Initial Report of the Hazardous Materials Subcommittee of the City of Davis Natural Resources Commission

Pesticide Use in Davis with Initial Recommendations to Reduce Use and Potential for Exposure and Increase Efficiency

January 23, 2017

Executive Summary

Background

Davis established its first IPM program in 1989 and its first IPM coordinator was hired in 1990. Since 2007, consistent progress has been made by the current IPM Specialist in reducing use of pesticides in public places across Davis and in reaching out to the local community to teach IPM principles. In particular, steady reduction of overall use and/or elimination of some of the most toxic and or environmentally persistent chemicals has been seen such as glyphosate (a herbicide found in Round-Up ™) and neonicotinoids (a class of systemic insecticide implicated in pollinator die-off).

Within the last year, there have been of citizen complaints and observations about inappropriate use or planned use of pesticides in locations used by children and pets throughout the City where they had previously not been used. These included herbicide spraying or planned spraying in established Pesticide Hazard and Exposure Reduction Zones in certain major parks (Mace Ranch and Slide Hill), directly adjacent to childrens' or pet animals' play areas in other parks in South Davis, along a storm drainage channels adjacent to a walking path in North Davis, and in the North Davis ditch open space areas, and green belts in South Davis and North Davis.

An update of pesticide use in the City also shows increased overall glyphosate use as a herbicide in the City as well as a renewed use of neonicotinoids by City Staff replacing an unwritten policy of discontinuance of neonicotinoid use. As a result, three different City Commissions discussed the problem and passed a series of motions calling on the City Council to establish a new body comprising representatives of the Natural Resources, Open Space and Habitat, and Recreation and Parks Commissions. The task of the new body would be to undertake a comprehensive pesticide use review in Davis with additional stated objectives of eliminating use of the neonicotinoid class of insecticide as soon as possible due to their adverse effects on pollinators. It was also recommended that the City gradually phase out the use of glyphosate as a herbicide in the City due to recent disclosures of environmental toxicity.

Eventually, it was unilaterally decided that such a review of the IPM and Pesticide Use policy would alternatively be undertaken by the Hazardous Material Subcommittee of the Natural Resources Commission with subsequent review by all three of the Commissions. This report is the initial effort by this subcommittee to identify and quantify the problems and make specific recommendations to improve the IPM program in Davis.

Scope of Problem

The City of Davis currently manages 1,616 acres of land that may be subject to pesticide application by the city. This acreage is divided into six major management areas including:

Location	Acreage
Parks, greenbelts, & streetscapes	487 ac.
Open Space	519 ac.
Transportation System	20 ac.
Stormwater System	100 ac.
Wastewater Treatment System	489 ac.
Wastewater Collection Systems (sewer lines)	3 miles

The Public Works Department is by far the largest user of pesticides in the City accounting for approximately 80% of the glyphosate used annually and almost 100% of the herbicides Garlon,

Transline, and Telar. Much of this use is associated with the overland flow process at the wastewater treatment plant and associated vegetation management requirements will be eliminated upon completion of the wastewater treatment plant upgrades. In general, the public is not exposed to these applications although there is substantial environmental exposure associated with this use. A substantial amount of herbicide is also used for storm water conveyance channels although most of this weed control can also be accomplished by mowing. Most storm channels are freely accessible by the public and often used by children "exploring" and/or pets during roaming activities.

Parks and green belts are the next largest user of herbicides and represent the most common mode of exposure to the general public. Most of the alternative treatments discussed in Section 4 of this report have been carried out to some degree to reduce herbicide use in these areas. These herbicides are applied both by City workers and the contracted landscape maintenance firm with that firm using approximately twice as much herbicide as City workers. It is recommended that initial efforts to reduce public exposure to these herbicides should focus on application to parks and greenbelts.

Proven Non-Toxic Alternatives Exist to Eliminate Use of the Most Toxic Pesticides Used by the City – Glyphosate for Weed Control and Neonicotinoids to kill Tree Aphids and Lawn Grubs

Alternatives to Glyphosate for Weed Control

The overwhelming use of pesticides in Davis is for weed control. However, there are a variety of proven alternative methods available for acceptable weed control in lieu of use of glyphosate or other contact or pre-emergent herbicides. These include:

- Mechanical Removal (Weeding),
- Mulching,
- Solarization,
- Grazing,
- Weed Flaming,
- Green Herbicides,
- Use of Native Vegetation in Landscaping Projects, and
- Irrigation Control

Alternatives to Neonicotinoids for Tree Aphid and Turf Grub Control

The City has also reintroduced use of a neonicotinoid insecticide ("Imidicloprid") for treatment of leaf-sucking aphids on some trees (particularly Chinese Hackberry). Such an aphid infestation can result in deposition of "honeydew" excretions which fall to the ground and are unsightly. Staff has stated this presents a potential public safety hazard on concrete surfaces which view in not necessarily shared by the subcommittee.

In lieu of conventional treatments with systemic insecticides (typically neonicotinoids), good control of the problem can be obtained by maintaining tree health and vigor of the tree through proper watering and fertilization, application of a dormant spray during the winter months to smother overwintering eggs (organic copper-oil formulations are available), and release of predatory lace-wings which feed on the aphids in the spring and/or summer if warranted by monitoring.

Grubs live and propagate beneath lawn surfaces by feeding on the grass roots which can cause death or unsightly browning of the overlying turf. Staff has stated such turf damage can result in uneven playing surfaces and possible trip hazards on recreation fields which view in not necessarily shared by the subcommittee. Often neonicotinoids are applied to the turf surface which is uptaken by the grass

and results in death of the feeding grubs. Good control can otherwise be obtained by biological release of appropriate nematodes populations which are eaten only by the grubs and results in their near-immediate death, or by application of non-systemic, contact insecticides.

Other Municipal IPM Strategies

Many U.S. cities, particularly in the western half of the country, have adopted or implemented IPM programs and policies. To various degrees, these mandate use of or consideration of use of cultural mechanisms or organic or least toxic chemicals on public property in lieu of chemicals with more adverse environmental impacts or persistence of health and safety issue.

Following are lists of such California cities:

1) Policies or ordinances restricting use of toxic pesticides on public property in favor of alternative, organic methods – San Francisco, Richmond, Fairfax, Irvine

2) Policies or ordinances promoting an IPM policy that restricts highly toxic pesticides and urges pesticide use as a last resort – Moraga, Oakland, San Anselmo, Corte Madera, Mill Valley,

3) Policies or ordinances promoting an IPM policy that urges pesticide use as a last resort – Palo Alto, Berkeley, Albany, Arcata

4) Policies or ordinances encourages implementation of a limited IPM program – ***Davis***, Contra Costa Co, Alameda Co, Marin Co., Santa Barbara

Following are lists of Western US cities that have Park policies that prohibit pesticide usage in parks:

5) Policies or ordinances prohibiting the use of non-organic pesticides in public parks with limited exceptions – San Carlos CA, Portland OR, Eugene OR, King Co. WA, Seattle WA, Shoreline, WA

Following are lists of Western US cities that have policies that prohibit the use of neonicotinoid insecticides on public property with limited exceptions:

6) Policies or ordinances prohibiting the use of neonicotinoid insecticides in public places with limited exceptions – Sacramento CA, Boulder and Boulder County CO, Seattle WA, Spokane WA, Thurston County WA, Milwaukie OR

Outreach -

On December 7th, a public forum was held in the multi-purpose room at the Senior Center that was sponsored by the Davis Natural Resources Commission. Approximately 80 – 90 members of the public attended in addition to speakers, City Staff, and members of various City citizen commissions. An extended Q&A and public comments period was also held in which many members of the public spoke in favor of reduced pesticide use by the City.

This sentiment was also expressed by many of the 25 participants in the survey conducted by the sub-committee both on Surveymonkey.com and distributed and collected after the public forum. The survey results show that the survey participants are quite knowledgeable about IPM, glyphosate and neonicotinoids, and how tolerant they might be of seasonal or periodic “unconventional” or unkempt look that is natural in transitioning from using chemicals to more Green or organic practices.

Survey Results Summary:

a. 100% are familiar with the impacts of pesticides on pollinators.
b. 92% of respondents make an effort to reduce pesticides at home.
c. 91% said they are willing to put in at least 1-2 hours per month to volunteer to help maintain those parks by pulling weeds or spreading mulch.

These results indicate a strong desire on the part of the survey participants to eliminate use of pesticides and a willingness to tolerate some seasonal messy appearance to accomplish long term Green IPM goals (there were no responses that indicated a desire for manicured landscape). And they indicated they were willing to volunteer their time to make it happen in their parks.

Proposed Policy Changes to Further Explore -

a. Move IPM Specialist from Parks and Community Services Department to the Environmental Resources Division within Public Works, or to the Open Space Division within Community Development with Supervisory Authority over Pesticide Management Citywide
b. Immediately Ban Use of Neonicotinoids
c. Gradual phaseout of glyphosate on all public places and open spaces over a three year period
d. Convert all parks and open spaces where children and pets play to "Green" status and strive for full organic status with neighborhood volunteers for problematic weed abatement
e. Concurrent public education plan, activities, and signage to notify residents
f. Establish City-wide abatement crew under the IPM Specialist
g. Update the IPM Policy to be more specific regarding exemption procedures
h. Incorporate IPM policy requirements into city contracts/lease agreements and establish practices
I. Increase Public Availability of IPM and Pesticide Application Data

Proposed Next Steps -

1. Present this report to the Natural Resources, Open Space and Habitat, and Recreation and Parks Commission – Upon acceptance of this report following initial presentation to and receipt of comments from the Natural Resources Commission, it should be subsequently presented to Staff and the Open Space and Habitat Commission and the Parks and Recreation Commission by the Hazardous Material subcommittee comments and deliberation.

2. Prepare Detailed Time-line and Financial Analysis for Each Goal – Upon receipt of comments from the respective Commissions and following further discussions with Staff, an implementation time-line should be developed including a cost analysis for implementing each objective or goal in the Plan

3. Plan for Additional Public Outreach and Input – Staff has indicated their intention to perform further public outreach including a public forum to discuss standards of service and an additional public survey with a broader reach. The Hazardous Material Subcommittee welcomes these efforts providing they are coordinated with an include input from the respective Commissions

4. Update Initial Report with Finalized Recommendations and Additional Information and Present Policy Changes to City Council – Upon receiving comments from each of the Commissions, suggestions from Staff, and input from the public outreach effort, the initial report will be updated and finalized and presented to City Council for their deliberation.

Table of Contents

Section 1. Introduction

a. History of IPM in Davis

Davis established its first IPM program in 1989 and its first IPM coordinator was hired in 1990. In 1991, the first formal IPM guidelines were discussed and developed by the Parks and Recreation Commission.

In recognition of the importance of IPM to the health and safety of the community and the degree of interest shown by citizens in reducing pesticide exposure, the City Council established an IPM Task Force in 1996 with the following primary goals:

1) Reduce the pollution load of pesticides within the City of Davis.
2) Increase awareness and use of IPM by citizens via education and outreach.
3) Provide recommendations that will assist in improving the IPM program.
4) Reduce the use of pesticides within the city, by businesses and retail operations via technical assistance and education programs.

In 1998, the IPM task force submitted the following summary recommendations to achieve those primary goals:

1) For each pest, identify the specific conditions causing or leading to the particular pest problem.
2) Devise ways to change those conditions so as to discourage reoccurrence of the pest problem.
3) Select least hazardous combination of strategies to control the problem.

In 1999, the City received a US EPA PESP (Pesticide Environmental Stewardship Program) Grant Award for designing and posting IPM demonstration signs throughout parks and greenbelts

In 2000, another IPM program review was completed with recommendations to continue to reduce Category II pesticide applications, post signs for pesticide applications in parks, establish a native grass conservation area, and to implement IPM training efforts with citizens and staff.

From 2000 – 2005, IPM management was jointly coordinated with the City's Environmental Resource Supervisor, Wildlife Resource Specialist, and Environmental Compliance Supervisor who oversaw and reported on the IPM program.

In 2005, the Public Works department developed an updated IPM plan that called for less reliance on chemical control and attempted to balance weed controls with departmental economic constraints. The Plan called for improved relations and communications between the city’s departments and regulatory agencies and concerned public entities, and recommended the City hire a dedicated IPM coordinator.

In 2007, the current IPM Specialist was hired who oversaw the first update of the IPM plan, completed in 2008. This plan prioritized the use of non-toxic alternatives instead of more environmentally unhealthy pesticides. In some areas, there were conflicts.

In 2013, concerns were expressed by the NRC to the Open Space and Habitat Commission and the Recreation and Parks Commission that there were conflicts between the IPM Policy and the concurrently existing Pesticide Use Policy in the City. This resulted in an effort to integrate the two policies into a single IPM and Pesticide Use policy to improve functionality of the policy.

b. <u>Recent Incidents and Developments Led to Current Review</u>

Within the last year, there have been a number of citizen complaints and observations about inappropriate use or planned use of pesticides in locations throughout the City where they had previously not been used. These included herbicide spraying in established Pesticide Hazard and Exposure Reduction Zones in certain major parks (Mace Ranch and Slide Hill), directly adjacent to childrens' or pet animals' play areas in other parks in South Davis, and along a storm drainage channels adjacent to a walking path in North Davis, the North Davis ditch open space areas, and green belts in South Davis and North Davis.

