Cape Alliance for Pesticide Education
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March 15, 2010

Sue Phelan, Director
GreenCAPE
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Commissioner Scott Soares
251 Causeway Street, Suite 500
Boston, MA 02114

Dear Commissioner Soares,

In response to your request for scientific information from the citizens of Cape Cod who are opposed to NSTAR's use of herbicides on utility rights of ways, we respectfully submit this compilation of information for your review.

We believe that there is a risk of exposure to Cape citizens to the six herbicides being proposed for use by NSTAR across over 150 miles of rights-of-way on Cape Cod through groundwater contamination, direct contact during recreation use of rights-of-ways, chemical drift during spray application, and household dust from tracked-in residues. We are also concerned about the impacts to wildlife and the unsustainable nature of this management scheme.

We believe it is incumbent on NSTAR and the government agencies who regulate them to prove, that in these site-specific circumstances, herbicide use will not pose a risk to human health and the environment. The burden of proof should not be on those impacted. This shifting of burden of proof is already happening in Europe's chemical policy reform, and is being promoted in the U.S. Additionally, the impending Safer Alternatives Bill in the Massachusetts Legislature, if passed, will promote a shift towards finding safer alternatives to toxic chemical use. This provides the Department of Agriculture with an opportunity to be a leader in this major shift.

We understand needs for clearing rights-of-way, but we do not think that the risk posed by the current management plan to use herbicides matches the threat of the weeds NSTAR is trying to control. We believe there are more sustainable methods that will not contaminate our water supply or threaten our health.

Furthermore, based on operations so far, it has been shown that NSTAR does not have accurate maps or methods of meeting required setbacks from sensitive areas. We have concerns about the violation records of the companies applying the herbicides and the fact that the job goes to the lowest bidder.

A concise factsheet with just some of our research on the documented effects of the herbicides proposed for use by NSTAR related to these concerns is in Appendix A. In addition to that referenced factsheet, we submit more information on the following points.

We want the Department of Agriculture to act in the interests of Cape Cod residents and disallow the use of herbicides. We will work with NSTAR closely in the coming year, as agreed, to identify more viable alternatives that we believe will be a win-win both for long-term suppression of unwanted vegetation and for protection of our environment and health.

Sincerely,

Sue Phelan, Director
GreenCAPE

1. Current Pesticide Regulation does not Protect Human Health or the Environment
The continually emerging information on pesticide body burden in human blood and urine, pesticides in household dust, pesticides in ground and surface waters across this country, along with the ever growing body of literature linking pesticides to cancer, developmental delays, neurological harm, endocrine disruption and other health impacts show us that the current regulatory framework for pesticides does not provide for the protection of human health and the environment. See Appendix B.

The current mechanism for reviewing pesticide safety, the Registration Eligibility Decision (RED), process is slow to act on emerging information. For instance, since the publication of the agency's 1993 RED document, data has been emerging that point to various health and environmental consequences resulting from glyphosate and Roundup use. These include an increased risk of non-Hodgkin's Lymphoma (NHL), genetic damage, neurological impacts, as well as water contamination, impacts on amphibians and increasing weed resistance. We submit testimony to you on Glyphosate that was compiled by the national environmental community and submitted to EPA on September 21, 2000. See Appendix C.

2. Cape Cod is a Particularly Sensitive and Vulnerable Population and Ecosystem
On Cape Cod, with the incidence of breast cancer higher than the state average and women on the Cape having a 20% higher risk for breast cancer[i] we have an even greater reasons to work on a regional approach to sustainable land management that assures that our vulnerable populations and sole source aquifer will be protected from toxic and endocrine disrupting chemicals. We have a legacy of pesticide use on the Cape[ii] that is being investigated as the source of the high incidence of breast cancer. These pesticides, while more persistant than those used today, show that once tracked indoors they remain a source of exposure. [iii] Further, the chemical Triclopyr, being used by NSTAR, is part of a new investigation on endocrine disrupting chemicals on Cape Cod.

The drinking water supply for Cape residents is supplied almost entirely from the aquifer that underlies the entire land surface of the Cape. The sandy soils often have low organic content and the ground water can be ten feet below the surface or closer. Further, groundwater typically travels at a foot per day on Cape Cod, so these chemicals could easily contaminate groundwater supplies and nearby private drinking water wells. These hydrogeologic conditions would allow the two highly **mobile herbicides being used by NSTAR, Imazapyr isopropylamine salt and Metsulfuron-methyl,** to easily enter our aquifer. Glyphosate, a less mobile herbicide, has been found in groundwater in less permeable circumstances.

