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Opposition to Interfor Pest Management Plan No. 215-229-02/07

The Forest Action Network (FAN) is strongly opposed to Interfor's PMP application for a number of reasons, as outlined below. In particular, chemical pesticides such as Vision (containing glyphosate) and Release (containing triclopyr) must never be used.

(A) ENVIRONMENTAL PROBLEMS WITH GLYPHOSATE AND TRICLOPYR

Glyphosate and Triclopyr are known to impact non-target species. There is an overwhelming volume of evidence to support this. Twenty-two example scientific studies on glyphosate alone are listed in Appendix 1. The citations listed include evidence of impacts on deer, moose, small mammals, songbirds, and other species. The use of glyphosate can result in significant population losses of terrestrial species due to habitat and food supply destruction and thus cause a threat to endangered species and biodiversity. It also effects beneficial insects and earthworms. Nitrogen-fixation can be reduced, lowering soil fertility. It can increase the susceptibility of some non-target plants to fungal diseases, and interferes with other metabolic processes such as ion and lignin production. Except for glyphosate, most of the ingredients and contaminates of Vision are considered trade secrets and are unknown to the public. The surfactants added to Vision to increase foliar absorption have also been shown to be toxic in test cases. The bottom line is that Vision is a non-selective herbicide, and everything in its path is ultimately threatened.

On the issue of the potential impacts of spraying herbicides on the reduction in browse and forage for wildlife species in general, some would argue that the areas treated are small and are surrounded by, or adjacent to untreated areas that can act as refugia or sites for repopulation (To wit, comments made by Keith R. Solomon in his expert report entitled "Ecotoxicological Assessment of Triclopyr Butoxyethly Ester (Release) in relation to its use in Canadian Forests", Page 8). If the proponent was only anticipating using herbicides for brush control on one or two cutblocks, one might be inclined to agree with this assessment. However, this PMP proposed extensive use of Triclopyr throughout the entire Mid Coast Forest District. The effect will be to remove most of the available browse in these areas, since primary forage species will clearly be targeted. This is a far cry from a few hundred square metres.

Pesticides are not controllable. It is impossible to prevent spray drift when applying glyphosate and triclopyr. Even with the most careful application using the injection method, it can be transmitted through decomposition, leakage, dripping, pitch, water, rain, insects, birds (e.g. woodpeckers), as well as human error.

Glyophosate is persitent. Although the claim is often made that glyphosate is inactivated rapidly in soil, it is more accurate to say that it is usually adsorbed to soil components. A sandy loam treated with glyphosate at recommended application rates was found to drastically reduce nitrogen fixation, growth, and modulation of subterranean clover planted 120 days after glyphosated treatment. In fact, studies show that glyphosate is persistent for up to 8 years,

depending on soil type and climate, and has been found in surface and groundwaters. Recent research shows that glyphosate may be more mobile in the environment than previously thought, indicating a greater risk of groundwater contamination. As it is absorbed by plants, glyphosate found in the soil can be taken up by plants long after its use. See Appendix 2 for a list of relevant scientific studies. Such long persistence increases the chance of glyphosate impacting on non-target species such as deer or salmon. An initial overview of scientific research indicates that triclopyr shows similar traits to glyphosate as outlined above.

Glyphosate is particularly threatening to salmon and other aquatic species. In general, it is moderately toxic to most fish and the surfactant used in certain formulations are often considerably more toxic. Some of the effects of glyphosate on fish include erratic swimming, laboured breathing, odd behaviour, and altered migration and reproduction (Monroe 1990; Holtby & Baillie 1989). Algae and non-target aquatic plants can be affected. The formulation found in Vision is classified as 'slightly toxic' by its manufacturer, chemical giant Monsanto. 96-hour LC_{50} levels range from 10 mg/L for Chinook to 22 mg/L for Rainbow Trout and Coho. Glyphosate can reach salmon habitat through spray drift, water, rain, etc. As the Mid Coast is an area of extremely high precipitation, there are ephemeral streams in practically every cutblock. In addition to ephemeral streams, glyphosate can be transmitted through runoff or groundwater, as indicated by recent evidence of desorption of glyphosate from soil particles which would result in glyphosate moving through soil and in groundwater (IPCS 1994; Piccolo et al., 1994; US EPA, 1993). There is never a 100% chance of zero precipitation within a three-day period, meaning that there is always a risk of glyphosate washing into salmon-bearing streams. This can eventually result in damage to salmon populations. Misclassification of streams is also known to exist through human error, adding even greater risks. In summary, the use of glyphosate is unacceptable given the current tragic state of salmon stocks throughout the coast of BC. An initial overview of scientific research indicates that triclopyr shows similar traits to glyphosate as outlined above.

