Spruce Budmoth — A Case History Issues and Constraints¹

by

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Abstract

An approach, involving all of the agencies that might be involved in a spray permit approval, to the design of a chemical control program for a *Zeiraphera* sp. infestation in extensive white spruce plantations in New Brunswick is described. The issues and constraints encountered in the exercise and that would probably be common to any attempt at implementing chemical control of a pest in plantations are highlighted. Steps that must be taken to resolve some of these difficulties are discussed. Adaptive Environmental Assessment and Management is suggested as an approach that might resolve issues and constraints.

Résumé

Ce rapport présente une approche, regroupant toutes les agences qui pourraient être impliquées dans l'examen et l'approbation du permis d'arrosage, qui vise à préparer un programme de répression chimique contre les infestations d'une espèce de *Zeiraphera* dans de vastes plantations d'épinettes blanches au Nouveau-Brunswick. Les situations aptes à être contestées ainsi que les contraintes affrontées dans cet exercice et qui seraient probablement rattachées à n'importe quel effort de mise en exécution d'un programme de répression chimique dans des plantations contre un ravageur y sont mises en évidence. On y discute également des étapes successives nécessaires pour résoudre certaines de ces difficultés. L'évaluation et la gestion adaptatives de l'environnement sont offertes comme une des approches qui pourrait résoudre les points de litige et les contraintes.

The Problem

An outbreak of the spruce budmoth (*Zeiraphera* sp.) in extensive white spruce, *Picea glauca* (Moench) Voss, plantations in New Brunswick and recent attempts at control provide an excellent case study to illustrate opportunities that may be available to managers, and issues and constraints that must be faced and resolved in the management of pests in plantations. Carrow (Ibid), used this study to describe potential opportunities. In this paper, this same case study will be used to illustrate some of the issues and constraints involved in the design and implementation of a control program.

About 30 years ago, the J.D. Irving Co. embarked on an ambitious program of plantation forestry in north central New Brunswick. Over the years, the total area planted grew by

leaps and bounds. Some minor insect and disease problems were experienced, but nothing of a serious nature. The Irving plantations rapidly became a showplace as one of the largest man-made forests in Canada. By the late 1970s the white spruce component of these plantations had grown to more than 14 000 ha and represented a total investment approaching 15 million dollars.

In the mid to late 1970s, however, what appeared at first to be a spruce budworm (*Choristoneura fumiferana* (Clem.)) problem began to develop. When the Irving Company applied conventional spruce budworm control measures to their plantations they got excellent results on the few scattered wild balsam fir (*Abies balsamea* (L.) Mill.), but virtually no effect on the white spruce. Because of their resulting confusion, and the fact that the problem was getting worse, they approached the Canadian Forestry Service (CFS) in the summer of 1979 for help. Their problem was identified as being caused by *Zieraphera* sp., not spruce budworm.

At this point, a slight digression is in order because there are individuals and agencies, which have become involved in

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one way or another with the Irving *Zeiraphera* problem, that believe the situation was created by the extensive planting of white spruce, i.e., the creation of a monoculture.

In New Brunswick, *Zeiraphera* outbreaks have erupted periodically, although how periodically is difficult to determine, because until 1979 sampling systems for *Zeiraphera* were non-existent. Until this time, most damage caused by *Zeiraphera* was confused with and labelled as spruce budworm damage. As a result of the discovery in the Irving plantations, the CFS intensified surveys for *Zeiraphera* infestations, province wide. It was found that even in 1980, *Zeiraphera* infestations were widespread on white spruce both in plantations and natural forests and were increasing yearly in both intensity and area covered. The point is, that although the *Zeiraphera* problem could conceivably have been aggravated by the extensive planting of white spruce, the Irving plantations certainly did not create the problem.