In addition, there have been concerns raised by Concerned Citizens Against Herbicide Use on Cape Cod and Massachusetts Breast Cancer Coalition that daycare centers and people with cancer that abut the rights-of-way are not adequately protected.

3. Pesticides (and Herbicides) have been Found to be Ubiquitous in U.S. Ground and Surface Waters

The U.S. Geologic Survey has done groundbreaking work to investigate the presence of pesticides, such as glyphosate, in ground and surface waters in urban and rural environments across many types of aquifers. This is particularly disturbing given that Roundup is marketed as immobile in the environment. While not all of the chemicals being used by NSTAR have been studied, the ubiquitous presence of many herbicides raises serious concerns. See Appendix D.

4. The Full Pesticide Product is not Disclosed or its Fate Understood in the Environment

The adjuvants and carrier agents, which often constitute the majority of the pesticide product are not part of the toxicity testing and therefore, the predictions of risk are not accurate. NSTAR continually informs the public that the amounts of herbicides being used are minute and this is misleading because they are not reporting the full volume of product. We should not be putting the petroleum distillates, one of the so-called "inerts" NSTAR is using, into our aquifer.

According to Cox, et. al, inert ingredients can increase the ability of pesticide formulations to affect significant toxicologic end points, including developmental neurotoxicity, genotoxicity, and disruption of hormone function. They can also increase exposure by increasing dermal absorption, decreasing the efficacy of protective clothing, and increasing environmental mobility and persistence. Inert ingredients can increase the phytotoxicity of pesticide formulations as well as the toxicity to fish, amphibians, and microorganisms. See Appendix E.

5. Resistance

The herbicides being used may not even be effective over the next several years in killing weeds. It is documented that weeds develop a resistance to herbicides, yet there is no regulatory mechanism to disallow their use when the herbicide is no longer effective. According to Herbicide-Resistance and Weed-Resistance Management (Dr. Ozair Chaudhry, Albert Campbell Collegiate Institute), "Over the past several years, we have seen the list of glyphosate resistant weeds grow to almost one dozen species, which are scattered across at least 20 states." He also cites a delay of when the resistance is found and when it is reported – 3 years for glyphosate.[iv]

6. Wildlife and Endangered Species are Inadequately Protected from Pesticides
The process by which one agency has signed off on the protection of endangered species has been perplexing to the concerned citizens. We would like documentation of what this process has been and how information is conveyed on to NSTAR. The fact that wildlife and endangered species are inadequately protected from pesticides, and that pesticides are frequently detected in vernal pools in parks and wildlife refuges are well documented. See Appendix F.

Appendix A

Support Sustainable Rights-of-Way Management

A Factsheet on NSTAR Herbicide Spraying across Cape Cod

http://www.greencape.org/NSTAR_GreenCAPE_SROWfactsheet.pdf

Appendix B
CDC Documents Chemicals in U.S. Population

The Centers for Disease Control and Prevention (CDC) is releasing its Second National Report on Human Exposure to Environmental Chemicals. This publication will report on levels of 116 chemicals measured in blood and urine of the U.S. population.

The CDC report includes expanded data on the 27 chemicals (metals, cotinine, organophosphate pesticides, and phthalates) that were listed in CDC's first report released in 2001, and first-time data on 89 additional chemicals that have never been measured in the U.S. population. New chemicals or categories of chemicals in the second report are additional organophosphate pesticides, organochlorine pesticides; carbamate insecticides; herbicides and pest repellents; polycyclic aromatic hydrocarbons; phytoestrogens; and dioxins, furans, and co-planar and non-coplanar PCBs (polychlorinated biphenyls).

To view the report and learn more about these chemicals and what it means that they are in our bodies, please visit the following sites. Please note that some of these sites will not be available until Friday, January 31, 2003 after the CDC report is released at 10:30 am eastern time.

CDC's New Report <<http://www.cdc.gov/exposurereport>> - A direct link to the Centers for Disease Control's Second National Report on Human Exposure to Environmental Chemicals. CDC tested hundreds of Americans for 116 chemicals.

Collaborative on Health and the Environment (CHE)- http://www.cheforhealth.org and CHE's Science Page - http://www.protectingourhealth.org. Describes the health effects of some of the chemicals covered in the CDC report.

EWG/Commonweal Body Burden Report <http://www.ewg.org> - With Mt. Sinai School of Medicine in New York, the Environmental Working Group and Commonweal tested nine Americans for 210 chemicals found in consumer products and industrial pollution. The EWG/Commonweal report provides a personal view of chemical body burden testing and its implications for public health.