While broadcast treatments (Section 2.4, Page 13) and aerial spraying pose the greatest threats, all forms of application bear the risks outlined above. The obvious response to broadcast spraying in particular includes the fact wind patterns are unpredictable, and even the most careful aerial spraying can be blown into non-target areas. Also, as described above, the Mid Coast is an area of extremely high precipitation. There is always the chance of rain, even in the driest period. The risks associated with any form of pesticide use, especially aerial spraying is far too great.

Human error is a concern. From June 1995 to June 1997, Interfor had approximately 400 minor noncompliances with the Forest Practices Code (in addition to other major breaches). These small noncompliances are an indication that human error not only unavoidable but endemic.

Interfor's plan is to use glyphosate and triclopyr throughout the entire Mid Coast Forest District. Given their toxicity and adverse effects described above, Interfor should not be allowed to use these or any other pesticides or herbicides.

(B) IMPACTS ON HUMAN HEALTH

Glyphosate is known to have impacts on human health, including links to cancer. For example, a recent study by eminent oncologists Dr. Lennart Hardell and Dr. Mikael Eriksson of Sweden, has revealed clear links between glyphosate and non-Hodgkin's lymphoma, a form of cancer. The researchers also stress that with the rapidly increasing use of glyphosate since the time the study was carried out, glyphosate deserves further epidemiologic studies.

The results of certain studies which conclude that glyphosate is safe are highly questionable. Often, in studies meant to show where the chemical appears in our metabolisms, the data has been incomplete. Invalid cancer studies in the mid 1980s forced Monsanto to release information that indicated glyphosate causes kidney tumors (renal tubule adenomas) in mice; these particular tumors are rarely found in untreated mice. The EPA classifies glyphosate as a class C (possible human) carcinogen. Furthermore, testing is done on glyphosate, not on Vision itself. In addition, glyphosate may include a trace contaminant called N-nitrosoglyphosate, or the compound may be formed in the environment when combined with nitrite which is present in human saliva or fertilizer. The majority of these compounds are carcinogenic.

In addition to possible long-term impacts of glyphosate, there are many recorded cases of poisonings. For example, in Malaysia, there is an increase in cases of poisoning by glyphosate as it is becoming more widely used as an alternative to paraquat. In February 1995, a person was near death after using glyphosate for clearing his land before planting fruit trees. (Jayabalan, 1995; PRN, 1995) In the UK, glyphosate is the most frequent cause of complaints and poisoning incidents recorded by the Health and Safety Executive. (Pesticides Trust, 1996) Other studies of humans have shown glyphosate to cause lung congestion or dysfunction; erosion of the gastro-intestinal tract and massive gastro-intestinal fluid loss; abnormal electrocardiograms and low blood pressure; kidney failure; and through direct skin contact swelling of the eye and lid, rapid heartbeat, raised blood pressure, swollen face, tingling of the skin, and recurrent eczema. (Cox ,1995; IPCS, 1994) Among 94 people recorded exposed to glyphosate in the US the following symptoms were noted: bronchial constriction, pleuritic chest pain and nasal congestion; blurred vision, corneal erosion and conjunctivitis; contact dermatitis; headache; nausea, diarrhoea and abdominal pain; irritability; excessive sweating; vertigo; malaise; swelling of extremities; and nervous system disorders. (US EPA, 1980)

An initial overview of scientific research indicates that triclopyr shows similar traits to glyphosate as outlined above.