An update of pesticide use in the City also shows increased overall glyphosate use as a herbicide in the City as well as a renewed use of neonicotinoids by City Staff replacing an unwritten policy of discontinuance of neonicotinoid use.

These incidents were probably due to a variety of factors including discontinuity of support of the IPM policy and program by management due to persistent turnover of administrators that were unfamiliar with the history and demands of Davis citizen. For instance, the City's current IPM Specialist has been with the city for 9 years and has had 8 different immediate supervisors with continuous management changes in two departments (Public Works and Recreation & Parks). Additionally, one park maintenance contractor service that had a very good reputation among citizens in South and West Davis was discontinued. In certain cases, these management and contractor changes have resulted in different interpretations of the IPM/Pesticide use policy and insufficient management of pesticide application leading to increased or inappropriate pesticide application.

As a result, three different City Commissions have since discussed the problem and passed a series of motions calling on the City Council to establish a new body comprising representatives of the Natural Resources, Open Space and Habitat, and Recreation and Parks Commissions. The task of the new body would be to undertake a comprehensive pesticide use review in Davis with additional stated objectives of eliminating use of the neonicotinoid class of insecticide as soon as possible due to their adverse effects on pollinators. It was also recommended that the City gradually phase out the use of glyphosate as a herbicide in the City due to recent disclosures of environmental toxicity.

Following discussion by Staff, it was unilaterally decided that such a review of the IPM and Pesticide Use policy would alternatively be undertaken by the Hazardous Material Subcommittee of the Natural Resources Commission with subsequent review by all three of the Commissions.

Section 2. Current Pesticide Usage in Davis

The City of Davis currently manages 1,616 acres of land that may be subject to pesticide application by the city. This acreage is divided into six major management areas including:

Location	Acreage
Parks, greenbelts, & streetscapes	487 ac.
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Stormwater System	100 ac.
Wastewater Treatment System	489 ac.
Wastewater Collection Systems (sewer lines)	3 miles

a. **Current Pesticides Used by City and Concerns**

Following is the list of chemicals currently used by the City of Davis across all departments:

Commercial Name	Common Name	Type	Category	Characteristics
Roundup	Glyphosate	Herbicide	3	Post emergent, non selective
Scythe	Pelargonic Acid	Herbicide	2	Post emergent, non selective, used in green zones
Fiesta	Iron Chelate (FeHEDTA)	Herbicide	3	Post emergent, broadleaf selective in turf
Drive 75 DF	Quinclorac	Herbicide	3	Post emergent grass selective for Crabgrass and Kikuyugrass
Turflon	Triclopyr	Herbicide	3	Post emergent, broadleaf selective in landscaped areas
Garlon 4	Triclopyr	Herbicide	3	Post emergent, broadleaf selective and brush right of way apps.
Garlon 3A	Triclopyr	Herbicide	1	Post emergent, broadleaf selective and brush, aquatic uses
Snapshot	Trifluralin & isoxaben	Herbicide	3	Pre emergent, non selective in landscape uses
Barricade	Prodiamine	Herbicide	3	Pre emergent, non selective in turf and landscape uses
Transline	Clopyralid	Herbicide	3	Post emergent, open space & right of way for starthistle control
Telar	Chlorsulfuron	Herbicide	3	Post emergent, open space & right of way for pepperweed control
Malice	Imidacloprid	Insecticide	3	Systemic insecticide used for aphid control in trees.
Arena	Clothianidin	Insecticide	3	Insecticide used for grub control in turf.
Fusilade	Fluazifod-P-butyl	Herbicide	3	Post emergent control of grasses in landscapes
Milestone VM	Aminopyralid	Herbicide	3	Post emergent control of grasses in open spaces and rifgt of way
Goal 2XL	Oxyfluorfen	Herbicide	2	Pre & post emergent non selective, Goaltender used in landscapes
Sapphire	Penoxsulam	Herbicide	3	Postemergence control of clover and English daisy in lawns.
Suppress	Caprylic, Capric Acid	Herbicide	2	Post emergent, non selective, used in green zones
Sedgehammer	Halosulfuron	Herbicide	3	Post emergent selective on nutsedge in landscapes
Surflan	Oryzalin	Herbicide	3	Pre emergent, non selective in landscape uses
Volunteer	Clethodim	Herbicide	3	Postemergence control of annual and perennial grasses.
Direx	Diuron	Herbicide	3	Pre emergent, non selective in landscape uses
R-11	Alkylphenol ethoxylate	Adjuvant	2	Nonionic surfactant spreader sticker
Activator 90	Alkylphenol ethoxylate	Adjuvant	3	Nonionic surfactant spreader sticker
Cayuse Plus	Ammonium sulfate	Adjuvant	2	Acidifier
Liberate	Lecithin, methyl ester	Adjuvant	2	Nonionic surfactant spreader sticker
Choise	Ammonium sulfate	Adjuvant	3	Acidifier
Vaporooter	Metam Sodium	Fumigant	1	Used for root intrution control in sewers

A “Green” material is one which is generally considered to have minimal adverse environmental or chronic health and safety impacts (but which may otherwise have an acute health and safety impact). A “Yellow” material is one with a greater degree of either adverse environmental impact or health and safety concerns.

Of these chemicals, the following are the most widely used or present the greatest concern because of their associated adverse health and safety or environmental impacts.

Green Materials List

Trade Name – Active Ingredient – Description / Environmental and/or health concerns

Scythe - Pelargonic Acid 57% - Fatty acid contact herbicide / Little environmental impact but can irritate skin or eyes if contacted.

Yellow Materials List

Trade Name – Active Ingredient – Description / Environmental and/or health concerns (***Most serious concerns are listed in bold, italics***)

Roundup - Glyphosate – Contact systemic herbicide / ***See Appendix A for additional environmental and health and safety information***

Snapshot - Trifluralin – Herbicide / Slight acute toxicity, possible carcinogen, suspected endocrine disruptor

Garlon or Turflon - Triclopyr / Herbicide – Slight acute toxicity, unclassifiable carcinogenicity

Telar - Chlorsulfuron – Herbicide / Slight acute toxicity, ***developmental or reproductive toxin***, potential aquatic contaminant

Transline - Clopyralid - Herbicide / ***Acute toxicity***, possible aquatic contaminant

Sledgehammer - Halosulfuron – Herbicide / Slight acute toxicity

Malice - Imidacloprid – Systemic insecticide used for variety of insect pests / ***See Appendix B for additional environmental and health and safety information***

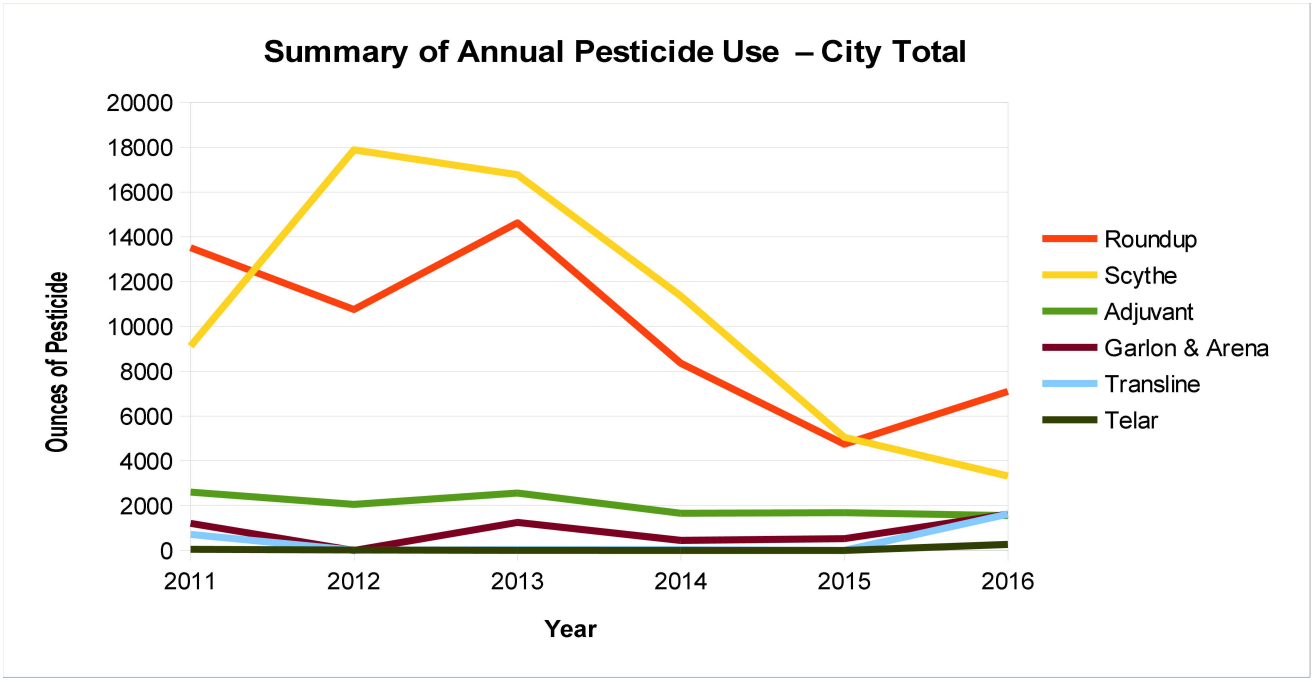
Additional information on glyphosates and neonicotinoids are provided in Appendices A and B respectively, attached to this report.

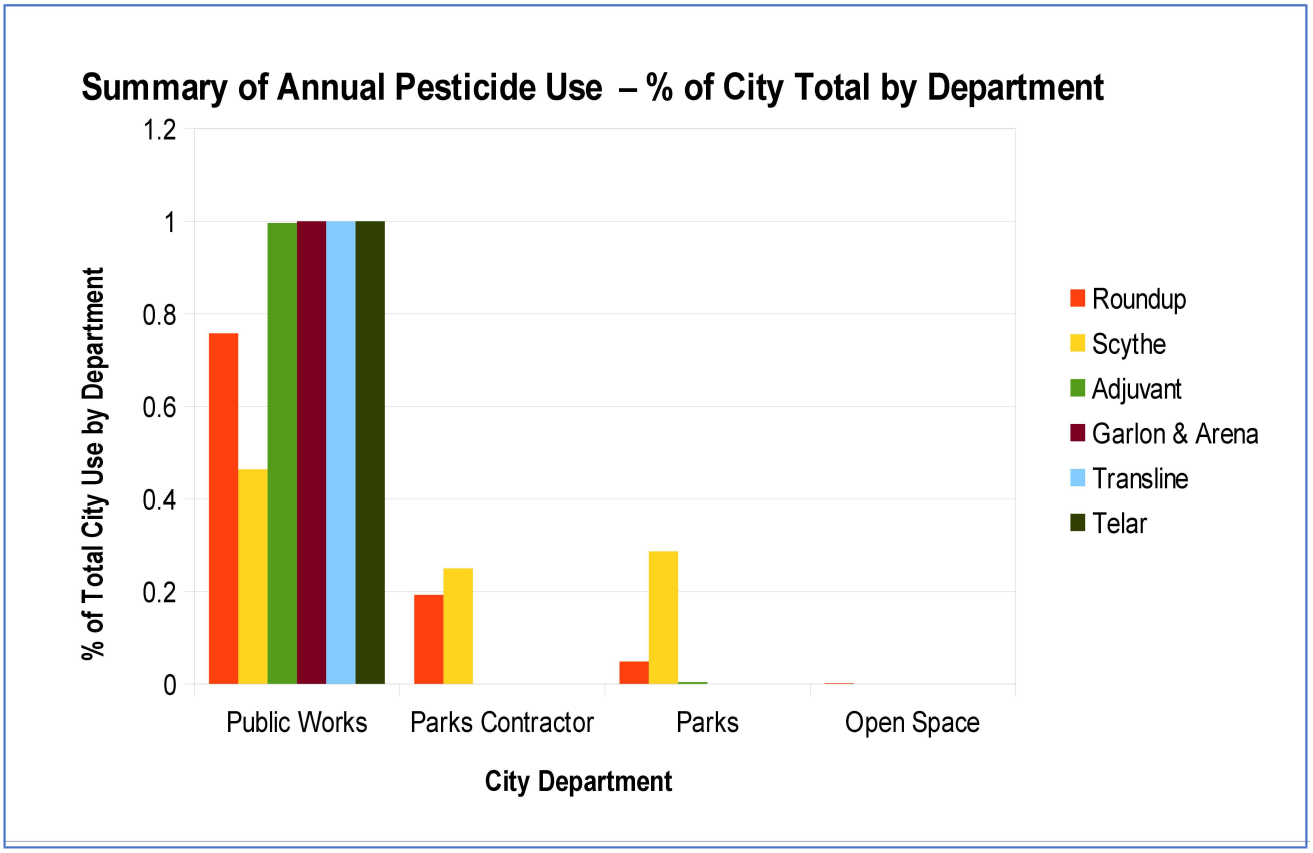
b. **Municipal Usage by Department over Time**