Pesticide Action Network's Pesticide Backgrounder <http://www.panna.org> - Describes the types of pesticides found in the CDC report, sources of exposure and health effects, with detailed fact sheets on 7 key chemicals and direct links to PANNA's pesticide database for 32 pesticides.

Physicians for Social Responsibility's *Bearing the Burden: Health Implications of Environmental Pollutants in Our Bodies* <http://www.environhealthaction.org/bearingtheburden> - Provides information on the known and potential health effects of human exposure to the chemicals studied in the CDC report.

Appendix C

BEYOND PESTICIDES
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September 21, 2009

Office of Pesticide Programs (OPP) Regulatory Public Docket (7502P), Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460–0001.

Re: Registration Review; Glyphosate Docket Opened for Review and Comment. Docket Number: EPA–HQ–OPP–2009–0361

Dear Sir/Madam,

Thank you for the opportunity to comment on the docket for glyphosate. Glyphosate (N-phosphono-methyl glycine), first registered in 1974, has become one of the most popular herbicides in the US market, with use dramatically increasing in recent years. Most commonly formulated as Monsanto's Roundup herbicide, approximately 135 million pounds per year1 of glyphosate end-use products are used on a variety of agricultural crops (and non-agricultural sites such as lawns, gardens and parks), more than seven times its annual reported usage when its first Reregistration Eligibility Decision (RED) document was published in 1993.2 During this time of increasing glyphosate popularity, and **since the publication of the agency's 1993 RED document, data has been emerging that point to various health and environmental consequences resulting from glyphosate and Roundup use. These include an increased risk of non-Hodgkin's Lymphoma (NHL), genetic damage, neurological impacts, as well as water contamination, impacts on amphibians and increasing weed resistance.** As a result of these human and environmental health impacts, Beyond Pesticides and the signatories to this letter strongly urge the agency, as it moves forward with the Registration Review process, to seriously consider the new and emerging science which illustrates that glyphosate and its formulated products pose unreasonable risk to human and environmental health, and as such should not be considered eligible for continued registration.

Human Exposures to Glyphosate Pose Unacceptable Risks There are hundreds of glyphosate products currently registered with the agency3 under numerous formulations. The agency considers the active ingredient glyphosate (most commonly used as its three salts—isoproplyamine, sodium and monoammonium salts- as well as the technical acid, in registered pesticide products) to be of low acute toxicity (Toxicity Category III). In June 1991, EPA classified glyphosate as a Group E carcinogen—evidence of non-carcinogenicity for humans—based on the lack of convincing evidence of carcinogenicity in adequate studies. **Since this decision, a 1999 study found that people exposed to glyphosate are 2.7 times more likely to contract non-Hodgkin Lymphoma (NHL)4. In 2002, study of Swedish men showed that glyphosate exposure was *significantly***

associated with an increased risk of NHL, and hairy cell leukemia—a rare subtype of NHL. 5 Further, a 2003 review of studies conducted on farmers by researchers at the NationaCancer Institute showed that exposure to glyphosate was associated with an increased incidence of NHL.6 According to the American Cancer Society, non-Hodgkin lymphoma is a cancer that starts in cells called lymphocytes, which are part of the body's immune system.7

Researchers evaluated associations between glyphosate exposure and cancer incidence in the Agricultural Health Study (AHS)8, a cohort study of 57,311 licensed pesticide applicators and found that glyphosate had a suggested association with multiple myeloma, a cancer that starts in plasma cells, a type of white blood cell.9 This association with multiple myeloma was observed with use of glyphosate and cumulative exposure days of use (a combination of duration and frequency).

There is also a tentative association between ADD/ADHD,10 increased risks of late abortion,11 and endocrine disruption12 with glyphosate use.

Researchers agree that glyphosate deserves further epidemiologic study in light of these data and the widespread use of this chemical. Given that the reported incidence of NHL

has increased during the period 1990-2005 (0.4% for men, 1.2% for women)13 coincides with the increased use of Roundup during that period (glyphosate was the most used active ingredient in agriculture and ranked #2 for non-ag uses in 2001),14 it is hard to ignore these statistics.

Roundup Formulations Are Toxic, Yet Go Unevaluated For each of the many Roundup product formulations on the market, people are exposed to not only the active ingredient glyphosate, but the various "inert" ingredients included to make the product a more effective and/or long lasting herbicide. Beyond Pesticides and many of the signatory organizations have long advocated for the full disclosure and evaluation of all chemical ingredients in pesticide products. These ingredients are neither inert nor inactive, and are responsible for serious human health implications.

