ROADSIDE HERBICIDE SPRAY RECORD DATA

FOR:

JACKSON COUNTY, OREGON

APRIL 2018 TO APRIL 2019

REVISED DECEMBER 20, 2019

November 3, 2019

CONTENTS

ERRATA

Following the publication of our report on November 3, 2019, we discovered errors in our data compilation of gallons of concentrated herbicide used. Transcribing hand written records into a digital format was a monumental task, as was tabulating those data into useful and meaningful reports and charts. All errors were unintentional resulting from either the use of incorrect formulas summarizing data or where individual cells in the spreadsheet were out of place; for example, incorrectly linking to 497 ounces of Telar instead of the 23 gallons. The original calculation of total gallons applied of 2575 gallons was incorrect; the correct calculation should be 1569 gallons.

All errors in product quantities have been corrected and are listed in Table 1 and in Graphs 1 and 2.

On page 12, IMPACTS OF PESTICIDES, WATERWAYS: this sentence is corrected to read: "The stream surveys detected the herbicide Diuron in 71 of 151 samples although it never exceeded the EPA benchmark concentration for environmental contamination."

We took this opportunity to make additional changes within the document to clarify our points.

Three additions to the REFERENCES section were added:

Two references from the US EPA regarding Urban Runoff - Low Impact Development (22) and Green Infrastructure (23) and the following:

Can herbicides cause breast cancer? Purdue and INSERM scientists discover a piece to the puzzle.

Using a human breast tissue cell line implanted into experimental animals revealed glyphosate exposures at minute levels can cause the most serious and aggressive forms of breast cancer in a human breast tissue cell line and an experimental model system. "Although cells exposed to glyphosate alone did not induce tumor growth, cancerous tumors did develop after glyphosate was combined with molecules that were linked to oxidative stress. Oxidative stress is a chemical reaction that occurs as the result of aging, diet, alcohol consumption, smoking or other stressors, and it alters the organization and integrity of the genome of the breast, aiding cancer development." Frontiers in Genetics, September 30, 2019. https://www.purdue.edu/newsroom/releases/2019/Q3/can-herbicides-cause-breast-cancer-purdue-and-inserm-scientists-discover-a-piece-to-the-puzzle..html (27)

ACKNOWLEGEMENTS

We acknowledge the following groups and people for their help in putting this report together.

First, thank you to the Jackson County Roads Department for responding quickly and professionally to our request for one-year of spray record data. Without that information, this report would not have been possible.

Non Toxic Southern Oregon is an initiative of Pollinator Project Rogue Valley and Beyond Toxics. A huge thanks to Kristina Lefever for all of her unending enthusiasm and encouragement, and Dr. Ray Seidler who helped to keep us focused on the big picture and provided invaluable scientific data about the risks from herbicides currently in use by Jackson County Roads. The report was improved with the insight they both contributed. And, grateful appreciation to Lisa Arkin and Bianca Ballara for their support and guidance throughout this whole process.

Thanks go out to our amazing Non Toxic Roadsides team here in Jackson County. Thank you for all your contributions and unending enthusiasm. You have helped keep us all motivated and moving in a positive direction.

We wish to acknowledge and appreciate the conversations we have had with our Jackson County Commissioners and John Vial of Jackson County Roads since the publication of our first report. We are very pleased that the Owner Maintained Agreement and process for people to notify the county to not spray along their own road frontage will be reviewed and updated, the Integrated Vegetation Roadside Management Plan will be reviewed with public input, and, most importantly, a Roads advisory committee will be formed to discuss the use of highly hazardous pesticides along Jackson County roads and alternatives to same.

EXECUTIVE SUMMARY

This Report was written for our Jackson County Commissioners and the Jackson County Roads Department. It was compiled from actual spray records obtained, published health studies, and environmental reports from the Pesticide Stewardship Partnership. We hope the findings from this Report will be addressed without delay. Our intent is to share this updated errata Report with the public.

We reviewed 12 months of Jackson County Road spray records, which are the daily logs recorded by the spray operators. Because some records were incomplete for some of the spray events, our tabulations are based only on the documented numbers recorded by the spray operators:

- Approximately 1569 gallons of concentrated herbicides were applied
- 19 different herbicides were used
- 86% of the volume of herbicides applied are Highly Hazardous Pesticides as defined by the International Pesticide Action Network (note: an herbicide is a pesticide that kills weeds)
- 677 unique roadside locations were visited, with a total of 1391 spray events along those roads
- 58 of these sites were visited 5 or more times during the year
- Several of the same herbicides applied by Jackson County Roads were found in surface waters by the Pesticide Stewardship Partnership sampling and analysis program conducted by Oregon DEQ and the local Jackson Soil and Water Conservation District
- Epidemiological and molecular studies provide substantial evidence that pesticides are associated with excess cancer risk in applicators, bystanders, and agricultural workers
- Scientists around the world are calling for a "serious reduction in pesticide usage" now to prevent the extinction of up to 41% of the world's insects, including pollinators, within the next few decades
- Many municipalities throughout the US and around the world have taken action to reduce the use of pesticides in public spaces. Alternative roadside management strategies and methods that don't rely on toxic herbicides are already in use in Oregon.

We encourage Jackson County Roads to consider this report and craft an Integrated Roadside Vegetation Management program to reduce, if not eliminate, the use of herbicides along county roads.

Non Toxic Southern Oregon is requesting that the County Commissioners schedule a public work session with experts from Lane County, Portland Metro, and Washington State DOT in 2020. We have invited and received confirmation that these Road Maintenance Departments are willing to share their knowledge and protocols on roadside maintenance. Our goals are to facilitate this discussion and the transition to methods and products that will ensure our County is a safer place for all residents.

