# E X H I B I T   A

## Conflicting Research that YST Reduction Project EA fails to analyze and consider

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BIOLOGICAL ISSUES ASSESSMENT BY MARY H. OBRIEN, PH.D.

The following was presented by Mary H. O'Brien, Ph.D. at a Noxious Weed Workshop, sponsored by the U.S. Forest Service, Pacific Northwest Region. Oregon State University, Corvallis, Oregon, December 1, 1997.

*SOME OF THE PROBLEMS WITH HERBICIDE TREATMENTS FOR NOXIOUS WEEDS*

*by Mary H. O'Brien, Ph.D.*

*Vegetation management with toxic herbicide formulations has caused historic and repeated problems at a number of junctures: Manufacturing, transport, storage, application, dispersal within the environment, transformation into other toxic chemicals, and disposal. Historically and repeatedly, public control over the use of toxic herbicide formulations for vegetation management has been compromised at points of registration, review, monitoring, and enforcement.*

*Within the context of the current Environmental Impact Statement (EIS) and Mediated Agreement for Vegetation Management in Region 6 Forest Service, I would like to focus on five particular problems with managing noxious weeds with toxic chemicals.*
*1. Use of toxic chemicals to react to noxious weeds is an ongoing, toxic addiction unless it is part of an explicit program to prevent the establishment and spread of noxious weeds and to eliminate the need to use herbicides.*

*Herbicide applications often leave the soil bare, which is a condition that favors re- establishment by weeds, unless steps are taken to ensure otherwise.*

*Herbicide applications in themselves generally do nothing to change the conditions which allowed the noxious weeds to establish in the first place. An example might be destruction of ground cover of microbiotic crusts. This summer, I took five high school students into Hells Canyon for a week, in which we documented some vegetation features in an allotment that has not been grazed by livestock for 14 years, and an adjacent allotment that is grazed by livestock. The most striking finding was the* *extensive cover of microbiotic crust on the vacant allotment and lack of microbiotic crust cover on the sites grazed by livestock. The ability of the microbiotic crust to prevent establishment or spread of noxious weeds may be considerable.*

*In the absence of an explicit program to prevent noxious weeds, land managers generally continue to manage land in such a way that noxious weeds are assisted. It is intriguing to contemplate how the Forest Service would approach its management of the public's National Forests differently if the agency knew that it would no longer have herbicides available. The simple availability of herbicides is a siren song to continue noxious weed-favoring activities.*

*2. The Forest Service does not know what it is spraying or all the effects of what it is spraying.*

*Regardless of the reality that the federal pesticide law has (at least until NCAP v. Browner) seemingly allowed the Forest Service to remain ignorant of the identity of most toxic solvents, surfactants, emulsifiers, and other substances in an herbicide formulation, this is an ongoing problem. What it means is that whenever you don't have a list of all ingredients in a specific formulation you are using (and Region 6 doesn't have such a list for most formulations it is spraying), you don't know what toxic chemicals you're spraying, what your applicators or wildlife are being exposed to, or what you're releasing into the public trust resources of water and air. This means Agency risk assessments cannot account for reality, and that you may be doing harm.*

*For instance, the Region 6 herbicide information profile for picloram indicates that "The manufacturer has not revealed the identity of the inert chemicals other than water in these formulations. [Note: Water is not an inert ingredient]...No ingredient in any picloram formulations was categorized by EPA to have evidence or suggestion of toxic effects." In fact, Region 6 doesn't know what is in Tordon K or 22K, but published its assurance of low concern on the fact that Tordon's inert ingredients are either on List 4 of inerts, which are generally recognized as safe, or on List 3, which Region 6 characterized as being "low priority for health effects testing based on absence of data or chemical structures that would indicate toxic effects."*

*This is not true. List 3 is the list of "Inerts of Unknown Toxicity", and as Holly Knight, an intern at NCAP discovered, even this is not true: 1,981 pesticide inerts hide on List 3, including 264 pesticide active ingredients, some of which are known to be highly toxic, including naphthalene (which can cause brain damage, convulsions, and death in children), chlorothalonil (a probable carcinogen), and chloropicrin (a* *respiratory tract irritant that can cause asthma). Other inerts that are not active ingredients, are likewise well-known to be of toxicological concern.*

*In other words, what you don't know about the constituents of Tordon K or 22K, or any other pesticide formulation could adversely affect your workers, wildlife, and humans who are exposed in water, air, or food to these chemicals.*

*Even if you do know what you are spraying, you do not necessarily know how the different formulation components interact. For instance, you know that Roundup contains a surfactant in addition to the active ingredient, Glyphosate. A surfactant enhances contact of the active ingredient with the plant's surface cells. Does it enhance uptake of Glyphosate by cells in wildlife or the workers spraying it? Since chronic effects testing is not required for full formulations, you know little about the consequences of exposing wildlife or workers to the combination of Glyphosate and a surfactant.*

*3. Most Forest Service planners don't know what is known about adverse impacts of the herbicides they may use.*

*Consider picloram, an herbicide being used by Region 6. The 1995 reregistration of picloram by EPA was opposed by EPA's Environmental Fate and Ground Water Branch of the Special Review and Registration Division, "...because its use would pose unreasonable adverse effects to the environment. Because of picloram's mobility in soil types and its persistence under normal ambient conditions, no practical use restriction can prevent it from contaminating the environment surrounding the target site...The use pattern of picloram is highly specialized, but it is almost certain to eventually reach ground water in areas where it persists in the overlying soil. In submitted terrestrial field and forestry studies, picloram exhibited calculated half-lives of up to 278 days and was detected up to the limits of sampling depth (up to 1.8 m)...Picloram has a high degree of phytotoxicity." [Emphases added.]*