An increasing number of studies have found that formulated glyphosate products are more toxic than the active ingredient glyphosate alone. One study by Walsh, et al. found that Roundup decreased steroidogenesis, indicating that at least one other component of the formulation is required to disrupt steroidogenesis since it was observed that glyphosate alone did not alter steroid production.15 In 1998, researchers found that Roundup was able to induce a dose-dependent formation of DNA adducts in the kidneys and liver of mice.16 The researchers concluded that the Roundup-related DNA adducts were not related to the active ingredient (the isopropylammonium salt of glyphosate) but to another, "unknown" component of the herbicide formulation. Dallegrave et al. (2003 & 2007), in studies with Wistar rats, also found that Roundup induces developmental retardation of the fetal skeleton, a decrease in sperm number, an increase in the percentage of abnormal sperms and a dose-related decrease in the serum testosterone level at puberty.17 A 2004 study examining glyphosate effects on cell cycle regulation concluded that glyphosate-based pesticides are clearly of human health concern based on results that demonstrated a molecular link between glyphosate-based products and cell cycle dysregulation—a hallmark of tumor cells and human cancers.18 A 2008 study confirmed <u>that the adjuvants in Roundup formulations kill human cells, particularly embryonic, placental and umbilical cord cells, even at very low concentrations</u>.19 These researchers found that Roundup formulations cause total cell death within 24 hrs, through an inhibition of the mitochondrial succinate dehydrogenase activity, and necrosis, by release of cytosolic adenylate kinase measuring membrane damage. Polyethoxylated tallowamine or POEA—a surfactant used in herbicidal products—was found to be the most potent "inert" and was responsible for the elevated toxic effects. Another study found that the cytotoxicty of Roundup formulations were amplified with time and that exposure affects human reproduction and fetal development.20 Roundup reduces human placental JEG3 cell viability at least two times more efficiently than glyphosate, disrupts aromatase activity, and mRNA levels.21

EPA is aware that certain glyphosate formulations are toxic due especially to inert ingredients. In **EPA's 1993 RED document for glyphosate the agency noted that "a toxic inert in glyphosate end use products" was toxic to fish and necessitates labeling requirements.22 In EPA's recently published registration review summary document for glyphosate, the agency requests toxicity data for POEA "due to uncertainty about its risk to aquatic animals**."23 We are urging the agency to look into human toxicity regarding POEA and other potentially toxic "inert" ingredients in

glyphosate formulations based on the above mentioned data and in light of increased residential, occupational and recreational use exposures. **EPA tends to perform risk assessment on individual active ingredients and ignore formulations that include other ingredients that can either amplify the toxicity for the active ingredient or that are toxic themselves**.

The continued exemption of inert ingredients in the registration process highlights the primary flaw with the agency's regulatory process for both active and inactive ingredients in pesticide products. Rather than adopt a precautionary approach when it comes to chemicals with unknown toxicity, EPA continues to allow chemicals to remain "innocent until proven guilty," and relies on a flawed risk assessment process that does not adequately address exposure and risk. Once proven guilty, these pesticides, both active ingredients and "inerts", have already left a toxic trail in the environment and people's well-being. EPA now has the opportunity and the obligation to address concerns about "inert" ingredients in glyphosate products.

FQPA 10x Factor Must be Reinstated. EPA, in its 2006 aggregate human health risk assessment for glyphosate, decided that the Food Quality Protection Act (FQPA) safety factor of 10x be removed and reduced to 1x citing that "no evidence of quantitative or qualitative increased susceptibility of the young demonstrated in the prenatal developmental studies in rats and rabbits and pre/post natal reproduction study in rats."24 This decision is flawed in light of the science. The purpose of the FQPA 10-fold margin of safety is to "to protect infants and children, taking into account the potential for pre- and post-natal toxicity." 21 USC §346a(b)(2)(C). As mentioned above, the data shows that glyphosate and its formulated products adversely affect embryonic, placental and umbilical cord cells, and impacts fetal development. Richard, et al. reports that glyphosate is toxic on human placental JEG3 cells within 18 hrs with concentrations lower than those used in agriculture.25 This effect was found to increase with concentration and time, or in the presence of Roundup adjuvants. Arbuckle, et al. found that preconception exposures to glyphosate moderately increased the risk for spontaneous abortions26 in mothers exposed to glyphosate products.

