, there is no question that it does represent a fundamental challenge to current assumptions and practices"* (page 174). *"There is sufficient information in these two volumes to provide concrete guidance for policy makers across a number of dimensions."*

In other words, the GPI is *not* "business as usual.'' A different measurement and accounting system means a different set of policy options based on values previously hidden and ignored. It therefore means a different way of doing business. Seen from that perspective, the GPI is not a theoretical construct, but a practical tool for action that has direct relevance for policy. Thus, it is perceived as threatening to those with a vested interest in existing structures and systems. That seems to be the reason for the intensity of Dr. Gunn's negativity and invective.

A more careful reading of the GPI report indicates that there is actually nothing to fear. Recommended changes (e.g. financial incentives for restoration forestry, tax reforms, etc.) are all designed to encourage gradual change that can be accommodated without threat to the financial stability and viability of the province's forest sector. On the contrary, the GPI report, and the volume 2 case studies in particular, indicate clearly that a wide range of long-term benefits will accrue to all forest stakeholders from a change in forest practices and management techniques.

In actual fact, if Dr. Gunn could take the time to look at the GPI report with just a modicum of objectivity and open-mindedness, he would find ample room for a genuinely constructive dialogue. Ultimately, all Nova Scotians share a common goal in relation to the province's forests, and that is to improve their health and functioning for the benefit not only of this generation, but of future generations of Nova Scotians. GPI Atlantic very much hopes that the current conflict will quickly give way to such a constructive dialogue. Dr. Gunn offers one sentence at the end of his comments that offers great hope and promise for such a dialogue. He acknowledges that *"[t]he forest is a complex system interacting with other complex systems."* This acknowledgement is certainly the basis for an excellent and substantive discussion of the GPI results. It is a pity Dr. Gunn did not take this statement as the basis and starting point for his comments. They would have looked very different if he had.

GPI Atlantic's real desire is to create such a genuine and civil dialogue, based on mutual respect, that serves our common purpose of ensuring healthy forests and a sustainable wood supply for the benefit of future generations of Nova Scotians. GPI Atlantic extended an invitation for such a dialogue directly to Dr. Gunn. However, he ignored the invitation, wrote a disparaging reply claiming to have more experience than us, and decided to take his comments to the press instead. Therefore, GPI Atlantic has had no choice but to answer Dr. Gunn's comments here with some sharpness. We hope that we can move quickly to a more civil and constructive interchange.

19) Changes made to GPI Report

After carefully reading and reviewing Dr. Gunn's comments, the following changes have been made to the GPI Forest Accounts:

1) In paragraph 3, page 86, (the quotation from Schulze et. al.), the following sentence has been added to the quote as follows: *"...organic matter. Both effects may override the anticipated aim, namely to increase the terrestrial sink capacity by afforestation and reforestation."* (Schulze et. al. 2000)

2) In volume 2, chapter 5, the estimate of employment per unit of biomass harvested for Algonquin Park has been reduced from 4.39 direct jobs per 1000 m^3 to 4.1 jobs per 1000 m^3, in light of new evidence from the Ontario Ministry of Natural Resources, published since the completion of the Algonquin Park case study.

3) The title of Chapter 8 both on page 55 and in the table of contents has been changed to: "Impact of Disturbance and Stress on Forest Ecosystem Health and Productivity." This is to clarify that other chapters also deal with forest ecosystem health and productivity.

4) The distinction between "forest industries" and "forestry industries" has been clarified. The term "forest industries" is used in accordance with usage by the Canadian Forestry Service (CFS), Natural Resources Canada, and in the APEC (2000) report, to refer to all forest sector industries, including the logging, pulp and paper, and wood industries. See the CFS website at: http://www.nrcan.gc.ca/mms/efab/mmsd/forest/pdf/IV4E.pdf. "Forestry industries" are more narrowly defined in the official sources, and are reported with the logging industry numbers only, exclusive of the pulp, paper, and wood industries. "Forestry industries" therefore include only the activities associated with logging operations, as well as forestry patrol, fire inspection, reforestation, forestry farms, and timber crop operations.

Appendix 1: Letter to Eldon Gunn from Jim Drescher, Windhorse Farm

Thanks for your thoughts about the Windhorse forestry experiment. It strikes me, however, that to call it a critique, based on the very sketchy notes you provide, is a bit presumptuous. Nonetheless, I welcome the opportunity to discuss this with you here in the woodlot at any mutually agreeable time. For now, I will make a few comments which relate to some of the points I think you are trying to make.

1. The Windhorse experiment has been a "persuasive example of what is possible" for many of those who have come here to tour or study. It may or may not be persuasive for you. I suggest you come and have a look before solidifying your opinion.

