



APPEAL; 84/20 PES.

J U D G E M E N T

PERMIT NO;

104-655-84/86 and its amendment of August 8th, 1984, issued to the Minister of Forests for the use of Roundup (Glyphosate) for vegetation control in preparation for planting, by aerial (helicopter) and ground-based application techniques to 42.5 hectares of forest lands, 6 kilometers southwest of Vedder Crossing, B.C. The application rate is 3.5 kg/ha, and the total active ingredient would be 148.0 kgs. The target species are alder, birch, maple, salmonberry, thimbleberry and bracken fern.

APPEAL:

The grounds for the appeal were given as follows:

- 1) There is insufficient evidence about the use of glyphosate herbicide, sold under the trade name of "Roundup". (Presumably, this statement means that there is insufficient information on the possible adverse effects of the chemical on mankind and the environment).
- 2) The appellant believes that if Roundup is used on the Columbia Valley side of Vedder Mountain, it will dangerously affect the watershed.
- 3) Spraying of the herbicide (Roundup) on Vedder Mountain will reduce property values when the fact becomes public knowledge.
- 4) The appellant was most concerned regarding the accuracy of aerial spraying near the watershed. The down-drafts from Vedder Mountain are not reliable.

HEARING INFORMATION:

The hearing was held on October 23rd, 1984, at the Empress Hotel, in Chilliwack, B. C.

The members of the Board in attendance were:

Mr. Frank Hillier, P. Eng. - Chairman;  
Mr. James Warr, P. Eng., - Member  
Mr. Duncan Heddle, P. Eng. - Member

Miss Shirley Mitchell - Official Recorder

REGISTERED APPELLANT;

The registered appellant was the Columbia Valley Ratepayers Association, P.O. Box 256, Chilliwack, B.C. The representatives of this organization were:-

Mr. Larry Gritzmaker - Spokesman  
Trustee of the Association

Mr. Don Erho - Witness  
President of the Association

Mr. Harry Peters - Witness  
Vedder Mountain Clean Water Group

Mrs. Arlene Currie - Witness  
Recording Secretary of the Association

RESPONDENT;

The respondent was the Minister of Forests, represented as follows:

Mr. G.D. (Glen) Bertram - Spokesman  
Operations Superintendent, Forestry  
Chilliwack Forest District

Mr. Mel E. Scott, - Witness  
Stand Tending Co-ordinator,  
Vancouver Forest Region

Mr. E. H. MacInnes - Witness  
Field Supervisor - Silviculture  
Chilliwack Forest District

Mr. Ron P. Gladiuk - Witness  
Forest Technician (on leave)  
Chilliwack Forest District

LIST OF EXHIBITS;

- "A" A paper entitled, "Influence of Glyphosate (N-(Phosphonomethyl)Glycine) on Performance and Selected Parameters of Broilers", by L.F.Kubena, H.E. Smalley and F. M. Farr of the Veterinary Toxicology and Entomology Research Laboratory of the U.S. Department of Agriculture.
- "B" A paper entitled, "Environmental Effects of New Herbicides for Vegetation Control in Forestry", by Masood Ghassemi and Sandra Quinlivan, of TRW, and Michael Dellarco, of the U.S. Environmental Protection Agency.
- "C" The minutes of a public meeting in the Yarrow Community Centre, on September 26, 1984, regarding "How reforestation projects on Vedder Mountain will affect the quality and supply of domestic water."
- "D" The Presentation of the Ministry of Forests.

SUMMARY OF THE APPELLANT'S PRESENTATION;

Larry Gritzmaker's testimony was as follows:

- 1) The Columbia Valley has a population of approximately 270 people.
- 2) The Ratepayers' Association has a membership of 117 people.
- 3) 180 letters of protest have been sent to the Minister of Environment about the proposed herbicide application.
- 4) The Columbia Valley community has over 40 domestic water licences on Vedder Mountain's south-eastern slope, which supplies drinking water daily to over 100 residents. The Ratepayers' Association also holds a Conditional Water Licence (No. 46012) on Parent Creek, which supplies the community hall with water. The majority of Columbia Valley residents use this water supply at the many community events held at the hall. Vedder Mountain's western slope supplies water to the community of Yarrow, B.C.