Residential uses of glyphosate expose infants and children to variable and high concentrations of active and "inert" ingredients, via drift and direct or indirect contact with treated lawns. A Farm Family exposure study found that all but one of the 79 children evaluated had detectable concentrations of glyphoste in their urine.27 **While most of the active ingredient glyphosate is excreted quickly from the body, "a part may be retained or conjugated with other compounds that can stimulate biochemical and physiological responses."28 Other studies, including those cited above, name glyphosate as an endocrine disruptor due to its activity on aromatase activity and mRNA levels.** The agency still lags behind in finalizing a screening process for endocrine disruption and has still not been able to screen any chemicals for endocrine disruption to date.

As a result of the evidence against glyphosate for endocrine disruption, placental cell damage, and the potential for impaired fetal development, the agency must reinstate the 10X safety factor in accordance with FQPA.

Polyethoxylated Tallowamine (POEA) Surfactant The agency is specifically requesting data for the surfactant POEA. The agency also proposed two approaches for assessing the hazard posed by POEA: (1) use of structural activity relationships for surfactants, and (2) toxicity testing for a subset of the surfactants. The use of structural

activity relationships (SAR) is a useful tool to help determine the potential toxicity of a chemical in the absence of real data. They can be used to make predictions about the physical, chemical and/or biological activity of the chemical being assessed. However, it is by no means to be used as a substitute for available, reliable, measured data, especially in this case, where data is already available. Therefore the agency must utilize toxicity testing and toxicity data, which can be supplemented with SARs, in its assessment of POEA.

As noted above, POEA has been found to be highly toxic. A study by Brausch and Smith found that three formulations of POEA consisting of a 5:1, 10:1, and 15:1 average oxide:tallowamine ratio were all extremely toxic to fairy shrimp (*Thamnocephalus platyurus)*,29 and toxic to *Daphnia magna.30* POEA toxicity was also found to increase as the tallowamine chain length was reduced. POEA accounted for more than 86% of Roundup toxicity on microalgae and crustaceans in a study conducted by Tsui and Chu.31 This study also found that an increase in pH (6-9) and increase of suspended sediment concentration (0-200 mg/l) significantly increased the toxicity of Roundup to *Ceriodaphnia dubia*. Interestingly, this study determined that the order of toxicity to aquatic invertebrates were as follows; POEA>Roundup>glyphosate acid>IPA salt of glyphosate. In light of these and other available data on POEA, the agency must determine that POEA poses unreasonable risk to human health and the environment.

Glyphosate and Roundup Threaten Water Quality and Aquatic Life More than 135 million pounds of glyphosate are used annually in the U.S., applied to agricultural fields, lawns, **right-of-ways** and other areas where weeds are not wanted. The prevalence of Roundup-ready crops—genetically modified to tolerate glyphosate, has contributed to the high rates of glyphosate use on agricultural sites. Many sites where Roundup is used are in proximity to water ways and wetlands.**32 In 2002, the U.S. Geological Survey collected 154 water samples from 51 streams in nine Midwestern States and glyphosate was detected in 55 (36%) of the samples, and aminomethylphosphonic acid or AMPA (a degradation product of glyphosate) was detected in 107 (69%) of the samples.33 APMA is typically detected much more frequently, especially in urban environments.34 This study found that glyphosate contamination endured from spring through to fall when many researchers presumed it would have already degraded so late in the growing season. Glyphosate and AMPA are more frequently detected in surface water rather than ground water.35 EPA acknowledges that glyphosate has the potential to contaminate surface water because it does not readily break down in water or sunlight. Due to glyphosate's potential for contamination, the agency has established a maximum contaminant level (MCL) for glyphosate (0.7ppm).36 The agency lists the short- and long-term heath effects for** drinking water exposures: for relatively short periods of time, congestion of the lungs and increased breathing rate; for lifetime exposure at levels above the MCL kidney damage and reproductive effects. Glyphosate has registered use for control of emergent aquatic weeds in ditches, wetlands, and margins of water bodies. However, glyphosate and its formulated end-use products have been proven to be toxic to aquatic organisms. It is therefore unclear why the agency would allow such uses for glyphosate. Glyphosate was measured at high concentrations (highest-328 µg/l) in vernal pools and adjacent flowing waters in Washington, D.C.—a concentration that exceeds the freshwater aquatic life standard for glyphosate—in a 2008 study conducted by researchers at the USGS.37 **A study by Relyea in 2005 found that Roundup alone is "extremely lethal" to amphibians in concentrations found in the environment.38 Another study found that**

