Province of British Columbia Ministry of Environment ENVIRONMENTAL APPEAL BOARD Victoria British Columbia V8V 1X5

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APPEAL: 84/19 PES

JUDGEMENT

PERMIT NO; - 104-414-84/86, issued to the Minister of Forests for the use of Roundup (Glyphosate) for conifer release, by aerial (helicopter) and ground-based application techniques to 80 hectares of forest lands, 2 kilometers south of Laidlaw, B.C. The application rate is 1.8 kg/ha, and the total active ingredient would be 144 kgs. The target species are alder, maple, birch, willow, cherry, thimbleberry and salmonberry.

APPEAL; The grounds for the appeal are:

- (1) The program would pollute Lorenzetta Creek with dangerous chemicals and, therefore, adversely affect the water supplies of the residents of Laidlaw. The pollution would affect both water supplies taken directly from the creek and from shallow wells in the area.
- (2) The program would be detrimental to the quality of life which the residents enjoy in the Laidlaw area.
- (3) The program has the potential to be life threatening to the residents, as well as to the domestic animals and wildlife in the area.
- (4) The adverse effects of the spray program far outweigh any benefits which could be achieved by the program.

HEARING INFORMATION:

The hearing was held on October 22nd, 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 Mr. R. Hagkull of Hope, B.C., who also represented some 16 other people in the general area of the proposed herbicide application.

He appeared before the Board with three witnesses, who were as follows:

Mrs. Anne Chapman – Laidlaw, B. C. Mrs. Maureen Chapman – Laidlaw, B. C. Mr. Harry Peters – Yarrow, B. C.

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 Scott - Witness Stand Tending Co-ordinator Vancouver Forest Region

Mr. E.H. MacInnes - Witness Field Supervisor - Silviculture 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" The initial presentation of the Forest Service by Mr. G.D. Bertram, C.E.T.
- "C" An additional presentation of the Forest Service entitled Vegetation Management, by Mel Scott, R.P.F.
- "D" The final presentation of the Forest Service by G.D. Bertram, C.E.T.

SUMMARY OF THE APPELLANT'S PRESENTATION;

Mr. R. Hagkull's testimony was as follows:

- 1) He said that he was not a resident of the area involved in the herbicide applications as yet, but intended to buy a house in this area in the near future.
- 2) He contends that there will be a detrimental effect on the area below the pesticide application site, and that there is a high degree of concern by the people of Laidlaw in this regard.
- 3) He is most worried about the possibility of Lorenzetta Creek becoming contaminated with Roundup should a mishap occur in the application of the herbicide, such as a spill, or an overkill of the forest, which would then result in flash flooding of the agricultural plain below the application site.

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- 4) He asked the questions, "What if the spray chemicals reached the creek in the event of accidents of this nature? Would the Ministry of Forests compensate the residents for the damages which would be done? What about the fish in the creek - coho and humpback salmon spawn in the lower reaches of the creek?"
- 5) He said that the Lorenzetta Valley is a natural watershed for all the domestic water supplies lying along Lorenzetta Creek. There are no less than twelve wells, whose main supply of water is affected by the creek. No less than three of these wells are within 100 feet of the creek. One water licence takes its suply of water directly from the creek. A large dairy farm exists close to the creek and its animals drink water directly from the creek. Also, numerous other small farms exist along the creek, and their animals drink water directly from the creek.
- 6) He said that there are gaps in the available data on the impact of Roundup on humans and the environment. He also said that all of the studies that he could find were concerned with agricultural and laboratory systems, which do not necessarily reflect the conditions in the complex forest ecological system.
- 7) He contended tht Roundup or any other man-made chemical could cause cancer. Not enough testing had been done on Roundup over a long enough period of time.
- 8) He asked the question, "What if 20 years down the "road", Roundup is found to cause cancer?"
- 9) He said that the forest would reproduce itself naturally in the normal course of events. He did say, however, that the hardwoods would be the first species to regenerate themselves and would form a canopy over the conifers. Notwithstanding this fact, the conifers would eventually break through as part of nature's cycle and establish predominance over the hardwoods. On this basis, he wondered why the Forest Service would endanger peoples' lives just for the sake of speeding up the process.
- 10) Mr. Hagkull concluded his presentation by stating that the herbicide application in question was equivalent to 1.59 lbs per acre. He said that studies in the United States indicated that if the active ingredient of Roundup was applied at less than this concentration, it would be ineffective, and that at concentrations above

this figure, it would cause dieback of the conifers. He, therefore, felt that because of the difficulties in maintaining accurate concentration control, the herbicide application would be a failure, and on this basis, believed it to be unwarranted.