REPORT FINDINGS

In April 2019 Non Toxic Roadsides Southern Oregon, an all-volunteer group of concerned citizens, requested and received the roadside vegetation spray records from Jackson County Roads Department.

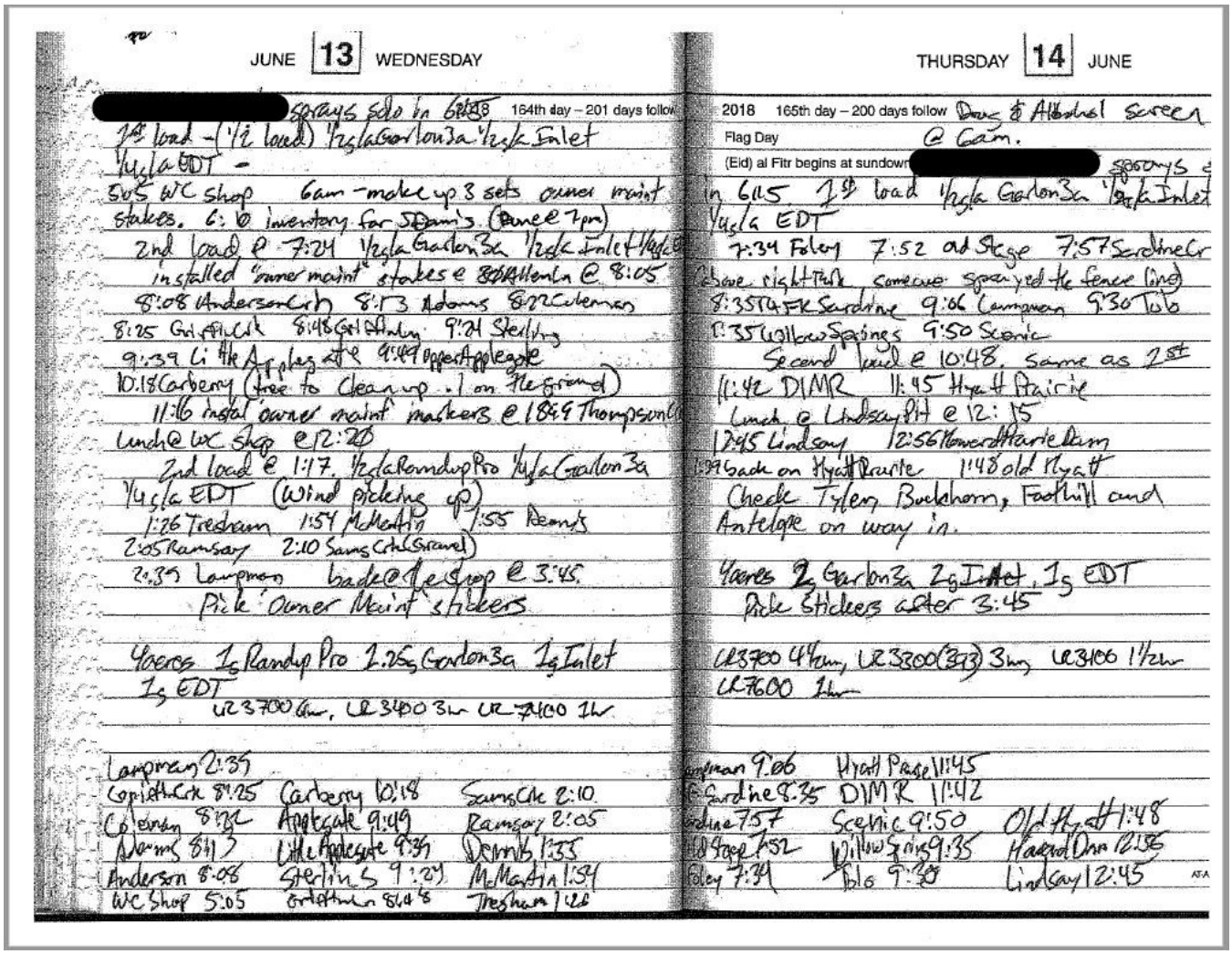
We spent time reviewing, compiling, and digitizing this report because we are very concerned with the amount of herbicides being applied along County roads every year, as well as the impact to our health, the environment, and our County budget. Another concern is the visual impact to both residents and tourists from the dead plant material and bare dirt along the roads they drive on within our beautiful Valley.

SPRAY RECORDS

The period reviewed covered one year of spray records from April 16, 2018 to April 18, 2019.

Over this one-year period, 203 spray records were evaluated. An example of a handwritten spray record is shown below (Figure 1).

Figure 1 sample of original spray record.



In general, County spray operators recorded the following in each daily record: spray equipment operator, vehicle and driver, type and application rate of herbicide used (plus adjuvants), road names and time of visits, the date, and number of times tanks of herbicides were reloaded each day. At the end of each day, spray operators typically recorded the total gallons of concentrated herbicides used, total acres sprayed and lane miles traveled.

The data we used to digitize these (incomplete) records and evaluated in this report include: type and quantity of herbicides used, date of herbicide application, name of roads sprayed, and total acres of roadsides where herbicides were applied onto the roadside shoulders.

SPRAY RECORD INCONSISTENCIES

Not all spray records listed all the information consistently. Of the 203 spray records, 15% of the records did not record the total acres and 62% of the records were missing the total lane miles traveled. Likewise, 32% of the daily records were missing the total gallons of herbicides used. If the total acres for that day was listed, the estimated total gallons of herbicides used that day was calculated using the recorded rate of application multiplied by the total acres recorded that day.