(C) FOOD AND MEDICINAL PLANTS

Interfor's claim that "Food plants are not known to be utilized within the plan area." (section 6.6, Page 33) is nonsense. A short list of food plants in wide regular use by residents of the Mid Coast include Alder bark (note that Alder is a primary target of pest management), Thimbleberry shoots, Fireweed, Salmonberry berries and shoots, Hemlock needles, Devil's Club, Skunk Cabbage roots, Stinging Nettles, fireweed, and many others. This list is by no means comprehensive. As well, there are indirect food uses such a burning alder for smoked salmon, or non-food uses such as carving or wildcrafting various plants. Clearly, there is potential for Vision spraying to have a direct impact on people's health living in the PMP area.

As an attempted precaution, Interfor's PMP claims that "no foliar spraying shall occur... of berry species that are used for human consumption between the time of flowering and the point at which the berries would no longer be fit for picking" (point 6, page 71). It is too much of a risk to the public for Interfor to judge such constraints. Unless a survey of every single resident and tourist in the entire PMP permit application area is conducted, Interfor cannot know which plants are for human consumption, which parts of the plants (berries, roots, shoots, or leaves), and at which times they are eaten. For example, people who collect and consume shoots of certain berry plants might happen to pick during or close to spraying intervals.

As glyphosate can be persistent for up to 8 years as described earlier - with indications of persistency for triclopyr - it therefore has the potential to impact on human health into the future. It is not possible to ensure that the public do not venture into sprayed areas long after the pesticide has been applied.

Many supporters, friends and volunteers of the Forest Action Network are using areas impacted by the PMP for work, recreation, food and medicine. On behalf these individuals, FAN opposes the use of pesticides.

(D) HUNTING AND FISHING

The environmental impacts listed in section (A) will have an impact on wildlife, and therefore on hunting and fishing. Many residents of the Mid Coast rely on hunting and fishing for a substantial part of their subsistence. Any impact on subsistence hunting and fishing is unacceptable.

(E) MISTAKES IN THE PMP

There are at least five significant mistakes in Interfor's PMP, which put into question the accuracy of the entire document. Five examples include: [1] the obvious omission of recent scientific evidence linking glyphosate to cancer (e.g. Hardell and Eriksson, 1999); [2] Section 6.3, Page 32, states "herbicides are unlikely to cause any direct toxic effect to wildlife." is obviously contradictory to the large volume of evidence outlined in section (A) above and appendix (1) below; [3] mixing the words "Pest" (cover of PMP) and "Pesticide" (in the cover letter dated Jan. 11, 2002); [4] omission of Klemtu, Stuie, and Anahim Lake as permanent habitations in close proximity to the plan (Section 2.3, Page 12) - also the semi-permanent habitations of Hakai, Dean River and others are ignored; [5] the inclusion of TL T0945/T0364 Hot Springs, TL T0941/T0356 No Name Creek, T0697 Lockhart Gordon and others - all of which are scheduled for protection and will be removed shortly from Interfor's operating base.

(F) NON-TRANSPARENCY OF THE PUBLIC INPUT PROCESS

59% of the ingredients and contaminates of Vision are considered trade secrets by Monsanto and are unknown to the public. It is not possible to make informed comments on the use of secret chemicals.

Interfor's Operating Zones are nothing but 'greenwash'. Interfor defines four Operating Zones (OZ). OZ 1 requires no consultation while OZ 2 requires only the bare minimum annual consultation with "stakeholders" (in this case, Interfor considers First Nations to be nothing more than stakeholders). OZ 3 involves more scrutiny by the Ministry of Water, Land and Air Protection and OZ 4 involves no pesticides at all. However, "IFP is nor proposing to include any of the managed areas in the PMP as OZ3... [or] OZ4". Essentially, Zones 3 and 4 do not exist: their inclusion in the text of the PMP appears to be nothing more than an attempt to mislead the public.

We are not able to properly critique a plan that does not yet exist. The present copy of the so-called "plan" does not contain any details of the proposed pest management. It does not describe any specifics of where, when, how or why pesticides or other treatments are to be used. The actual "plan" will not be developed until after the public review process is over. This is undemocratic.

There are insufficient public review opportunities available, especially considering that the plan is meant to last half a decade. In 2001, the review period was not announced in the Coast Mountain News until a full 10 days after the review period began, effectively reducing the review time for Bella Coola valley residents by nearly one quarter. To make matters worse, we did not receive acknowledgement of our submission until over half a year later. The situation has hardly improved in 2002.