Maureen Chapman's testimony was as follows:

- She said that she and her husband had built a house in the Laidlaw area, and had lived there for some eleven years.
- 2) She said that over the last few years, when it rained in the area, the creek rose very quickly and overflowed its banks within an hour. She said that when this happened, the overflow carried mud and silt into her basement. As a result, she and her husband had built a concrete wall around their house recently to prevent occurrences of this nature from continuing.
- 3) She said that before building their house, she and her husband had lived in the same area in a trailer for some 6 to 8 years, and had never experienced any problems from flooding.
- 4) She said that she was very concerned that the herbicide would kill off all of the forest undergrowth above her property, which, in turn, would promote additional flooding of this property during heavy rainfall.
- 5) She said that her cows and chickens drink water directly from Lorenzetta Creek.
- 6) She concluded her presentation by saying that the Lorenzetta Valley experienced very high winds, which were also unpredictable. She said that her main concern was that the Forest Service, or its contractors, would not pay sufficient attention to this fact and, therefore, contaminate the Valley with Roundup.

Anne Chapman's testimony was as follows:

She said that she had no faith that the herbicide applications would not be detrimental to the community. As an example, she stated that when the Public Works people had sprayed the roads close to her property, they had also killed twenty of her fruit trees.

Harry Peter's testimony was as follows:

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 results of specific feeding tests at zero concentrations, 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 weights of males or females in 7, 14 or 21 days.
- b) The addition of glyphosate in 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.

Comments made during the cross-examination of the Appellant:

From Mr. Hagkull's comments, it appeared that he did not have any literature from the Federal Government (i.e. National Research Council, Health and Welfare, Canada, or Agriculture Canada, etc.) on the properties of glyphosate or Roundup. The only information he seemed to have was from Monsanto and Exhibit "A". He did not believe the Monsanto information to be reliable.

SUMMARY OF THE RESPONDENT'S PRESENTATION:

Mr. Bertram's testimony was as follows:

- The area in question was originally logged in 1956, slash-burned in 1957 and the lower half planted in 1967. The upper half was restocked naturally between 1957 and 1961.
- The plantation and part of the natural restocking is now being overcome by deciduous species, mainly Red Alder (Alnus rubra).

- 3) The application of a herbicide after the hardening off of the annual coniferous growth is a proven method of conifer release. The herbicide Roundup, containing the active ingredient glyphosate, is registered by Agriculture Canada for this forestry use.
- 4) The Ministry of Forests will abide by the conditions of Permit No. 104-414-84/86. One of these conditions is to provide a 10-meter pesticide free zone along all waterbodies. There are also to be buffer zones to ensure this 10-meter pesticide free zone. This will provide adequate protection for the public and the environment, and prevent any negative effect of the pesticide used under this permit.
- 5) During the course of the hearing, Mr. Scott and Mr. MacInnes will show why a herbicide treatment of this area of forest near Lorenzetta Creek is necessary. They will also show that a 10-meter pesticide free zone can be maintained with buffer zones.
- 6) Studies of actual projects by Environment Canada which are documented in a publication entitled "Environmental Monitoring of Selected Pesticide Spray Operations in British Columbia", have shown that drift from helicopter spraying of pesticides can be restricted to 75 meters if the following conditions are observed:
 - a) Proper identification of the spray plots and non-target areas;
 - Aerial and ground review of spray plots, spray swaths and spray patterns;
 - c) Choice of appropriate formulations;
 - Inclusion of a drift control agent, if necessary;
 - e) Continuous monitoring of weather conditions before, during and after spraying,

Projects done this year in the Chilliwack Forest District and monitored by Environment Canada have proved that these conditions can be observed.