2. An unmodified Windhorse model is not widely applicable. No one approach is workable everywhere. Good forestry is site specific, which is one of the reasons monomethod industrial forestry is failing to protect biodiversity and the socioeconomic fabric of our rural communities. Certainly the Windhorse model cannot be extrapolated to all of Nova Scotia in any reasonable way. The point is that here is a different way of doing things, some aspects of which could offer benefit to many other woodlot owners. My understanding of the GPI recommendation is that this is one (of many) "ways forward."

3. Confusion about the size of the woodlot is understandable. The "home place" is 55 ha (I still think in acres). We also manage the adjacent 40 ha as part of the same operation. In addition, we have different management and harvesting arrangements with other woodlot owners in the community.

4. The standing merchantable (> 10" dbh) timber volume on the home place is estimated to be 2000 Mfb.

5. The AAC has been 60Mfb until Dec 1999, when we reduced it to 30Mfb due to a perceived shortage of dead wood.

6. Much more study needs to be done on the effects on long-term productivity of various forestry practices.

7. Certainly growth has a predictable curve in an uneven aged stand, and it is slower in an 80-year-old stand than it was in the same stand at 50 years. It should be recognized that the volume curve is not the same as the value curve.

8. What happens to the volume and value curves under various selection harvesting conditions is more interesting to me, and much more difficult to ascertain.

9. Economically, it seems the important question is the rate of growth in value, which is more dependent on the growth in high value timber (large forest grown trees) than in simple volume.

10. It is interesting to speculate (fortunately, that's all we can do) on how much merchantable log volume would have been harvested from this woodlot if it had been logged in four successive clearcuts. Less than 6500Mfb is my guess. Questions as to how much nutrient depletion and other site degradation would have resulted from the clearcutting would have to be answered. Also, what stocking estimates and bole size distribution should one use for the speculations? Lots of unknowns. No controls. The main point is that the quality/value of the timber cut during the clearcutting sequence (except the first cut) would have been much lower than in the slow grading selection method that was used.

11. I suspect that the relatively high site capability at Windhorse Farm is partly a result of intact forest conditions. This is another area of forest research conspicuous by its absence.

12. Obviously it is unrealistic to extrapolate the Windhorse model to the whole province for many reasons. The GPI point here, as I read it, is that much could be gained, ecologically and socially, if this type of forestry, appropriately modified for particular circumstances, were more widely applied.

13. This forestry is not dependent on horses. Other extraction methods may work as well or better in other situations. We use horses here because, in our particular circumstances this is the most cost effective of the various low impact solutions.

14. Treatment of forestry workers by employers, and society as a whole, has driven people away from woods work. That trend could be reversed if the work were more creative, better rewarded, and more highly respected.

15. Seven people (full time equivalents) are employed in the Windhorse operation, including forest management, harvest planning, logging, saw milling, lumber drying, wood product manufacture (flooring, mouldings, cabinet lumber, etc.), and retail sales. The principle here is small-scale, vertically integrated forest at the community level, adding value as close to the stump as possible.

16. Log prices vary considerably through time and space, and they always depend on species and grade. However no logs are exported from Windhorse Farm. Only lumber and other value-added wood products are sold. We try to reasonably maximize dollar-to-biomass ratios for all sales, thus keeping "cheap biomass" at home to serve in nutrient and water cycling and general enrichment of the forest habitat.

17. 150Mfb in logs yields over 200Mfb in lumber from a portable band saw mill. Retail prices range from 600/Mfb to 4000/Mfb for most products and as high as 8000/Mfb for some specialty wood (e.g. soundwood).

18. High quality logs needed for this kind of operation are very rare, due to a long history of forest depletion in Nova Scotia. Restoration of quality is urgently needed. It will take a long time, so now is the best time to begin.

Appendix 2: Comments by Jeremy Frith, woodlot owner

Here is the skeleton of a reply to Eldon Gunn's criticism of the GPI report, based on my perspective as a participant and as a woodlot owner and forestry operative.

I find Gunn's arguments in turn fatuous, specious, and spurious. An example of this is his use of spruce budworm to explain the even aged condition of NS forests, though this took place really only in Cape Breton. Budworm damage is also an indicator of poor past management in that it attacks a limited spectrum of age and species classes usually indicative of past clearing either as clearcuts or for farmland. Indeed serious budworm outbreaks that caused the degree of devastation witnessed in the 1970s were essentially unheard of before the 20th century. Leading industrial researchers such as Baskerville and MacLean showed, through work done in the 1970s that uneven aged mixed woods were essentially safe from budworm depradations.

