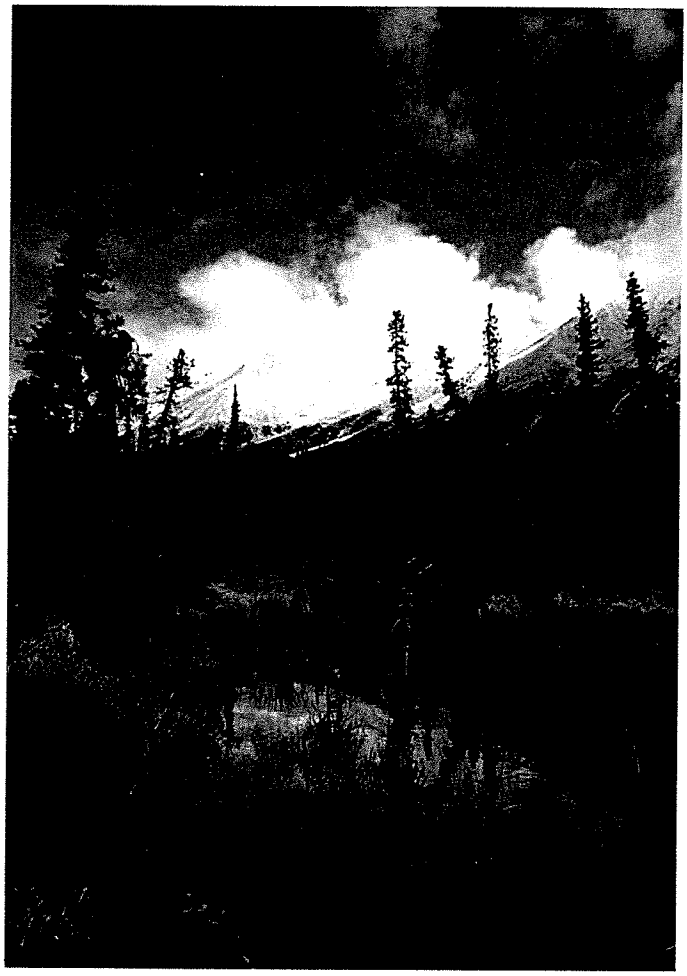
A Model of the Integrated Forest Inventory: Combining Conservation and Commodity Values Using the Natural Community Classification System and the Forest Examination Inventory



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THESIS PROPOSAL

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Abstract

Changing perspectives in forest management toward an ecosystem approach warrants a revision in forest inventory methods. In Vermont it has been suggested that the more traditional Forest Examination (FOREX) inventory system could benefit from being combined with the Non-game and Natural Heritage Program's "natural community" inventory system, which could supply more comprehensive information about regional biodiversity. A field test has been proposed on Mt. Mansfield to address three questions: 1. can these inventory systems be combined, 2. can this be done in an efficient and useful manner, and 3. can natural community designations be retroactively given to previously gathered FOREX data?

INTRODUCTION

Forest inventory is an evolving process. It began in the United States at the turn of the century when foresters realized that forest management and conservation were impossible without information on the forested area, standing timber, tree mortality and forest "health" (Powell et. al. 1994). From the late 19th century to the end of the 1960's, information gathered in United States Forest Service inventories focused on timber productivity, and consequently "the primary beneficiaries were forest industries."(Powell et. al. 1994 p7).

In the 1960's and 70's with the passage of the Multiple Use and Sustainable Yield Act and the Forest and Rangeland Renewable Resources Planning Act, the philosophy of forest use expanded to include a multi-resource perspective (Powell et. al. 1994). This meant an expansion of what needed to be inventoried in forests to account for recreation, wildlife and other resource potentials. Also, as understanding of forest ecology has progressed, new information about forest structure and function warrants new management approaches. For example, the realization that fire can be a beneficial influence in certain forests calls for new management policies regarding this disturbance.

In the mid 1980's and 1990's a new voice has been raised in favor of taking an ecosystem approach to forest management. This perspective is new in that management no longer centers around specific human uses associated with forests, but tries to integrate human needs with maintaining a "healthy" ecosystem. Also, without knowledge of ecosystems, a "sustainable" harvest of resources from a forest is not possible (Noss 1993). It has been recognized that fragmentation of ecosystems associated with traditional management (i.e. clearcuts and roads), cannot continue if we expect to maintain habitat for a wide diversity of

species. This new direction is not surprisingly referred to as "ecosystem management".

As management perspectives evolve, so does the information we gather about forest ecosystems in inventories. For the purposes of this study, there are two main perspectives that a forest inventory should inform in light of the shift toward ecosystem management. Poleman (1996a.) summarized these as the "commodity perspective" and the "conservation perspective". The commodity perspective values forests for the services derived for human benefit. The conservation perspective values a wide representation of native biodiversity and healthy ecosystems.

Under the new forestry view of forest management, there has been a triad approach suggested for forest management (Hunter 1990). First, forests of rare or representative ecological value that will be left alone. Secondly, there will be land that is managed for both ecological and commodity values. Thirdly, there will be a strict commodity approach, or what can be viewed as forest agriculture. This study is concerned with the second approach to forest management and how to integrate both consumption and conservation practices on the same piece of land. In light of this, we need an inventory procedure that will inform both the commodity and conservation perspectives in order to make informed management decisions (Poleman 1996a.).