7) The Forest Service, therefore, requests at this time consideration by this Board to recommend an amendment to Condition No. 7 of the permit, changing the required buffer zones from 300 meters to 100 meters, and 50 meters to 10 meters, respectively.

The Forest Service also advises the Board that the area to be treated has been reduced from 80 hectares, as shown on the permit, to 40 hectares. The remaining 40 hectares in the upper half of the block is being left for a later treatment by juvenile spacing because the percentage of deciduous growth is less, and, therefore, giving less competition to the coniferous species.

Mr. Scott's testimony was as follows:

- 1) He said that the reforestation of logged-over forest land is the most important prerequisite for sustained yield forestry. The task of returning forest land to production by either planting trees or by natural regeneration may appear to be a simple one. However, a number of questions have to be answered before reforestation is undertaken. Should an area be planted or left to regenerate naturally? What site preparation is needed to ensure successful regeneration? What tree species or combination of tree species will grow best on the site? What stock type should be used for planting? What planting method should be used? Will shrub and weed control be necessary to ensure seedling survival and The answers to these questions are site specific. growth? What may work well on one site may prove disastrous on other An incorrect answer to any one of the above sites. questions may result in reforestation failure or poor growth of the next tree crop.
- 2) He then presented a diagram which was intended to show a poor site, a medium site and a good site. The Board got the impression that the higher up a hillside or mountain, the poorer the site became.

- 3) Mr. Scott indicated that poor sites will usually regenerate themselves naturally, within 5 years after clear-cut logging has been completed. Hemlock and balsam are the most common restock species. The area cannot be burned, and seed must be available from nearby stands of timber. Some fill-in planting may be required. Usually, very few deciduous species will invade the area.
- 4) Mr. Scott then indicated that on a medium site, it is the normal practice to burn the area after clear-cut logging has been completed. This will remove the deciduous growth as well as the slash. Planting will be done the following spring. Since deciduous invasion of the area will be slow, the conifers will survive and outgrow the deciduous trees, which will eliminate the need for brushing of the unwanted species. Whatever unwanted growth does appear can be removed at the time of juvenile spacing.
- 5) Mr. Scott then told the Board that in order to successfully establish a crop of acceptable commercial species on good forest sites, it requires careful planning and consideration of suitable species, method of site preparation, stock type, planting method and brush control. Since deciduous trees always invade and try to take over the good sites, brush control is always necessary. Frequently, the reforestation plan includes burning and planting, usually with larger seedlings to help in the competition with deciduous species for growing space.
- 6) Mr. Scott said that the Lorenzetta Valley site was considered to be a medium to good site. It had not been replanted immediately after logging had taken place, and as a result, at this time, the conifer forest had been overtopped by the deciduous growth.
- 7) Mr. Scott said that the Forest Service had carried out a number of field trials in British Columbia with Roundup on Douglas Fir seedlings. The treatment, when properly applied, had not resulted in any dieback of the fir tree leaders. He said that this would only happen during a rapid growth period and not at a time when the Forest Service would apply the chemical. He said, however, that if the species was hemlock or cedar, as much as 30 cm. dieback could be expected. (This evidence was in contradiction to the appellant's evidence which indicated that a 3 to 12 inch dieback could be expected if a fall application of Roundup was made to Douglas Fir seedings).

Mr. MacInnes's testimony was as follows:

- He presented two series of slides for the Board's consideration. The first series of slides described the application site and the brush removal requirements. The second series of sites described how the herbicide application would be made.
- 2) When Mr. MacInnes showed the Board the first series of slides, he pointed out the boundaries of the application area, the slope of the land and Lorenzetta Creek. He said that Lorenzetta Creek was about 12 feet wide and 1.5 feet deep. It flowed out of the toe of the mountain, and across the agricultural land below the application site. He said that there was no bridge across the creek, which was one of the reasons why the Forest Service had not considered manual brush removal. A bridge was estimated to cost about \$10,000.
- 3) Mr. MacInnes then said that from his observations on a field visit to the site on October 5th, 1984, there were only two creeks in existence on the application site; one about a foot wide and one inch deep, and the other about 18 inch wide and also one inch deep. He said that there may be other streams or gulleys in the area, but they were undetectable at that time.
- 4) He said that the Chapman water licence was the only licence on Lorenzetta Creek, and that it was registered for irrigation and the watering of domestic animals.
- 5) He said that the distance from the application site to the nearest residential establishment was about 1.4 kilometers.
- 6) He said that the area involved in the herbicide application had been reduced from 80 hectares to 40 hectares because the upper or poorer areas of the site do not have enough deciduous growth to warrant chemical treatment. He further said that of the 40 hectares, 27 hectares would be done by the hack and squirt process, and 13 hectares would be done by aerial spraying, provided the 300 meter buffer zone remained in effect. He said that the hack and squirt method of brush control would be used in the buffer zones and places where aerial spraying could not be done.

