How Policy Discussions Drive Innovation in Forest Management

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Abstract:
Science based forest management has a proud tradition where scientific innovations have played important roles both in improving forest stewardship and meeting human needs from the forest. Now broad scale forest management discussions are influencing innovation in forest management and the convergence of three processes (the science management process, the adaptive management process, and the innovation-decision process) are changing the expectations and standards for science and science products. These discussions are impacting science management by emphasizing the importance of synchronizing problem solving research with knowledge discovery, synthesis, and science delivery to users.

Keywords: Innovations, science management, forest management.

Introduction

The forestry community has long prided themselves on the scientific foundations of modern forest management. From our earliest days a century ago, we have made much of the role that scientific innovations have played both in improving forest stewardship and meeting human needs from the forest.

There are a number of forces that drive science based innovation including management questions which are frequently thought to influence science processes. In addition to these management questions scientists, themselves, often cite the opportunities for knowledge discovery as a stimulant for innovation. There are also powerful forces outside of the traditional science community that drive innovation. Among these are information brokers especially those that act as advocates for science delivery. There are also individuals that want to use science to further their agendas.

Also changing the nature of science questions is a reinvigorated interest in the delivery of scientific products. Traditional science delivery has been in terms of publications (both scholarly and for lay audiences) and through small group and one-on-one consultations. Recent emphasis, however, has been on the development of tools (physical devices, software, frameworks, etc.) useful to land managers and where success can be demonstrated by their application in the field to actual problems.

Here I want to explore both how different broad scale discussions have driven innovation in forest management and how the convergence of three processes (the science management process, the adaptive management process, and the innovation-decision process) are changing the expectations and standards for science and science products. These discussions are from the perspective of science management where the main task is to synchronize problem solving research with knowledge discovery, synthesis, and science delivery to users.

Forces Driving Science Based Innovation

There are a number of forces driving science based innovation but I want to focus on three particular forces. First there are ongoing discussions about broad scale forest management issues including the need for or the effects of policies, regulations, or the consequences of markets. From a social science perspective these can be characterized as civic discussions as they often involve the technical, scientific, and lay communities and reveal values, attitudes, and beliefs of each about the various aspects of underlying issues and the nature and extent of various interactions. Importantly, these discussions often shape the perceptions of various groups about the need for or the effectiveness of various potential policies or management actions. Second, among the intellectually curious these civic discussions raise interest about resolving knowledge gaps or better understanding the interplay among different system components. In the science community this is called knowledge discovery and to many in the community represents the most interesting challenges. Third, there are forces represented by brokers of information. Often these are individuals or organizations that act as advocates for placing scientific information (sometimes translated into tools) into the hands of users. Sometimes these are highly focused efforts to develop and deliver relatively specific information or management

tools. At other times they are more entrepreneurial trying to match scientific information/expertise to recently encountered problems.

Much of this discussion proceeds as if there is a high level of certainty around our ability to clearly describe the questions that motivate science. I acknowledge however, that our practical experience suggests that question formulation is in itself an emergent process where questions emerge only after much discussion.

Figure 1 (from Haynes 2005a) gives one perspective of managing the science process. All three forces are illustrated as well as several steps (like question filtering) that can impact the effectiveness of the process or challenging those providing leadership.