*Likewise, the Chief of the Ecological Effects Branch recommended against the reregistration of all active ingredients of picloram. "This conclusion is based," he or she wrote, "on the extreme exceedance of the acute levels of concern for non-endangered and endangered terrestrial plants."*

*Over the objections of its review branches, EPA reregistered all uses of picloram. How many Forest Service land managers are aware of these concerns by EPA environmental effects specialists? The Forest Service has not explained these problems to the public in its information sheet. Don't these problems warrant primary attention to prevention?*

*Another example: The Region is considering adding two sulfonylureas to its use list and it should drop that idea. Sulfonylurea studies out of Oregon State University and the EPA indicate that they can devastate the flower, seed and fruit production of nearby plants if even tiny amounts of the chemicals drift to them at certain stages of development. The sulfonylurea herbicides appear to be up to 1,000 times more potent at inhibiting plant reproduction than some chemicals that have been used expressly for that purpose. Moreover, sulfonylureas can be persistent in soil, posing risk of reproductive damage over multiple seasons.*

*Although these studies have focused on agricultural crops, what might sulfonylureas do to native plants in grasslands or the forests? Three researchers note in a study of chlorsulfuron, "If the effect of chlorsulfuron on cherry trees is characteristic of other sulfonylurea herbicides and the cherry tree's response is characteristic of other plant species, drifting sulfonylureas may severely reduce both crop yields and fruit development on native plants, an important component of the habitat and foodweb for wildlife."*

*How would Forest Service managers or botanists detect reduced reproduction in susceptible native plants if it happened? Sulfonylurea herbicides, such as Oust (sulfometuron methyl) are used in such extremely small amounts that they may be chemically undetectable in affected plants.*

*4. Many of the adverse impacts the Forest Service may be causing have not been investigated, and likely will never be investigated for herbicide formulations and combinations of herbicides and other stresses.*

*a. Direct effects.*

*For instance, numerous chemicals are being found to affect any of numerous elements of endocrine, or hormone systems, of wildlife and humans. This can compromise development, reproduction, behavior, sexual integrity, and immune and nervous system functioning. The association in several dozen epidemiological studies of phenoxy herbicides such as 2,4-D with cancer, for instance, as well as the association of 2,4-D with birth defects, may be related to action of 2,4-D on the endocrine system.*

*A so-called "inert" ingredient in Banvel CST (active ingredient: dicamba), which is used in Region 6, is ethylene glycol, which has caused birth defects and a decrease in male fertility in laboratory animals. The decrease in male fertility was not reported in the Region's information profile on dicamba formulations, including the inert ingredient, ethylene glycol. Ethylene glycol appears to be an endocrine disruptor.*

*Chemicals that differ widely in molecular structure are involved in endocrine disruption, such that any given component of an herbicide formulation may be an endocrine disruptor and you could not know that unless it has been tested for various mechanisms of endocrine disruption such as mimicking estrogen or blocking testosterone. Most herbicide formulations have not been tested for any mechanisms of endocrine disruption and likely will never be tested.*

*b. Indirect effects*

*Indirect effects of herbicides include those effects that follow, like ripples, from the removal of both target and non-target vegetation. If stream or wetland temperature is raised upon the removal of vegetation, or if cover is lost upon which butterflies, nesting birds, or other wildlife depend, effects that are not even considered or tested for in the registration of herbicides may be caused. EPA states, for instance, that "a number of terrestrial and aquatic plant species are listed as being at jeopardy from the use of herbicides." I would guess that none of the registration documents for any of those herbicides predicted or even discussed the demise of rare plants from the use of the herbicides.*

*c. Cumulative effects*

*Noxious weeds are most often, but not always, found in those areas that have been disturbed by such activities as logging, livestock operations, motorized recreation, and heavy visitor usage. The removal of microbiotic crusts, depletion of myccorhizal fungi, erosion, soil compaction, replacement of native vegetation or wildlife with exotic vegetation or wildlife, removal of old growth trees or riparian vegetation, isolation from floodplain functioning, and other stresses may be cumulative with herbicides on wildlife and vegetation. For instance, if livestock grazing has reduced riparian vegetation, and the stream temperature has been raised somewhat, will the toxicological effects of an herbicide be enhanced by the temperature increase?*
*Again, the registration of the active ingredients of herbicide formulations do not, and cannot, take the cumulative impacts of site-specific stresses into account. The Forest Service is neither funded nor inclined toward detecting cumulative impacts when herbicides are used, and none of the herbicide information profiles consider these impacts.*
*A field study of Glufosinate, for instance, found that it reduced the number of fungi in forest soils by 20 percent. Plant disease-causing fungi were among those species least impacted, while Trichoderma species, considered beneficial because they parasitize disease- causing species, were among the most sensitive to glufosinate.. The researchers noted that use of glufosinate has "important microbiological consequences."*

*While glufosinate is not an herbicide Region 6 is currently using, I mention this study for two reasons. The first is that a soil whose cover and rooting vegetation have been reduced by logging or livestock or heavy recreation use might already have compromised biological functioning. The use of an herbicide that further reduces biological functioning is a cumulative impact.*