(G) THE PMP IS ANTI-LABOUR

Interfor's PMP is an attack against labour. Manual methods require more labour than when using pesticides. This PMP, if it goes forward, will result in more money going to Interfor and multinational chemical corporations, and less money going to communities already suffering from massive unemployment.

(H) NOT ECOSYSTEM-BASED MANAGEMENT

As part of the CCLRMP and the so-called "Great Bear Rainforest Agreement", Interfor has agreed to pursue ecosystem-based management. Pesticide use is contradictory to all existing consensus on ecosystem-based management. Interfor also agreed to a moratorium on development in most of the pristine valleys where it previously had plans to operate. Yet, the proposed Pest Management Plan (PMP) includes potential for pest management in some of these areas (Green River, Sandell River, and others). Both of these examples indicate blatant attempts to circumvention of the spirit and intent of ecosystem-based management.

(I) LEGALITY

Glyphosate and triclopyr are legal in Canada. However, the federal government relies on information submitted by companies like Monsanto when they apply for an application to sell a product. In fact, the last decade has seen those regulations, ineffective though they were, watered down considerably. Note that Health Canada also approves the use of genetically-modified organisms, or 'frankenfoods'. We cannot trust that federal government approval is done in the best interests of the public or environment. Canada's position is not consistent with scientific opinion worldwide. For example, a 1999 European Union draft document warned of glyphosate's harmful effects on insects and spiders, and recommends against its use in Europe.

Compliance with the Forest Practices Code is an irrelevant benchmark. In early 1998, after intense lobbying by Interfor and other logging companies, the government of British Columbia weakened environmental protection by introducing more than 500 changes to existing legislation. Changes include giving logging companies permission to conduct even larger clearcuts, and the reduction of the public's opportunities to comment on logging plans. In May 2000, the BCGEU representing Ministries of Forests and Environment staff issued a scathing report about lack of compliance. The report states that, as a result of sweeping government budget and staff cuts, "the largest forest companies operating in the province are not properly inspected or monitored." The Forest Practices Board also issued a report stating that "basic compliance with Code requirements is not sufficient to protect environmental values" Similarly, the federal Department of Fisheries and Oceans, and the BC Ministry of Environment, Lands and Parks have come out with similar critiques of the Code at various occasions, and a legal complaint has been lodged that the Code's weak standards violates Canada's commitment under NAFTA. Even Canfor president David Emerson recently stated that the Code has not worked, and that BC is not a model of sound forest policy.

The question that has to be asked is not if pesticides are legal, but whether or not the use of toxic chemicals should be allowed which impact on biodiversity, salmon, and human health.

(J) CONCLUSION

Due to the concerns listed above, the Forest Action Network is completely opposed to any approval or further development of Interfor's Pesticide Management Plan.

APPENDIX 1 - Studies showing that glyphosate damages non-target species

Black, H.C., and Hooven, E.H. 1974. Response of small mammal communities to habitat changes in Western Oregon. In Wildlife and forest management of the Pacific Northwest. Edited by H.C. Black. Oregon State University, Corvallis. pp. 177-186.

Borrecco, J.E., Black, H.C., and Hooven, E.F. 1979. Response of small mammals to herbicide induced habitat changes. Northwest Science 53: 97 106. (Populations of vagrant shrews, Pacific jumping mice, pocket gophers, and Oregon voles were less abundant on treated areas than untreated areas.)

Campbell, D.L., Evans, J., Lindsey, G.D., and Dusenberry, W.E. 1981. Acceptance by black-tailed deer of foliage treated with herbicides. USDA For. Serv. Res. Pap. PNW-290. (Deer rejected foliage treated with glyphosate.)

Clough, G.C. 1987. Relations of small mammals to forest management in northern Maine. Can. Field Nat. 101: 40-48.

D'Anien, P., Leslie, D.M., Jr., and McCormack, M.L., Jr. 1987. Small mammals in glyphosate-treated clearcuts in northern Maine. Can. Field Nat. 101: 547-550. (Red-backed voles were less abundant on herbicide-treated plantations than in naturally regenerated areas.)