Figure 1--Contemporary science management processes

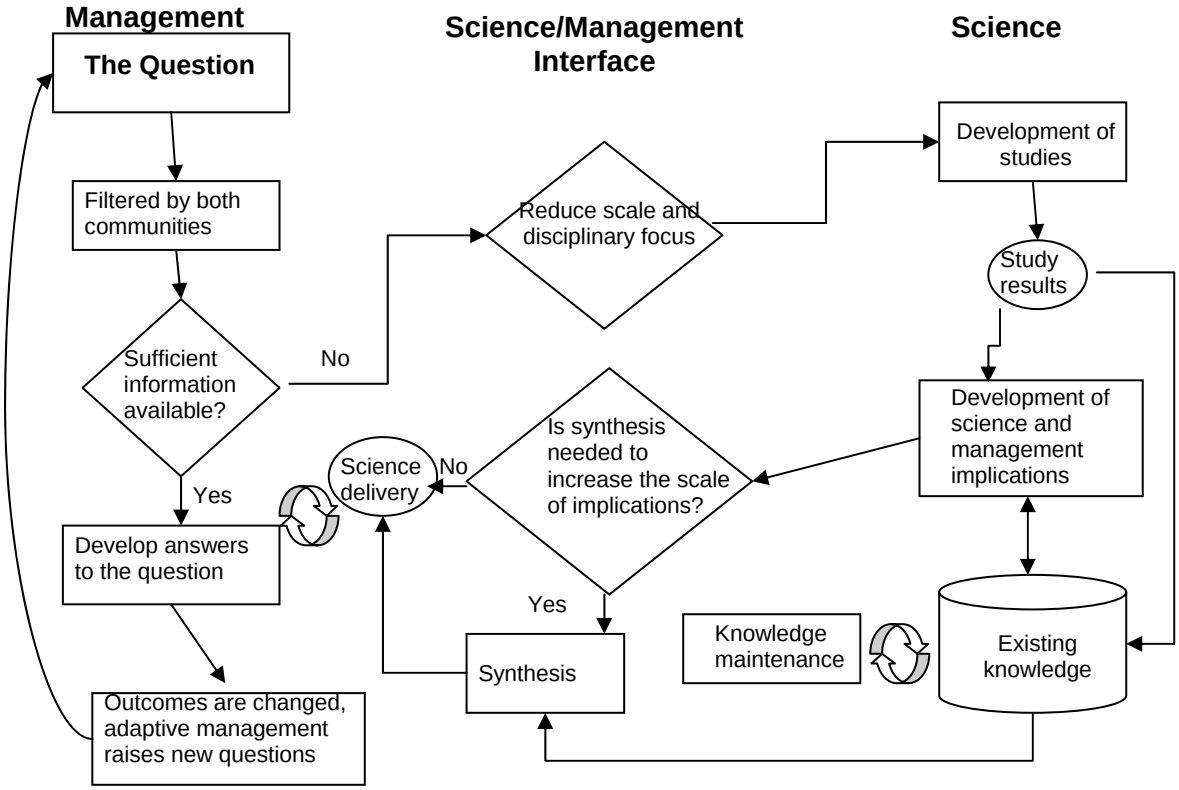
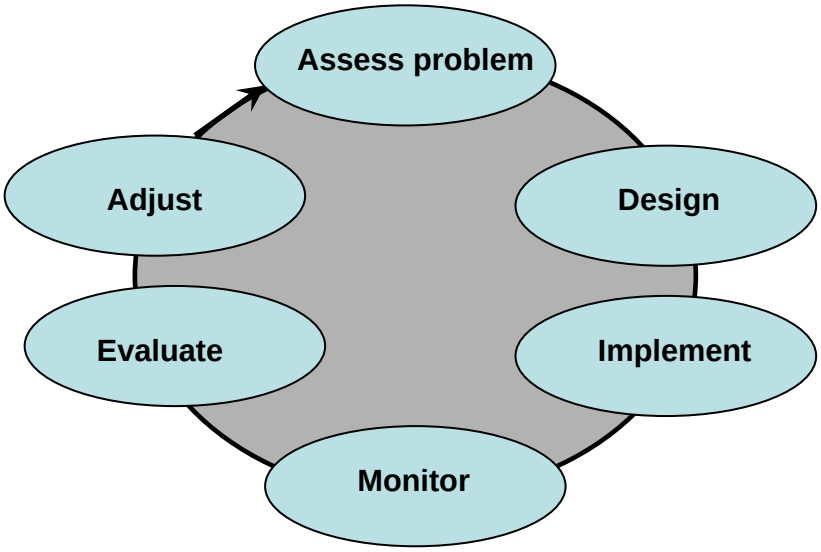


Figure 1 also does not provide details on the nature and form of science delivery which often today is discussed in terms of tools. In the past this discussion was mostly in terms of publications both scholarly and for lay audiences and through small group and one-on-one consultations. The recent emphasis has been on the development of tools (physical devices, software, frameworks) useful to land managers.