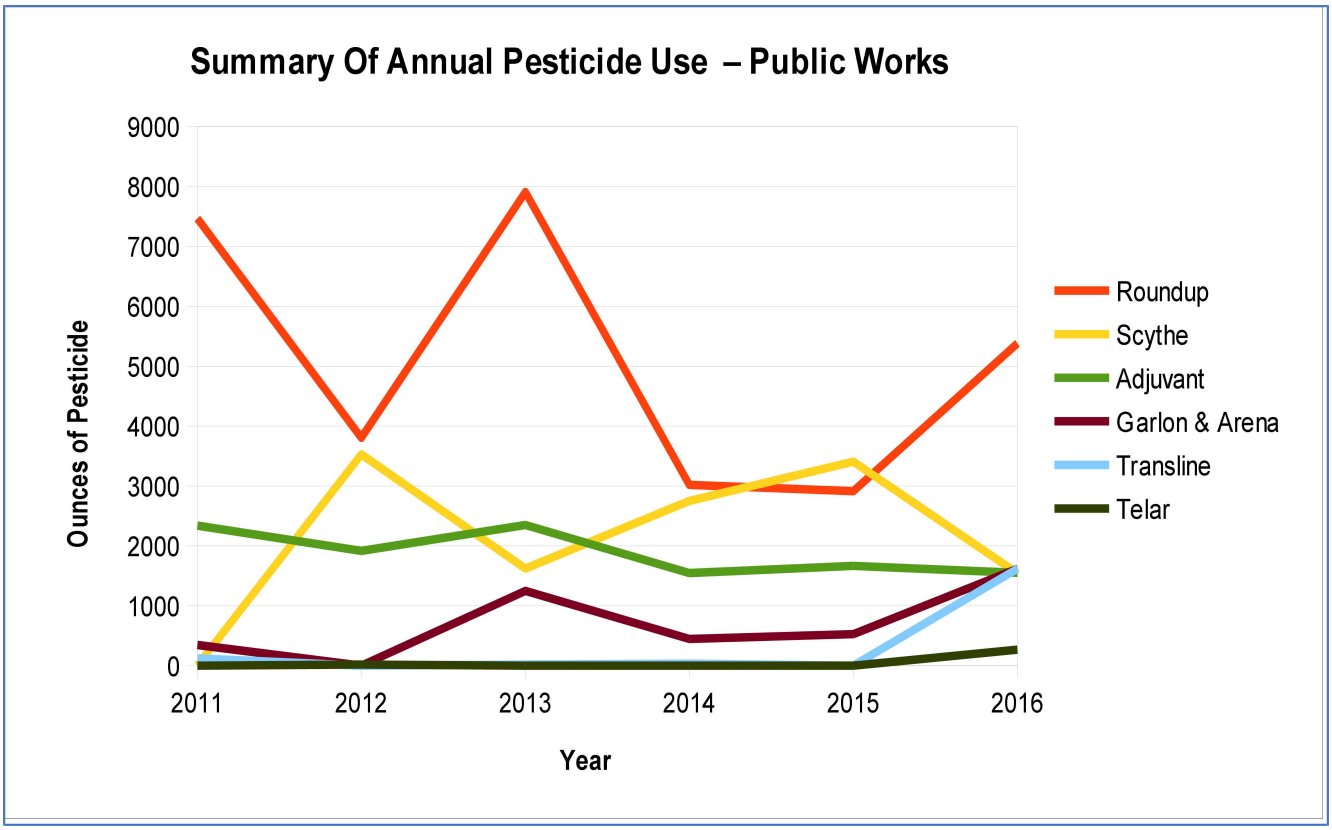
Following are the quantities of the chemicals currently most widely used by the City of Davis across all departments:

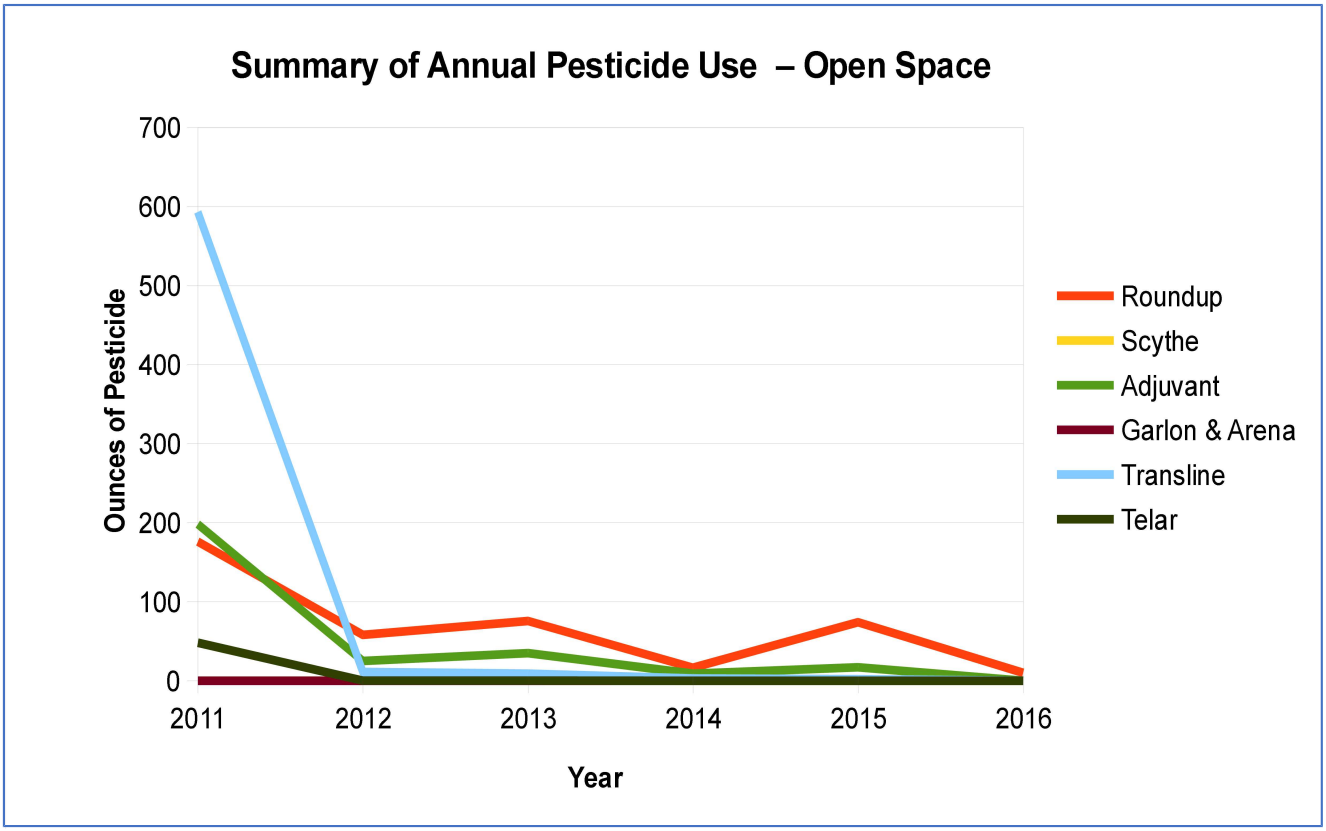
Citywide Pesticide Use 2006- 2016 (in Gallons)

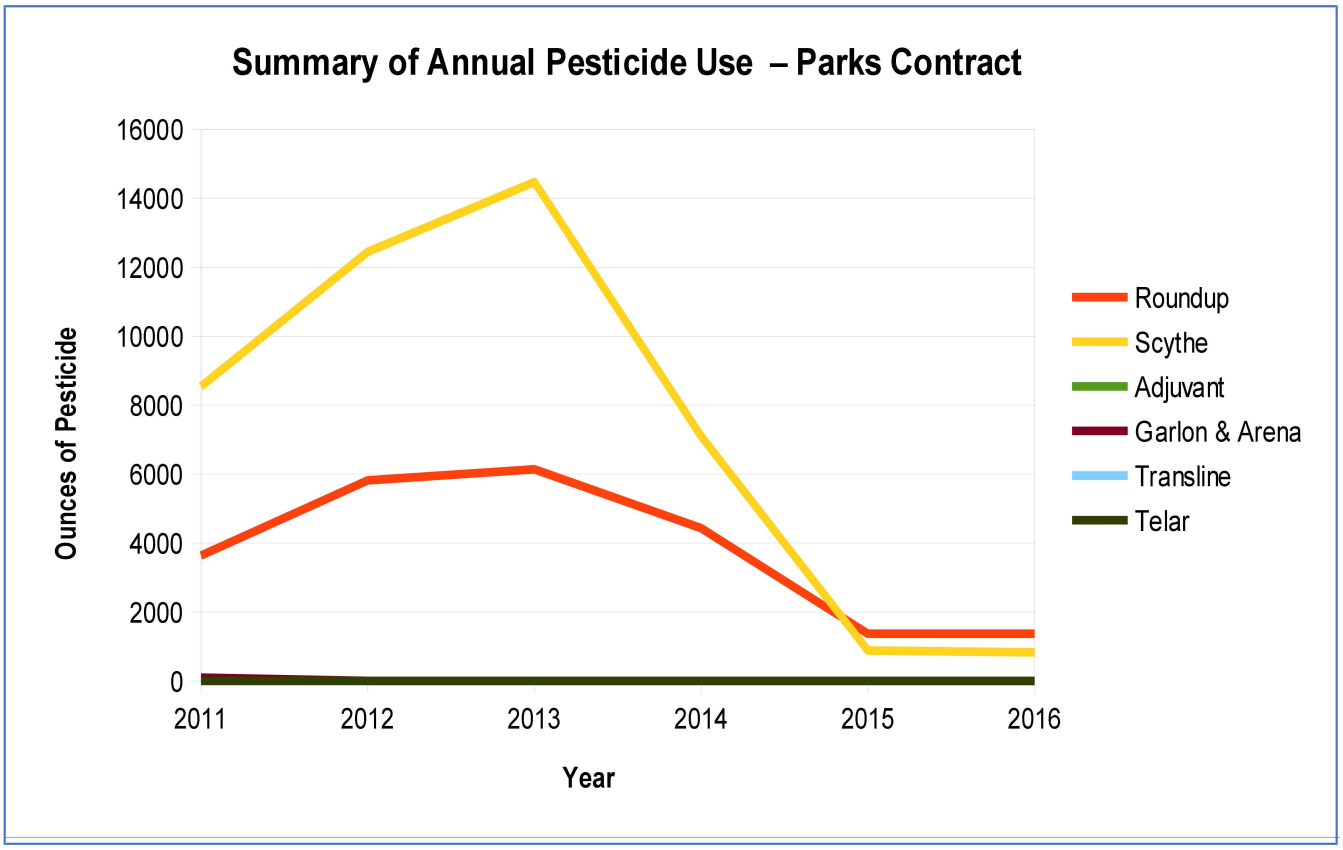
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Round-up	100	180	127	93.5	103.1	109.2	99	118	78	48	56.5
Scythe	0	0	1.3	7.7	21.7	104.8	173	153	100	46	25.5
Garlon	20.8	22	1.1	1.3	0.52	2.9	1.8	9	11	7	12.6
Goal	100	180	21.2	23.1	16.3	7.7	3.9	2	0.02	0	0
Turflon	0.2	0.03	3.1	32	17.9	14.6	7.7	0.2	0.7	0	0.06
Transline	1	0.3	1.3	2.4	0.64	5.7	0.09	0.14	0.3	0.05	2.3
Adjuvants	NA	NA	NA	16.7	15.8	17.1	20.2	20	16	15	12
Direx	NA	NA	NA	0	0	0	0	0	1.6	3.5	0
Surflan	NA	NA	NA	0	0	0	0	0	0	8.3	0

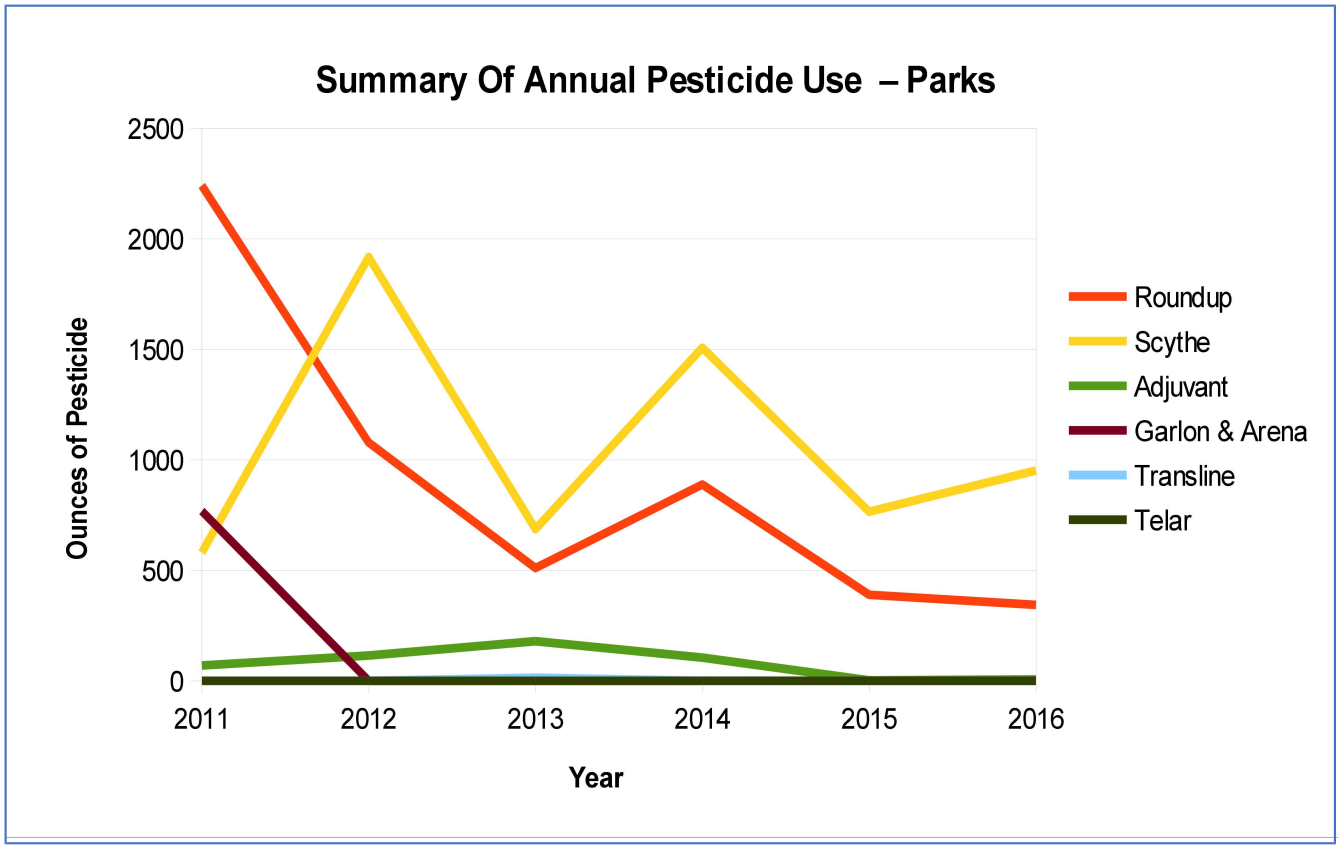

Summary of Annual Pesticide Use – City Total
Ounces of Pesticide
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
2011
2012
2013
2014
2015
2016
Year
Roundup
Scythe
Adjuvant
Garlon & Arena
Transline
Telar