Only 6% of the records list where specific herbicides had been applied (typically a road intersection or bridge) along with the type of vegetation targeted (i.e., grasses, broad leaf, shrubs, trees, mixture, etc.).

Only 2% or the records list that the vegetation was controlled mechanically.

SPRAY RECORD DATA SUMMARY

Over the period evaluated, according to the spray records, an approximate total of 1569 gallons of concentrated herbicides * were diluted into tanks of water and applied over approximately 2585 acres of County roadside rights of way. The acreage listed is taken from the original spray records. (Note: overall actual total acreage is unknown since 15% of the logs did not record this data.)

Table 1 lists all the products used over the one-year time period, the total concentrate used, the season(s) of use, and the active ingredients.

Peak herbicide use occurred from December through May, though spraying occurred throughout the year at lower levels. The most common herbicides used during winter and early spring spray applications were pre-emergent types of herbicides: Esplanade, Telar and Diuron. Spring herbicide applications consisted of broad spectrum post emergent herbicides containing glyphosate: Glyphosate 5.4, RoundUp Pro and RoundUp Custom, and specialized herbicides that target specific plant types such as woody and other broadleaf plants, in this instance Garlon 3A.

TABLE 1: COMPLETE LIST OF HERBICIDES SPRAYED

Table 1 lists the 25 chemicals sprayed (includes 6 adjuvants) by Jackson County Roads Department on the County's roadsides from April 2018 to April 2019.

Products listed in the **Bold** red box are on the Highly Hazardous Pesticide (HHP) list**.

PRODUCT NAME *	TOTAL PRODUCT APPLIED (GALLONS)	ACTIVE INGREDIENTS	SEASON OF USE	HHP
HERBICIDES				
Diuron 4L	651.30	3-(3,4-dichlorophenyl)-1,1-dimethylurea	Year-round, peak Jan - May	**YES**
Glyphosate 5.4	5.06	Glyphosate, N-(phosphonomethyl)glycine, in the form of its isopropylamine salt	Spring only	**YES**
Krovar I DF	362.80 (quantity is listed in pounds)	Bromacil [5-bromo-3-sec-butyl-6-methyluracil] and Diuron	Discontinued; used Apr - May, Airport only	**YES**
RoundUp Custom	42.75	Glyphosate, N-(phosphonomethyl)glycine, in the form of its isopropylamine salt	Year-round	**YES**
RoundUp Pro	655.81	Glyphosate, N-(phosphonomethyl)glycine, in the form of its isopropylamine salt	Year-round, peak spring	**YES**
Speedzone	0.00 (0.06 ounces)	Carfentrazone-ethyl, 0.62%; 2,4-D, 2-ethylhexyl ester 28.57%; Mecoprop-p acid 5.88%; Dicamba acid 1.7%	One-time use, Dec 2018	**YES**
Element 4E	0.10	Triclopyr: 2-[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid, triethylamine salt	One-time use, winter (Jan)	NO
Escort XP	0.74	Metsulfuron methyl Methyl 2-[[[[(4-methoxy-6-methyl-1,3,5-triazin2-yl)amino]-carbonyl]amino]sulfonyl]benzoate	Summer - Fall, Aug - Oct	NO

PRODUCT NAME *	TOTAL PRODUCT APPLIED (GALLONS)	ACTIVE INGREDIENTS	SEASON OF USE	HHP
Esplenade 200 SC	53.75	Indaziflam N-[(1R,2S)-2,3-dihydro-2,6-dimethyl-1H-inden-1-yl]-6-[(1RS)-1 fluoroethyl]-1,3,5-triazine-2,4-diamine	Winter - Spring, Jan - June	NO
Garlon 3A	104.93	Triclopyr: 2-[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid, triethylamine salt..	Spring - Fall, May - Nov	NO
Habitat	0.12	isopropylamine salt of imazapyr: (2-(4,5-dihtdro-4-methyl-4-(1-methylethyl)-5-oxo-1 H-imidazol-2-yl)-3-pyridinecarboxlic acid)	One-time use, spring (May)	NO
Imazapic 2 SL	0.45	Ammonium salt of imazapic (±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1 H-Imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid	One-time use spring (June)	NO
Imazapyr 4 SL	10.11	Isopropylamine salt of Imazapyr (2-[4,5-dihydro-4-methyl-4- (1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)*	Limited use Jun - Sept, one-time Dec	NO
Landmark XP	9.75	Sulfometuron methyl {Methyl 2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino]-carbonyl]amino] sulfonyl]benzoate} and Chlorsulfuron; 2-Chloro-N-[(4-methoxy-6-methyl- 1,3,5-triazin-2-yl)aminocarbonyl] benzenesulfonamide	Limited use Apr - Jun, one-time Jan	NO
Oust XP Herbicide	0.30	Sulfometuron-methyl {Methyl 2-[[[[(4,6-dimethyl-2 -pyrimidinyl)amino]-carbonyl] amino]sulfonyl]benzoate}	Discontinued, one-time use Apr 2018	NO