Much of science today that is conducted in support of land management is in the context of the Adaptive Management Process shown in figure 2 as a Six-Step Cycle. Frequently steps 2 and 3 are combined in the more familiar “act” step and steps 5 and 6 are combined together. There are several differentiating characteristics of adaptive management that poses challenges to the science community. First, it acknowledges uncertainty about what practice is best. Often in the science community, we operate as if

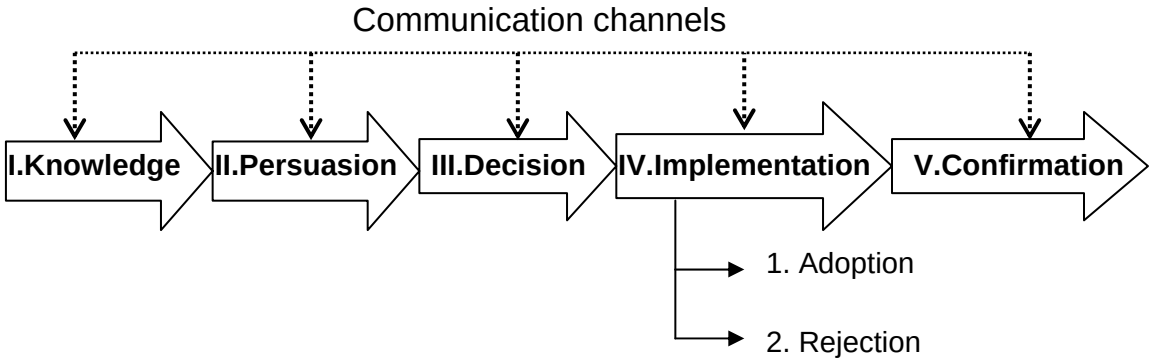
we know what the best practice is. Second, adaptive management requires thoughtful and careful implementation that is documented. In addition to the need for documentation, there is also a need to recognize missing information. Third, there is a need for monitoring of key response indicators. Fourth, there is a need to analyze management outcomes relative to original objectives and incorporate results into future decisions.

Figure 2--Adaptive management process



A third aspect to this discussion is the concern around improving the delivery of science to end users especially land managers. Central to this discussion is the model of innovation/diffusion shown in figure 3. This model from Rogers (2003) helps us understand how policy questions will eventually influence innovation and diffusion and how new knowledge or practices are defused among potential users.

Figure 3--Innovation-decision process



It was first formalized in the 1960s and has been refined. It starts when an individual is exposed to an innovation and gains an understanding of how it functions. It includes the role of persuasion and the importance of the need for an individual to form a favorable or unfavorable attitude. It recognizes the differences between when a decision takes place (defined as when an individual engages in activities that lead to a choice) and

implementation (when an individual puts a new idea into place). It ends when an individual seeks reinforcement of an innovation-decision already made.