Connor, J., and McMillan, L. 1990. Winter utilization by moose of glyphosate-treated cutovers. Alces 26: 91-103. (Moose utilized non- sprayed control areas 32 times more often than glyphosate treated areas. Glyphosate reduced browse to 25% of pre treatment levels.)

Cumming, H.G. 1989. First-year effects on moose browse from two silviculture applications of glyphosate in Ontario. Alces 25: 118-132. (Glyphosate reduced available moose browse by 63-92% at least one growing season after treatment.)

Eschholz, W., Raymond, K., and Servello, F. 1992. Herbicide effects on habitat and nutritional ecology of moose and deer in Maine. Cooperative Forestry Research Unit Report No. 31. Maine Agric. Exp. Stn. Misc. Rep. 376: 31-34. (Twenty-five percent of available moose winter browse was reduced during the first winter after spraying.)

Hjeljord, O., Sahigaard, V., Enge, E., Eggestad, M., and Gronvold, S. 1988. Glyphosate application in forest-ecological aspects. VII. The effect on mountain hare (Lepus timidus) use of a forest plantation. Scand. J. For. Res. 3: 123-127. (Mountain hare use of glyphosate-sprayed plots decreased after treatment when compared with untreated plots.)

Kennedy, E.R. 1986. The impact of the herbicides glyphosate and 2,4-D on moose browse in conifer plantations in northeastern Minnesota. M.S. thesis, University of Minnesota, Minneapolis.

Kennedy, E.R. and Jordan, P.A. 1985. Glyphosate and 2,4-D:The impact of two herbicides on moose browse in forest plantations. Alces 21:149-160. C (Glyphosate-treated plantations averaged at most one fourth of the available browse four years after treatment.)

Lloyd, R.A. 1989. Assessing the impact of glyphosate and liquid hexazinone on moose browse species in the Skeena region. Fish and Wildlife Branch, BC Ministry of Environment. Third-year report.

Lloyd, R.A. 1990a. Assessing the impact of glyphosate and liquid hexazinone on moose browse species in the Skeena region. Addendum. Fish and Wildlife Branch. B.C. MOF, Victoria.

Lloyd, R.A. 1990b. Impact on vegetation after operational Vision treatment at varying rates in the Skeena region. Fish and Wildlife Branch. (Moose preferred control areas by 3:1 over treated areas 1-3 years after glyphosate treatment.)

MacKinnon, D.S., and Freedman, B. 1993. Effects of silviculture use of the herbicide glyphosate on breeding birds of regenerating clearcuts in Nova Scotia. Journal of Applied Ecology 30: 395-406. (Songbird abundance was 5-20 times greater on the reference plot than glyphosate-treated plots. Abundances on treated plots remained depressed until at least fourth growing season after spraying. White throated sparrow, common yellowthroat, black and white warbler, red-eyed vireo, ruby-throated hummingbird, and others disappeared from treated plots.)

McMillan, L.M., Connor, J.F., Timmermann, H.R., McNicol, J.G., and Krishka, C.S. 1990. Small mammal and lesser vegetation response to glyphosate tending in north central Ontario. Ontario Ministry of Natural Resources, Northwestern Ontario Forest Technology Dev. Unit, Thunder Bay. Tech. Rep. No. 57. (Red-backed voles decreased for at least three years after spraying.)

Milton, G.R., and Towers, J. 1990. Relationships of songbirds and small mammals to habitat features on plantation and natural regeneration sites. Canadian Institute of Forestry, Nova Scotia Dept. of Natural Resources. (Glyphosate-treated conifer plantations had lower species richness of songbirds when compared with naturally regenerated sites for at least 4 5 years after spraying. Red-backed voles were less abundant on glyphosate-treated plantations than in naturally regenerated areas.)

Morrison, M.L., and Meslow, E.C. 1984. Effects of the herbicide glyphosate on bird community structure, western Oregon. For. Sci. 30: 95-106. (Significant decreases of orange-crowned warbler, American goldfinch, and song sparrow were observed for at least two years after glyphosate treatment.)