Summary of Annual Pesticide Use – % of City Total by Department
% of Total City Use by Department
1.2
1
0.8
0.6
0.4
0.2
0
Public Works
Parks Contractor
Parks
Open Space
City Department
Roundup
Scythe
Adjuvant
Garlon & Arena
Transline
Telar


Summary Of Annual Pesticide Use – Public Works
Ounces of Pesticide
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
2011
2012
2013
2014
2015
2016
Year
Roundup
Scythe
Adjuvant
Garlon & Arena
Transline
Telar


Summary of Annual Pesticide Use – Open Space
Ounces of Pesticide
700
600
500
400
300
200
100
0
2011
2012
2013
2014
2015
2016
Year
Roundup
Scythe
Adjuvant
Garlon & Arena
Transline
Telar


Summary of Annual Pesticide Use – Parks Contract
16000
14000
12000
10000
8000
6000
4000
2000
0
Ounces of Pesticide
2011
2012
2013
2014
2015
2016
Year
Roundup
Scythe
Adjuvant
Garlon & Arena
Transline
Telar


Summary Of Annual Pesticide Use – Parks
2500
2000
1500
1000
500
0
Ounces of Pesticide
2011
2012
2013
2014
2015
2016
Year
Roundup
Scythe
Adjuvant
Garlon & Arena
Transline
Telar

Discussion

The Public Works Department is by far the largest user of pesticides in the City accounting for approximately 80% of the glyphosate used annually and almost 100% of the herbicides Garlon, Transline, and Telar. Much of this use is associated with the overland flow process at the wastewater treatment plant and associated vegetation management requirements will be eliminated upon completion of the wastewater treatment plant upgrades. In general, the public is not exposed to these applications although there is substantial environmental exposure associated with this use.

A substantial amount of herbicide is also used for **storm water conveyance channel**s although most of this weed control can also be accomplished by mowing. Most storm channels are freely accessible by the public and often used by children “exploring” and/or pets during roaming activities.

Parks and green belts are the next largest user of herbicides and represent the most common mode of exposure to the general public. Most of the alternative treatments discussed in Section 4 of this report have been carried out to some degree to reduce herbicide use in these areas. These herbicides are applied both by City workers and the City's contracted landscape maintenance firm with the maintenance firm using approximately twice as much herbicide as City workers.

Recommendation: initial efforts to reduce public exposure to these herbicides should focus on application to parks and greenbelts.

Section 3. Current IPM Program in Davis and Elsewhere

a. Description of Existing Davis IPM Policy and Areas for Improvement

The City of Davis' current IPM policy establishes pest management policies, procedures, and practices applicable to all City operations, whether conducted by city staff or by contractors. Beyond requiring adherence with applicable pesticide, environmental, and occupational safety laws, the current IPM policy requires first implementing, or at least seriously considering, non-chemical tactics such as cultural, biological, or mechanical controls to address a given pest problem. The current policy states, "Pesticides will only be used in those authorized situations where other alternative methods have proven not to be effective or feasible (e.g. cannot be sustained due to budgetary or other constraints)."

Even when pesticides applications are deemed necessary, generally only "those pesticides with the least toxicity to humans and the environment shall be applied." The IPM policy includes as an appendix lists of "green," "yellow," and "red" chemicals – in order of increasing hazard. The IPM policy specifies that "red" or "category 1" chemicals are generally not to be used within city limits, and that no pesticides are to be applied in designated playgrounds. Furthermore, the policy indicates that areas frequented by people and pets should generally only be treated with chemicals from the "green" list. Before applying pesticides, a site or area-specific plan must be developed, and the plan and specific pesticide applications must be approved by a Supervisor, the IPM Coordinator, and/or their designee.

The appropriately approved pesticide applications may only be conducted by or under the supervision of appropriately qualified applicators. The IPM policy includes a number of other specific guidelines on timing and method of pesticide application intended to maximize effectiveness and minimize otherwise undesirable effects. Applicators must submit a Pesticide Application Information form to its supervisor the "day prior, or on the morning of the desired day of the proposed pesticide application." The IPM coordinator then uses this information to inform citizens who call the "Pesticide Hotline." Each pesticide application requires its own notification process to be completed. Furthermore, if a planned pesticide application is canceled for any reason, such as due to weather conditions under which the IPM policy specifically prohibits pesticide applications, the "make-up" pesticide application still requires a new and separate Pesticide Application Information, public notification, etc. Applicators must place informational/warning signs at each end of a publicly accessible area being treated with pesticides, but no more than 300 feet apart which must remain until the pesticide material dries.

The policy provides that the IPM Coordinator and/or Department Directors may grant an exemption for application of a chemical that is not on the approved chemicals lists, or that the policy and lists would not ordinarily permit to be applied at a given locale:

> In specific circumstances where there is a risk to public health or the environment, materials not on the approved materials list can temporarily be used, but only after all alternatives have been reviewed, evaluated, and/or implemented, and only after the IPM Coordinator has authorized the use of the pesticide for the specified purpose. Exemptions may be one-time or programmatic, and the decision to approve an exemption will be based upon an evaluation of the failure or success of alternatives, and taking into consideration public health, environmental, and financial risks.

As discussed in more detail below, the Hazardous Substances Subcommittee has identified areas in which it feels the IPM policy should be revised for clarification of existing provisions, strengthened protections of the community and environment, and increased transparency and accountability.

b. Other Municipal and Park Pesticide Use Policies in California and the Western US

Following is a list of California cities with IPM-related policies and with their general classification and a link to that policy on the City's website. The information summarized below was obtained from the Beyond Pesticide's *Map of US Municipal Pesticide Reform Policies* (see reference source at the bottom of this document).

General Range of Scope of Municipal IPM Pesticide Policies/Ordinances in California

Beyond Pesticides and the Organic Consumer Association has created and reviewed a list of US cities that have IPM-related policies or ordinances and assigned each ordinance and/or policy a classification according to how restrictive is the policy.

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7) Policies or ordinances restricting use of toxic pesticides on public property in favor of alternative, organic methods – San Francisco, Richmond, Fairfax, Irvine

8) Policies or ordinances promoting an IPM policy that restricts highly toxic pesticides and urges pesticide use as a last resort – Moraga, Oakland, Belvedere, San Anselmo, Corte Madera, Mill Valley,

9) Policies or ordinances promoting an IPM policy that urges pesticide use as a last resort – Palo Alto, Berkeley, Albany, Arcata

10) Policies or ordinances encourages implementation of a limited IPM program – ***Davis***, Contra Costa Co, Alameda Co, Marin Co., Santa Barbara

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Following are lists of Western US cities that have Park policies that prohibit pesticide usage in public parks:

11) Policies or ordinances prohibiting the use of non-organic pesticides in public parks with limited exceptions – San Carlos CA, Portland OR, Eugene OR, King Co. WA, Seattle WA, Shoreline, WA

Following are lists of Western US cities that have policies that prohibit the use of neonicotinoid insecticides on public property with limited exceptions:

12) Policies or ordinances prohibiting the use of neonicotinoid insecticides in public places with limited exceptions – Sacramento CA, Boulder and Boulder County CO, Seattle WA, Spokane WA, Milwaukie OR

A more detailed listing of the policies restricting use of toxic pesticides on public property in favor of alternative, organic methods (i.e. the most restrictive in California, e.g. the most restrictive - San Francisco, Richmond, Fairfax, Irvine) is attached as Appendix E to this document. Included in Appendix E are Western US cities that have pesticide free parks programs and policies and/or bans on neonicotinoids.

International IPM Programs

France – In 2016, France became the first country in the world to ban all pesticides from parks and green spaces as reported by the Associated Press. In 2019, the law will expand from public green spaces to private gardens when the over-the-counter sale of pesticides to non-professionals becomes a thing of the past. While private residential green spaces are generally more compact than public spaces, instances of abuse and misuse of pesticides by amateur gardeners is common and pesticide use in modest backyard gardens can be just as high extensive as in large urban parks and pose just as high, or even higher, risk to birds, bees and other beneficial species. Further information on this ban is attached as Appendix G to this document.

Section 4. Proven Alternatives to Pesticide Use in Davis

a. For Weed Control:

As discussed, the overwhelming use of pesticides in Davis is for weed control. There are a variety of alternative methods available for weed control in lieu of glyphosate or other contact or pre-emergent herbicides. Many have been tested by the IPM Specialist in local parks and have been successfully employed in Davis by all municipal departments to at least some degree.

Mechanical Removal: Mowing, weed trimming, hoeing, hand removal and tilling are already extensively used by City crews to control weeds. Mowing and tilling are used throughout the Waste Water Treatment Plant (WWTP), wetlands, drainage channels and other City Open Space areas. In park and greenbelt weed trimming, hoeing, and hand pulling are the principal methods of mechanical weed controls.

Mulching: It is the single most successful and cost-effective cultural practice that reduces herbicide applications. Parks maintenance staff and volunteers continue to maintain mulch around landscaped areas and in some tree wells. Besides smothering weeds, mulch reduces the need for fertilizer and water and stimulates soil microorganisms that aid in plant growth. In 2015 the City's crews, contractors and local tree services distributed over 500 tons of wood chips in parks and throughout the community.

Solarization: Soil solarization is a non-chemical method for controlling soil pests and weeds using high temperatures produced by capturing radiant energy from the sun. The method involves first wetting the soil and then heating the soil by covering it with a clear plastic tarp for 4 to 6 weeks during a hot period of the year when the soil will receive the most direct sunlight. The plastic sheets allow the sun's radiant energy to be trapped in the soil, heating the top 12 to 18 inches and killing a wide range of soilborne pests, such as weeds, pathogens, nematodes, and insects. One acre of ground at the Mace Ranch Passive Recreation area was successfully solarized during the late summer and early fall of 2013. Native grasses were sown and only one broad leaf weed species (filaree) survived requiring a broadleaf selective application early in 2014. This method saved time, pesticide applications and labor, advancing the native grass establishment by a year. Unfortunately, no additional solarization projects were authorized and carried out in 2015 or 2016.

Grazing: Livestock grazing has successfully reduced weeds and the need to spray them at the South Fork Preserve along Putah Creek and at the wetlands. Sheep and goats are free ranged for periods of time, effectively keeping grasses and weeds down.

Weed Flaming: Propane flamers are used to reduce the need for other forms of weed control. This technique is effective on small, recently germinated broadleaf weeds. In parks, small 5-gallon propane tanks are used to control weeds around tree wells or between cracks.

Green Herbicides: Successful use of the soap-based herbicide Scythe in the green zones and sensitive areas and the combination with Glyphosate has contributed to the reduction of our conventional pesticide use. The recommended rate for a Scythe Glyphosate mixture is 1 ounce of roundup per gallon mix with 2-3 ounces of Scythe. Glyphosate alone is mixed at 2.66 ounces to achieve a 2% solution. A new organically approved herbicide, Suppress, which has Caprylic and Capric Acids as active ingredients and will be evaluated for use in our green areas as well as with a Glyphosate mixture.

Use of Native Vegetation in Landscaping Projects: The City plants native and drought tolerant trees, shrubs, and grasses when possible in municipal landscape projects. Native and drought plants are demonstrated in the UC Davis Arboretum and in the landscaping of the Central Park Gardens. The use

of perennial fescue around tree wells and under fences and structures in parks has reduced or eliminated herbicide applications resulting in efficient maintenance of the area. Lawn conversion projects at Arroyo Park have included planting native drought tolerant plants along with chip mulching.