- 6) The Ratepayers' Association claims that the information they have on the properties of Roundup is invalid because it was prepared by the Company (Monsanto) who manufactures and sells the herbicide. The Ratepayers' Association also claims that since the test information for registration of the herbicide all comes from the manufacturer, the registration (presumably in both Canada and the U.S.A.) also has no validity.
- 7) The Ratepayers' Association claims that since no pesticide industry exists in Canada, the Government of Canada has exercised no control over the actual testing of the chemical or the information gathered for registration by the Company.
- 8) The Ratepayers' Association believes that the studies on the non-active ingredients of Roundup are inconclusive.
- 9) The Ratepayers' Association believes that the nature of the water flow on Vedder Mountain is so complicated (i.e. streams go underground and can appear hundreds of meters away as springs), that the normal precautions taken by the Forest Service to keep the herbicide out of waterbodies and wetland areas will be inadequate. Since Agriculture Canada recommends that glyphosate not be applied directly to any body of water populated by fish or used for domestic water supplies, and, also, that it should not be used in areas where there is a possible adverse impact on domestic water supplies or aquatic species, the Association is sure that the Community will suffer from the proposed application if it is allowed to proceed.
- 10) Mr. Gritzmacher then brought several comments made by the Forest Service at a meeting on September 26th, 1984, at Yarrow, B.C. (Exhibit "C") to the Board's attention. These comments were as follows:



- a) Question - addressed to Mr. Bertram, "who will be responsible if the water becomes contaminated or disappears?"
- Answer - "That would have to be resolved in court."
- b) Question - addressed to Mr. Anderson, "Has research been done on using Roundup within a forest environment?"
- Answer: - "Tests show that Roundup is a safe chemical. No long-term tests have been done using Roundup within a forest environment."
- c) Question - addressed to Mr. Carradice, "I live in the Columbia Valley. What would happen if there was a flash runoff after you sprayed there?"
- Answer - "The chemical would get into your water".

Don Erho's testimony was as follows:

- 1) He said that he knew the Forest Service did not spray in registered watersheds. Unfortunately, the people in the Columbia Valley do not hold a registered watershed. They only hold registered water rights. He then stated that because of these water rights, or licences, the people of the Columbia Valley should have, or believe they should have, natural rights over the watershed which feeds their licenced water supplies.
- 2) He then indicated that herbicide could be carried from the herbicide application area into the community's adjacent watershed areas. He noted four possible ways this could happen, which were as follows:
- a) There was a stream, and perhaps more than one stream, originating above the application site, which went underground in or close to the application site, but then re-appeared above the ground below the application site. This stream, or streams, fed the community's water

supply and could become contaminated, even with the best of intentions by the Forest Service.

- b) He also felt that contaminated slash could be washed from the herbicide application site to a stream west of the application site.
- c) He said there was a large rock outcropping in the herbicide application area which would probably be sprayed. He felt that water from rainfall passing over this rock outcropping could carry herbicide from the application site into the community's watershed area.
- d) He also felt that deer could become contaminated in the herbicide application area, leave the area, and then die in the community's watershed area.

Mrs. Currie's testimony was as follows:

- 1) She said that the main water supplies on Vedder Mountain were as follows:

Parent Creek	School House Creek
Iverson Creek	Juliana Brook
Pleasant Creek	Swanberg Creek
Mikes Spring	Mountain Creek
James Creek	Telford Spring
Martin Creek	Lion Creek
Belgrove Creek	Peskie Creek Swamp

Unfortunately, she never told the Board whether these water supplies would be affected by the herbicide application, or how, or what remedial action could be taken.

- 2) She said that these water supplies provided 59 persons with individual licenced water sources which, in turn, served over 100 residents.
- 3) She said that the community hall water licence supplies up to 2000 to 2500 invited guests per year, including some 300 to 400 children.
- 4) She also said that under the provisions of the water licences, there are seven wells which are fed from Vedder Mountain.

Mr. Peter's testimony was as follows:

- 1) He produced a paper which became Exhibit "A" of this Judgement. The paper was concerned with the influence of glyphosate on the body weight of broilers (chickens).