Between the fall of 1979 and mid-summer 1983, considerable interest and activity was generated by this problem. The Canadian Forestry Service initiated laboratory toxicological tests, biological studies, and single tree spray trials. At this time, little was known about the biology of the insect. Sampling systems were developed, the infestation was intensively surveyed, and the efficacy of control attempts was measured. The Irving Company continued each year to try to control the pest by aerial application of various insecticides, fenitrothion, Dylox, and Orthene, with little or no effect.

By mid-summer 1983, the Irving Company was in a panic. Despite repeated attempts at control they were losing the battle. In their view, some of their older white spruce plantations could already be written off for sawlog production because of multiple leadering, repeated severe current defoliation, and retarded growth. There was also every indication that the rest of their white spruce would shortly suffer this same fate. Obviously, they were in real jeopardy of losing a major portion of their very substantial investment. From a provincial point of view, the loss of these Irving plantations would be a serious blow to already tight-wood-supply situations in the future.

On the other hand, some potentially useful information on the biology of *Zeiraphera* had been accumulated. Egg hatch could now be timed. It was known that the only time the insect could be exposed to insecticide would be the short period between egg hatch and seclusion of the larva within the bud beneath the bud cap. Timing of sprays would be critical. It was also known that of the various insecticides tested, permethrin or Ambush, would be most effective, in spite of the knowledge that permit approval for this chemical would be difficult. Representatives of the federal Department of Fisheries and Oceans had repeatedly opposed use of permethrin.

Approach to Control

Clearly, a more rational and systematic approach to control was urgently needed.

After consultation among J.D. Irving Ltd., the Forest Pest Management Institute (FPMI), the Director General for the Atlantic Region of Environment Canada, and the Maritimes Forest Research Centre, an approach was decided upon — an approach that would hopefully not only result in the design of a control program that could be implemented in 1984, but also might make the usually tortuous and repetitious route to permit approval easier. The strategy had three important parts.

1. A representative from each of the federal and provincial agencies that have involvement or influence in the permit approval process was to be invited on a tour of the Irving plantations to view the problem, first hand. This tour took place and was apparently successful. Everyone was shocked at the damage, and in spite of 'I told you so' rumblings, here and there, about monocultures creating insect problems, nearly everyone was sympathetic to the need to do something to alleviate the problem.
2. A committee was to be appointed to design a detailed plan for a control program. This committee would hopefully include representatives from all agencies. The philosophy was that if agencies were involved at the outset in program design rather than presenting them with a finished proposal for approval, the route to permit approval would be substantially expedited. The first difficulty was that Environmental Protection Service (EPS) did not want to participate because they might compromise their position as a regulatory agency. However, the committee was formed, did function, and included EPS members.
3. Finally, the third step — the Maritimes Forest Research Centre was to take the lead in preparing a paper on pest management in plantations, that would outline the necessity of pest management in plantations, demonstrate that plantation forestry is more like agriculture than conventional forestry, and provide the rationale for adjusting overall forest protection strategies to plantation situations. A draft of this paper was provided to committee members but it is difficult to know whether or not it had any influence on their thinking. The effect, if any, was probably minimal.

Although the committee did not have its first meeting until late January 1984, and time was obviously going to be tight, things seemed to be on schedule, and probably were until shortly after the second committee meeting.

At that meeting, J.D. Irving Ltd. and the Forest Pest Management Institute put forth proposals for the committee's consideration. The FPMI proposal was for the spraying of about 200 ha with permethrin and 200 ha with aminocarb in eight experimental blocks. While a few committee members expressed some concerns about the size of the area proposed for permethrin applications, the proposal was finally accepted. However, during the discussion of the FPMI proposal, a Fisheries and Oceans representative commented that as far as registration of permethrin for *aerial* application in forestry was concerned, forestry interests were beating their heads against a wall. The Irving proposal was operational in nature and proposed the spraying of a large area with permethrin and a still larger area with aminocarb. The committee had no substantial concerns with the proposal for aminocarb, but was unanimous in the feeling that the lack of efficacy data for this insect would not permit support of such a large operational trial with permethrin. A substantial reduction in area was recommended.