In Vermont "Forest Examination" (FOREX) is the inventory system that tries to inform both perspectives. This system seeks to:

1. allow for evaluation of individual tree health based on crown condition
2. provide for additional wildlife information to be collected
3. clarify and define land surface features
4. provide for a structured analysis of understory vegetation.

(From Vile 1989)

FOREX represents a step toward the conservation perspective by incorporating information about wildlife habitat and significant physiographic features on an assessed parcel of land. However, FOREX falls short of gathering comprehensive biodiversity information. Data collected to assess biodiversity still refers to game species such as deer, and the understory vegetation data gathered is oriented toward plant species that inhibit the regeneration of commercially important tree species (Poleman 1996b.)

Because of this gap in the FOREX inventory, Poleman (1996b.) recognized that more information would have to be collected during forest inventories in order for land managers to make informed decisions about critical biodiversity issues in the Vermont. He suggested that FOREX and the Nongame and Natural Heritage program's "natural community" approach be married in an integrated inventory that could potentially provide information to both the commodity and conservation perspectives.

A "natural community" is a relatively new unit used in landscape inventory. It was delineated in 1974 when The Nature Conservancy decided to take on the project of inventorying the nation's biodiversity in order to help identify and protect endangered ecosystems and species (Blair 1991). What developed out of this effort was the Nongame and Natural Heritage Program which is an evolving computerized inventory of biodiversity in all 50 states. The natural community system's focus on biodiversity is the reason it would be valuable if combined with the FOREX inventory.

This study will address three questions:

1. Can the quantitatively based FOREX inventory system be combined with the qualitatively based natural community system?
2. If these can be combined can the inventory be conducted in a way that will be efficient and informative enough to be useful in protecting biodiversity?

3. Can natural communities be retroactively designated from the data sets collected from the FOREX inventory?

LITERATURE REVIEW

An overview of the natural community inventory system is described by The Nature Conservancy (1994). It is a hierarchical classification system with a primary division between terrestrial and aquatic systems in a landscape. The application of this classification scheme represents a "coarse filter" approach to conserving biodiversity. Natural communities are characterized by the dominant plant species that recur in recognizable patterns across a landscape. By preserving a full range of natural communities that occur in a particular region, other species associated with the dominant plant species will be conserved as well. In this way, this system serves as a "filter" or net catching the dominant and associated species together. The Nature Conservancy estimates that 85-90% of the species can be conserved this way (Hunter et al. 1988). This inventory system is an iterative process by which natural community designations are refined and further delineated as more time is spent in the field identifying them.

If a species falls through the coarse filter, or is rare enough that its distribution is not in any discernible pattern, then the fine filter approach is used and individual rare species are protected in reserves or by legislation. Natural communities can be endangered also, and are therefore worthy of protection. In the words of Hunter et. al. (1988 p.380) "many ecologists believe that particular communities are important biological entities in their own right, and thus have intrinsic value as a component of biodiversity. In other words they are recognizable and somewhat predictable, and have emergent qualities such that the whole community represents more than the sum of the component species."

The units of conservation under this system, natural communities, are defined by Sperduto (1996 p.5) as "recurring assemblages of organisms found in particular physical environments". By this definition, a natural community is analogous to an ecosystem, but what the word "ecosystem" really means needs some clarification. Rowe and Barnes (1994) attempt to define this ambiguous word offering a division into two categories, one based on landform (soil, aspect, topography, hydrology) and one based on biota. The former is referred to as "geo-ecosystems" and the latter are "bio-ecosystems". Since natural communities emphasize the plants and animals that occupy a given site, these fall into the category of bio-ecosystems.

Whether geoecosystems or bioecosystems are used as the basis of a land classification unit depends on the goals of managers since both ways framing ecosystems are valuable. A geoecosystem will emphasize a much more static unit of land, but will take the emphasis off immediate associations of biodiversity. In contrast, using a bioecosystem definition will do the opposite- focus on the plants and animals on a given site while taking the emphasis on the more permanent physiographic characteristics.

The ECOMAP project being conducted by the United States Forest Service (USFS 1993) is an example of a classification system that utilizes geoecosystems as their fundamental unit of classification. Since about 1990 with the "New Perspectives" program, the National Forest Service began to pursue "ecosystem management" in hopes of improving "understanding of how to sustain ecological systems at multiple geographic scales for a richer variety of current and future benefits and uses" among other reasons (Salwasser et al. 1993). It became apparent that in order to manage ecosystems they needed to separate different physical areas into separate ecosystems. Since the Forest Service was interested in long term

management, they chose geo-ecosystems or what became known as "Ecological Land Types" (ELTs), as their managing unit.

People differ in how they believe the conservation of biodiversity should be approached and because of this, the use of natural communities toward this end is controversial. Hunter et al. (1988 p382.) recognize and agree with the basic premise of the natural community system: "Our concern is in identifying the best strategies for maintaining a high level of species diversity." They find three main problems with using natural communities though:

1. They are impractical for predicting the distribution of very rare, patchily distributed species.
2. They are transitory assemblages of plant and animal species.
3. Community dominant species may not be as sensitive to environmental change as the associated species are.