The result of specific feeding tests on the broilers at zero concentration, 60.8 ppm, 608 ppm and 6080 ppm were as follows:

- a) The addition of glyphosate to the diet of broilers at levels of zero, 60.8 ppm and 608 ppm did not significantly influence body weight of males or females in 7, 14 or 21 days.
  - b) The addition of glyphosate to the diet of broilers at levels in the order of 6080 ppm reduced body weight approximately 50 percent in both sexes as early as 7 days of age, and this reduction of body weight continued for the rest of the experiment.
  - c) The broilers, both male and female, were one day old when the experiments started.
- 2) He then produced a second paper, which became Exhibit "B" of this Judgement. He read out certain passages of this paper, which were as follows:

- a) The assessment of potential risks associated with the use of pesticides in forestry (or agriculture) requires data on environmental fate, toxicity, and anticipated level of exposure to nontarget plants and animals. Much of the available data for the new herbicides, however, have been generated very recently and are not available to practicing foresters, state and local regulatory agencies, and the public interested in the safe use of pesticides. This paper presents an up-to-date review of the environmental fate and toxicity of three new herbicides (fosamine ammonium, glyphosate, and hexazinone), which appear to be promising for vegetation control in forestry and for some of which data have recently been generated through well-designed forest ecosystem studies. The paper also draws attention to major gaps and conflicts in the existing data so that appropriate testing and field studies can be designed to generate the additional data (See Data



Limitations and Recommendations for Future Studies).

Much of the data presented here have been generated by the manufacturers in support of pesticide registration. Additional sources of information include published literature, interviews with scientists in government, industry, or academic institutions, with site visits to commercial forests in several regions of the United States. Some general properties and use data for the pesticides reviewed are summarized in Tables 1 and 2 respectively.

- b) Roundup, and the surfactant used in the Roundup formulation have indicated that the surfactant, and not the glyphosate, is the primary toxic agent in Roundup (Folmar et al, 1977). Several studies have been conducted to determine the carcinogenic or mutagenic properties of certain of the herbicides.
- c) While somewhat extensive data have been generated for hexazinone through systemic and well-designed scientific studies, much less data are currently available for fosamine ammonium and glyphosate, particularly in the areas of toxicity and potential impacts on nontarget organisms.

The use of fosamine ammonium and glyphosate in forestry represents relatively new applications for these herbicides. Much of the available environmental effects data for these herbicides, and to a lesser extent for hexazinone, are from nonforestry applications (e.g. agriculture or right-of-way and industrial maintenance) and hence would not be directly applicable to the forest environment due to difference in soil characteristics, climate, and sunlight conditions. Also, much of the available data are from laboratory studies conducted under carefully controlled and simplistic conditions which do not necessarily reflect the complex forest ecological systems. Field studies in which environmental persistence and impacts are evaluated under "real world" conditions can provide the data base needed for a more accurate assessment of environmental effects of the subject herbicides in forestry applications.

COMMENTS MADE DURING THE CROSS-EXAMINATION OF THE APPELLANT;

- 1) The Appellant's spokesman admitted that he could not say positively that Agriculture Canada's registration requirements for Roundup were inadequate. He had a "gut feeling" but did not really know.
- 2) The Fish & Wildlife Branch of the Ministry of Environment have reviewed the permit as far as fish and wildlife are concerned, and have not objected to the permit being issued.
- 3) The distance to the nearest residence from the boundary of the herbicide application site is about 500 meters.
- 4) Vedder Mountain does not have a steep slope - about 30 degrees to the horizontal.
- 5) Any open water intakes on creeks near the herbicide application area are a few hundred meters away from the boundary of the application area (at least 200 to 250 meters).

SUMMARY OF THE RESPONDENT'S PRESENTATION:

Mr. Scott and Mr. Gladiuk gave no direct evidence.