- 7) He then showed the Board what the conditions were in regards to tree growth in the herbicide application area. The deciduous trees were about 6 inches in diameter and 35 feet high. The conifers were about 3 inches in diameter and 20 feet high. They were overtopped and suppressed by the deciduous growth. The conifer species were Douglas Fir and hemlock.
- 8) He then showed the Board an area which had been planted about the same time as the Lorenzetta Creek area, and also had conditions which were very similar to the Lorenzetta Creek area, except that this area had been treated with a herbicide application to remove the deciduous growth. The conifers were growing well, about 6 inches in diameter, and there were very few deciduous trees to compete with them.
- 9) In the second series of slides, Mr. MacInnes showed the Board how the herbicide 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 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 borders of the site.
- 10) 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 tanks for the herbicide, and a threenozzle boom which would be mounted below the helicopter. This boom would be shorter than the rotor blade diameter so as to prevent wash from the blades distorting the spray patterns. The helicopter, when making the herbicide application, would fly about 30 feet above the canopy and at about 25 to 30 miles per hour.

The preparation of the herbicide would be made up in a 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, spill of the herbicide during preparation, mixing and filling of the helicopter tanks was extremely unlikely.

11) Mr. MacInnes then showed the Board a similar area to the one in question, on 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. 12) Mr. MacInnes said that before the Forest Service made a herbicide 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.

- 13) 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.
- 14) In addition to the monitoring noted in Item 13, the Forest Service also puts out drift cards in the buffer zone area, placed at 10-meter centres across the buffer zones. Before application, the herbicide is coloured with a purple dye. During the herbicide application, any problem which may develop in maintaining the buffer zone can be immediately detected and corrected.
- 15) 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.
- 16) Mr. MacInnes then explained how the Forest Service carried out the hack and squirt process. As part of this explanation, he showed the Board one of their herbicide dispensers. It looked somewhat like a small oil can dispenser and was calibrated to squirt one milliliter with each pressing of the trigger. A milliliter looks like a large drop of rain. The Forest Service uses 1 milliliter per 2 1/2 cms. of tree diameter in the hack and squirt process.

COMMENTS MADE DURING THE CROSS-EXAMINATION OF THE RESPONDENT;

- 1) After weed trees have been treated with a herbicide, the tree dies in a relatively short period of time (less than a year). The tree, however, does not fall, but slowly disintegrates, piece by piece, over a relatively long period of time (five to seven years). Manual falling of weed trees, by chain saws, etc., can cause extensive damage to the young conifers by breaking their branches, etc. The disintegration of the weed trees after a herbicide application causes very little damage to the young conifers.
- 2) The gentleman who lives on the agricultural plain about 1.4 kilometers from the herbicide application site volunteered the information that he did not believe the herbicide would have any adverse effects on his property or water supply.
- 3) The aerial spray applicator's contract includes a clause that says that he must not spray the site in question if the wind velocity exceeds 8 kilometers per hour. This condition is part of his fixed price contract. It is anticipated that because of the wind conditions in the Lorenzetta Creek area, the spraying will have to be done in a very short period of time around daylight on each day. The winds are at a minimum during this period of the day.
- 4) The Forest Service is confident that only one herbicide application of the site will be necessary to satisfy their requirements.
- 5) Mr. MacInnes stated that he personally had conducted experiments on applications of Roundup on Douglas Fir seedlings at various concentrations. He stated that when the buds have been hardened off, no damage is done to the tree leaders at mixtures of 4 percent. He indicated, however, that damage would be done to the trees at mixtures of 12 percent and above.

