# AdaptiveManagement Newsletter

Summer 1997


"Planning requires prediction of how things and people will perform.

Tests and experiments of past performance can be useful, but not definitive."

— Deming (1986)

**IN THIS ISSUE**



## Total Quality Management and Adaptive Management

Adaptive management shares elements with approaches used in other fields. For example, some of the principles and methods of adaptive management are similar to the "Deming" management method (and the related approach of "Total Quality Management") now popular in the business world. W. Edwards Deming was an American statistician who worked closely with Japanese business leaders to rejuvenate Japanese industry after World War II. Mary Walton, in her book "The Deming Management Method", introduces Deming, his philosophy and methods, and describes their rediscovery by American business in the 1980's.

Both the Deming method and adaptive management emphasize continual learning and improvement. Early experience taught Deming that, along with statistical methods, "what was needed was a bed-

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## Project Updates

The BC Forest Service is undertaking a number of pilot projects to evaluate and demonstrate the how to apply the principles and methods of adaptive management to forest management issues. The following projects are underway:

### Management of heavily-used recreation sites

(see Spring 1997 newsletter for more details)

This project is now in its second year, and has expanded to three Forest Districts (Chilliwack, Kamloops and Merritt). All study sites were extremely heavily used on the May long weekend (perhaps because of the sunny weather), but the Canada Day weekend was much quieter (it rained!).

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# Project Updates cont.

## Management of riparian areas adjacent to small streams

Management of riparian areas adjacent to small streams is one of the major areas of uncertainty and contention in the Forest Practices Code. Because small streams comprise a large proportion of watersheds, Code guidelines are expected to impose significant constraints and additional costs on timber harvesting. On the other hand, there is some concern that the guidelines may not adequately protect riparian and stream integrity. To address these concerns, District staff, scientists, and industry partners are planning a management experiment that will compare various alternatives for managing riparian areas adjacent to streams less than 3 m wide (i.e., those classified as S4 and S6 under the Forest Practices Code). The project will be centred in the Prince George Forest District and will complement several intensive scientific studies going on in the area. Alternative ways of harvesting riparian areas will be tested at an operational scale and a limited number of timber, riparian, hydrologic and stream ecology indicators will be monitored.

## Management of montane forests on northern Vancouver Island

Planning is underway for a project that will compare alternatives for managing stands in the coastal montane forest, in Canadian Forest Products' Tree Farm License 37, on northern Vancouver Island. This project could provide the opportunity to evaluate some of the stand-level guidelines in the Biodiversity Guidebook, as well as the impacts on harvesting costs, regeneration success, windthrow, and hydrology of small streams.


## Management of the McCully Creek area

The Kispiox Forest District in northwestern B.C. has initiated a project to develop and implement a long term management plan for the McCully Creek chart area of the Small Business Forest Enterprise Program (SBFEP). The plan will be based on the principles of ecosystem management and adaptive management. The 45,000 ha planning area includes three tributaries of the Kispiox River, north of the community of Hazelton. The ecosystems lie in the transition zone between coastal and interior climatic influences.

The overall goal is to manage the area to maintain its ecological integrity, meet the objectives of the local community, and supply timber for SBFEP. Key issues include the impact of harvesting and road-building on biological diversity, key wildlife (e.g., mountain goat, moose), hydrology, and other forest users (e.g., mushroom pickers). The area falls within the traditional use territories of several houses of the Gitxsan First Nation. Because of its size and the fact there has been relatively little harvesting to date, the McCully Creek area provides a good opportunity to compare alternative treatments at a large scale - options are not constrained by past activities. In addition, the project can draw on and complement ongoing research at the Date Creek Silvicultural Systems trial.

After an initial scoping session, members of the local community, agency foresters and scientists, and others collectively worked with