Mr. Bertram's testimony was as follows:

- 1) The target area was originally logged in the 1930's and was subsequently burned by a wild fire in 1951. The area, like much of Vedder Mountain, then became reforested with a stand of deciduous species, a combination of Broadleaf Maple (*Acer macrophyllum*), Red Alder, (*Alnus rubra*) and White Birch (*Betula papyrifera*), preventing the satisfactory stocking of commercial conifer species.
- 2) Vedder Mountain, because of its soil characteristics, is one of the most productive forest sites in the province. Vedder Mountain is within the Chilliwack Provincial Forest and is part of the Fraser Timber Supply Area.
- 3) To maintain the productivity of the timber supply area and benefit the economy of the Chilliwack area, a program of site rehabilitation was started in 1981. This 42.5 hectare block is a part of that program.



- 4) The proven method of rehabilitating these forest lands from non-commercial brush to commercial forests is to cut down the existing stand, dessicate the herbaceous growth with a herbicide, burn the dried material and plant selected oversized seedlings. As a pesticide permit was not issued in time, the burn was done without benefit of the dessication of the herbaceous growth. This resulted in a poor burn and the rapid regrowth of both the herbaceous shrubs and the deciduous trees.
- 5) To ensure survival of the plantation, it is necessary now to kill the brush and deciduous trees.
- 6) The appeal of this permit prevented the application of the herbicide this fall, which would have been the best time. It will now be necessary to apply it just before planting in the late spring of 1985. If this cannot be done, we would request an amendment to this permit to change the purpose of the application and the amount of active ingredient per hectare to allow spraying after the planted stock has hardened off in the fall of 1985.
- 7) The Appellant has expressed a number of concerns in the letter of appeal. These are addressed as follows:
  - a) Roundup is registered for forestry use by Agriculture Canada. They have a review system to investigate the chemical prior to issuing the registration.
  - b) The spray will not be directed over open waterbodies. Roundup binds strongly to the soil and does not leach through or move off the treated area.
  - c) Weather conditions are monitored during the spraying operations. Measurements of temperature, relative humidity, wind direction and speed are taken. Using this information and direct radio contact, the applicator can ensure the accuracy of the spray application.
  - d) On good forest land, the application of a herbicide for brush control has consistently proved to be more practical and economical than any manual method. The use of manual labour and hand tools has proved to result in damage to the coniferous seedlings hidden in the brush.



- e) The Ministry of Forests will abide by the conditions of the permit #104-655-84/86, which will prevent any negative effect of the herbicide used under this permit.
- 8) As a special note, we wish to advise the Board that we would only use the recommended dosage as per the label of 2.1 kg. of active ingredient, or a total of 89.25 kg. of active ingredient.

Mr. MacInnes' testimony was as follows:

- 1) He presented three series of slides for the Board's consideration. The first series of slides showed the four phases of forest land site rehabilitation, which were:
  - a) Slashing, or Removal of Cover, which means falling all deciduous trees and removing the merchantable timber.
  - b) Browning, which means a treatment with a herbicide to kill off all the herbaceous and deciduous weed growth, which will make the material easier to burn.
  - c) Controlled burning - gets rid of the slash and debris on the ground and also kills weed seeds.
  - d) Planting with new conifer trees, usually 2 to 3 years old.

The four phases should be fairly tightly scheduled, and a delay in any one of the phases considerably affects the success of the whole program.

- 2) Mr. MacInnes then went on to his second series of slides which showed an overview of Vedder Block 7, being the area in question. He pointed out the boundaries of the site and the slope of the land. He said that the area was slashed and burned in 1983. At present, the site is covered with herbaceous and deciduous weed growth, about a meter high, because of the delay in the herbicide application caused by this appeal. Some of the elderberry was above 6 feet high. The site is an excellent area for Douglas Fir.