Shortly after this second committee meeting, the Irving Company became anxious over the prospects of getting approval for any proposal involving the use of permethrin. They had heard rumors that certain Fisheries and Oceans officials in Ottawa were dead-set against any aerial application of permethrin to forests, regardless of the stance taken by any regional committee. To gain support at the highest level, the company sent their proposal, without the recommended reduction in area to be sprayed with permethrin, to three federal ministers. This action had two serious consequences.

Firstly, it initially caused a few committee members to

question their role in serving on the committee, but this situation was fairly easily resolved.

Secondly, the Irving interests did not anticipate the time it would take for ministers to reply. When they finally received a reply to their total proposal, just a few weeks from anticipated commencement of spraying, it was negative! It seemed that the effort that had gone into this exercise had been wasted.

A final meeting of the committee was held on May 10 in an attempt to salvage what they could of the original proposals. The Irving Company was asked to drop the permethrin segment of their proposal and reapply immediately to Agriculture Canada and New Brunswick Environment for permission to apply aminocarb only. This they did. Committee support was also given to the FPMI proposal which had changed somewhat over the intervening months. At this meeting, Environmental Protection Service announced that they would not be prepared to support any aerial application of permethrin that did not observe a 500 m buffer zone around all water. When it was pointed out that the only direction in northern New Brunswick in mid-May where one could go 500 m from water was straight up on a sunny day, they grudgingly relented and reduced the buffer to 150 m.

In the final analysis, New Brunswick Environment gave approval to the Irving Company to spray 6368 ha with aminocarb and to FPMI to spray 155 ha with permethrin and 365 ha with aminocarb. Environmental Protection Service requested permission and were granted approval to spray a brook in the area, directly with aminocarb, to study aquatic effects.

Lessons Learned

Well, what was learned from this exercise? What were the problems, issues, and constraints? Seven of them are listed.

1. To design an experimental or operational trial using chemicals in forest pest management and seek approval for its implementation has been and will continue to be extremely complicated and will involve many federal and provincial agencies. If the approach used is to involve all of the agencies at the outset and obtain agreement on an overall strategy to follow, then the agencies must adhere to the agreed upon strategy. For one to strike off on a different tack, without consultation and agreement from the others, will only create chaos and almost ensure failure.
2. An almost total lack of perception of differences in the management of plantations as opposed to natural forests was encountered, particularly in the area of forest protection. Amongst some of the agencies involved, there was even a mind-set that said plantations are bad and should be avoided as a forest management practice. In this kind of atmosphere, headway with arguments that things could and should be done differently in plantations was frustratingly difficult. That targeted spraying could be done with greater efficiency and precision; that in plantations potential environmental risks of chemical control could be greatly reduced; that guidelines, rules, regulations governing operational spraying of natural forests could and should be adjusted for plantation situations, seemed almost unacceptable ideas.

It is now widely accepted that plantations will be an increasingly important part of modern intensive forestry in this country. They are an integral and essential part of provincial and industrial forestry programs, especially in those regions where demand will exceed wood supply from natural forests. To continue in this direction and be able to

protect the large investment, negative mind-sets and lack of perception will have to be turned around.

3. In attempting to design the *Zeiraphera* control program most of the participants felt they were under the gun, particularly where both proposals under initial consideration involved the use of permethrin. It is difficult to maintain a positive attitude when operating in a situation where a single individual or agency could, for almost any reason, effectively oppose any proposal that might be advanced. The stance of Fisheries and Oceans with respect to registration of permethrin for aerial application in forestry certainly did not help. This is a pity because permethrin is, in many respects, an ideal insecticide and has great potential in forestry. Its only real drawback is that it is toxic to fish-food organisms and, to some extent, fish. However, many forest managers believe there are situations where it could be used effectively with minimal risk to aquatic life. Plantations are a good example.

This absolute veto power is intolerable, but unfortunately there appear to be no good suggestions for dealing with it.