Irrigation Control: Crew are replacing inappropriate sprinkler heads and fixing broken lines to reduce water use and weed growth. In 2015 over 200 sprinkler heads have been capped in parks and greenbelts. An additional 1000 sprinkler heads have been retrofitted to appropriate heads reducing overspray and improving uniform distribution.

b. For Aphid and Scale Control:

Leaf-sucking aphids on some trees (particularly Chinese Hackberry) result in deposition of “honeydew” excretions which fall to the ground and are unsightly on concrete surfaces. Staff has stated this presents a potential public safety hazard which view in not necessarily shared by the subcommittee. Scale can also develop on trees bark surfaces which can ultimately harm the tree due to stress-related phenomena. In lieu of conventional treatments with systemic insecticides (typically neonicotinoids), good control of the problem can be obtained by maintaining tree health and vigor of the tree through proper watering and fertilization, application of a dormant spray during the winter months to smother overwintering eggs (organic copper-oil formulations are available), and release of predatory lace-wings which feed on the aphids in the spring and/or summer if warranted by monitoring.

c. For Turf Grub Control:

Grubs live and propagate beneath lawn surfaces by feeding on the grass roots which can cause death or unsightly browning of the overlying turf. Staff has stated such turf damage can result in uneven playing surfaces and possible trip hazards on recreation fields which view in not necessarily shared by the subcommittee. Often neonicotinoids are applied to the turf surface which is uptaken by the grass and results in death of the feeding grubs. Good control can be otherwise be obtained by biological release of appropriate nematodes which are eaten by the grubs resulting in their death, or by application of non-systemic, contact insecticides with less adverse environmental impacts.

Section 5. Public Forum on Pesticide Usage in Davis

On December 7th, a public forum was held in the multi-purpose room at the Senior Center that was sponsored by the Davis Natural Resources Commission. Approximately 80 – 90 members of the public attended in addition to speakers, City Staff, and members of various City citizen commissions.

A keynote presentation was given by current Executive Director of the California Department of Pesticide Regulation who discussed the evolution of IPM in California with an emphasis on municipal IPM programs. Additional presentations were made discussing the toxicology of glyphosate and neonicotinoids, the current and historical use of chemical control methods and proven alternatives in Davis, and case studies of organic landscapes and neighborhood “adoption” of parks to reduce pesticide usage. An extended Q&A and public comments period was also held.

The proceedings were video-taped by Davis Media Access and are available through DCTV. The full published agenda for the forum is attached as Appendix C to this report.

Section 6. Results of Davis Community Survey on Pesticide Use

A survey was conducted by the sub-committee both on Surveymonkey.com and distributed and collected at the public forum. The detailed results from all surveys are listed below. Specific questions were asked and space for comments followed each selection of answers. An effort was made to determine how knowledgeable the public is about IPM, glyphosate and neonicotinoids, and how tolerant they might be of seasonal or periodic "unconventional" or unkempt look that is natural in transitioning from using chemicals to more Green or organic practices.

Results Summary:

Results indicate a strong desire on the part of the residents to eliminate use of pesticides.

- 100% are familiar with the impacts of pesticides on pollinators.
- 92% of respondents make an effort to reduce pesticides at home.
- Answers indicate a willingness to tolerate some seasonal messy appearance to accomplish long term Green IPM goals (there were no responses that indicated a desire for manicured landscape).
- 91% said they are willing to put in at least 1-2 hours per month to volunteer to help maintain those parks by pulling weeds or spreading mulch.
- There were some good suggestions about unconventional looks having degrees of acceptability.

Detailed Results:

Survey Results as of 12/11/16: Total 11 responses Online and 14 responses Offline

1. **Do you make an effort to reduce pesticide (herbicide, insecticide, rodenticide) on the property where you live?**

Yes	**92.00%** (23)
No	**0.00%** 0
I live in an apartment and have no say	**8.0%** 2
Total	25

Comments

Online1 - I do not use any pesticides on my property.
Offline1 – I garden organically and do not use any pesticides
Offline2 – I use none
Offline3 – Do not use synthetics
Offline4 – We have 3 acres and use none or very little

2. **Have you heard about studies on the impacts of pesticides on pollinators (for example, bees and butterflies who move from flower to flower to pollinate flowers in yards or crops in agricultural fields and orchards)?**

Yes	**100.0%** 25
No	**0.00%** 0

A little	0. 0
Total	25

Comments 0

3. **Do you know anything about the health impacts of glyphosate (RoundUp[TM]) or neonicotinoids on humans and animals (like dogs and cats)?**

Yes	**84.0%** 21
No	4. 1
A little	**12.0%** 3
Total	25

Comments 0

5. **How do you feel about public parks or neighbors' yards you see that have some plants that look like weeds or patches of brown lawn? Please select the answer(s) that apply.**

I don't mind it at all	**40.0** 10
I don't mind it at all, it is natural	**48.0%** 12
It bothers me, it looks like the owners don't care	**8.0%** 2
It bothers me, I feel it could be a health hazard	**0%** 0
It bothers me as it could impact my property values	**4.0%** 1
Total Respondents:	25

Comments

Online1 - There are weeds that are left unattended that have been spreading in city parks over the last few years, including burrs, which reduce the usable space and continue to spread within the parks. I would like to see weeds prioritized by how they affect the use of a space and the ones that cause issues dealt with before they become larger issues
Online2 - It all depends on the plant. I don't like non-native, invasive weedy plants, but I do like native, drought tolerant plants which can sometimes look messy. I don't need to see perfectly manicured lawns and yards.
Online3 - I don't like the brown, dead weeds when it is due to pesticide application.
Offline1 – If they have brown lawns it means they care about the environmental
Offline2 – It's a plus it means they are not spraying or over-watering

6. **What do you think about yards and parks that have piles of mulched leaves and bark around trees vs. having it raked clean of leaves with cleared dirt or manicured grass on the ground?**

I don't mind mulch, it helps protect plants and trees and helps	**100.0%** 25

deter weed growth	
I don't really think about it	0% 0
I prefer a neat and clean look with traditional grass or dirt that has been raked or blown free of debris like leaves and mulch.	0% 0
Total	25

Comments

Online1-I don't mind mulch but I also want the health of the trees to be kept in mind and the space around the trunk itself cleared as needed to ensure that the tree stays healthy.
Online2-Live by Slide Hill park and worked to do just this in June
Offline1 – Its ridiculous to use chemicals to create a synthetic lawn
Offline2 – Trees are sad when you take their leaves away

7. If you have been to Village Homes, do you enjoy the landscaping and vegetation there?

I have never been there	0% 0
Yes, I do	100.0% 25
No, I do not	0% 0
I do not have a preference	0% 0
Total	25

Comments

Online1-I like the more natural look
Offline 1 – I am a real estate broker and like taking clients there because it is so beautiful

8. In order to have organic (non-toxic) landscaping in parks and greenbelts while keeping costs down for the City, would you be willing to join a volunteer group and periodically work as a team to care for the area? (This might include activities such as helping spread mulch or pulling weeds.) If you answer yes, please check the hours per month you might be willing to contribute.

	1-2 hours per month	3-4 hours per month	5-7 hours per month	8-10 hours per month	More than 10 hours per month	Total
Yes Combined	45.5% 10	50.0% 11	0% 0	4.5% 1	0% 0	91.6% 2
No Combined			100.0% 2			8.33% 2

Comments

Online1-Herbicides are an important tool in managing weeds.
Offline1 – Depends on overall viability of program

9. Should the City have an audit by an independent 3rd party to make sure we are following State law regulating pesticide (herbicide, insecticide, rodenticide) application and the City's existing Integrated Pest Management Plan?

Yes	**50%** 12
No	**50%** 12
Total	24

Comments

Online1-I am sure the City can follow the state laws.
Online2-I don't believe state law is environmentally sensitive enough. Davis should take a lead and move further away from toxic chemicals.
Online3-Depends on the regulations. I want less pesticide use. I am not sure if the State law would require the City of Davis more application or less.
Offline1 – We should not be using any herbicides, pesticide, and rodenticides in any parks-and-community-services
Offline2 – Depends on the cost of the audit
Offline 3 – I don't know enough. Do we have good enough internal procedures already?
Offline4 – I trust the City is already following state laws
Offline 5. Unless it costs too much money
Offline6 – Why do we need an audit? Is the City that corrupt?

10. Vegetation management that is friendly habitat for pollinators can look unconventional, sometimes overgrown or with plants that look dead during some seasons of the year. Please check one answer for each of the following four questions:

	It does not bother me at all	I don't love it, but realize it is natural	I don't care one way or the other	I think it looks neglected	It bothers me a lot	It bothers me enough to complain	Total
Does it bother you to see in a City park? Online and Offline Combined Results	84.00% 21	16.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	25
Does it bother you to see at your neighbor's house? Online and Offline Combined Results	80.0% 20	16.00% 4	0.00% 0	4.00% 1	0.00% 0	0.00% 0	25
Does it bother you to see on a school property? Online and Offline Combined Results	84.00% 21	8.00% 2	8.00% 2	0.00% 0	0.00% 0	0.00% 0	25
Does it bother you to see in City-owned farm land (such as the Cannery and Mace Curve 25 acres)? Online and Offline Combined Results	80.0% 20	12.00% 3	0.00% 0	8.00% 2	0.00% 0	0.00% 0	25

Comments

Online1-Native and pollinator friendly habitat can be managed to look somewhat conventional. There are degrees of management and I prefer a look that is friendly to pollinators but also more managed in public and residential spaces while more of a natural look makes sense in parks and schools. It isn't all or nothing.
Online2-It mostly depends on the plants. I don't like non-native, invasive weedy plants, but I do

	It does not bother me at all	I don't love it, but realize it is natural	I don't care one way or the other	I think it looks neglected	It bothers me a lot	It bothers me enough to complain	Total

like native, drought tolerant plants which can sometimes look messy. I don't need to see perfectly manicured lawns and yards.
Online3-All these areas can be "cleaned up" by residents and students seeking community service credits. This to remove seasonally dead vegetation.
Online4-I'd rather things be done right than to have things look pretty
Offline1 – I don't favor monocultured lawns

11. Should the City make it a priority to eliminate toxic chemicals in public spaces?

Yes	**91.67%**	23
No	**8.33%**	2
Total		25

Comments

Online1-This seems like a loaded question. I don't mind occasional spot spraying herbicides for weeds. Those are toxic chemicals to weeds, but used per directions I don't have a problem with that application.
Online2-We are already surrounded by toxic agrochemicals and pollen. Our air is very polluted and so is our water. We do not need more toxic chemicals in public spaces. The City SHOULD eliminate toxic chemicals for our well being and a safer/less toxic environment.
Online3-Pesticides and insecticides should. It be used in any public Spaces period. They shouldn't be used anywhere children or pregnant women are. They shouldn't be used anywhere people with asthma may encounter them. I don't want cancer. The pesticide companies all say it's safe but it's barely regulated and people should not use them.
Offline1 – I feel very strongly that the City should move very rapidly in this direction. Do not delay.
Offline2 – They should work to limit exposure to the public and in the long term eliminate.

Section 7. Proposed Objective Goals and Justification

a. Move IPM Specialist from Parks and Community Services Department to the Environmental Department Resources Division within Public Works, or to the Open Space Division within Community Development with Supervisory Authority over Pesticide Management Citywide

As is covered above in Section 1 a. A History of IPM in Davis, the IPM Specialist position has been shifted around to different departments with frequent changes in reporting structure and supervisors. IPM Policy and the concurrently existing Pesticide Use Policy in the City. This resulted in an effort to integrate the two policies into a single IPM and Pesticide Use policy to improve functionality of the policy. However, application of pesticides and weed control are being completed in a decentralized fashion. It would be more in line with the public's interest in safety to have an environmental specialist's oversight of the IPM Specialist who has expertise in organic weed abatement and landscaping practices and we recommend functional pesticide control activities be overseen by one person (the IPM Specialist) across all departments with a lead contact in each department so communication can be conducted regularly. The Community Services and Sustainability Department or Environmental Resources Division of Public Works appear to be better suited department.