*The second is that this type of effect could be happening with the Region's current use of any of its herbicides, but the Agency is not looking for cumulative impacts, and would most likely not know they were occurring.*

*5. There is no incentive (e.g., budget, rewards) to look for adverse consequences of herbicide use.*

*Herbicide applications are concrete activities, which are visible signs to supervisors, Congress, and an often irate public or industry that a District has been doing something about noxious weeds. Research into adverse direct, indirect, or cumulative impacts is not.*

*Uncovering adverse consequences of herbicide use might put pressure on the District, other Districts, permittees, the Forest Service, and/or Congress to change current perceptions, nmanagement habits, or permitting of commercial or recreation activities. Such changes are, to speak mildly, generally not welcomed.*

*6. Prevention As Mitigation*

*All of the above problems with herbicide use are lessened if prevention is given first priority with regard to noxious weeds. If the Agency consciously requires prevention first, its use of toxic herbicides, with all their demonstrated and uninvestigated problems, will be minimized.*

*In 1995, for instance, a coalition called the Hells Canyon CMP Tracking Group developed a Native Ecosystem Alternative to be included in the Draft EIS for a new Comprehensive Management Plan for the Hells Canyon National Recreation Area. In that alternative we emphasized prevention of noxious weeds and restoration of native vegetation.*

*One of the proposed guidelines for grasslands (in which noxious weeds are a present and looming problem) is as follows:*

*Prepare a draft qualitative analysis of the conditions that prevent, minimize, or reverse the presence of specific non-native plant species in HCNRA grasslands (e.g., cheatgrass, star thistle); and conditions and activities that introduce or increase presence of non-native species or* *processes (e.g., the presence of cheatgrass facilitating the spread of medusahead and star thistle.) Incorporate findings of the analysis in all activity planning and in livestock grazing permits and annual operating plans.*

*The Wallowa-Whitman National Forest, illegally, I believe, neither included the Native Ecosystem Alternative as an alternative in its Draft EIS, nor planned analysis of the conditions in Hells Canyon that prevent the presence of non-native plant species, including noxious weeds. This is not reasonable, and it legally contradicts the Region 6 Vegetation Management EIS and Mediated Agreement.*

*Prevention, required as the first step in approaching noxious weeds, is the single most certain form of mitigation for the multiple, inherent problems of herbicide use.*

*--Presented at Noxious Weed Workshop, sponsored by the U.S. Forest Service, Pacific Northwest Region. Oregon State University, Corvallis, Oregon, December 1, 1997.*

end.

2) ###############

MEDICAL IMPACTS TO HUMAN HEALTH

CANCER THREAT FROM GLYPHOSATE
published in New Scientist (UK)

New Scientist says researchers in Sweden have linked pesticides to one of the most rapidly increasing cancers in the Western world, non-Hodgkins lymphoma - which has risen by 73% in the USA since 1973. This, says the journal, is probably caused by several commonly used crop sprays.

The Lund University Hospital has found that Swedish sufferers of the disease were 2.7 times more likely to have been exposed to the herbicide MCPA than healthy people. "MCPA, which is used on grain crops, is sold as Target by the Swiss firm Novartis," says the journal.

"The patients were also 2.3 times more likely to have had contact with Glyphosate."

"Use of [Glyphosate] sold as Round-Up by the US firm Monsanto, is expected to rocket with the introduction of crops such as Roundup-Ready soya beans that are genetically modified to resist Glyphosate. The researchers suggest

that the chemicals have suppressed the patients' immunity, allowing viruses
such as Epstein-Barr to trigger cancer."

The report, on page 23 of New Scientist is by Fred Pearce and Debora Mackenzie

end.

Available FROM: bcarter@igc.apc.org : posted to an organic farming forum:

3) ############

## Examining the Newest Agricultural Myth
## Tracy Irwin Hewitt and Katherine R Smith

September 1995

Zahm, Sheila Hoar, and Aaron Blair. 1992. "Pesticides and Non-Hodgkins Lymphoma," *Cancer Research* (October 1). vol. 52, pp. 5485s-5488s.

**Human occupational exposure to pesticides is a significant cause of deaths, worldwide, and is suspected to contribute to serious long-term and chronic health hazards in developed as well as developing countries.**

- Epidemiological research has determined that farmers are at a higher risk for certain types of cancer than the general population. The greater incidence of cancers such as soft tissue sarcoma, non-Hodgkin's lymphoma, and stomach cancer has been linked with exposure to pesticides and nitrates. For example, agricultural use of phenoxyacetic acid herbicides (particularly 2,4-D) "has been associated with 2- to 8-fold increases of non-Hodgkins lymphoma in studies conducted in Sweden, Kansas, Nebraska, Canada, and elsewhere."

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Available FROM:

http://www.hawiaa.org/iaeq.htm

4) ############

Briefing Paper No.5

EFFECTS OF ROUNDUP ON MAMMALIAN FERTILITY

by Hartmut Meyer, German Working Group on Biodiversity Forum for Environment and Development

FOR more than ten years it has been known that low concentrations of pesticides in the environment and food can have negative effects on male fertility (ELIASON 1985). The complex regulation of male fertility is known to be very susceptible to externals factors. The alteration of fertility parameters by e.g. pesticides are often the first signs of other adverse effects on human and animal health. In addition, recent scientific reports have stressed that numerous chemicals acting as endocrinal substances are potential threats to children's development (HERMAN-GIDDENS *et al*. 1997).