- 3) He said that the herbicide application site does not have any creeks on it which flow the year around. There is a stream, however, which is some 68 meters in from the cutting boundary on the far west side of Block 7 (Presumably, just outside of the boundary of the herbicide application site). The 100 meter buffer zone would apply to this stream. There are three very small periodic creeks on the site which are expected to dry up in the summer time.
- 4) Mr. MacInnes then showed the Board a comparison of two sites which had been planted in 1982. The first site had been slashed, burned and planted with three-year-old stock. It had not had a herbicide treatment. At the present time, deciduous and herbaceous growth had invaded the area and the fir trees were now under stress. The other site, which was adjacent to the first site, had been prepared in exactly the same manner as the first site, but had also had a treatment of 2,4-D. The conifers on this second site were robust and growing well, without interference.
- 5) Mr. MacInnes then said that the present plan was to treat Vedder Block 7 with a Roundup application in late May of 1985, provided the Forest Service got good weather conditions. Otherwise, the herbicide application would have to be made sometime in early September, after planting.
- 6) In the third series of slides, Mr. MacInnes showed the Board how the helicopter application would be carried out. He said that the helicopter would fly along the contour lines of the site slope, laying down one swath after another of the herbicide, but turning off the spray as the helicopter left the area each time. When the area was essentially completed, the helicopter would then lay down a swath of herbicide around the peripheral boundaries of the site. The effective swath-width was stated to be 12.5 meters.
- 7) He said that the helicopter the Forest Service would use for the herbicide application would be a Bell 47. It would have two 25-gallon fibre glass tanks for the herbicide, and a three-nozzle boom which would be mounted below the helicopter. The boom would be shorter than the rotor blade's diameter so as to prevent wash from the blades distorting the spray pattern. The helicopter, when making the herbicide application, would fly about 30 feet above the canopy and at about 30 miles per hour.



- 8) The preparation of the herbicide would be made up in a 1200-gallon steel tank mounted on a truck. The quantities of water and herbicide would be metered into this mixing tank. The herbicide mix would then be loaded into the helicopter tanks in a manner similar to that used in a gasoline service station pumping system. In other words, a spill of this herbicide during preparation, mixing and filling of the helicopter tanks was extremely unlikely.
- 9) The helicopter could spray about 13 hectares per hour. The application site should, therefore, take about 3 hours to complete.
- 10) Mr. MacInnes then showed the Board a similar area to the one in question, in which an aerial (helicopter) herbicide application had been made on July 10th, 1984. The purpose of showing the Board the slides of this area was to illustrate how accurate the Forest Service could be in maintaining the buffer zone boundaries. The results appeared to be very good.
- 11) Mr. MacInnes then said that before the Forest Service made a helicopter application, it laid down a demarkation line at the edge of the buffer. This was done from the air with a mixture of agricultural lime and latex paint.
- 12) Before and during a helicopter herbicide application, the Forest Service monitors wind velocity, temperature, and relative humidity at the application site on a continuous basis. If the wind velocity exceeds 8 km/hour, the operation is not started, or if it is in progress, it is immediately stopped. The ground personnel in charge of monitoring are in radio contact with each other and the helicopter pilot.
- 13) In addition to the monitoring noted in Item 12, the Forest Service also puts out drift cards in the buffer zone area, placed at 10-meter centres across the buffer zone. Before application, the herbicide is coloured with a purple dye. During the herbicide application, any problems which may develop in maintaining the buffer zone can be immediately detected and corrected. Drift cards, or dye cards, are also used to protect other sensitive areas.



- 14) Mr. MacInnes then showed the Board what the sprayed foliage would look like immediately after an aerial spraying of Roundup. The foliage was not drenched. In fact, there were only a few drops of the herbicide on some of the leaves of the trees, with very little of the herbicide reaching the ground. The Board was told that, provided it did not rain for six hours, most of the herbicide would be absorbed into the leaves of the trees, and it was very unlikely that any appreciable amount would then be washed off by rainfall after the six-hour period.
- 15) Mr. MacInnes then said it took about 3 weeks before the deciduous foliage started to die, or at least, the process became noticeable.
- 16) He said that the Ministry of Environment and Environment Canada will be monitoring the water courses in the areas after the spraying to ensure that the Forest Service has done its job properly.