(Hunter et al. 1988)

Their first point raises the concern that the coarse filter method is too coarse, and rare species will go extinct through habitat loss because they were not found in time. The Nature Conservancy admits these species oversights by the very name they gave to this system: the "coarse filter". The system is meant to preserve a majority of species and then, to the degree that is possible, rare species will be found and protected by the "fine filter" approach using special conservation attention, such as the Endangered Species Act (Noss 1987).

The second point, that natural communities are transitory assemblages of organisms is important. Hunter et al. (1988) use the paleoecological record (determined from pollen distribution in bog cores) as a conformation that natural communities shouldn't be the unit of conservation but geoecosystems should since the former have changed many times within a few thousand year period. Their justification is that the theater should be preserved, not the theatrical production that occurs within it. There is an immediacy to conservation efforts,

though, that make utilizing a geoecosystem approach problematic. Wilson (1986) describes an unprecedented fragmentation of habitats and loss of biodiversity occurring in the modern world. The time scale that we are working with is much shorter than the scale at which geoecosystems function, and if preserving biodiversity is the goal, a natural community approach is better suited.

Their third concern is also an important one to consider. In situations where the dominant plant species grow in different environmental conditions that would change the understory plant species. For example a red spruce community in the Northeast can occur at high elevation in well drained soils or within lowlands in poorly drained soils, conditions which may change the understory composition (Hunter et. al.) Since defining natural communities is an iterative process, an inconsistent community description can be split into two or more communities to account for new found variation.

Sperduto (1996) gives two justifications for using natural communities: first that in a given region, physical factors (geology, soils, climate, etc.) and disturbance agents (fire, wind-throw etc.) interact to create recognizable vegetation patterns across a landscape. These patterns can be classified into natural communities, a unit that then can be protected. Then he states, "The second reason is a pragmatic one: we are human and need a way to sort out, understand and communicate about this complexity to be good stewards. Although community types do not always occur as discrete , clearly definable units on the ground and can intergrade into one another, classifying the variation into community types gives us a powerful way of lending context to a site."

The developers of the natural community system admit to its shortcomings. It was never meant as the definitive land classification system. Communities shift based on natural disturbance (fire, flood, blowdown), human land use (tree harvesting), and successional stage. Although natural communities are not

enduring entities, this system is effective at cataloging and protecting biodiversity at various scales (Stolzenburg 1992) which would be helpful if integrated into the FOREX inventory system.

METHODOLOGY

In light of the benefits in combining the natural community approach and FOREX the actual integration of the two will be conducted on the Vermont Monitoring Cooperative land (VMC) on the west side of Mt. Mansfield. The 250 acre parcel is located just south of Stevensville brook and extends from about 1700ft to 2500ft in altitude. The relatively small size of the property will be an asset considering the short time frame in which to conduct this study. FOREX inventory data was already gathered by the coordinator of the VMC parcel in the summers of 1995 and 1996, so the data gathered in this study will only be using the natural community system.

Preestablished systematic plots were laid out on the parcel for the FOREX inventory. Each FOREX plot will be revisited taking compass bearings from the Butler Lodge trail which vertically divides the parcel. A natural community designation will be given at each plot using Liz Thompson's guide Natural Communities of Vermont: Uplands and Wetlands, the definitive guide in Vermont. Revisiting these plots will make comparing the FOREX data and the gathered natural community data easier since there will be an actual area with which to compare the two data sets. The decision of which natural community is present is a subjective measure, consisting of comparing site characteristics with community descriptions in the guide book. This will make data collection go relatively quickly since much ground can be covered in a short amount of time.

An attempt to delineate natural communities on the parcel will be conducted using the FOREX data sets gathered by the VMC. This will raise questions about whether the designation of natural communities in the field is

really necessary, and also whether these designations can be given retroactively to previous FOREX inventories.

A map of the parcel will be generated using a Geographic Information System which will have two layers: first the stand map of the area created by the VMC, and second the natural community map. Comparison of the two will raise questions about how silviculturally significant "stands" compare to natural communities.

Natural communities will be designated during the "leaf off" season since many forest inventories are conducted during the winter months for maximum tree visibility (Poleman 1996 pers. comm.) This will address the question of whether the natural community approach is accessible to forest inventories conducted in winter .

From this study I hope to learn more about ecosystem delineation and forest inventory techniques.

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PLAN OF ACTION

TIMELINE

January 20, 1997	Begin field work
February 15, 1997	Finish field work
March 1, 1997	Finish analysis of FOREX data and if natural communities can be retroactively designated
March 15, 1997	Draft of introduction and literature review done
April 1, 1997	First Draft of Thesis will be ready for review
May 1, 1997	Final Draft of Thesis done

EXPENSES

Projected expenses are as follows:

Travel (Milage) (6 trips @ $7 per trip)	$42.00
Photocopying costs	10.00
Map Production costs	10.00
Publishing costs	15.00
Supplies (Compass)	28.30
Total	105.30