- 6) The concentration of active ingredient in Roundup, as purchased, was given as 35.6 percent. When utilized in the spray program, four liters of Roundup are mixed with 96 liters of water. This then gives an application concentration of 1.424 percent of active ingredient, or 14,240 ppm. The rainfall in the area was estimated at about 70 inches per year.
- 7) The surfactant which is part of Roundup was reported to be slightly more toxic than glyphosate. The surfactant helps in the absorption of the chemical into the plant.
- 8) Should the herbicide application not be made at this time to the young conifer forest in the Lorenzetta Creek area, there is every reason to believe that the Forest Service will lose the plantation and have to rehabilitate and replant the area.
- 9) Mr. Bertram stated that in previous aerial spraying in the Chilliwack Forest District, he had entered the buffer zone four minutes after the application had been made. Under similar conditions to that of the Lorenzetta Creek area, and application and wind conditions as previously stated in the Forest Service's Evidence-in-Chief, he found that the drift of the herbicide had only reached 5 meters inside of the buffer zone (i.e. five meters past the whitewash boundary line).
- 10) The Chapman water intake (only water licence on Lorenzetta Creek) is 3 kilometers downstream of this application site.
- 11) Mr. Bertram is absolutely confident that with a 100 meter or 300 meter buffer zone, no herbicide will get into Lorenzetta Creek. The only exception he would make to this statement is in the event of a failure of the aircraft.
- 12) The herbicide application is estimated to take place sometime between mid-August and early September, 1985.
- 13) There are only two creeks within the application site and it is believed that both will be dry at the time of the herbicide application.

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- 14) Lorenzetta Creek has no fish in its upper reaches. It does have fish in the lower reaches. They cannot get up to the area of the application site because of a waterfall.
- 15) The Forest Service is prepared to take water samples on Lorenzetta Creek before, during and after the herbicide application. They will have these samples tested in a laboratory for evidence of Roundup, and make this information available to the appellant. The cost of testing the samples is \$170.00 per sample. The Forest Service is prepared to carry out this testing in order to prove to the appellant that the herbicide application has been done correctly.

DECISION;

The Environmental Appeal Board has considered all of the evidence submitted to it at the appeal hearing on Pesticide Use Permit No. 104-414-84/86, issued to the Minister of Forests for conifer release by the Administrator of the Pesticide Control Act, and has decided that the implementation of the program, as amended by the Board, will not cause an unreasonable adverse effect to mankind and/or the environment.

The appeal is, therefore, dismissed.

The amendment to the permit and, hence, to the program, is as follows:

Section 7 of the permit shall be revised to read as follows:

A 10-meter pesticide free zone shall be maintained along all waterbodies and wetland areas, and the applicator shall be instructed to maintain whatever size buffer zone topographic and climatic conditions require to ensure that this 10-meter pesticide free zone is achieved. The buffer zone, however, for aerial application shall not be less than 100 meters, measured horizontally and not down the slope. There shall be no buffer zone for ground applications, other than the 10 meter pesticide free zone.

COMMENTS OF THE BOARD;

- The Board notes that the appellant does not, as yet, live in the herbicide application area. Further, the appellant neglected to tell the Board where or when he intends to move. The Board, therefore, has extreme difficulty in assessing how the appellant will be affected by the herbicide application.
- 2) The Board is confident that Lorenzetta Creek will not become polluted by the herbicide application; therefore, there will be no effect on the water supplies from the creek or on the shallow wells fed from the creek.
- 3) Notwithstanding the above statement, under the worst possible conditions imaginable, any contamination of Lorenzetta Creek from the herbicide application would be far below any concentration which could affect mankind, domestic animals, wildlife of any kind, or fish in the lower reaches of the creek.
- 4) The Board believes that wildlife, including birds and animals, exposed to the herbicide at the site and at the time of the application and afterwards, would still not experience any lasting adverse effects from the chemical. Certainly, broiler chickens are in no danger, whatsoever, on farms in the area.
- 5) 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.
- 6) The program will have absolutely no adverse effect on the quality of life of the residents in the Laidlaw area.

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

Victoria, B.C. November 26th, 1984