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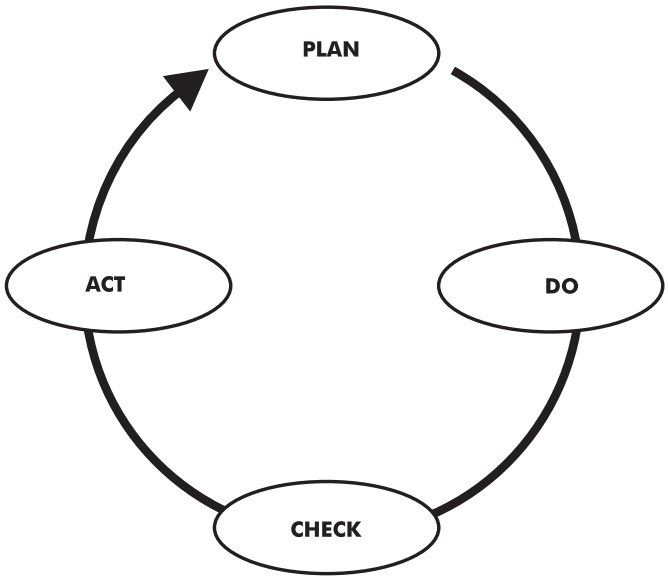
# Total Quality Management cont.

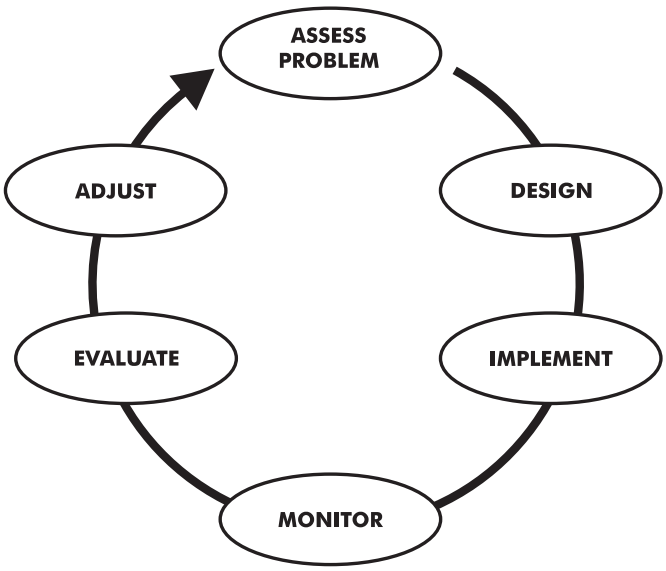
rock philosophy of management, with which statistical methods were consistent" (Walton, pg 33). This principle of continual learning is embodied in the 4 step "Deming" or "Shewart" cycle, which is similar to the cycle used by the BCFS and others to describe adaptive management. Both methods emphasize that actual outcomes must be compared to predicted outcomes.

***The Deming Cycle***




Both use statistical methods to distinguish between treatment effects and confounding variation. Deming demonstrated that attempts to eliminate variation in production processes by constantly, routinely readjusting the processes could instead lead to increased variation and decreased quality. This is because these routine adjustments often fail to distinguish between chance variation and some underlying problem with the process.

***The Adaptive Management Cycle***




Similarly, attempts to "overcontrol" natural systems and reduce natural variation can lead to systems that are less resilient (Bednar and Shainsky, 1996). One of the main roles of management experiments in adaptive management and statistical analysis in the Deming management method is to allow managers to better distinguish between "chance variation" (where readustment is counter-productive) and treatment effects (where readjustment is productive).

For more information on the Deming Management Method:

Walton, Mary. 1986. *The Deming Management Method*. Perigree Books, New York.

Walton, Mary. 1991. *Deming Management at Work*. Perigree Books, New York.

Deming, W. Edwards. 1986. *Out of the Crisis.* MIT Centre for Advanced Engineering Study, Cambridge, Mass.

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# Questions???? & Comments!!!!

We have received a number of comments on this newsletter and the working definition of adaptive management used by the BC Forest Service (Fall, 1997 issue). One comment was printed in the second (Spring 1997) issue; another is included below.

## Comment. . .

*Three comments on your newsletter:*

*This newsletter is a good idea. It is useful to have these brief descriptions about the various projects being implemented around the province. Some examples of cases where the results of specific projects have lead to significant modifications in management strategies would also be interesting.*

*The working definition of adaptive management provided in the newsletter doesn't strike me as rigorous enough. For example, shouldn't there be a requirement that: (a) the desired outcome be explicitly stated in quantifiable terms; (b) appropriate response variables be stated; (c) a testable hypothesis be stated; (d) management practices or treatments be applied in a manner that provides for the application of appropriate hypothesis testing techniques; and (e) a monitoring schedule be established that identifies the frequency and duration of required evaluations.*

*The brief adaptive management project descriptions should attempt to present a summary of the elements of an adaptive management project as they were prepared for each of the examples (i.e., a brief description of the 5 items listed above). By providing this type of information the message that adaptive management is a rigorous, science-based approach to management, as opposed to a simple trial-and-error approach, will be reinforced.*

*Marty Osberg*
*Manager, Forest Soils Research*
*Research Branch, BC Forest Service*

## Response. . .

Your points are good ones. Although the elements you suggest are not explicitly mentioned in the working definition, they and other key steps *are* outlined in "An Introductory Guide to Adaptive Management for Project Leaders and Participants" available from the BC Forest Service (see address on page 5 of this newsletter).