Recently, scientists from Egypt and Norway demonstrated that Glyphosate, the active ingredient of Monsanto's widely used herbicide Roundup, exhibits negative effects on the fertility of male white rabbits (YOUSEF *et al*. 1995). The animals were treated with Glyphosate in sublethal doses of 1/10 and 1/100 of the $LD_{50}$ dose (380 and 38 mg kg-1 body weight, SMITH & OEHME 1992). After a six-week experimental period the animals were allowed to recover from the treatment for a further six weeks. Seven fertility parameters were measured weekly during the whole experiment. As an overall parameter of the physical status of the animals, the body weight was measured.

In contrast to former findings with dogs and rats, Glyphosate fed at sublethal levels significantly lowered the body weight of the treated rabbits. All seven observed parameters of semen quality were influenced negatively by Glyphosate. Four of these parameters did not return to the levels of the control group during the six-week recovery period:

semen volume
sperm concentration
percentage of abnormal sperms
methyl blue reduction time (activity of spermatozoa).

The two definitive texts dealing with environmental and toxicological effects of Glyphosate (GROSSBARD & ATKINSON 1985; WHO 1994) report no other research in this area. Adverse effects of Glyphosate on male fertility have up to now not been a matter of concern. This situation clearly changed with the findings Of YOUSEF *et al*. (1995).

The development and market introduction of genetically engineered herbicide resistant Roundup Ready crop plants together with the herbicide by Monsanto will lead to a significant increase of Roundup applied on agricultural land throughout the world. It is established that Glyphosate residues in food derived from Roundup treated crops will lead to increased human and animal consumption of the chemical (GROSSBARD & ATKINSON 1985; WHO 1994). Another previously unexpected pathway for ingestion of Glyphosate was discovered with recent evidence from Germany that Glyphosate and its metabolise AMPA showed up in surface water after application in the surrounding region (Skark *et al*. 1997). It seems likely that Glyphosate may appear in the drinking water sooner or later. This situation is of special importance for regions where water supplies rely largely on surface water itself, as in much of the developing world.

Thus this case of application of modern biotechnology in agriculture shows that adverse effects on human and animal health may occur. The possible reduction of fertility of wild animals might have negative effects on the conservation of biodiversity. Following the precautionary principle as incorporated in the Convention of Biological Diversity export and registration of Roundup Ready crops should only take place after further investigations of the above discussed critical issues.

Eliason, R. 1985. Clinical effects of chemicals on male reproduction. *Reproductive Toxicology*, R. L. Dixon (ed.). New York: Raven Press, 1985, pp. 161-172.

Grossbard, E.; D. Atkinson. 1985. *The Herbicide Glyphosate*. London: Butterworths, 1985, 490 p..

Herman-Giddens, M. A.; *et al*.. 1997. Secondary sexual characteristics and menses in young girls seen in office practice: A study from the pedriatic research in office settings network. *Pedriatrics* 99: 505-512.

Skark, C.; N. Zullei-Seibert; U. Schottler; C. Schiett. 1997. *The occurrence of Glyphosate in surface water*. Research Results Sheet, Institute of Water Research, Dortmund, Germany.

Smith, E. A.; F. W. Oehme. 1992. The biological activity of Glyphosate in plants and animals: A literature review. *Veterinary and Human Toxicology* 34: 531-543.

WHO. 1994. *Glyphosate. Environmental Health Criteria 159*. Geneva: WHO. 1994, 161 p..

Yousef, M. I.; M. H. Salem; H. Z. lbrahim; S. Heimi; M. A. Seehy; K. Bertheussen. 1995. Toxic effects of carbofuran and Glyphosate on semen characteristics in rabbits. *Journal of Environmental Science and Health* B30: 513-534.

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Available FROM:

http://www.twnside.org.sg/souths/twn/title/effec-cn.htm

5) ###########

TEN REASONS TO "NOT" USE ROUNDUP.

Compiled by Caroline Cox, Northwest Coalition for Alternatives to Pesticides- (NCAP)

May 7, 1997

Roundup, and related herbicides with Glyphosate as an active ingredient, are advertised as products that can "eradicate weeds and unwanted grasses effectively with a high level of environmental safety." However, an independent, accurate evaluation of their health and environmental hazards can draw conclusions very different from those presented in the ads. Consider these facts:

1. Glyphosate can be persistent. In tests conducted by Monsanto, manufacturer of Glyphosate-containing herbicides, up to 140 days were required for half of the applied Glyphosate to break down or disappear from agricultural soils. At harvest, residues of Glyphosate were found in lettuce, carrots, and barley planted one year after Glyphosate treatment.

2. Glyphosate can drift. Test conducted by the University of California, Davis, found that Glyphosate drifted up to 400 meters (1312 feet) during ground applications and 800 meters 12600 feet) during aerial applications.

3. Glyphosate is acutely toxic to humans. Ingesting about 3/4 of a cup can be lethal. Symptoms include eye and skin irritation, lung congestion, and erosion of the intestinal tract. Between 1984 and 1990 in California, Glyphosate was the third most frequently reported cause of illness elated to agricultural pesticide use.

4. Glyphosate has shown a wide spectrum of chronic toxicity in laboratory tests. The National Toxicology Program found that chronic feeding of Glyphosate caused salivary gland lesions, reduced sperm counts, and a lengthened estrous cycle (how often an individual comes into heat). Other chronic effects found in laboratory tests include an increase in the frequency of lethal mutations in fruit flies, an increase in frequency of pancreas and liver tumors in male rats along with an increase in the frequency of thyroid tumors in females, and cataracts. (the fruit fly study used Roundup; the other studies used Glyphosate.)