As stated above, the IPM Policy requires the City try non-chemical tactics such as cultural, biological, physical, or mechanical controls as the first line of defense to address pests such as weeds. The IPM Specialist needs supervisors who have training and understanding about what is possible.

b. Immediately Ban Use of Neonicotinoids

A number of cities and countries around the globe are banning the use of neonicotinoids not only by government staff, but also by residents on private property. The three-commission task force will complete a comprehensive pesticide use review in Davis with additional stated objectives of eliminating use of the neonicotinoid class of insecticide as soon as possible due to their adverse effects on pollinators. After a period of time during which there was an "unwritten" decision to avoid using this class of pesticide, usage has increased in the past year. The IPM Specialist has successfully demonstrated that it is not a necessary component of the landscape activities in public spaces. If we do not need it, why use a product that has been shown in numerous studies to negatively impact pollinators and other wildlife. We do not need to wait and recommend this ban be instated now.

c. Gradual phaseout of glyphosate on all public places and open spaces over a three year period

The IPM Specialist has made a presentation to the three commissions that details the process for converting to more stringent "Green" and organic practices. After interviewing him and the City Wildlife Resource Specialist about these processes this subcommittee estimates it will take a three to four year time period to convert to these methods with more labor costs up front but less expense concurrently on purchase, storage, and disposal of toxic, unnecessary chemicals. Labor costs will be somewhat mitigated by the proposal to enlist aid of local citizen volunteer weed and mulch corps focused on their specific neighborhood park areas.

d. Convert all parks and open spaces where children and pets play to "Green" status and strive for full organic status with neighborhood volunteers for problematic weed abatement

As has been demonstrated by the community around Slide Hill Park and confirmed by over 90% of survey participants, there is sufficient interest and willingness of residents to participate in keeping their parks and play areas non-toxic. Under the IPM Specialist's guidance about timing and tasks, City staff

can work with neighborhood team captains, make use of Nextdoor as a communication tool, and recruit additional volunteers during the education campaign to conduct some of the weed abatement.

e. Concurrent public education plan, activities, and signage to notify residents

It is critical to inform residents and raise their awareness of the seasonality of more organic landscapes with a public outreach effort. This would include communications such as news articles, website content, and importantly signage explaining processes such as solarization so the public understands that eyesores are temporary and bring long-term benefits.

f. Establish City-wide abatement crew under the IPM Specialist

In order to ensure compliance with the updated IPM Policy, manage the purchase, distribution, and storage of toxic weed abatement chemicals as well as contractor compliance, it seems most efficient to have weed abatement in all City owned spaces under the guidance of one expert with the oversight of a trained environmentalist. We recommend that the City establish a City-wide weed abatement crew under the IPM Specialist.

g. Update the IPM Policy to be more specific regarding exemption procedures

The current IPM policy lays out general procedures to follow when addressing a perceived pest problem, including developing a site-specific plan, attempting (or at least considering) non-chemical tactics first, and following specified protocol when pesticide application is desired. All of these would benefit from further development, including developing more dynamic, risk-based approved chemicals lists and further developing and clarifying the process for assessing non-chemical efforts prior to resorting to chemicals.

Specifically, however, the IPM policy's pesticide application exemption standards and procedures must be further developed and clarified to ensure clear and consistent application. Such exemptions ought only be utilized to address pest situations that pose true public health or environmental risks and that have not been and cannot be adequately addressed through less hazardous non-chemical or chemical means. The definitions and methodologies of assessing public health, environment, alternatives, and financial risk should be further developed and explained, as well as any other factors that are intended to be part of assessing appropriateness of exemptions. As noted below, the Hazardous Substances Subcommittee strongly suggests that the City of Davis also publicly post information on approved exemptions.

h. Incorporate IPM policy requirements into city contracts and lease agreements, and establish practices

The current IPM policy indicates that it applies to the City's contractors and that the City of Davis' "maintenance contracts" also include specific provisions regarding pesticide application and discipline procedures. However, some of the complaints or concerns raised by observing members of the public indicate that some contractors are either not subject to the requirements of the IPM Policy or are not following them. The Hazardous Substances Subcommittee strongly recommends expressly conditioning all relevant City contracts -- not only specifically for pest management but also for leases, property management, landscaping, or other goods or services – upon ongoing compliance with the City's complete IPM policy, including any subsequent revisions or amendments thereto. Furthermore, the Hazardous Substances Subcommittee strongly recommends that the IPM Coordinator and other City staff overseeing such contracts track and enforce contractors' compliance.

I. Increase Public Availability of IPM and Pesticide Application Data

The City of Davis' IPM webpage (http://cityofdavis.org/city-hall/parks-and-community-services/integrated-pest-management) provides relevant and useful information, including general information and presentations on IPM topics, a copy of the current IPM policy, a previous year's city-wide IPM annual report, site-specific pesticide application plans for certain city parks (PHAER Zones), and information regarding the city's pesticide "hotline." The Hazardous Substances Subcommittee strongly recommends upgrading this website to include:

1) The site-specific plans for other parks and many other City of Davis properties and facilities in which pesticides are applied;

2) Up-to-date substantive details on upcoming pesticide applications. The Hazardous Subcommittee presumes that the City could simply post the Pesticide Application Information forms, which appear to be the basis for information the pesticide "hotline" currently provides to members of the public who call.

3) An up-to-date list of all approved pesticide application exemptions, including the following information:

a) Applicant name and department
b) Pesticide product name, active ingredient, pesticide type, and EPA registration number
c) Target pest
d) Address of pesticide use
e) Justification for Use, including explanation of efforts to utilize alternatives
f) Strategy to prevent need for further exemptions
g) Date of exemption approval and name of authorized approver
h) Date range and other limitations on exemption

Furthermore, the Hazardous Substances Subcommittee recommends that the policy require that Pesticide Application Information and exemption approvals generally be publicly posted to the website (and signs posted at the physical application site) no later than 48 number hours before the pesticide is applied. The Hazardous Substances Subcommittee recognizes that the IPM policy likely requires an exception to this posting rule for true health or safety emergencies, but urges that the exemption be crafted extremely narrowly and still require notification as soon as possible prior to application. Physical signage at application sites is recommended to remain up for at least 96 hours following pesticide application, and electronic postings to remain on the website permanently, with archiving of older records or data as appropriate.

Section 8. Proposed Next Steps

a. Present this report to the Natural Resources, Open Space and Habitat, and Recreation and Parks Commission – Upon acceptance of this report following initial presentation to and receipt of comments from the Natural Resources Commission, it should be subsequently presented to Staff and the Open Space and Habitat Commission and the Parks and Recreation Commission by the Hazardous Material subcommittee for comments and deliberation.

b. Prepare Detailed Time-line and Financial Analysis for Each Goal – Upon receipt of comments from the respective Commissions and following further discussions with Staff, an implementation time-line should be developed including a cost analysis for implementing each objective or goal in the Plan

c. Plan for Additional Public Outreach and Input – Staff has indicated their intention to perform further public outreach including a public forum to discuss standards of service and an additional public survey with a broader reach. The Hazardous Material Subcommittee welcomes these efforts providing they are coordinated with an include input from the respective Commissions

d. Update Initial Report with Finalized Recommendations and Additional Information and Present Policy Changes to City Council – Upon receiving comments from each of the Commissions, suggestions from Staff, and input from the public outreach effort, the initial report will be updated and finalized and presented to City Council for their deliberation.

Appendix A – Information on Glyphosate

Summary

Glyphosate is a herbicide that is the primary ingredient in Round-up, made by Monsanto. It is also available generically in different concentrations and with numerous different added adjuvants. More glyphosate is used in Davis than any other pesticide.

The following information is excerpted from Wikipedia

Glyphosate (*N*-(phosphonomethyl)glycine) is a broad-spectrum systemic herbicide and crop desiccant. It is an organophosphorus compound, specifically a phosphonate. It is used to kill weeds, especially annual broadleaf weeds and grasses that compete with crops. It was discovered to be a herbicide by Monsanto chemist John E. Franz in 1970.[3] Monsanto brought it to market in 1974 under the trade name **Roundup**, and Monsanto's last commercially relevant United States patent expired in 2000.

Farmers quickly adopted glyphosate, especially after Monsanto introduced glyphosate-resistant Roundup Ready crops, enabling farmers to kill weeds without killing their crops. In 2007, glyphosate was the most used herbicide in the United States' agricultural sector and the second-most used in home and garden, government and industry, and commerce.[4] By 2016 there was a 100-fold increase from the late 1970s in the frequency of applications and volumes of glyphosate-based herbicides (GBHs) applied, partly in response to the unprecedented global emergence and spread of glyphosate-resistant weeds.[5]:1

Glyphosate is absorbed through foliage, and minimally through roots,[6][7][8] and transported to growing points. It inhibits a plant enzyme involved in the synthesis of three aromatic amino acids: tyrosine, tryptophan, and phenylalanine. Therefore, it is effective only on actively growing plants and is not effective as a pre-emergence herbicide. An increasing number of crops have been genetically engineered to be tolerant of glyphosate (e.g. Roundup Ready soybean, the first Roundup Ready crop, also created by Monsanto) which allows farmers to use glyphosate as a postemergence herbicide against weeds. The development of glyphosate resistance in weed species is emerging as a costly problem. While glyphosate and formulations such as Roundup have been approved by regulatory bodies worldwide, concerns about their effects on humans and the environment persist.[5][9]

Summary of Toxicology

Many regulatory and scholarly reviews have evaluated the relative toxicity of glyphosate as a herbicide. The German Federal Institute for Risk Assessment toxicology review in 2013 found that "the available data is contradictory and far from being convincing" with regard to correlations between exposure to glyphosate formulations and risk of various cancers, including non-Hodgkin lymphoma (NHL).[10] A meta-analysis published in 2014 identified an increased risk of NHL in workers exposed to glyphosate formulations.[11] In March 2015 the World Health Organization's International Agency for Research on Cancer classified glyphosate as "probably carcinogenic in humans" (category 2A) based on epidemiological studies, animal studies, and *in vitro* studies.[9][12][13] In November, 2015, the European Food Safety Authority published an updated assessment report on glyphosate, concluding that "the substance is unlikely to be genotoxic (i.e. damaging to DNA) or to pose a carcinogenic threat to humans." Furthermore, the final report clarified that while other, probably carcinogenic, glyphosate-containing formulations may exist, studies "that look solely at the active substance glyphosate do not show this effect."[14][15] In May 2016, the Joint FAO/WHO Meeting on Pesticide Residues concluded that "glyphosate is unlikely to pose a carcinogenic risk to humans from exposure through the diet", even at doses as high as 2,000 mg/kg body weight orally.[16]

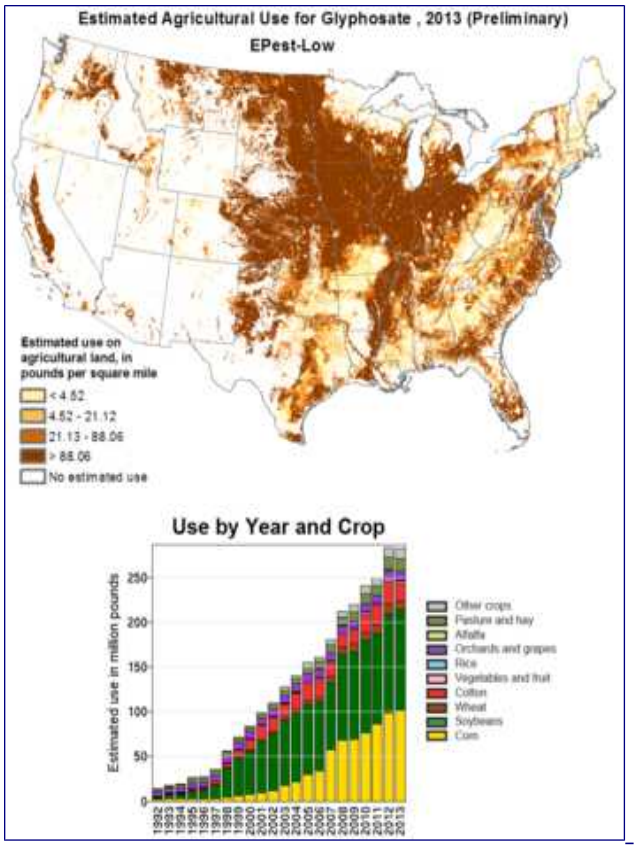
Environmental fate

Glyphosate adsorbs strongly to soil, and residues are expected to generally be immobile in soil. Ground and surface water pollution is limited.[39] Glyphosate is readily degraded by soil microbes to aminomethylphosphonic acid (AMPA, which like glyphosate strongly adsorbs to soil solids and is thus unlikely to leach to groundwater). Though both glyphosate and AMPA are commonly detected in water bodies, a portion of the AMPA detected may actually be the result of degradation of detergents rather than from glyphosate.[40] Glyphosate does have the potential to contaminate surface waters due to its aquatic use patterns and through erosion, as it adsorbs to soil particles suspended in runoff. The mechanism of glyphosate sorption to soil is similar to that of phosphate fertilizers, the presence of which can reduce glyphosate sorption.[41] Phosphate fertilizers are subject to release from sediments into water bodies under anaerobic conditions, and similar release can also occur with glyphosate, though significant impact of glyphosate release from sediments has not been established.[42] Limited leaching can occur after high rainfall after application. If glyphosate reaches surface water, it is not broken down readily by water or sunlight.[43][44]

The half-life of glyphosate in soil ranges between 2 and 197 days; a typical field half-life of 47 days has been suggested. Soil and climate conditions affect glyphosate's persistence in soil. The median half-life of glyphosate in water varies from a few to 91 days.[7] At a site in Texas, half-life was as little as three days. A site in Iowa had a half-life of 141 days.[45] The glyphosate metabolite AMPA has been found in Swedish forest soils up to two years after a glyphosate application. In this case, the persistence of AMPA was attributed to the soil being frozen for most of the year.[46] Glyphosate adsorption to soil, and later release from soil, varies depending on the kind of soil.[47][48] Glyphosate is generally less persistent in water than in soil, with 12- to 60-day persistence observed in Canadian ponds, although persistence of over a year has been recorded in the sediments of American ponds.[43] The half-life of glyphosate in water is between 12 days and 10 weeks.[49]

According to the National Pesticide Information Center fact sheet, glyphosate is not included in compounds tested for by the Food and Drug Administration's Pesticide Residue Monitoring Program, nor in the United States Department of Agriculture's Pesticide Data Program. However, a field test showed that lettuce, carrots, and barley contained glyphosate residues up to one year after the soil was treated with 3.71 lb of glyphosate per acre (4.15 kg per hectare).[7] The U.S. has determined the acceptable daily intake of glyphosate at 1.75 milligrams per kilogram of bodyweight per day (mg/kg/bw/day) while the European Union has set it at 0.3.[50].