***Rana pipiens* tadpoles chronically exposed to environmentally-relevant concentrations of glyphosate formulations, containing POEA, exhibited decreased snout-vent length at metamorphosis, increased time to metamorphosis, tail damage, and gonadal abnormalities. These effects were due in part to disruption of hormone signaling, because thyroid hormone receptor beta mRNA transcript levels were elevated by exposure to formulations containing glyphosate and POEA.39 The authors of this study concluded that surfactant compositions must be considered in the evaluation of toxicity of glyphosate-based herbicides.** Native freshwater mussels, *Lampsilis siliquoidea,* were found to be the most sensitive aquatic organisms tested with glyphosate-based chemicals and its surfactants.40

EPA's and Monsanto's message is that the application of Roundup, at recommended rates, should not adversely affect resident populations of fish or invertebrates in these systems. Yet the agency requires the labeling of some glyphosate products "toxic to fish" as these products are applied directly to aquatic environments. **The agency has not taken into consideration concentrations of glyphosate or Roundup that have already contaminated these water bodies via transport of residues adsorbed in soil particles suspended in runoff water, leaching and drift, phenomena it is well aware occurs.41 Other environmental factors such as high sedimentation, increases in temperature and pH levels have been shown to increase the toxicity of Roundup, especially to young fish,42 though they go unaddressed by the agency.** The agency has already determined that glyphosate and its salts, as well as its metabolite AMPA, are likely to adversely impact the endangered California red-legged frog based on prey and habitat reduction.43 EPA must now determine that glyphosate, its salts, metabolite and its formulated end-use products, pose unreasonable harm not only to frogs, but to other aquatic organisms.

<u>Glyphosate</u> and Roundup-Ready Crops Lead to <u>Increasing Resistance</u> Herbicide-resistant weeds have ballooned in recent years, due particularly to the expansion of Roundup-ready crops, including soybeans and alfalfa. According to the USDA's National Agricultural Statistics Service, biotechnology plantings as a percentage of total crop plantings in the U.S. are 46% for corn, 76% for cotton, and 85% for soybeans. With rising prevalence of herbicide-tolerant crops, challenges caused by increased herbicide resistance have arisen. When genetically engineered food products, such as Roundup-ready crops, were commercially developed in the 1990's, they were sold to the public as a technology that, among other things, would reduce pesticide use. In reality, it has done just the opposite. The use of Roundup-ready crops increases the use of glyphosate products and in turn increases the onset of resistant species. **One survey of farmers' herbicide use patterns found that glyphosate use continued to increase, with concomitant decreases in utilization of other herbicides, with a high number of farmers making one to three post applications per year.44** Glyphosate-resistant horseweed was first reported in 2000 in Delaware45 and has since been found in several other states, including Mississippi, Arkansas and Tennessee.46 In 2005, University of California researchers identified strains of mare's tail, also known as horseweed (*Conyza canadensis*), that are resistant to herbicide.47 Data showed that clusters of horseweed can grow robustly even when sprayed with four times the recommended amount of theherbicide glyphosate. **The researchers hypothesized that resistance evolved due to the repeated use of glyphosate over a number of years over large treated areas**. A follow-up study in 2007 showed that a glyphosate-resistant biotype of horseweed also exists in non-crop areas.48 In addition, resistance is found in rigid ryegrass (*Lolium*

rigidum) populations, the inheritance of which appeared to be nuclear, incompletely dominant, multigenic, and pollen-transmitted.49 In general, in regions of the U.S. where Roundup-ready crops dominate, there are now evolved glyphosate-resistant populations of economically-damaging weed species including *Ambrosia artemissifolia* L., *Ambrosia trifida* L., *Amaranthus palmeri* S, *Amaranthus rudis, Amaranthus tuberculatus* (Moq) *Conyza* and *Lolium* spp.50 In other parts of the world where Roundup-ready crops are used, weed resistance has also appeared. In Argentina and Brazil, for example, there are now evolved glyphosate-resistant populations of *Sorghum halepense* L. and *Euphorbia heterophylla* L. **The proliferation of glyphosate-resistant weeds presents an ever-growing economic concern to farmers, since a widespread distribution of hard-to-control weeds has the potential to cause significant economic losses. Scientists studying the phenomenon agree that it is of economic concern and advise against the dependence on glyphosate, and advise the use of crop rotations and the rotation to non Roundup-ready crops.51**

Human Incidents Are Too High EPA's Incident Data System recorded 289 incidents involving glyphosate between 2002 and 2008. Symptoms recorded included dermal, neurological, gastro-intestinal symptoms among others. The agency states that their findings were "moderately large" and warrants searching other databases for consistency and reproducibility of incident data. The American Association of Poison Control Centers 2007 data for the National Poison Data System reported 4,593 cases involving glyphosate with 25% involving children younger than six yrs and over 85% being unintentional (accidental) exposures. This figure is considerably larger than EPA 'moderate' 289 incidents. Glyphosate is one of the highest-ranking herbicides that causes pesticide-induced illness or injury. EPA must make a greater effort to protect consumers from pesticide injuries and reevaluate the "low toxicity" rating given to glyphosate products.