PRODUCT NAME *	TOTAL PRODUCT APPLIED (GALLONS)	ACTIVE INGREDIENTS	SEASON OF USE	HHP
Panoramic 2SL	3.02	Ammonium salt of imazapic (±)-2-[4,5-dihydro-4-methyl-4- (1-methylethyl)-5-oxo-1 H imidazol-2-yl]-5-methyl-3-pyridinecarboxylicacid*	Limited use Jun - Jul, Apr 2019, one-time Jan	NO
Payload	7.43	Flumioxazin (*(2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2H-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1H-isoindole-1,3(2H)-dione))	Limited use Jun 2018, Jan & April 2019	NO
Telar XP	23.33	Chlorsulfuron 2-Chloro-N-[(4-methoxy-6-methyl1,3,5-triazin-2 -yl)aminocarbonyl] benzenesulfonamide	Winter - spring, Jan - June	NO
Vanquish	Quantity unknown	Diglycolamine Salt of 3, 6-dichloro-o-anisic Acid	One-time hand spray, April 2019	NO
ADJUVANTS				
Clasp	148.12	Polyvinyl Polymer (Polyarylamide)	Year-round, not spring	NO
EDT	80.48	Ammonium sulfate, propane-1,2,3-tiol, citric and phosphoric acid, polyacrylamide polymer	Spring only	NO
Inlet	79.54	Polyalkoxylated and non-alkoxylated aliphatics, and derivatives thereof	Year-round, not spring	NO
R.O.C. Crop Oil	4.25	Paraffin Base Petroleum Oil	Very limited use	NO
Hyd. 46	6.50	Unknown	Very limited use	NO
Field Oil/Crop Oil	1.50	Paraffin Base Petroleum Oil	Very limited use	NO

* Product names are both manufacturer's brand names and chemical names.

** Products were determined to be on the Highly Hazardous Pesticides list according to Pesticide Action Network (PAN) International, March 2019.

NUMBER OF SITES VISITED

Over the 12 month period, records show that 677 unique roadside locations were visited, with a total of 1391 spray events. Of these 677 locations, 58 were visited 5 or more times, with 538 spray events and 38 sites visited 6 or more times.

Table 2 lists the roads within the County that were visited 5 or more times during the period evaluated. Since vegetation targeted or exact locations along roadways was rarely listed, it is unclear why some roads were visited many times in one year. We determined that 5 or more visits were excessive based on the assumption that 1 late winter or early spring pre-emergent application, 2 spring, and 1 fall application would be a reasonable number of visits, depending on the type of vegetation targeted.

Also, given the current manual record keeping for spray applications, it cannot be determined that the combined total of all applications of each product at an individual site does not exceed the maximum label recommended amounts per site per year. For example, there are recommended limits on the use of Diuron (and other herbicides) depending upon soil types and weeds to be eliminated.

TABLE 2: JACKSON COUNTY ROADS VISITED

Table 2 lists roads within Jackson County that were visited 5 or more times in the year evaluated. Each visit represents one spray event.

LOCATION IN JACKSON COUNTY, OREGON	NUMBER OF TIMES VISITED APRIL 2018-APRIL 2019	LOCATION IN JACKSON COUNTY, OREGON	NUMBER OF TIMES VISITED APRIL 2018-APRIL 2019
Agate Rd.	15	Lewis Rd.	6
Butte Falls - Prospect Rd.	15	Little Applegate Rd.	6
Old Stage Rd.	13	Penninger Rd.	6
Antelope Rd.	12	Pleasant Cr. Rd.	6
Anderson Cr. Rd.	11	Rancheria Rd.	6
Sterling Cr. Rd.	11	Ulrich Rd.	6
Brophy Rd.	10	Wards Cr. Rd.	6
East Antelope Rd.	10	Willow Springs Rd.	6
Lampman Rd.	10	Worthington Rd.	6
Rogue River Dr.	10	Ball Rd.	5
Blackwell Rd.	9	Butte Falls Hwy	5
Dead Indian Memorial Hwy	9	Butte Falls Rd.	5
Upper Applegate Rd.	9	Cady Rd.	5
Ave. H	8	Dodge Rd.	5
Griffin Cr. Rd.	8	East Evans Rd.	5
Hwy 227	8	Foss Rd.	5
Reese Cr. Rd.	8	Gibbon Rd.	5
Vilas Rd.	8	Hamilton Rd.	5
Dark Hollow Rd.	7	John Day Rd.	5
Duggan Rd.	7	Lost Cr. Rd.	5
Elk Cr. Rd.	7	Meridian Rd.	5
Hillcrest Rd.	7	Mountain View Rd.	5
Laurelhurst Rd.	7	Old Hwy 234	5
Meadows Rd.	7	Red Blanket Rd.	5
Scenic Rd.	7	Reese Cr. Pit	5
Tolo Rd.	7	South Fork Little Butte Rd.	5
Coleman Cr. Rd.	6	South Stage Rd.	5
Crowfoot Rd.	6	Upton Rd.	5
Galls Cr. Rd.	6	Wagner Cr. Rd.	5

CONCLUSIONS AND SIGNIFICANCES

The herbicides listed for the evaluation period were cross referenced with the lists of Highly Hazardous Pesticides as identified by the Pesticide Action Network (PAN) International, a coalition of 600 experts in 90 countries. These Highly Hazardous Pesticides (1) are classified by internationally recognized professionals under four types of hazards:

- Acutely toxic to humans via swallowing, skin contact or inhalation.
- Long-term human health hazards related to cancer, birth defects and reproductive harm, disruption of hormone systems or damage to genetic material.
- Environmental hazards: persistent in soil or water; ability to accumulate in the food chain; highly toxic to bees; toxic to aquatic organisms.
- Recognized as causing serious or irreversible harm under actual conditions of use.