COMMENTS MADE DURING THE CROSS-EXAMINATION OF THE RESPONDENT;

- 1) Environment Canada will take water samples downstream of the sprayed areas prior to spraying, after spraying, and after the first heavy rainfall. These samples will be sent to the Provincial Environmental Laboratory for testing and the results will be available to the public two to three weeks later.
- 2) Over the last year, twenty-two different sites have been sprayed in the Chilliwack Forest District using similar methods and precautions as those described by the Forest Service in their evidence-in-chief. All areas have been tested. In all of these samples taken by Environment Canada, the Laboratory has not been able to detect any contamination of the water by the herbicides. (detection level is 0.005 ppm).
- 3) Mr. Scott brought to the Board's attention an excerpt from the Appellant's Exhibit "B", Page 393, which was as follows:  
  
"Adsorption of glyphosate to soil reduces its mobility through leaching and surface runoff. Comes et al (1976) investigated leaching of glyphosate from banks of irrigation canals treated

with glyphosate. Neither glyphosate nor its primary soil metabolite, aminomethylphosphonic acid (AMPA) were detected in the first flow of water through two canals following application of "Roundup" at 5.6 kg/ha to ditchbanks when the canals were dry. Soil column leaching studies have also indicated limited potential for leaching (USEPA, 1979a). In these studies, soil columns treated with either glyphosate or its sodium salt were aged for 30 days prior to eluting with 0.05 ha/cm of water per day for 45 days; leaching of the parent compound was insignificant. In laboratory runoff studies conducted by Rueppel et al, (1977), maximum runoff of less than  $2 \times 10^{-4}$  kg/ha was observed from Ray, Drummer, and Norfolk soil beds inclined at 7.5 and treated with 1.12 kg/ha glyphosate and subjected to three artificial rainfalls."

- 4) Mr. Peters presented some information from Dr. Michael Watson of the U.S. Environmental Protection Agency, Washington, D.C., which was as follows:

Glyphosate or Roundup has the ability to react to the metal in unlined steel or galvanized steel tanks to form a highly explosive hydrogen gas.

- 5) The Forest Service said that they only plan to make one spraying of the area in question. If any herbicide is left over, they will not spray a second time just to use it up,

#### DECISION;

The Environmental Appeal Board has considered all of the evidence submitted to it at the appeal hearing on Pesticide Use Permit No, 104-655-84/86, and its amendment of August 8th, 1984, which was issued to the Minister of Forests for vegetation control in preparation for planting conifers, by the Administrator of the Pesticide Control Act, and has decided that the implementation of the program will not cause an unreasonable adverse effect to mankind and/or the environment.

The appeal is, therefore, dismissed.



COMMENTS OF THE BOARD:

1) The Board hereby directs the Administrator of the Pesticide Control Act to amend this permit to allow the Ministry of Forests to apply the herbicide for conifer release on this application site, as well as for vegetation control in preparation for the planting of conifers. It should be noted, however, that the herbicide application can be made only once, and for only one purpose or the other.

2) The Board is satisfied that enough reliable information exists on the properties and use of Roundup for the Board to allow this herbicide application to go forward. The Board has absolutely no doubt that the herbicide application will be safe, and that no harm will come to human beings, domestic animals, wild animals, birds or fish in the area involved.

3) The Board is also confident that the water supplies of the people of the Columbia Valley will not become polluted with Roundup from this particular herbicide application.

4) From Exhibit "C", the Forest Service for the Chilliwack Forest District reports that from their past experience, the worst case of runoff or leaching contamination outside a herbicide application area has been in the order of 0.025 ppm. Since Roundup application rates run from about 15,000 to 25,000 ppm, it becomes obvious that the information given in Exhibit "B" by Mr. Scott is confirmed, and that Roundup is extremely reluctant to migrate from its application site. This runoff or leaching concentration is about 800,000 times less than the application rate.

5) From the Appellant's evidence, one-day-old chicks were fed up to 608 ppm of glyphosate for a period of 21 days without seemingly doing them any damage; at least for those parameters which were measured. This is 24,000 times above the worst case runoff rate recorded by the Forest Service. The Board, therefore, finds it difficult to see how wildlife feeding in or near the spray areas will be adversely affected.

6) No evidence was presented to the Board, nor is there any information available to the Board on Roundup, which would indicate that it can cause cancer, mutations or birth defects.

7) The Board is convinced that with proper care and attention, aerial spraying by helicopter can be accurately done.

Victoria, B.C.  
November 26, 1984



F.A. Hillier, P. Eng.,  
Chairman, Environmental Appeal Board