Conclusion As the agency moves forward with the registration review process for glyphosate, we hope that the scientific evidence provided in these comments, and others, would be duly considered. Glyphosate and Roundup have been linked to so many serious adverse human and environmental health concerns that the agency must take care to thoroughly evaluate the data. Most important is the finding that glyphosate end-use products are more toxic then glyphosate itself. This is important since the agency has traditionally ignored the effects of pesticide mixtures and inerts and tends to focus solely on the active ingredient. The ingredient POEA found in many glyphosate products (and others) has been found to be incredibly toxic to human cells and aquatic organisms. The agency must reconsider the use of this ingredient in any pesticide formulation, based on its potential to cause unreasonable harm.

Arguments will be made that glyphosate and Roundup are valuable herbicidal tools in the agricultural and lawn care markets. Roundup is cheaper and more readily available than many other chemicals and provides an economic benefit to many farmers for the short-term control of weeds. **However, based on current science, the risks posed by glyphosate to human health and the environment, and to agriculture in the form of increasing weed**

resistance, far outweigh any short-term economic benefit that it may provide. Conversely, there are safer alternatives for lawn care and agriculture that have proven effective at controlling weeds, provide long term economic benefit and environmental sustainability. These include organic and sound IPM practices. The agency has been tasked to protect and uphold human and environmental health and now is the time to do so.

Thank you for your attention to our comments.

Sincerely,
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Nichelle Harriott
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Appendix D

1. Glyphosate Studies

a) Glyphosate Herbicide Found in Many Midwestern Streams, Antibiotics Not Common

http://toxics.usgs.gov/highlights/glyphosate02.html

Researchers with the U.S. Geological Survey (USGS) recently investigated 51 streams in nine Midwestern States to determine the presence of a wide range of herbicides, their degradation byproducts and antibiotics. Herbicides were detected in most water samples, which were collected to coincide with runoff events following herbicide application, but antibiotics were detected in only 1 percent of the samples.

What was found?
A total of 154 water samples were collected during the 2002 study in nine Midwestern States. Glyphosate was detected in 36 percent of the samples, while its degradation product, aminomethylphosphonic acid (AMPA) was detected in 69 percent of the samples. The highest measured concentration of glyphosate was 8.7 micrograms per liter, well below the MCL (700 micrograms per liter). The highest AMPA concentration was 3.6 micrograms per liter (there is no MCL for AMPA). Other herbicides were detected at low levels, below health standards, in most samples. Atrazine was detected at or above the 3 microgram per liter MCL in 30% of the samples. Atrazine concentrations were generally lower, however, than those found in previous USGS studies conducted in the 1990s.

b. Concentrations of Glyphosate, Its Degradation Product, Aminomethylphosphonic Acid, and Glufosinate in Ground- and Surface-Water, Rainfall, and Soil Samples Collected in the United States, 2001-06

By Elisabeth A. Scribner, William A. Battaglin, Robert J. Gilliom, and Michael T. Meyer http://pubs.usgs.gov/sir/2007/5122/

2. U.S. Geologic Survey Pesticides in Nations Streams and Groundwater
http://pubs.usgs.gov/fs/2006/3028/

Streams in agricultural and urban areas almost always contained complex mixtures of pesticides and degradates. More than 90 percent of the time, water samples from streams with agricultural, urban, or mixed-land-use watersheds contained 2 or more pesticides or degradates, and about 20 percent of the time they had 10 or more. Mixtures were less common in ground water. Nevertheless, about half of the shallow wells in agricultural areas and about a third of shallow wells in urban areas contained 2 or more pesticides and degradates—less than 1 percent had 10 or more. The herbicides atrazine (and its degradate, deethylatrazine), simazine, metolachlor, and prometon were common in mixtures found in streams and ground water in agricultural areas. The insecticides

diazinon, chlorpyrifos, carbaryl, and malathion were common in mixtures found in urban streams.