Reynolds, P.E., (ed.). 1989. Proceedings of the Carnation Creek Workshop. FRDA Rep # 63. (a. The dry mass of glyphosate was higher 151 days post- application than 47, 49, and 57 days post-application in tributary 1600, indicating persistence.) (b. The conclusion was made that Roundup "...sediment residues were relatively persistent ..." [p. 61].) (c. The amount of glyphosate was higher 150 days post- application than 37 and 60 days post-application in the upper watershed (p. 77), again indicating persistence.) (d. The statistical variance of glyphosate residue in the soil of upper, middle, and lower watersheds is greater than or approaches the mean residue for many sampling days throughout a calendar year. This strongly indicates persistence is beyond one year (pp. 82-84). (e Macroinvertebrate densities were 42% lower in the Roundup-treated swamp than in the untreated swamp [p. 263].)

Santillo, D.J., Brown, P.W., and Leslie, D.M., Jr. 1989. Response of songbirds to glyphosate-induced habitat changes in clearcuts. Journal of Wildlife Management 53:64-71. (Treatment reduced the complexity of vegetation through three growing seasons post-treatment compared with untreated clearcuts. Yellowthroat, Lincoln sparrow, and alder flycatcher were reduced in treated areas.)

Santillo, D.J., Leslie, D.M., Jr., and Brown, P.W. 1989. Response of small mammals and habitat to glyphosate application on clearcuts. Journal of Wildlife Management 53: 164-172. (Fewer small mammals were captured on glyphosate-treated clearcuts at least 1-3 years post-treatment compared to untreated clearcuts.)

Slagsvold, T. 1977. Bird population changes after clearance of deciduous scrub. Biol. Conserv. 12: 229-244. (Herbicide-treated areas had reduced bird populations for at least four growing seasons after treatment.)

APPENDIX 2 - Studies indicating that glyphosate is persistent for up to 8 years

Morrison, M.L., and Meslow, E.C. 1984. Effects of the herbicide glyphosate on bird community structure, western Oregon. For. Sci. 30: 95-106. (Significant decreases of orange-crowned warbler, American goldfinch, and song sparrow were observed for at least two years after glyphosate treatment.)

Santillo, D.J., Leslie, D.M., Jr., and Brown, P.W. 1989. Response of small mammals and habitat to glyphosate application on clearcuts. Journal of Wildlife Management 53: 164-172. (Fewer small mammals were captured on glyphosate-treated clearcuts at least 1-3 years post-treatment compared to untreated clearcuts.)

Santillo, D. J., P. W. Brown, and D. M. Leslie, Jr. 1989. Response of songbirds to glyphosate-induced habitat changes on clearcuts. J. Wildl. Manage. 53:64-71

McMillan, L.M., Connor, J.F., Timmermann, H.R., McNicol, J.G., and Krishka, C.S. 1990. Small mammal and lesser vegetation response to glyphosate tending in north central Ontario. Ontario Ministry of Natural Resources, Northwestern Ontario Forest Technology Dev. Unit, Thunder Bay. Tech. Rep. No. 57. (Red-backed voles decreased for at least three years after spraying.)

Kennedy, E.R. and Jordan, P.A. 1985. Glyphosate and 2,4-D:The impact of two herbicides on moose browse in forest plantations. Alces 21:149-160. C (Glyphosate-treated plantations averaged at most one fourth of the available browse four years after treatment.)

Milton, G.R., and Towers, J. 1990. Relationships of songbirds and small mammals to habitat features on plantation and natural regeneration sites. Canadian Institute of Forestry, Nova Scotia Dept. of Natural Resources. (Glyphosate-treated conifer plantations had lower species richness of songbirds when compared with naturally regenerated sites for at least 4 5 years after spraying. Red-backed voles were less abundant on glyphosate-treated plantations than in naturally regenerated areas.)

Lautenschlager, R.A. 1993. Response of wildlife to forest herbicide applications in northern coniferous ecosystems. Can. J. For. Res. 23: 2286 2299. (Glyphosate treated areas still had 55-80% removal of browse at least eight years after treatment.)