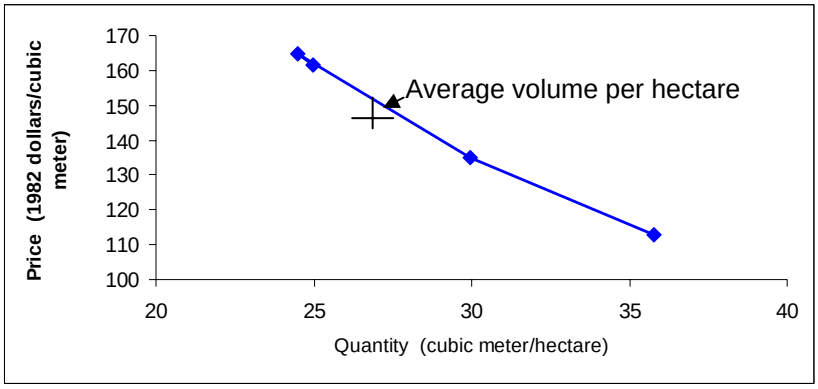
Some Examples

While there are many examples, I would like to talk about three that are current research topics. The first is what seems like a perennial question of trying to understand the propensity of land owners to implement improved technologies for forest stewardship. Our attempts to explain why land owners adopt higher levels of management intensities has challenged generations of forest analysts. The second is understanding the role that markets play both in shaping land owner perceptions as well as in shaping the competitiveness of one region or nation's ability to process forest products. The third is the rapidly evolving discussion about the social consequences of sustainable forest management.

Propensity to Manage

Figure 4 shows the tradeoffs between stumpage prices and volume per hectare while maintaining the same expected returns for a 50 year rotation. It shows that as long as quantity increases as prices decrease, financial returns remain the same for the landowner (the data is from Haynes 2005b). The slope of this relation is -15.62 suggesting that land owners would remain indifferent to financial returns as long as there is a gain from increased management of one thousand board feet (or 4.53 m^3) if stumpage prices are reduced by no more than $15.62/mbf. It helps explain why land owners with a high propensity to invest would be indifferent to expected declines in stumpage prices as long as increases in management intensity would lead to the same or greater returns.

Figure 4--The tradeoff between stumpage prices and volume per hectare while maintaining the same expected returns for a 50 year rotation



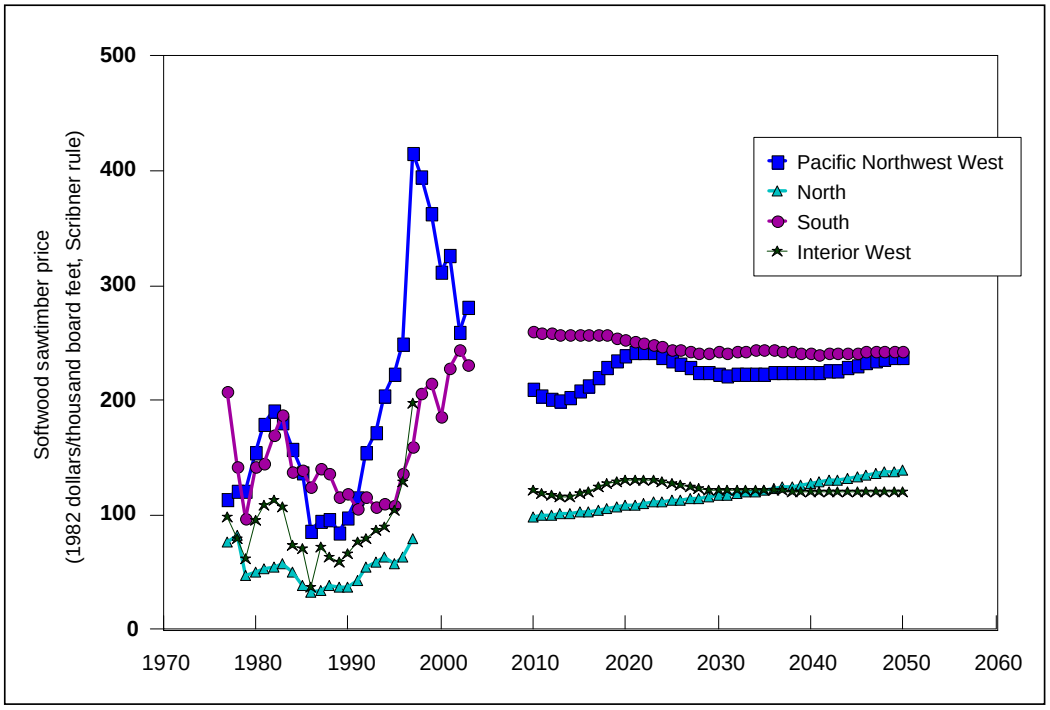
Source: Haynes (In press), derived from data in Haynes 2005b.