5. Roundup contains toxic trade secret ingredients. These include polyethoxylated tallowamines, causing nausea and diarrhea, and isopropylamine, causing chemical pneumonia, laryngitis, headache, and bums.

6. Roundup kills beneficial insects. Tests conducted by !he International Organization for Biological Control showed that Roundup caused mortality of live beneficial species: a Thrichgramma, a predatory mite, a lacewing, a ladybug, and a predatory beetle.

7. Glyphosate is hazardous to earthworms, Tests using New Zealand's most common earthworm showed that Glyphosate, in amounts as low as 1/20 of standard application rates, reduced it- growth and slowed its development.

8. Roundup inhibits mycorrhizal fungi. Canadian studies have shown that as little as 1 part per million of Roundup can reduce the growth or colonization of mycorrhizal fungi.

9. Glyphosate reduces nitrogen fixation. Amounts as small as 2 parts per million have had significant effects, and effects have been measured up to 120 days after treatment. Nitrogen- fixing bacteria shown to be impacted by Glyphosate include a species found on soybeans and several species found on clover.

10. Roundup can increase the spread or seventy of plant diseases. Treatment with roundup increased the severity of Rhizoctonia root rot in barley, increased the amount and growth of take-all fungus, a wheat disease), and reduced the ability of bean plants to defend themselves against anthracnose.

end.

Available FROM:

The Northwest Coalition for Alternatives to Pesticides, P.O. Box 1393, Eugene, OR 97440, (503)344-5044.
http://metalab.unc.edu/pub/academic/environment/pesticide-education/NCAMP.RoundUp.information

6) ###########

<u>HERBICIDES KILL FROGS</u>

By Michael J. Tyler

The Australian Government has taken unprecedented action and banned 84 herbicide products from use near water because of their impact upon frogs and tadpoles.

All of these products, of which Roundup (Monsanto) is the best known, contain Glyphosate as the active ingredient. However, there is agreement that it is not the Glyphosate that is the principal problem but a detergent additive termed as a dispersant or wetting agent (surfactant). The function of the dispersant is to break down the surface tension at the leaf surface, so that the individual spray droplets disperse to completely cover the leaf.

Unfortunately, all detergent compounds interfere with cutaneous respiration in frogs and particularly gill respiration in tadpoles (aquatic invertebrates in the food-chain before frogs and tadpoles are equally impacted). Impact may vary with water temperature because oxygen saturation decreases with temperature. To date there have been no tests at 40 degrees C or above - conditions when oxygen availability is very low.

Although the herbicide (Glyphosate) is claimed to be "environmentally friendly", it is clear that users have been lulled into a false sense of security. The use of these herbicides near water is already banned in the UK (United Kingdom). It is hoped that other countries join Australia in following suit.

end.

Available FROM:

Michael J. Tyler, Department of Zoology, The University of Adelaide, GPO Box 498, Adelaide, South Australia 5005, Australia, e-mail mtyler@zoology.adelaide.edu.au

7) ############

Journal of Pesticide Reform - Fall 1998, Vol. 18, NO.3

HERBICIDE FACTSHEET

GLYPHOSATE

by Caroline Cox

Given the marketing of Glyphosate as benign, it is striking that laboratory studies have found adverse effects in all standard categories of toxicology testing. These include medium-term toxicity (salivary gland lesions), long-term toxicity (inflamed stomach linings), genetic damage (in human blood cells), effects on reproduction (reduced sperm counts in rats; increased frequency of abnormal sperm in rabbits), and carcinogenicity (increased frequency of liver tumors in male rats and thyroid cancer in female rats).

Glyphosate has been called "extremely persistent" by the U.S. Environmental Protection Agency, and half lives of over 100 days have been measured in field tests in Iowa and New York. Glyphosate has been found in streams following agricultural, urban and forestry applications.

Glyphosate treatment has reduced populations of beneficial insect, birds and small mammals by destroying vegetation on which they depend for food and shelter.

In laboratory tests, Glyphosate increased plants susceptibility to disease and reduced the growth of nitrogen-fixing bacteria.

end.

The above is a summary of some excerpts from the complete copy containing 183 research citations showing environmentally harmful effects of Glyphosate is available from: www.efn.org/~ncap/gly.pdf  and www.efn.org/~ncap/factsheets.html

8) ###########

Californians for Alternatives to Toxics

Toxics Profile

Product: ROUNDUP
Active ingredient: GLYPHOSATE 41%
Type: HERBICIDE, (Systemic)

Mode of Action: Inhibits enzymatic activity necessary for aromatic amino acid biosynthesis, a process specific to plants. Other enzyme systems in plants and animals not specific to this biosynthetic pathway are affected by Glyphosate. (Heitanen et. al. 1983)

*Of pesticides used during 1994, Glyphosate was #7 for overall total pounds of active ingredient applied in California. Of the total Glyphosate used in California in 1994, 10% was used in grape production, yet grapes were the number one crop associated with Glyphosate- related illnesses from 1984 to1990 (Pease1995).*

TOXICOLOGY

In California agriculture, Roundup's active ingredient, Glyphosate, ranked 3rd for reported pesticide related skin and eye acute illnesses, 15th for reported systemic and respiratory acute illnesses and 3rd for reported pesticide related acute illnesses of any kind from 1984 to 1990 (Pease 1993). It ranked eighth in acute illnesses per million pounds applied.