GRAPHS

Graph 1 shows 16 herbicides applied. Not shown are the 3 herbicides: Krovar (Airport use only), Oust (discontinued April 2018) and Vanquish (no volume listed in the records for the one-time use) and the 6 adjuvants. Graph 1 reveals that over 86% of the volume applied consisted of highly hazardous pesticides. And, six of the 19 herbicides products used by Jackson County Roads are on a highly hazardous pesticides list: Diuron, Krovar (limited use, but contains both Diuron and Bromacil), Speedzone (also limited use but contains 2,4-D), and RoundUp Pro, RoundUp Custom and Glyphosate 5.4 (all contain glyphosate).

Graph 2 shows that glyphosate was the most common herbicide used by Jackson County Roads, followed by Diuron.

IMPACTS OF PESTICIDES

WATERWAYS

The report, "Middle Rogue Pesticide Stewardship Partnership 2015-2017 Summary" (2), from a Pesticide Stewardship Partnership sampling and analysis program conducted by Oregon DEQ and the local Jackson Soil and Water Conservation District lists several of these same herbicides in surface waters in the Rogue Valley. The herbicides, Diuron, Sulfometuron, and Imazapyr, were found in 47%, 23%, and 11% (respectively) of the local streams sampled. The stream surveys detected the herbicide Diuron in 71 of 151 samples although it never exceeded the EPA benchmark environmental concentration limits. Of the herbicides detected, Diuron is highly toxic to beneficial aquatic invertebrates that use our streams for some or all of their life cycle. Aquatic invertebrates such as dragonflies, stoneflies, mayflies, midges as well as mussels, crayfish, snails, and other aquatic organisms, are vital links (3) in the aquatic food chain, providing nutrients to larger organisms such as fish, amphibians, reptiles, birds and mammals. Herbicides may enter this environment from roadsides following rain and stormwater runoff events and are capable of moving and exposing many new habitats and beneficial life forms far from their original points of application. Evidence of the occurrence of this flush and transport is noted in the Pesticide Stewardship Partnership Monitoring data.

Overlaying the County's spray record data with the data from the Middle Rogue Pesticide Stewardship Partnership, we identified some locations where roadside herbicide applications were made in the

vicinity of streams which tested positive for the same herbicides. Historically, the occurrence of herbicides in local creeks and streams within the Rogue Valley has been attributed to agricultural and forestry practices. However, some of these herbicides, such as Diuron, are designed to maintain a bare ground area to prevent weeds and other undesirable vegetation from growing in, for example, a roadside gravel shoulder. Linking the type of herbicides found in these streams and their designed use — to control and regulate plant growth — the evidence leads us to conclude that roadside spraying of herbicides may be another contributor to the dispersal of pesticides within that environment.

INSECTS

In April of this year, scientists reported (4) the precipitous decline in insects worldwide due in part to urbanization and the widespread proliferation in the use of synthetic toxic pesticides. Scientists in Portland, Oregon have called the insect decline (5) catastrophic, and declared that a "serious reduction in pesticides" is key to preventing the extinction of up to 41% of the world's insects, including pollinators, within the next few decades. Over 85% of the world's flowering plants require pollination (6) by insects, including at least 1/3 of the crops grown for human consumption.

Scientists also recently showed that glyphosate removes important beneficial bacteria from the gut of honeybees because glyphosate also acts as an antibiotic. Following glyphosate exposures, the honey bees became more susceptible to diseases as they lost portions of their gut micro-biome.

Insects, pollinators and many aquatic invertebrates are critical links in the food chain for other insects, birds, fish and wildlife. In fact, the scientific community is currently publishing study after study documenting the tremendous decline of bird populations, due in large part to the scarcity of insects (7) and pesticide use.

HUMAN HEALTH

Exposure to the herbicide glyphosate is now widely accepted as a cause of blood cancers in humans (8), liver disease, and other reproductive maladies (9). Krovar (Diuron and Bromacil), glyphosate-based herbicides, and 2,4-D are known or suspected endocrine disruptors (10) and/or causes of cancers. Endocrine disruptors (11) are chemicals that interfere with the body's hormones and produce adverse developmental, reproductive, neurological illnesses, cancers, and immune disorders in both humans and wildlife. Scientists at New York University (12) recently estimated that exposures to endocrine disrupting pesticides (like glyphosate, 2,4-D and Diuron, and others) annually leads to total U.S. health costs exceeding $44 billion, loss of 1.8 million I.Q. intelligence points, and some 7,500 mental disability cases.

Endocrine disrupting herbicides like Diuron, glyphosate, and 2,4-D are biologically important in minute ppb (parts per billion) concentrations, slightly above the herbicide levels sometimes measured in local creeks. PPB concentrations are approximately 1,000-fold below the concentrations of pesticides when they are sprayed along our roadsides. In laboratory assays, exposures of yeast cells to 23ppb Diuron detectably reduces a key metabolic function (13). At 1ppb in drinking water *and less*, glyphosate causes liver disease in experimental animals. Concentrations of Diuron and glyphosate in local creeks rarely exceeded 0.8ppb. However, laboratory studies work with single chemicals only whereas natural stream conditions have numerous types of pesticides, adjuvants, other toxic materials present at once and synergistic responses would be expected to induce biological effects at lower concentrations than single pesticides.

A growing number of well-designed epidemiological and molecular studies provide substantial evidence that the pesticides used in agricultural, commercial, and home and garden applications are associated with excess cancer risk. This risk is associated both with pesticide applicators and, under some conditions, those who are simply bystanders to the application (i.e., the public. This article (14) written for The American Cancer Society, cites the emerging evidences from epidemiological, molecular biology, and toxicological studies published in peer reviewed scientific literature reveals the links between pesticide exposures and five cancers including prostate, non-Hodgkin lymphoma, leukemia, multiple myeloma, and breast cancer. There are now over 40,000 legal cases pending against the makers of glyphosate for its probable causation of non-Hodgkins lymphoma. Three juries have already leveled multimillion-dollar awards to the litigants.