Similarly, Gunn uses the SAWS computer model in his arguments and states that it is based on even aged management. He claims that no uneven aged data is available for the Maritimes or East Coast forests. Yet work done on the West Coast, in Ontario and Quebec and particularly by the USDA Forest Service Northeast Research Stations, shows almost overwhelmingly that uneven aged management is more productive on many levels in a mixedwood forest such as the Acadian Forest. These findings are not considered relevant by NS industry or government. 'What applies there doesn't work here" is the standard response to the use of these examples.

Unfortunately, these respondents are the very people who control the research purse strings, personnel and political will to have similar research performed here which could either confirm or deny conclusively whether these findings are relevant here. They studiously and steadfastly avoid implementing any such research programs in spite of the fact that individuals such as myself have offered to carry out the groundwork within a mutually agreed upon scientific framework and using their data collection abilities. Perhaps, since the federal government is empowered to perform forestry research, it should be approached. With Eldon Gunn as chair of the Nova Forest Alliance and with the NFA the main vehicle for federal involvement in NS Forest affairs, this research is unlikely to happen.

Gunn claims that my approach as a woodlot owner is hobbyist and inapplicable to province wide woodlot management. Yet he ignores the following salient facts:

a) Few if any passive woodlot owners derive true long term financial benefit from owning their lands, in spite of tax breaks (managed forest pays 25 cents per acre per year) that make owning forest land less than onerous. The average managed woodlot in Cape Breton probably brings in a lot less than $1000 per year including home firewood at retail value. This hardly compares to incomes of nearly $10,000 per year per 100 acres in Ontario and New England for well managed mixed wood forests. Studies have been done that show that 240 acres of well managed Acadian forest in Cape Breton could produce full time employment for a trained forest operative on a year-in year-out basis.

b) The 10 to 20 year payback period I envision pales in comparison to the 50+ years spruce plantations take to begin really paying off.

c) Gunn says that Nova Scotia woodlot owners don't have the knowledge, time and physical conditioning to do what I have done on my woodlot. As per (a) above, rather than diminish the need for a well trained, skilled and fully employed forestry workforce in NS, my management presupposes a more involved and management-capable group of owners, producing higher quality and quantities of wood for a more diverse industry with a much greater rate of return for all concerned. I am certain that Wade Prest can confirm that there is a need for workforce and contractor resources in this province that are more trained and flexible in management and extraction techniques and more capable of a long view of forest ecosystems and productivity.

Sweden's example shows that woodlots can be owned, managed and improved through extension services and the creation of diverse and highly specialised small contractors carrying out pre-commercial and commercial silviculture at all levels and scales. Industry and government in Nova Scotia have in fact been the authors of much of the disengagement on the part of woodlot owners by moving to obligatory 8'(eight foot long) pulpwood and hardwood ("too big for a man, too small for a horse") thereby making it impossible for a woodlot owner to do his/her own extraction with just a chainsaw and a small tractor. Instead a large investment in equipment becomes necessary and is seldom justified on a single woodlot. Enter the contractor! Exit many woodlot owners who possess no willingness to have their lands trashed.

Machinery does exist which would allow woodlot owners and contractors to practice selection techniques without resorting to Gunn's 40,000+ horses. Most of Nova Scotia's 30,000 woodlot owners possess or could be easily given the rudimentary knowledge necessary for basic management, and do in fact have time, especially the one hour per week I appear to have spent. They also require really only sufficient physical conditioning to walk their woodlot regularly with a measuring tape, clipboard and perhaps pruning saw. This would *improve* their physical condition and give them an intimate knowledge of just what it was that they owned, *and* it would avoid contractor rape. So, in fact, what I propose is to get more woodlot owners on side who would be

willing to let their holdings be intelligently managed, and thereby provide more productive land base.

d)Gunn and others love to use statistics such as "30,000 woodlot owners" but fail to mention how many of them allow some or any forestry activity on their land. This is similar to his use of 10-20 years as a long time when in forestry terms anything under half a century is short term, particularly in even aged management. He extrapolates the 452 hours of physical work I have carried out on my woodlot over the eight years in which I have lived on it and comes up with the 'hobby' conclusion of an hour a week. He pays no attention to the descriptions of age classes and stand conditions described in the GPI report, to address the issue of what I purchased or found when I moved here, or to suggest just what a "bona fide" woodlot owner would have done with same.

It is not his fault that I did not include the fact that I did not begin work on the woodlot until 1995/6 having spent the first 2 1/2 years working on home and buildings, nor that I did not include the 5 to 7 hours per week average hours spent walking the woodlot and assessing my options for long range management. I would just assume that a real forestry professional would factor in such actions as basic needs for good management. I wonder how much time Dr. Gunn spends in the woods.