4. The guidelines governing what can and cannot be done in experimental and operational trials tend to be fuzzy and *ad hoc* in nature. An example is the establishment of buffer zones. The rationale for the original Environmental Protection Service request for a 500 m buffer zone around water for permethrin spraying is far from clear. Their subsequent reduction to 150 m is even more confusing.

A few years ago, when there was little, if any, information on which to base the establishment of buffer zones, an *ad hoc* approach was acceptable and to err on the conservative side was understandable. Today, however, most scientists in the business believe that enough is known about spray-cloud behavior and drift under different atmospheric conditions that more logically sized buffer zones can be safely set. Moreover, virtually all of the new zones would be considerably narrower than those used in the past. An *ad hoc* approach is no longer acceptable. New guidelines based on sound scientific evidence are desperately needed for experimental programs and operational spraying, as well as for forest protection in natural forests and plantations.

5. The evidence seems almost overwhelming that there are double standards governing pesticide usage in this country. Consider an example relating to use of permethrin; 1984 regulations for ground application in agriculture call for a 15 m buffer around water, but ground application in forestry for Christmas trees, seed orchards, etc. calls for a 150 m buffer. Why the difference? Is there a difference in the value of fish in the two situations? Does Agriculture Canada pay less attention to Fisheries and Oceans concerns in agriculture than in forestry?

There may be valid reasons for double standards; but if there are, they should be laid out on the table for all to see and appreciate. If there are none, all double standards should be done away with.

6. Forestry seems to be on a collision course with agriculture. It is becoming increasingly difficult to stay away from the trap of "If agriculture can do such and such, why can't we." The only product of this kind of approach will be a loss to agriculture and no gain to forestry. We shall all end up a lot hungrier when we are standing around looking at what's left of our forests.

Historically, agriculture and forestry have never worked as closely together in the regulation of use of pesticides as they should have. As forest management in this country becomes more intensive and our requirements

become more similar to those in agriculture for plant protection, it becomes more and more imperative for us to work together if we are to retain some of the tools so essential to our respective businesses.

7. We were operating in a climate where seemingly it already had been universally decreed that a fish is more important than a field of wheat is more important than a stand of trees, regardless of the economics of the situation — and further, there are no trade-offs to be made. It is remarkable that we ever arrived at a situation like this in a country such as ours, so dependent upon its forests. I suspect two of the main reasons are: (a) in spite of recently increased efforts by the forestry community, we still have not been able to create a widespread appreciation of the value of the forests and at the same time explain how we go about our business in those forests; (b) forestry has had a notoriously weak political lobby, much weaker than agriculture or fisheries. To the limits that our respective jobs will permit, we all have to work towards strengthening our political lobby.

In some cases, fish may be more important than trees or wheat — but not always. We need a rational approach based on such things as risks, economics, and aesthetics — not one based on rigid dogma, where one sector seems able to dictate to others.

The Future

So much for what we learned and the constraints under which we operated. What is our next step in dealing with the *Zeiraphera* problem? There is research underway on *Zeiraphera* pheromones, exotic parasites, B.t., and egg parasites; but to develop potentially successful strategies will take some time. Population sampling indicates that *Zeiraphera* will again devastate Irving plantations in 1985.

Efforts are currently underway to interest all potentially involved agencies and special interest groups in an approach called Adaptive Environmental Assessment and Management (AEAM) (Holling 1978). At this point, no one can really predict what AEAM will do for the Irving *Zeiraphera* problem. It apparently has a good track record, but a miracle solution in the immediate future is unlikely.

The Irving *Zeiraphera* problem is beginning to attract widespread attention in Canada. Whatever the outcome, the trials and tribulations in attempting to solve the problem will undoubtedly set precedents that will have significant implications for pest management in plantations and other high value forests in Canada. The situation bears watching.

Reference

Holling, C.S. (Ed.) 1978. Adaptive Environmental Assessment and Management. John Wiley and Sons. 377 p.

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