Cancer rates vary by county and year to year. However, in Jackson County alone, medical professionals estimate by extrapolation of State numbers, that the County will see (15) approximately 383 new cases of these 5 types of cancers in 2019.

ECONOMIC

Based on the following verifiable data alone, we extrapolated that the health impacts associated with pesticide exposures to Jackson County is significant.

Costs (16) for chemotherapy drugs to treat one patient for 1 year run from $100,000 to 400,000 not including other medical costs, hospitalization, surgery, and doctor fees.

Most medical plans pay about 80% of medical costs after a specific deductible is met. It is clear then that if a significant reduction in the use of 1569 gallons of county pesticides drops the incidence of these cancers by as little as 1% (4 fewer cases) there is a major cost reduction and emotional relief associated with such changes.

Also, pollinators are integral to the production of our food crops, and losses of healthy honey bees and other managed bee populations negatively impact our local farmers' ability to grow abundant and nutritious foods. According to the 2017 Census of Agriculture for Jackson County (17), at least 50% of the $71 million in crops produced in our County are dependent on pollination services. In addition, pollinators are critically important to the specialty seed industry in Southern Oregon, an area recognized as one of the top seed producing areas in the world.

ALTERNATIVES and RESOURCES

Supported by widespread scientific evidence, demands from the public (18) for a safer and healthier environment have become loud and clear. Many alternatives (19) to the use of toxic herbicides are now available. With this growing scientific evidence and the desire to protect the health of all residents, municipalities throughout the US and around the world (20) have been motivated to take action (21) to limit the use of herbicides in public areas.

There are already alternative roadside management strategies and methods that don't rely on toxic herbicides to maintain roadsides in use in Oregon. Some of these alternative strategies include applying least toxic and non-toxic, organic herbicide applications during low insect activity and using mechanical methods such as strategic seasonal mowing, steam applicators, and the planting of appropriate native vegetation.

One important management strategy is designing and maintaining our roadsides as multifunctional transportation facilities which achieves several overlapping benefits. Retrofitting roadside shoulders and ditches by incorporating Low Impact Development (22) or Green Infrastructure (23) methods for storm water filtration systems within these areas promotes more natural in situ water treatment rather than carrying it away. If designed properly, benefits to in situ storm water treatment can include a reduction in shoulder slope erosion, preservation and longevity of road infrastructure including the pavement and subgrade, and improved water quality. These low cost design solutions, can also provide tangible benefits to our local ecosystems and wildlife, and at the same time reduce fire danger.

Furthermore, this 2010 report published by Washington State Department of Transportation, Assessment of Alternatives in Vegetation Management at the Edge of Pavement (24), demonstrated that by establishing desirable vegetation up to the edge of pavement, life-cycle roadside management costs are lower compared to the traditional method of a maintaining a vegetation-free strip treated with residual bare-ground herbicides.

Also, Lane County's Integrated Roadside Vegetation Policy Program (25) strives to "promote public safety, reduce maintenance costs, sustain road system integrity and promote environmental stewardship" using a combination of mechanical and chemical methods of control. Lane County has twice the miles of paved county roads (1400) as Jackson County, but the total amount of herbicides applied during 2018 (26) was 950 ounces (less than 10 gallons) of 3 herbicides: Vastlan, Milestone, and Ecomazapyr 2SL.

We encourage Jackson County Roads to use the data we have collated from their daily spray records to develop an Integrated Roadside Vegetation Management Plan (IRVM). Developing such a plan will enable the Roads department to determine and target areas with the highest need, thus allocating hard to come by budget dollars in a more efficient manner. We also suggest taking advantage of the expertise provided by the Jackson Soil and Water Conservation District. Lastly, we encourage the Roads department to participate in a work session attended by Maintenance personnel from Oregon and Washington.

ENDNOTE

When we began the review and data compilations of these spray records, we did not know what to expect. Now, with this information in hand, our message to the Jackson County Roads Department is clear: we must find another way to maintain our roadsides.

This volume of herbicide applications is impacting the residents of Jackson County in many ways.

The 1569 gallons of herbicides are a heavy environmental burden to absorb, and is affecting aquatic life, pollinators, birds, humans and more. Based on the total number of 2585 acres sprayed, we calculate that this is approximately equivalent to the removal of all plant material from almost 2,000 football fields. These herbicides continue to persist in the decaying plant material, roadside soils, and creek sediments, migrating through the soil, air, and waterways.

Alternatively, well timed mowing along the roadside shoulder can reduce the risk of high intensity fires, and installing low-growing native bunch grasses along roadway shoulders can reduce the frequency of mowing events while at the same time, absorb and retain rain and storm water runoff.

With a budget line item of over $100,000 annually, the cost of purchasing and applying this volume of herbicides should be of interest to the tax payers of Jackson County. With manual record keeping, it is difficult to track and manage usage, methods and products for budgetary purposes. We therefore strongly suggest consideration of an automated computer-based tracking system such as the systems developed by Portland Metro and Lane County Roads to reduce costs and increase effectiveness of any product or method used.

We recognize visibility, drainage and fire mitigation as critical factors that define the goals of a well-maintained roadside, but we know there are other ways to meet those goals. Fewer herbicide applications will result in more visually appealing roadsides and promote community pride. And, healthy roadsides will provide valuable habitat for pollinators, fish, birds, and other wildlife.