Inhibits enzymes involved in the detoxification of chemicals in the body. Test animals injected with Glyphosate showed depressed function of cytochrome P450 and two other enzymes which are vital to the body's processing of toxicants (Heitanen 1983). At least two enzymatic steps are involved in the processing of toxicants in the liver of humans; the first involves cytochrome P450 enzymes and the second involves glutathione S tranferases (GSTs). People who do not possess certain GSTs due to genetic variation (estimated at approximately 50% of the Caucasian population), may have a greater risk of some types of cancer (Perera 1996).

U.S. EPA has recently reclassified Glyphosate as a Group E chemical, meaning that evidence exists that the compound is not a human carcinogen. Studies submitted to the California Department of Pesticide Regulation have shown possible adverse cancer effects, with rare tumor formation in the kidneys and adrenal cortex of test animals. Other studies found an increase of testicular tumors, thyroid cancer in females, and a rare kidney tumor (U.S.EPA 1982;1983;1985;1991).

Metabolites and breakdown products of Glyphosate include the known carcinogen formaldehyde (Lund 1986). Formaldehyde is listed as a carcinogen by California's Office of Environmental Health Hazard Assessment under Proposition 65. It also causes gene mutations and is a reproductive toxicant (MBTOC 1995).

N- nitrosoglyphosate, a contaminant of Glyphosate, is a member of a chemical family of which approximately 75% are known carcinogens (Lijinsky 1974; Sittig 1980). Glyphosate is a severe eye irritant. Symptoms of external exposure to Glyphosate products include eye and skin irritation, which is sometimes quite severe and can persist for months (Temple and Smith 1992).

A study in humans documented a greater incidence of impaired lung function, throat irritation, coughing and breathlessness in workers exposed to dust of flax treated with Roundup, as compared to those exposed to untreated flax dust. (Jamison 1986)
A low dose exposure study in experimental animals demonstrated salivary gland abnormalities related to changes in adrenalin levels when the animals were exposed to Glyphosate. Changes were also observed in the kidney, liver, and thymus of the animals (U.S. Department of Health and Human Services).

An unknown percentage of Roundup's formulation is composed of Polyethoxethyleneamine (POEA), which is a surfactant added to enhance the performance of Glyphosate. POEA is three times as acutely toxic as Glyphosate (Sawada 1988), is irritating to eyes and skin, and causes gastrointestinal problems (Monsanto 1992). POEA is contaminated by 1,4 dioxane during the manufacturing process (NCAP 1990). U.S.EPA regards 1,4 dioxane as a probable human carcinogen. OEHHA recognizes 1,4 dioxane as a carcinogen under Proposition 65.

In animal tests, a mixture of Glyphosate and POEA caused cardiac arrest (UNEP/WHO/ILO 1994). The amount of Roundup, which is composed of Glyphosate and POEA, required to kill rats is about 1/3 of a lethal dose of either compound separately (Martinez 1990,1991), suggesting that synergism of the two chemicals may enhance toxicity.

ENVIRONMENTAL FATE AND EFFECTS

Glyphosate is a candidate for evaluation as a toxic air contaminant by the California Department of Pesticide Regulation. Formaldehyde, one of Glyphosate's breakdown products, is listed as a toxic air contaminant. (DPR 1994)

Between 14% and 78% of Glyphosate applied as a ground spray drifts off site (Freedman 1990, 1991). It has been documented to affect plants as far as 131 feet away, and residues have been detected 1,312 feet downwind (Marrs 1993; Yates 1978).

Glyphosate is highly persistent in soil, taking from 24 to 249 days for one- half of it to transform or biodegrade (Lappe 1996).

Glyphosate has been found in surface water as the result of agricultural run-off (Frank 1990; Edwards 1980) and in ground water (U.S.EPA 1992).

Physical and chemical factors such as temperature, pH and solute concentration in aquatic ecosystems influence the acute toxicity of Glyphosate to aquatic organisms (Caltrans 1991).

Glyphosate was shown in one study to inhibit the growth of mycorrhizal fungi, organisms which are essential to ecosystems and enhance plant survival (Cummins 1991).

Acute toxicity to mammals, birds, and bees is low, but no information is available regarding long term effects to these organisms. No data is available regarding the toxicity of Glyphosate to soil invertebrates, reptiles or amphibians. (Caltrans 1991)

FRAUD AND PROFIT

Laboratories contracted by the manufacturer to conduct toxicological analysis on Glyphosate have twice been documented as falsifying data for these tests (U.S. Congress 1984; EPA 1994).

Public perception of Roundup has largely been shaped by high profile advertising campaigns of its manufacturer, Monsanto, which has a high economic stake in its continued use. According to The Wall Street Journal (1/2/96) Roundup accounts for one half of Monsanto's earnings. Monsanto's advertises that Roundup can be used, "where pets and kids play" and that it, "breaks down into natural materials when its work is done." But in 1996 the New York Attorney General fined Monsanto $50,000 for these false claims and extracted a promise from Monsanto to never again advertise in the state that Roundup is safe.

end.

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Californians for Alternatives to Toxics
P.O. Box 1195, Arcata, CA 95518 USA (707) 822-8497(fax 7136) catz@reninet.com
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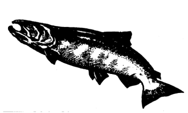
9) ###########

http://alternatives2toxics.org/wildlife.htm

Despite high public concern in California for the protection of wildlife and native habitat, very little information is available about the effects of herbicides on wildlife that the state's road maintenance agencies use.