We are promoting the idea that adaptive management should, to the extent practical, involve all the elements you mention. I say "to the extent practical" in recognition of the constraints faced in applying "appropriate hypothesis testing techniques" to issues that involve large spatial scales and long time frames, where it may be difficult to find enough areas that are sufficiently similar to act as replicates. We certainly want to encourage a rigorous approach to the design of management experiments but we also acknowledge that the level of rigour demanded of scientific experiments simply may not be achievable in some large-scale operational trials. Our goal is to encourage increased rigour, without setting unrealistic standards that discourage managers from applying adaptive management. In all cases, we still need *reliable* data from projects.

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We welcome your comments and questions on any issues in adaptive management. Please let us know of any case studies that readers might find helpful, or solutions to barriers you or others have faced in implementing adaptive management.

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# Project Updates (continued from page 2)

British landscape designer Simon Bell in a "Landscape Analysis Workshop". Participants identified key issues, described the structure and characteristics of the landscape, and briefly defined the desired future conditions for 10 zones. Both local and technical knowledge were used to build a common understanding of the area. At a subsequent workshop, District staff and regional scientists began to develop a project framework, by identifying key indicators and possible management actions at both the stand and landscape scales. In addition to these planning sessions, a number of inventories are underway (e.g., Total Chance Plan, terrain stability mapping, sediment source mapping). The next steps include confirmation of treatments, identification of treatment blocks, and preparation of a project plan.

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"Even after adaptive management is adopted as policy, it must remain in place over times of biological significance if it is to yield reliable knowledge. Such an approach calls for patience, which can be hard to sustain when there are political suspicions about delays and costs. .....Questions about delay should logically be framed in a comparative fashion: Is it slower than the practical alternatives?"

*— Lee (1993)*

"In a learning organization we surrender the belief that a person must be 'in charge' to be effective. We become willing to reveal our uncertainties, to be ignorant, to show incompetence -- knowing that these are essential preconditions to learning because they set free our innate capacity for curiosity, wonder and experimentalism."

*— Senge (1994)*

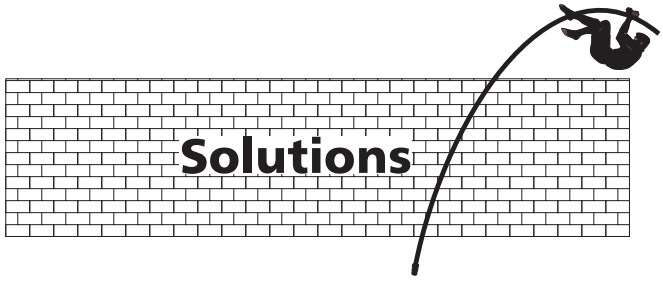
# Kicking Down the Barriers

Given that adaptive management promises substantial benefits and has been around for over 20 years, why isn't it more widely practised? There are a number of barriers, some institutional (e.g., regulations that make it difficult for people to try new things); some economic (e.g., cost of monitoring) and some technical (e.g., finding controls for large geographic areas). In each issue of this newsletter we highlight a potential barrier that people hoping to practise adaptive management might face, and suggest some potential solutions. We would also like to hear your ideas and experiences about how to "kick down the barriers".


One potential barrier to learning is the long time scale at which forest ecosystems operate. While some indicators respond quickly to management actions, others lag, or take a long time before a change is measurable. In addition, long-term responses may differ from short-term responses in both direction and magnitude, making it difficult to reliably extrapolate results over time. For example, large organic debris (LOD) found in streams may increase immediately after harvesting as leave trees blow down, but then decline over the long term because of loss of large trees that are sources of future LOD. Reduced bank stability may only show up several years after harvesting, once stabilizing root systems decay. Neither of these effects would be detected by short-term monitoring.