We believe Jackson County Roads can reduce, if not eliminate in many places, the use of toxic herbicides along county roads while still meeting safety standards. Road agencies from other parts of the state have offered to share their knowledge and protocols to help with the transition to make our County a safer place for all, pollinators, wildlife and humans alike.

We hope this report will prove useful for creating a new roadside management plan for Jackson County Roads in 2020. And, we look forward to working with the County Commissioners and Jackson County Roads to host a successful public work session in 2020 with experts from Lane County, Portland Metro, and Washington DOT. We look forward to hosting public events to educate our community on the health and environmental significances of our findings. We also hope to interface with the professionals from other locations to invite them to share their practical roadside management experiences applicable to Jackson County that may result in a reduction in the use of roadside herbicides.

REFERENCES

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FURTHER READING MATERIAL

Information about the Highly Hazardous Pesticides applied in Jackson County.

DIURON

Diuron Factsheet:
https://d3n8a8pro7vhmx.cloudfront.net/ncap/pages/26/attachments/original/1428423366/diuron.pdf?1428423366nown
Diuron Labels:
http://www.fcwp.org/labels/Diuron_4L_Label1v.pdf

http://www.cdms.net/LDat/ld64G012.pdf

BROMACIL

Bromacil Fact Sheets:
https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/fs_PC-012301_1-Aug-96.pdf
https://alligare.com/products/bromacil-80-wg/

Bromacil Label:
https://alligare.com/wp-content/uploads/2018/05/epa-8-20-2008-ag-bromacil-80-specimen-label_mk-approved-20101006-recd-051618.pdf

Tumors in Rats: Mode of carcinogenic action of pesticides inducing thyroid follicular cell tumors in rodents, P. M. Hurley, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1533205/?page=1

GLYPHOSATE

Glyphosate Factsheet
https://alligare.com/products/glyphosate-5-4/

Glyphosate Label:
https://alligare.com/wp-content/uploads/2019/04/ag-glyphosate-5.4-specimen_mk-appr-20190315.pdf

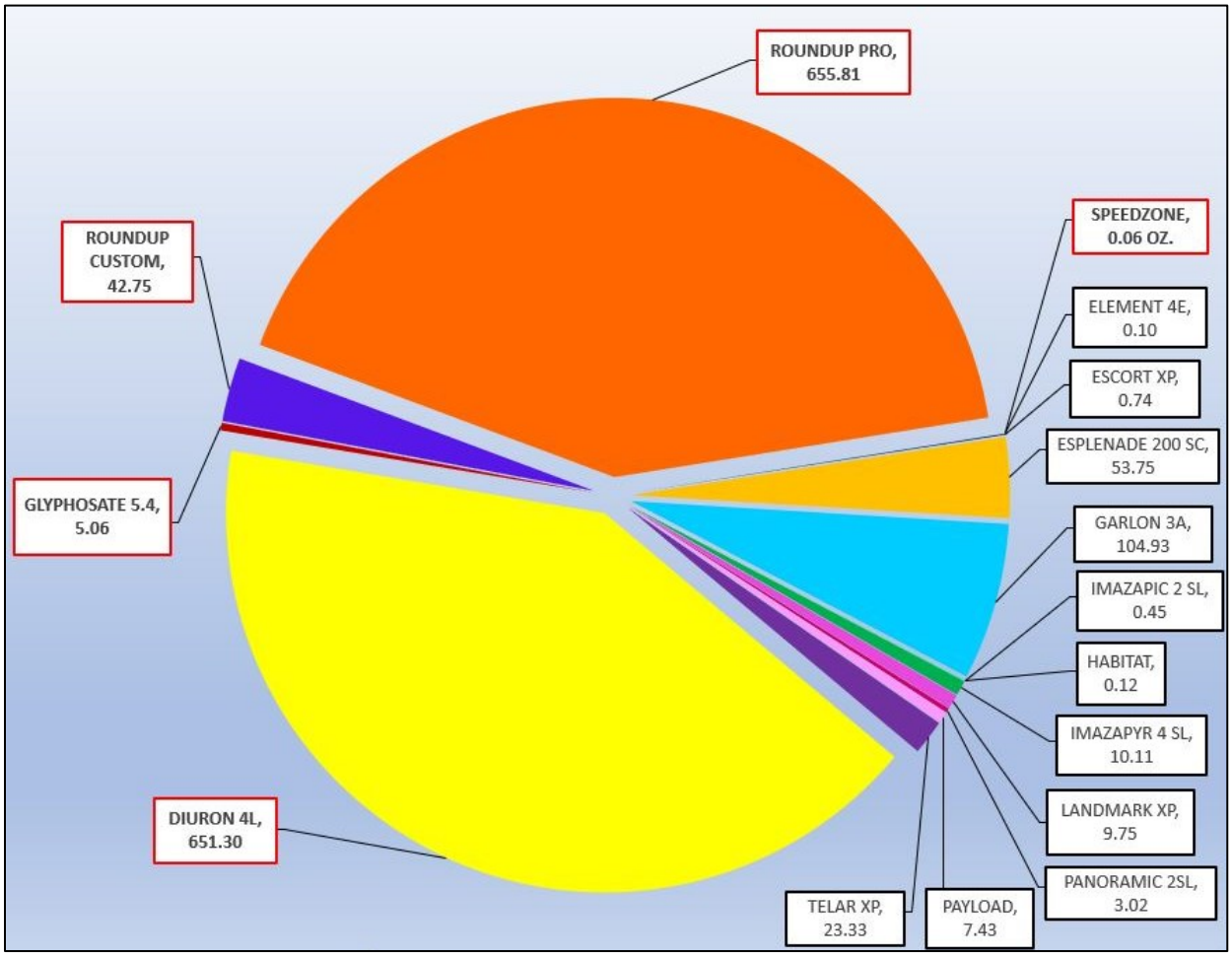
SPEEDZONE

Contains 2, 4-D, Dicamba, Mecoprop, Carfentrazone
Speedzone Fact Sheet:
https://www.epestcontrol.com/images/Products/labels/SpeedZonePIS.pdf