The information that is available gives rise to concern about the effects of chemicals used



by these agencies. Herbicides narrow the range of plants varieties. Perhaps worse, they also cross biological lines to injure and kill species which are not the intended target. Fish, birds and frogs - all species known to be suffering serious decline in the Golden State - are also known to be harmed by herbicides used by public road agencies.

It's hard to see the sublethal, or non-fatal consequences herbicides have on wildlife. Behavior changes, weight loss, impaired or unsuccessful reproduction, high offspring mortality or deformed embryos can result from herbicide contamination. Affected wildlife become easy prey for predators or lose their ability to adapt to environmental changes. Scientists are increasingly concerned about these less-than-acute exposures which, because they are subtle, are difficult to observe. But a toll is exerted on wildlife.

In a report from Oregon, a fish biologist outlined these subtle problems for salmon species that are in serious decline on the West Coast. The report noted that observations recorded in laboratory and stream studies have revealed serious changes in behavior. These include: interruption of schooling activity, inhibition of normal migration to the sea and, especially in salmon, avoidance of polluted water. Disturbances to behavior patterns impair fish survival because they interrupt the life cycle and disrupt reproduction.

Studies have also established a strong link between herbicide pollution and impacts to the olfactory, or smell, function - by which fish carry out their most critical survival and reproduction tasks. **Diuron**, for instance, has been found to affect how fish swim. It also affects social activities of fish such as grouping. Even slight variations in water quality can make herbicides more or less toxic to fish. In a study of **glyphosate** toxicity to Pacific salmonids and rainbow trout, there were significant variations in the toxic effects **glyphosate** had on the same fish species when different water types were used.

Though little is understood about the consequences of herbicide pollution on fish survival, even less is known about when herbicides are dispersed in the air, and how they harm the animals that fly there.

Searches are rarely conducted for birds killed by sublethal herbicide exposures. This is partly due to the difficulty involved in tracking dead birds. But the number of birds lost to pesticides, including herbicides, adds up. According to the National Audubon Society, of the roughly 672 million birds exposed to pesticides in the United States each year, 10 percent - or 67 million - are killed. This estimate does not include indirect losses caused by adult failure to return to eggs and young birds in the nest or of weakened birds which cannot escape predators.

Birds can be imperiled by herbicides when they drink from polluted puddles of water, preen feathers contaminated by spray drift or breathe vapors of evaporating herbicides. As is true for fish and all other wildlife, the timing of an exposure can have a great influence on the toxicity of the herbicide. The problem is that life-like exposures are difficult or impossible to replicate in a laboratory. Birds are more susceptible, for example, during nesting season or when food is hard to come by.

Like birds, frogs depend on very complex and subtle behavior patterns in order to survive, but what has been happening to frogs lately - which many scientists think is linked to the sublethal effects of herbicides and other chemicals - is anything but subtle. Large numbers of frogs are being found with gross abnormalities and are now considered to be in serious decline internationally.

**Diuron** and **glyphosate**, the two most popular roadside weed killers, were recently discovered to be among the likely culprits in the destruction of frog populations. **Diuron** effects the survival and growth of frog embryos and tadpoles and also causes malformations at levels that are found where the chemical has pooled. Tests of the surfactant most often mixed with **glyphosate** in formulations used on roadsides caused effects to frogs so great the Australian government banned spraying of the formulation anywhere near water.

Clearly, as public agencies, our road departments have a duty to protect wildlife for the current and future benefit of all Californians. Because viable alternatives are available, continuing to use chemicals that threaten wildlife - and all life - cannot be defended.

10) #############

# Chemical Herbicides on California Thoroughfares

http://alternatives2toxics.org/chemherbicide.htm

Called "economic poisons" by the state Department of Pesticide Regulation, herbicides are chemical poisons designed to kill plants by upsetting fundamental biological processes. Thousands of recorded injuries and laboratory studies have demonstrated that herbicides regularly cross ecological and biological boundaries to damage non-target organisms. Yet in spite of their poisonous nature and widespread use, health and environmental data are incomplete for virtually every herbicide formulation.

The chart with this section describes some of the known and suspected toxicological effects of eight herbicides used in the greatest quantities on California's roadsides. Associated with an array of human health disorders, these chemicals actually represent only a portion of those routinely sprayed onto California's roads.

For this chart, herbicides are compiled, named and described according to the active (directly herbicidal) ingredient shared in common by various formulations. This method was used because the identity of many of the other chemicals in formulations - called inert ingredients - are kept secret by manufacturers and regulatory agencies. The percentage of active ingredient contained in these mixtures is described on the chart in the proportions in which each appears in herbicide formulations.

**Diuron**, for example, is the active ingredient of several formulations - Karmex, Karmex DF, Krovar, Krovar 1 DF, Diurex 80 DF, Diurex 4L, Diuron FL - used on California thoroughfares. The portion of diuron in these formulations ranges from 40% to 80%. The identity of the 20% to 60% of the formulations' ingredients is a secret; chemical manufacturers conceal from the public the names of many chemicals in their formulations, and they are supported by state and federal agencies in this subterfuge. The information that is publicly available about inert ingredients, however, indicates that the majority are biologically active and toxic, often as much as are the active ingredients or, in some cases, even more so.