Use



Estimated use of glyphosate in the USA in 2013 and estimated total use from 1992–2013

Glyphosate is effective in killing a wide variety of plants, including grasses and broadleaf and woody plants. By volume, it is one of the most widely used herbicides.[7] In 2007, glyphosate was the most used herbicide in the United States agricultural sector, with 180 to 185 million pounds (82,000 to 84,000 tonnes) applied, the second-most used in home and garden with 5 to 8 million pounds (2,300 to 3,600 tonnes) and government applied 13 to 15 million pounds (5,900 to 6,800 tonnes) in industry and commerce.[4] It is commonly used for agriculture, horticulture, viticulture, and silviculture purposes, as well as garden maintenance (including home use).[7][51] It has a relatively small effect on some clover species and morning glory.[52]

Glyphosate and related herbicides are often used in invasive species eradication and habitat restoration, especially to enhance native plant establishment in prairie ecosystems. The controlled application is usually combined with a selective herbicide and traditional methods of weed eradication such as mulching to achieve an optimal effect.[53]

In many cities, glyphosate is sprayed along the sidewalks and streets, as well as crevices in between pavement where weeds often grow. However, up to 24% of glyphosate applied to hard surfaces can be run off by water.[54] Glyphosate contamination of surface water is attributed to urban and agricultural use.[55] Glyphosate is used to clear railroad tracks and get rid of unwanted aquatic vegetation.[8] Since 1994, glyphosate has been used in aerial spraying in Colombia in coca eradication programs; Colombia announced in May 2015 that by October, it would cease using glyphosate in these programs due to concerns about human toxicity of the chemical.[56]

In addition to its use as a herbicide, glyphosate is also used for crop desiccation (siccation) to increase harvest yield,[8] and as a result of desiccation, to increase sucrose concentration in sugarcane before harvest.[57]

Genetically modified crops

Some micro-organisms have a version of 5-enolpyruvoyl-shikimate-3-phosphate synthetase (EPSPS) resistant to glyphosate inhibition. A version of the enzyme that was both resistant to glyphosate and that was still efficient enough to drive adequate plant growth was identified by Monsanto scientists after much trial and error in an *Agrobacterium* strain called CP4, which was found surviving in a waste-fed column at a glyphosate production facility.[35][58][59]:56 This *CP4* EPSPS gene was cloned and transfected into soybeans. In 1996, genetically modified soybeans were made commercially available.[60] Current glyphosate-resistant crops include soy, maize (corn), canola, alfalfa, sugar beets, and cotton, with wheat still under development.

In 2015, 89% of corn, 94% of soybeans, and 89% of cotton produced in the US were genetically modified to be herbicide-tolerant.[61]

Formulations and trade names

Glyphosate is marketed in the United States and worldwide by many agrochemical companies, in different solution strengths and with various adjuvants, under dozens of trade names.[62][63][64][65] As of 2010, more than 750 glyphosate products were on the market.[66] In 2012, in terms of volume about half of the total global consumption of glyphosate was for conventional crops; Asia Pacific was the largest and fastest growing market.[67] Chinese manufacturers collectively are the world's largest producers of glyphosate and its precursors[68] and account for about 30% of global exports.[67] Key manufacturers include Anhui Huaxing Chemical Industry Company, BASF, Bayer CropScience, Dow AgroSciences, DuPont, Jiangsu Good Harvest-Weien Agrochemical Company, Monsanto, Nantong Jiangshan Agrochemical & Chemicals Co., Nufarm Limited, SinoHarvest, Syngenta, and Zhejiang Xinan Chemical Industrial Group Company.[67]

Adjuvant loading refers to the amount of adjuvant[69][70] already added to the glyphosate product. Fully loaded products contain all the necessary adjuvants, including surfactant; some contain no adjuvant system, while other products contain only a limited amount of adjuvant (minimal or partial loading) and additional surfactants must be added to the spray tank before application.[71] As of 2000 (just before Monsanto's patent on glyphosate expired), over 400 commercial adjuvants from over 34 different companies were available for use in commercial agriculture.[72][73]

Monsanto

Monsanto's Roundup is the earliest formulation of glyphosate.

Monsanto developed and patented the use of glyphosate to kill weeds in the early 1970s, and first brought it to market in 1974, under the Roundup brand name.[24][75] While its initial patent[76] expired in 1991, Monsanto retained exclusive rights in the United States until its patent[77] on the isopropylamine salt expired in September 2000.[78]

As of 2009, sales of these herbicide products represented about 10% of Monsanto's revenue due to competition from other producers of other glyphosate-based herbicides;[79] their Roundup products (which include GM seeds) represented about half of Monsanto's gross margin.[80]

The active ingredient of the Monsanto herbicides is the isopropylamine salt of glyphosate. Another important ingredient in some formulations is the surfactant polyethoxylated tallow amine.

Monsanto also produces seeds which grow into plants genetically engineered to be tolerant to glyphosate. The genes contained in these seeds are patented. Such crops allow farmers to use glyphosate as a postemergence herbicide against most broadleaf and cereal weeds. Soy was the first glyphosate-resistant crop.

Toxicity

Glyphosate is the active ingredient in herbicide formulations containing it. However, in addition to glyphosate salts, commercial formulations of glyphosate contain additives such as surfactants which vary in nature and concentration. The surfactants are added to enable the glyphosate to penetrate the cuticle of the plants. Toxicologists have studied glyphosate alone and formulations.

Glyphosate alone

Humans

Many regulatory and scholarly reviews have evaluated the relative toxicity of glyphosate as a herbicide. The German Federal Institute for Risk Assessment toxicology review in 2013 found that "the available data is contradictory and far from being convincing" with regard to correlations between exposure to glyphosate formulations and risk of various cancers, including non-Hodgkin lymphoma.[10]

Early epidemiological studies did not find associations between long-term, low-level exposure to glyphosate and any disease.[81][82][83] A 2000 review concluded that "under present and expected conditions of new use, there is no potential for Roundup herbicide to pose a health risk to humans".[84] A 2002 review by the European Union reached the same conclusion.[85] In 2013 the European commission reviewed a 2002 finding that had concluded equivocal evidence existed of a relationship between glyphosate exposure during pregnancy and cardiovascular malformations and found that "there is no increased risk at the levels of exposure below those that caused maternal toxicity."[86] A 2013 review found that neither glyphosate nor typical glyphosate-based formulations pose a genotoxicity risk in humans under normal conditions of human or environmental exposures.[87]

A 2014 review article reported a significant association between B-cell lymphoma and glyphosate occupational exposure.[11] In March 2015, the World Health Organization's International Agency for Research on Cancer classified glyphosate as "probably carcinogenic in humans" (category 2A) based on epidemiological studies, animal studies, and *in vitro* studies.[9][12][13] However, in 2016 a joint meeting of the United Nations (FAO) Panel of Experts on Pesticide Residues in Food and the Environment and the World Health Organization Core Assessment Group on Pesticide Residues concluded that based on the available evidence "glyphosate is unlikely to pose a carcinogenic risk to humans from exposure through the diet".[88]

Other mammals

Amongst mammals, glyphosate is considered to have "low to very low toxicity". The LD_{50} of glyphosate is 5,000 mg/kg for rats, 10,000 mg/kg in mice and 3,530 mg/kg in goats. The acute dermal LD_{50} in rabbits is greater than 2,000 mg/kg. Indications of glyphosate toxicity in animals typically appear within 30 to 120 minutes following ingestion of a large enough dose, and include initial excitability and tachycardia, ataxia, depression, and bradycardia, although severe toxicity can develop into collapse and convulsions.[7]

A review of unpublished short-term rabbit-feeding studies reported severe toxicity effects at 150 mg/kg/day and "no observed adverse effect level" doses ranging from 50 to 100 mg/kg/day.[89]

Glyphosate can have carcinogenic effects in nonhuman mammals. These include the induction of positive trends in the incidence of renal tubule carcinoma and haemangiosarcoma in male mice, and increased pancreatic islet-cell adenoma in male rats.[12]

Glyphosate-based herbicides may cause life-threatening arrhythmias in mammals. Evidence also shows that such herbicides cause direct electrophysiological changes in the cardiovascular systems of rats and rabbits.[90]

Glyphosate-based formulations

Glyphosate-based formulations may contain a number of adjuvants, the identities of which are considered trade secrets.[101] Surfactants are used in herbicide formulations as wetting agents, to maximize coverage and aid penetration of the herbicide(s) through plant leaves. As agricultural spray adjuvants, surfactants may be mixed into commercial formulations, such as Roundup, or they may be purchased separately and mixed on-site (tank mix).

Polyethoxylated tallow amine (POEA) is a surfactant used in the original Roundup formulation and was still being commonly used in 2015.[102] Different versions of Roundup have included different percentages of POEA. Although Monsanto product fact sheets do not disclose surfactants and their percentages, a 1997 US government report said that Roundup is 15% POEA while Roundup Pro is 14.5%.[103] A review of the literature provided to the EPA in 1997 found that POEA was more toxic to fish than glyphosate was.[103] POEA is more toxic to fish and amphibians than glyphosate alone.[103] [104]

Human

Data from the California Environmental Protection Agency's Pesticide Illness Surveillance Program, show glyphosate-related incidents are some of the most common.[105][106]

A 2012 meta-analysis of all epidemiological studies of exposure to glyphosate formulations found no correlation with any kind of cancer.[82] The 2013 systematic review by the German Institute for Risk Assessment of epidemiological studies of workers who use pesticides, exposed to glyphosate formulations found no significant risk, stating that "the available data are contradictory and far from being convincing".[10]:Volume 1, p64-66 However, a 2014 meta-analysis of the same studies found a correlation between occupational exposure to glyphosate formulations and increased risk of B cell lymphoma, the most common kind of non-Hodgkin lymphoma. Workers exposed to glyphosate were about twice as likely to get B cell lymphoma.[11]

Acute toxicity is dose-related; Skin exposure to ready-to-use glyphosate formulations can cause irritation, and photocontact dermatitis has been occasionally reported. These effects are probably due to the preservative benzisothiazolin-3-one. Severe skin burns are very rare.[107] Inhalation is a minor route of exposure, but spray mist may cause oral or nasal discomfort, an unpleasant taste in the mouth, or tingling and irritation in the throat. Eye exposure may lead to mild conjunctivitis. Superficial corneal injury is possible if irrigation is delayed or inadequate.[107] Death has been reported after deliberate overdose.[107][108] Ingestion of Roundup ranging from 85 to 200 ml (of 41% solution) has resulted in death within hours of ingestion, although it has also been ingested in quantities as large as 500 ml with only mild or moderate symptoms.[109] Consumption of over 85 ml of concentrated product are likely to cause serious symptoms in adults including burns due to corrosive effects as well as kidney and liver damage. More severe cases cause "respiratory distress, impaired consciousness, pulmonary edema, infiltration on chest X-ray, shock, arrhythmias, renal failure requiring haemodialysis, metabolic acidosis, and hyperkalaemia" and death is often preceded by bradycardia and ventricular arrhythmias.[107]

Other animals

A 2000 review of the ecotoxicological data on Roundup shows at least 58 studies exist on the effects of Roundup on a range of organisms.[94] This review concluded, "...for terrestrial uses of Roundup minimal acute and chronic risk was predicted for potentially exposed non-target organisms".