Degradates are often as common in streams and ground water as their parent pesticides. For example, atrazine, the most heavily used herbicide in the Nation during the study period, was found together with one of its several degradates, deethylatrazine, in about 75 percent of stream samples and about 40 percent of ground-water samples collected in agricultural areas across the Nation. Degradates are particularly important in ground water, which moves relatively slowly through soils and aquifers, providing the extended time and conditions favorable for transformation of pesticides. Most degradates are less toxic than their parent pesticide, but some have similar or greater toxicities.

The widespread and common occurrence of pesticide mixtures, particularly in streams, means that the total combined toxicity of pesticides in water and other media often may be greater than that of any single pesticide compound that is present. Continued research is needed on the potential toxicity of pesticide mixtures, including degradates, to humans, aquatic life, and wildlife. NAWQA data on the occurrence and characteristics of mixtures and degradates is helping to target and prioritize toxicity assessments.

b) Transport of Herbicides in Streams and Shallow Ground Water -- Cedar River, Iowa

http://toxics.usgs.gov/sites/cedar_river.html

This project investigated the movement of selected agricultural chemicals between surface water in the Cedar River and ground water in an adjacent alluvial aquifer in east-central Iowa. The selected chemicals include nitrate, alachlor, ametryn, atrazine, cyanazine, deethylatrazine, deisopropylatrazine, metolachlor, metribuzin, prometon, prometryn, propazine, simazine, and terbutryn. On a small scale, USGS scientists investigated chemical movements by installing observation wells in the alluvial aquifer adjacent to the river at an unfarmed site (an area where agricultural chemicals were not used) 15 kilometers downstream of Cedar Rapids, Iowa. Ground-water samples from these wells, as well as river and other surface-water samples, were collected during base-flow conditions and selected periods of runoff from May 1989 through July 1991. The results of this project showed that nonpoint source contaminants could migrate from surface water into ground water. This was demonstrated by modeling the water-quality data with a two-dimensional ground-water flow model. The model described quantitatively the movement of bank-storage water into and out of the alluvial aquifer in response to rising and falling river stages. On a large scale, the movement of agricultural chemicals from ground water to surface water was quantified for two periods of time in 1989 and 1990 along a 117-kilometer reach of the Cedar River.

Appendix E

Full Citation: Environ Health Perspect. 2006 Dec; 114(12):1803-6.
Unidentified inert ingredients in pesticides: implications for human and environmental health. **Cox C, Surgan M.,** Northwest Coalition for Alternatives to Pesticides, Eugene, Oregon, USA. caroline@cehca.org

BACKGROUND: By statute or regulation in the United States and elsewhere, pesticide ingredients are divided into two categories: active and inert (sometimes referred to as other ingredients, adjuvants, or coformulants). Despite their name, inert ingredients may be biologically or chemically active and are labeled inert only because of their function in the formulated product. Most of the tests required to register a pesticide are performed with the active ingredient alone, not the full pesticide formulation. Inert ingredients are generally not identified on product labels and are often claimed to be confidential business information. OBJECTIVES: In this commentary, we describe the shortcomings of the current procedures for assessing the hazards of pesticide formulations and demonstrate that inert ingredients can increase the toxicity of and potential exposure to pesticide formulations. DISCUSSION: Inert ingredients can increase the ability of pesticide formulations to affect significant toxicologic end points, including developmental neurotoxicity, genotoxicity, and disruption of hormone function. They can also increase exposure by increasing dermal absorption, decreasing the efficacy of protective clothing, and increasing environmental mobility and persistence. Inert ingredients can increase the phytotoxicity of pesticide formulations as well as the toxicity to fish, amphibians, and microorganisms. CONCLUSIONS: Pesticide registration should require full assessment of formulations. Evaluations of pesticides under the National Environmental Policy Act, the Endangered Species Act, and similar statutes should include impact assessment of formulations. Environmental monitoring for pesticides should include inert ingredients. To enable independent research and risk assessment, inert ingredients should be identified on product labels.

Full Article: http://ehp.niehs.nih.gov/members/2006/9374/9374.pdf

Appendix F

Wildlife and Endangered Species are Inadequately Protected from Pesticides
http://www.panna.org/node/817

Pesticides are Detected in Vernal Pools in Parks and Wildlife Refuges
http://toxics.usgs.gov/highlights/vernal_pools.html

[i] http://www.mbcc.org/content.php?id=123

[ii] http://library.silentspring.org/atlas/pesticides/index.asp

[iii] http://s20428.gridserver.com/our-research/everyday-chemical-exposures/household-exposure-study

[iv] http://www.weedscience.org/paper/Book_Chapter_I.pdf