## What We Do Know

The information that is available about the toxic effects of many of the chemicals used on California's roadsides has been learned in studies conducted by the manufacturers of the chemicals. These studies, done to satisfy requirements of federal and state governmental agencies, have characterized the more egregious potential hazards of the active ingredients.

Experiments to determine the effects of herbicides on human subjects is considered unethical and tracing their impacts in accidentally exposed humans is prohibitively expensive when not impossible. Instead, toxicological tests are conducted on animals. Rats, mice, rabbits, and beagle dogs are exposed to chemicals in a laboratory setting for studies designed to satisfy governmental requirements for certain information.

As a result of these studies, regulatory authorities and scientists have recognized a potential for herbicides most commonly used on California thoroughfares to cause illnesses to humans. These adverse health effects include: cancers (**diuron, oxadiazon, simazine, norflurazon, oryzalin, isoxaben, bromacil**); reproductive and development disorders (**diuron, oxadiazon, norflurazon, bromacil**); liver toxicity (**diuron, glyphosate, oxadiazon, simazine, norflurazon, oryzalin, isoxaben**); kidney toxicity (**glyphosate, oxadiazon, simazine, oryzalin**); blood disorders (**diuron, simazine, norflurazon, oryzalin**) and other adverse health effects.

## Uncharted Territory

Unfortunately, what we know about these herbicides is dwarfed by what we don't know. Despite the dangers, tests for many potential toxicological effects of herbicides are not required until overt examples of negative reactions are recorded over a long period. After that, it still takes decades to plan, initiate and carry out investigations. Most have never been completed.

Toxicological studies are not required for the effects of herbicides on:

**children**, although it's well established that they are more vulnerable to injury from biologically active chemicals such as herbicides. Chemicals considered to be moderately toxic can be highly disruptive to children because they constantly grow new cells, their bodies metabolize substances quickly and they are much smaller than adult males for whom chemical exposure standards are set. Many scientists believe that rising cancer rates among children are due to exposures to chemicals. As a result, the EPA is setting standards for how much herbicide residue children can eat, but ignoring exposures that may occur as a result of roadside spraying. Even **oxadiazon**, which is described under

California's Proposition 65 as a chemical known to cause cancer and birth defects, is not prohibited from use where children travel.

**individual sensitivity**, a condition which makes some people more susceptible than others to the negative effects of certain chemicals. Anyone who has an inherited inability to produce certain enzymes that detoxify chemicals, for example, may be more susceptible to the toxic effects of **glyphosate**, which has been found to depress certain other detoxification enzymes. **Diuron, norflurazon,** and **oryzalin,** have been shown to affect blood and blood-forming tissues and may be especially dangerous for persons with inherited blood abnormalities or acquired blood diseases. It was found in a study conducted by the California Department of Health Services that almost one in twenty Californians exhibit symptoms of chemical sensitivity.

**endocrine disruption**, or alteration of the regulatory system for hormones that rules every function of the body. Endocrine-disrupting chemicals such as **bromacil** often affect reproductive processes and can be especially dangerous to fetuses and young children. This is of particular concern to scientists because of the threat to future survival of humans and other species.

**immune system** depression has been shown to occur at greater rates in agricultural areas where herbicide use is concentrated. A poorly functioning immune system is the cause of increased infectious disease and can directly contribute to the promotion of cancer and other health effects simply because the body's defense mechanisms cannot function to promote optimum health.

Other chemicals such as inert ingredients or products of the break-down of herbicide chemicals are poorly understood. These include:

**inert ingredients** - the identity of which is kept secret from the public by manufacturers and government agencies but are nevertheless often highly toxic, sometimes even more toxic than the better characterized active ingredients. The surfactants mixed with the active ingredient **glyphosate**, for example, can be many times more toxic to humans than glyphosate itself. These surfactants cause severe skin, eye and respiratory harm while glyphosate itself does not share these toxicological effects.

**contaminants** - inadvertent waste products of chemical manufacture that cannot be removed from herbicide ingredients. These chemicals can be extremely hazardous, as in the case of 3,3,4,4-tetracholorazobenzene (TCA), a contaminant of **diuron** which is similar in structure and function to 2,3,7,8-TCDD, the most potent of the dioxins, or as in 1,4-dioxane, a potent liver carcinogen and contaminant of **glyphosate**.

**metabolites and degradants** - chemicals formed when herbicides break down in the environment due to mechanisms involving soil microorganisms, sunlight, heat and other processes. These secondary chemicals are often of equal or greater toxicity than the original parent chemical. When **glyphosate** is metabolized, for example, it becomes formaldehyde, recognized as a human carcinogen under California's Proposition 65.

chemical interactions such as **synergism** - effects created as a result of mixing chemicals together. **Glyphosate** and polyethoxethyleneamine - which are mixed together in the most popular roadside herbicide formulations - are about three times more lethal when tested in combination as when each ingredient is tested alone. Research on chemical blends like those in herbicide formulations is limited to lethal effects and acute eye and skin effects of formulations. No studies are done of mixtures of two or more formulations, and the added surfactants, regularly used on California's roads.

The potential for harm caused by these herbicides makes their use by government agencies on roads where millions of people travel each day a highly questionable activity. Caltrans recognized the gravity of this problem when it pledged to reduce its use of roadside chemicals by 50% by the year 2000. Unfortunately for Californians, by its own figures, it's clear that Caltrans will not fulfill this promise.