APPENDIX 3 - Studies and articles relating glyphosate to health

Lennart Hardell, M.D., PhD. Department of Oncology, Orebro Medical Centre, Orebro, Sweden and Miikael Eriksson, M.D., PhD, Department of Oncology, University Hospital, Lund, Sweden, 'A Case-Control Study of Non-Hodgkin Lymphoma and Exposure to Pesticides', Cancer, March 15, 1999/Volume 85/ Number 6

Cox, Caroline. "Glyphosate, Part 2: Human Exposure and Ecological Effects." J. of Pest. Rfm.: Vol.15, Winter 1995.

Bishop, Hunter. "Herbicide causing illness?" Hilo Tribune-Herald: October 24, 1996.

NTP Chemical Repository. Radian Corporation: August 29, 1991.

Nivia, Elsa and Gips, Judith. "Drug Control and Herbicide Spraying in Columbia." Global Pesticide Campaigner, February 1993.

Cox, Caroline. "Glyphosate, Part 2: Human Exposure and Ecological Effects." J. of Pest. Rfm: Vol. 15, Winter 1995.

Freedman, B. "Controversy over the use of herbicides in forestry, with particular reference to glyphosate usage." J. Envir. Sci. Hlth.: Vol: C8(2), 1990-1991.

Cox, Caroline. "Glyphosate, Part 2: Human Exposure and Ecological Effects." J. of Pest. Rfm: Vol. 15, Winter 1995.

APPENDIX 4 - Other references

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Brust, G., 1990. Direct and indirect effects of four herbicides on the activity of carabid beetles (Coleoptera: Carabidae). Pestic. Sci. 30:309-320.

Carlisle, S., Trevore, T., 1987. Glyphosate in the environment, Department of Environmental Biology, University of Guelph, Ontario.

Codex Alimentarius Commission. 1993. Pesticide residues in food. FAO, WHO, Rome.

Cox, C., 1995. Glyphosate, part 1: toxicology. J. Pestic. Reform 15(3):14-20).

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Eberbach, P., Douglas, L., 1983. Persistence of glyphosate in a sandy loam, Soil Biol. Biochem. 15(4):485-487.

Eberbach, P., Douglas, L., 1989. Herbicide effects on the growth and nodulation potential of Rhizobium trifolii with Trifolium subterraneum L. Plant and Soil 119:15-23.

Edwards, W., Triplett, G., Kramer, R., 1980. A watershed study of glyphosate transport in runoff. J. Environ. Qual. 9(4):661-665.

Eijsackers. H., 1985. Effects of glyphosate on the soil fauna. In Grossbard E., Atkinson, D. (eds), The Herbicide Glyphosate, Butterworths, London.

Frank, R., 1990. Contamination of rural ponds with pesticide, 1971-1985, Ontario, Canada. Bull. Environ. Contam. Toxicol. 44:401-409.

Grossbard, E., 1985. Effects of glyphosate on the microflora: with reference to the decomposition of treated vegetation and interaction with some plant pathogens. In Grossbard, E., Atkinson, D. (eds), The Herbicide Glyphosate, Butterworths, London.

Hassan, S., 1988. Results of the fourth joint pesticide testing programme carried out by the IOBC/WPRS Working group "Pesticides and beneficial organisms". J. Appl. Ent. 105:321-329.

Holtby, B., Baillie, S., 1989. Effects of the herbicide Roundup on Coho salmon fingerlings in an over-sprayed tributary of Carnation Creek, British Columbia. In Reynolds, P., (ed), Proceedings of

the Carnation Creek Herbicide Workshop, Nanaimo, B.C., Forest Pest Management Institute, Forestry Canada.

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Piccolo, A., Celano, G., Arienzo, M., Mirabella, A. 1994. Adsorption and desorption of glyphosate in some European soils. J. Environ. Sci. Health B29(6):1105-1115.

PRN. 1995. Personal communication, Pusat Racun Negara (National Poison Centre), Penang, to PAN Asia Pacific.

Rank, J., Jensen, A., Skov, B., Pedersen, L., Jensen, K., 1993. Genotoxicity testing of the herbicide Roundup and its active ingredient glyphosate isopropylamine using the mouse bone marrow micronucleus test, Salmonella mutagenicity test and Allium anaphase-telophase test. Mut. Res. 300(1):29-36.

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