This finding has a number of research implications. Long-term stumpage prices do shape perceptions of the incentives needed for forest management decisions. But gross returns to management depend on both prices and quantity changes; often we fail to recognize the quantity produced differences resulting from improved management techniques.

Economic Change is Relentless

Figure 5 shows softwood sawtimber stumpage prices by major U.S. region, with projections to 2050. The data is from the RPA Timber Assessments (Haynes 2003) and shows economic change is relentless. The differences among regions illustrate the pressure to reduce costs and the ability to move capital results in an industry able to shift locations relatively fast, especially relative to changes in the underlying resource situation. While not evident in the figure, events in one region precipitate changes in other regions. For example, federal harvest reductions in the west for habitat protection have led to increased harvests on private lands in the US South and increased lumber and panel imports from Canada.

Figure 5--Softwood sawtimber stumpage prices by major US region, with projections to 2050



How Forest Management Impacts Social Conditions

The emerging discussions about how forest management impacts local, regional and national social and economic conditions. These issues include Sustainable Forest Management (SFM), discussion of certification schemes (FSC, SFI), discussions about Corporate Social Responsibility, and the emerging open space discussion

But a number of issues are now influencing research challenges regarding the need to understand “the social element of forestry”. These topics included a diverse range:

- Social governance, including different publics gaining property rights
- Community stability
- Indigenous people
- Human rights

- The influence of gender on forest management
- Understanding multiple objectives of family forest landowners
- Improve understanding of social stability and health and how to compare it with concerns about economic and biological stability and health
- Illegal logging
- Implications of trends in governance for implementation of SFM
- The effectiveness of community based approaches to SFM
- Barriers to community-based forest management
- The use of indicators for landscape attractiveness in assessing concerns about open space

Discussion

Discussions about different approaches to forest management are changing expectations for science and its application by managers. Figures 1-3 illustrate while there are opportunities for continued knowledge discovery the expectations for synthesis and for tools directly useful to land managers are growing. Interpreting figure 1 requires some caution as it minimizes the difficulty in arriving at the questions that will lead to successful outcomes. Figure 2 reminds us that information new, revised, or synthesized is a key part of the adaptive management cycle. But the growing use of adaptive management also challenges the science community to develop monitoring protocols and evaluation frameworks for the effectiveness of new practices. While not much discussed (see Stankey and others 2005), part of what drives the adaptive management cycle is the iterative process of question refinement. Figure 3 illustrates the often lengthy diffusion process where knowledge plays a key early role but advocates or change agents (e.g. county extension agents) play a lengthy role in persuasion etc. The examples illustrate the almost timeless aspects of some problems (for example, understanding the propensity of some land owners to implement land management practices) while other problems reflect more temporal issues (for example, the recent interest in social aspects is an outgrowth of the broader societal interest in sustainable development).

These figures represent a vision for research. One that recognizes that a diverse set of clients make choices about the stewardship of a finite set of land resources in the face of uncertainty and changing societal values. Such a program of research melds knowledge creation along common thematic lines with socially relevant dynamic questions. Taking a combined approach contributes to a larger pool of experience that provides a better basis for forming judgments relative to outcomes.

Such a vision assumes that the worth of research and development activities will be judged by how well they can help create lasting solutions that alters outcomes. Successful solutions will likely weave together disparate types of information and allows the demonstration of the power of various disciplines to explain phenomena, outcomes, or consequences of actions. It is an enterprise that nurtures both artistic values and craft skills. Creating and implementing such a vision is a function of leadership including advocacy for careful problem selection that recognizes the full integrated nature of contemporary questions and the role that various disciplines can play in problem solution. These leaders need the skill to synchronize research oriented towards major questions

with knowledge creation. They are also ardent advocates for effective delivery of information to the eventual users for it is those users who determine the value of scientific contributions.

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