Some specific problems posed by ecological time frames that are longer than business, budgeting, or political time frames include:

- interruptions in funding and support
- staff turnover
- pressure for "quick fixes"
- changing priorities, values, and management objectives (so that information from long-term experiments becomes less relevant to current concerns)
- reluctance to pay now for benefits that will be received in the future (this is reflected in discount rates that reduce the "present value" of future benefits)




1 In some cases it may be possible to identify a subset of indicators that respond quickly to management actions and then correlate responses of short term indicators with those of long term indicators (through retrospective analysis of past actions or process-based research).

2 Recognise that long-term monitoring is not necessarily more expensive than short-term monitoring, if measurements are less frequent or less intensive. In addition, although discounting reduces the present value of future benefits, it also reduces the present cost of future monitoring.

3 Design powerful experiments - they yield information (i.e., detect a treatment effect) more quickly. Statistical power can be improved by increasing the number of replicates, reducing the sample variance (e.g., by improving monitoring methods), or implementing treatments that will provoke a strong, detectable response (i.e., increasing the effect size).

4 Use quantitative decision analysis to assess the trade-offs between length of monitoring, probability of making a "correct" inference, and cost. It can be very useful for de-

ciding the optimum length of time for monitoring, and for convincing funding authorities of the value of long-term monitoring.

5 Analyze past management actions (through retrospective studies) to provide information about long term responses. For example, by selecting stands that represent different stages of regeneration, space can serve as a proxy for time. (Keep in mind, though, that the inferences from retrospective analysis are not as strong as from management experiments where pretreatment conditions can be measured).

6 Keep good records and make sure that they are accessible. Document objectives, treatments, predicted outcomes, monitoring protocols and schedules, and the location of all treatment units. The Guide for the USDA Forest Service Northern Coast Range Adaptive Management Area recommends deciding "...what we're going to record, how we're going to measure it, and how we're going to store that information even before we actually do anything", and asking ourselves, before we undertake a project: "if I were someone else coming back to this project 20 or 30 years from now, what would I want to know to evaluate the effect of this action?"

7 Overlap employment windows of incoming and outgoing staff, and ensure that new staff are aware of project details.

8 Design experiments so that they are resilient to interruptions in funding. For example, design monitoring programs that will provide useful information in the short term as well as the long term, and if monitoring is interrupted. Design experiments so that unacceptable harm will not result if they are terminated prematurely.

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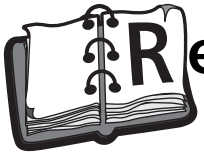

# Recent Publications

Stankey, G.H. and Shindler, B. 1997. *Adaptive Management Areas: Achieving the Promise, Avoiding the Peril.* Gen. Tech. Rep. PNW-GTR-394. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

The authors discuss four propositions that address barriers to the successful implementation of 10 AMAs in the US Pacific Northwest (e.g., "AMA boundaries must possess social meaning for stakeholders"). They then offer nine observations that suggest the kinds of actions needed to link communities and forest management successfully (e.g., "we must understand that successful implementation of adaptive management in the AMAs will take time")..

Bednar, L. F. and Shainsky, L.J. 1996. *The Concept of Overcontrolled Systems: Implications for Forest Management.* Journal of Forestry, August 1996, pp 29-33.

The authors argue that the approach of "total quality management" used in the business world has valuable lessons for forest management. They use a simple example to illustrate how repeated adjustments to processes in order to minimise variation often result in overcontrolled systems, characterised by increased variation and decreased product reliability. Similarly, frequent readjustment of treatments in forest management can lead to increased variation and decreased ability to meet management objectives. The key to avoiding overcontrol is to avoid confusing chance variation with treatment effects. The article concludes with some implications and recommendations for forest management.

Furnish, J.R., Manning, V.W., and Gray, A. 1997. *Northern Coast Range Adaptive Management Area Guide.* U.S Department of the Interior and U.S. Department of Agriculture.

The Northern Coast Range Adaptive Management Area (AMA) came into being in the summer of 1994 with the signing of the President's Northwest Forest Plan. This guide is intended as a working document, to help citizens, scientists, and agency managers work together in planning and implementing AMA activities. It discusses a shared vision, past and current conditions in the AMA, research and learning, opportunities, and implementation and monitoring.

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