Speedzone Label:
http://www.wplawinc.com/LiteratureRetrieve.aspx?ID=73102

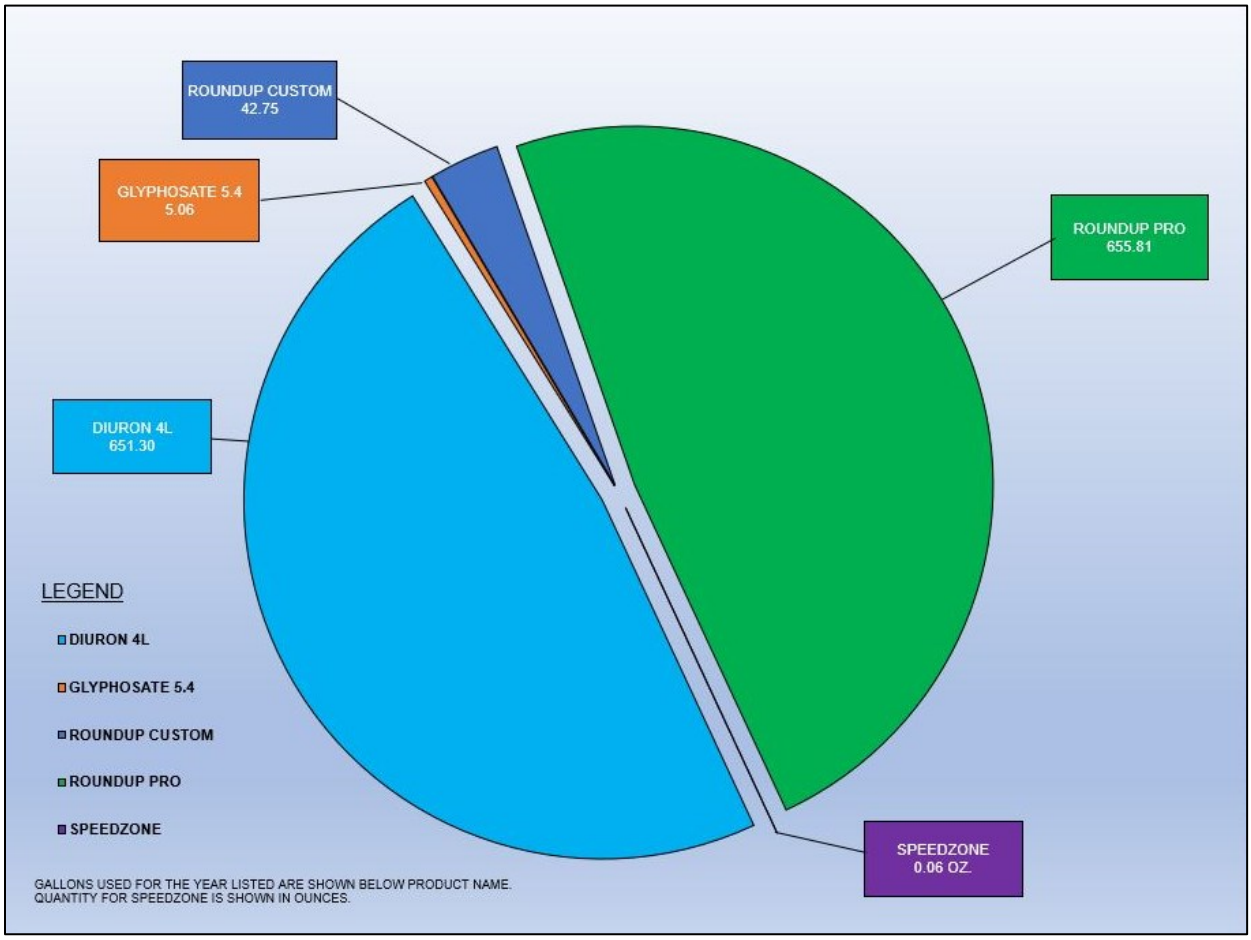
GRAPH 1: TOTAL HERBICIDES APPLIED APRIL 2018 TO APRIL 2019

Graph 1 shows the total gallons of all herbicides used over the year evaluated. Herbicides shown in **BOLD** red boxes are on the Highly Hazardous Pesticides list and make up 86% of the herbicides applied over the year evaluated. Three are not listed: Krovar was used at the Airport only; Oust was discontinued in April; and Vanquish had no volume listed for the one-time use.



GRAPH 2: HIGHLY HAZARDOUS PESTICIDES USED FROM APRIL 2018 TO APRIL 2019

Graph 2 shows that nearly all of the Highly Hazardous Pesticides used are two products – RoundUp Pro and Diuron. Krovar* was not listed since it was used at the Airport only. Of the 1569 gallons applied, 1355 gallons or 86% are Highly Hazardous Pesticides as defined by the Pesticide Action Network International.



*****362.8 pounds of Krovar was only applied at the Airport during April and May 2018. Product was discontinued and was not included in the gallons of herbicide used tabulations in the report.