In reproductive toxicity studies performed in rats and rabbits, no adverse maternal or offspring effects were seen at doses below 175–293 mg/kg of body weight per day.[7]

Fish

Monsanto and other companies produce glyphosate products with alternative surfactants specifically formulated for aquatic use, for example the Monsanto products "Biactive" and "AquaMaster".[110][111] Glyphosate formulations are much more toxic for amphibians and fish than glyphosate alone.[103][104] The half-life of POEA (21–42 days) is longer than that for glyphosate (7–14 days) in aquatic environments.[112]

Amphibians

Some researchers have suggested the toxicity effects of pesticides on amphibians may be different from those of other aquatic fauna because of their lifestyle; amphibians may be more susceptible to the toxic effects of pesticides because they often prefer to breed in shallow, lentic, or ephemeral pools. These habitats do not necessarily constitute formal water-bodies and can contain higher concentrations of pesticide compared to larger water-bodies.[104][113] Studies in a variety of amphibians have shown the toxicity of GBFs containing POEA to amphibian larvae. These effects include interference with gill morphology and mortality from either the loss of osmotic stability or asphyxiation. At sub-lethal concentrations, exposure to POEA or glyphosate/POEA formulations have been reported to be associated with delayed development, accelerated development, reduced size at metamorphosis, developmental malformations of the tail, mouth, eye and head, histological indications of intersex and symptoms of oxidative stress.[104]

A 2003 study of various formulations of glyphosate found, "[the] risk assessments based on estimated and measured concentrations of glyphosate that would result from its use for the control of undesirable plants in wetlands and over-water situations showed that the risk to aquatic organisms is negligible or small at application rates less than 4 kg/ha and only slightly greater at application rates of 8 kg/ha."[114]

A 2013 meta-analysis reviewed the available data related to potential impacts of glyphosate-based herbicides on amphibians. According to the authors, the use of glyphosate-based pesticides cannot be considered the major cause of amphibian decline, the bulk of which occurred prior to the widespread use of glyphosate or in pristine tropical areas with minimal glyphosate exposure. The authors recommended further study of species- and development-stage chronic toxicity, of environmental glyphosate levels, and ongoing analysis of data relevant to determining what if any role glyphosate might be playing in worldwide amphibian decline, and suggest including amphibians in standardized test batteries.[115]

Other aquatic fauna

Glyphosate-based formulations can cause oxidative stress in bullfrog tadpoles and Pacific oysters.[116]

Effect on plant health

A correlation was found between an increase in the infection rate of wheat by *Fusarium* head blight and the application of glyphosate, but "because of the nature of this study, we could not determine if the association between previous GF (glyphosate formulation) use and FHB development was a cause-effect relationship".[117] Other studies have found causal relationships between glyphosate and decreased disease resistance.[118] Exposure to glyphosate has been shown to change the species composition of endophytic bacteria in plant hosts, which is highly variable.[119]

Endocrine disruption

In 2007, the EPA selected glyphosate for further screening through its Endocrine Disruptor Screening Program (EDSP). Selection for this program is based on a compound's prevalence of use and does not imply particular suspicion of endocrine activity.[120] On June 29, 2015 the EPA released Weight of Evidence Conclusion of the EDSP Tier 1 screening for glyphosate, recommending that glyphosate not

be considered for Tier 2 testing. The Weight of Evidence conclusion stated "...there was no convincing evidence of potential interaction with the estrogen, androgen or thyroid pathways."[121]

Genetic damage

Several studies have not found mutagenic effects,[122] so glyphosate has not been listed in the United States Environmental Protection Agency or the International Agency for Research on Cancer databases.[123] Various other studies suggest glyphosate may be mutagen.[123] The IARC monograph noted that glyphosate-based formulations can cause DNA strand breaks in various taxa of animals *in vitro*[116]

Government and organization positions

European Food Safety Authority

A 2013 systematic review by the German Institute for Risk Assessment (BfR) examined more than 1000[124] epidemiological studies, animal studies, and *in vitro* studies. It found that "no classification and labelling for carcinogenicity is warranted" and did not recommend a carcinogen classification of either 1A or 1B.[10]:139, 34–37 It provided the review to EFSA in January 2014 which published it in December 2014.[10][125][126] On November, 12th, 2015, EFSA published its conclusion on the risk assessment of glyphosate, stating it was "unlikely to pose a carcinogenic hazard to humans".[127]

EFSA's decision and the BfR report were criticized in an open letter published by 96 scientists in November 2015 saying that the BfR report failed to adhere to accepted scientific principles of open and transparent procedures.[128][129] The BfR report included unpublished data, lacked authorship, omitted references, and did not disclose conflict-of-interest information.[129]

On April 4, 2016, Dr. Vytenis Andriukaitis, European Commissioner for Health and Food Safety, wrote an open letter to the Chair of the Board of the Glyphosate Task at Monsanto Europe asking to publish the full studies provided to the EFSA.[130]

US Environmental Protection Agency

The EPA, which last reviewed glyphosate in 1993, considers glyphosate to be noncarcinogenic and relatively low in dermal and oral acute toxicity.[43] The EPA considered a "worst case" dietary risk model of an individual eating a lifetime of food derived entirely from glyphosate-sprayed fields with residues at their maximum levels. This model indicated that no adverse health effects would be expected under such conditions.[43] In 2015, the EPA initiated a review glyphosate's toxicity and in 2016 reported their conclusion that glyphosate is likely not carcinogenic.[9][131]

International Agency for Research on Cancer

In March 2015, the International Agency for Research on Cancer published a summary of their forthcoming monograph on glyphosate, and classified glyphosate as "probably carcinogenic in humans" (category 2A) based on epidemiological studies, animal studies, and *in vitro* studies. It noted that there was "limited evidence" of carcinogenicity in humans for non-Hodgkin lymphoma.[9][12][13][132] The IARC classifies substances for their carcinogenic potential, and "a few positive findings can be enough to declare a hazard, even if there are negative studies, as well." Unlike the BfR, it does not conduct a so-called risk assessment weighing benefits against risk.[133]

The BfR responded that IARC reviewed only a selection of what they had reviewed earlier, and argued that other studies, including a cohort study called 'Agricultural Health Study', do not support the classification.[134] The IARC report did not include the German regulatory study published in December 2014, nor did it include industry-funded studies.[*citation needed*] Monsanto called the IARC report biased and said it wanted it to be retracted.[135] It started a case against California's carcinogen classification in 2016.[136]

Effects of use

Emergence of resistant weeds

In the 1990s, when the first genetically modified crops-such as glyphosate-resistant corn, canola, soybean and cotton—were introduced,[137][138] no glyphosate-resistant weeds existed.[139] By 2014, glyphosate-resistant weeds dominated herbicide-resistant research. At that time, 23 glyphosate-resistant species were found in 18 countries.[140]

"Resistance evolves after a weed population has been subjected to intense selection pressure in the form of repeated use of a single herbicide."[139][141] Weeds resistant to the herbicide have been called '**superweeds**'.[142]

According to Ian Heap, a weed specialist, who completed his PhD on resistance to multiple herbicides in annual ryegrass (*Lolium rigidum*) in 1988[143] –the first case of an herbicide-resistant weed in Australia[144]–by 2014 the *Lolium rigidum* was the "world's worst herbicide-resistant weed with instances in "12 countries, 11 sites of action, 9 cropping regimens" and affecting over 2 million hectares.[140] Annual ryegrass was known to be resistant to herbicides since 1982. By 1996, the first documented case of glyphosate-resistant *L. rigidum* was reported in Australia in 1996 near Orange, New South Wales.[145][146][147] In 2006, farmers associations were reporting 107 biotypes of weeds within 63 weed species with herbicide resistance.[148] In 2009, Canada identified its first resistant weed, giant ragweed, and at that time 15 weed species had been confirmed as resistant to glyphosate.[141][149] As of 2010, in the United States 7 to 10 million acres (2.8 to 4.0 million hectares) of soil were afflicted by superweeds, or about 5% of the 170 million acres planted with corn, soybeans, and cotton, the crops most affected, in 22 states.[150] In 2012, Charles Benbrook reported that the Weed Science Society of America listed 22 superweeds in the U.S., with over 5.7×10^6 ha (14×10^6 acres) infested by GR weeds and that Dow AgroSciences had carried out a survey and reported a figure of around 40×10^6 ha (100×10^6 acres).[151] The International Survey of Herbicide Resistant Weeds database lists species that are resistant to glyphosate.[152]

In response to resistant weeds, farmers are hand-weeding, using tractors to turn over soil between crops, and using other herbicides in addition to glyphosate.

Monsanto scientists have found that some resistant weeds have as many as 160 extra copies of a gene called *EPSPS*, the enzyme glyphosate disrupts.[153]

Palmer amaranth

Amaranthus palmeri

In 2004, a glyphosate-resistant variation of *Amaranthus palmeri*, commonly known as Palmer amaranth, was found in Georgia and confirmed by a 2005 study.[154] In 2005, resistance was also found in North Carolina.[155] Widespread use of Roundup Ready crops led to an unprecedented

selection pressure, and glyphosate resistance followed.[155] The weed variation is now widespread in the southeastern United States.[156] Cases have also been reported in Texas[156] and Virginia.[157]

Conyza

Conyza canadensis

Conyza bonariensis (also known as hairy fleabane and buva) and *Conyza canadensis* (known as horseweed or marestail), are other weed species that had lately developed glyphosate resistance.[158] [159][160] A 2008 study on the current situation of glyphosate resistance in South America concluded "resistance evolution followed intense glyphosate use" and the use of glyphosate-resistant soybean crops is a factor encouraging increases in glyphosate use.[161] In the 2015 growing season, glyphosate-resistant marestail proved to be especially problematic to control in Nebraska production fields.[162]

Ryegrass

Ryegrass *Lolium perenne*

Glyphosate-resistant ryegrass (*Lolium*) has occurred in most of the Australian agricultural areas and other areas of the world. All cases of evolution of resistance to glyphosate in Australia were characterized by intensive use of the herbicide while no other effective weed control practices were used. Studies indicate the resistant ryegrass does not compete well against nonresistant plants and their numbers decrease when not grown under conditions of glyphosate application.[163]

Johnson grass

Glyphosate-resistant Johnson grass (*Sorghum halepense*) is found in glyphosate-resistant soybean cultivation in northern Argentina.[164]

Monarch butterfly

Use of glyphosate to clear milkweed along roads and fields may have contributed to a decline in monarch butterfly populations in the Midwest.[165] Along with deforestation and adverse weather conditions,[166] the decrease in milkweed contributed to an 81% decline in monarchs.[167][168] The Natural Resources Defense Council (NRDC) filed a suit in 2015 against the EPA, in which it is argued that the agency ignored warnings about the dangers of glyphosate usage for monarchs.[169]

Legal status

Glyphosate was first approved for use in the 1970s, and as of 2010 was labelled for use in 130 countries.[17]:2

In September 2013, the legislative assembly of El Salvador approved legislation to ban 53 agrochemicals, including glyphosate; the ban on glyphosate was set to begin in 2015.[170][171][172]

In April 2014, the legislature of the Netherlands passed legislation prohibiting sale of glyphosate to individuals for use at home; commercial sales were not affected.[173]

In May 2015, the president of Sri Lanka banned the use and import of glyphosate, effective immediately.[174][175]

In May 2015, Bermuda blocked importation on all new orders of glyphosate-based herbicides for a temporary suspension awaiting outcomes of research.[176]

In May 2015, Colombia announced that it would stop using glyphosate by October 2015 in the destruction of illegal plantations of coca, the raw ingredient for cocaine. Farmers have complained that the aerial fumigation has destroyed entire fields of coffee and other legal produce.[177]

In June 2015, the French Ecology Minister asked nurseries and garden centers to halt over-the-counter sales of glyphosate in the form of Monsanto's Roundup. This was a nonbinding request and all sales of glyphosate remain legal in France until 2022, when the substance will be banned for home gardening.[178]

A vote on the relicencing of glyphosate in the EU stalled in March 2016. Member states France, Sweden, and the Netherlands objected to the renewal.[179] A vote to reauthorize on a temporary basis failed in June 2016[180] but at the last-minute the license was extended for 18 months and will be re-evaluated at the end of 2017.[181]

Legal cases

Advertising controversy

The New York Times reported that in 1996, "Dennis C. Vacco, the Attorney General of New York, ordered the company Monsanto to pull ads that said Roundup was "safer than table salt" and "practically nontoxic" to mammals, birds and fish. The company withdrew the spots, but also said that the phrase in question was permissible under E.P.A. guidelines."[182]

In 2001, French environmental and consumer rights campaigners brought a case against Monsanto for misleading the public about the environmental impact of its herbicide Roundup, on the basis that glyphosate, Roundup's main component, is classed as "dangerous for the environment" and "toxic for aquatic organisms" by the European Union. Monsanto's advertising for Roundup had presented it as biodegradable and as leaving the soil clean after use. In 2007, Monsanto was convicted of false advertising and was fined 15,000 euros. Monsanto's French distributor Scotts France was also fined 15,000 euros. Both defendants were ordered to pay damages of 5,000 euros to the Brittany Water and Rivers Association and 3,000 euros to the Consommation Logement Cadre de vie, one of the two main general consumer associations in France.[183] Monsanto appealed and the court upheld the verdict; Monsanto appealed again to the French Supreme Court, and in 2009 it also upheld the verdict.[184]

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Appendix B – Information on Neonicotinoids

Neonicotinoid (excerpted from Wikipedia)

Neonicotinoids are a class of neuro-active insecticides chemically similar to nicotine. In the 1980s Shell and in the 1990s Bayer started work on their development.[1] The neonicotinoid family includes acetamiprid, clothianidin, imidacloprid, nitenpyram, nithiazine, thiacloprid and thiamethoxam. Imidacloprid is the most widely used insecticide in the world.[2]

In 2008 neonicotinoids came under increasing scrutiny over their environmental impacts starting in Germany. Neonicotinoid use was linked in a range of studies to adverse ecological effects, including honey-bee colony collapse disorder (CCD) and loss of birds due to a reduction in insect populations. In 2013, the European Union and a few non EU countries restricted the use of certain neonicotinoids.[4][5][6]. A number of cities and states in the US have now also unilaterally banned the use of neonicotinoids by local and state governments ,

History

In 1985, Bayer patented imidacloprid as the first commercial neonicotinoid.[3]

During the late 1990s, primarily, imidacloprid became widely used. Beginning in the early 2000s, two other neonicotinoids, clothianidin and thiamethoxam entered the market. As of 2013, virtually all corn planted in the United States was treated with one of these two insecticides and various fungicides.[8] As of 2014, about a third of US soybean acreage was planted with neonicotinoid treated seeds, usually imidacloprid or thiamethoxam.[9]

Market

Neonicotinoids have been registered in more than 120 countries. After the introduction of the first neonicotinoids in the 1990s, this market has grown from €155 million in 1990 to €957 million in 2008. Neonicotinoids made up 80% of all seed treatment sales in 2008.[10] With a global turnover of about $1.5 billion in 2008, they represented 24% of the global market for insecticides.

Agricultural usage

Efficacy

Imidacloprid is effective against sucking insects, some chewing insects, soil insects and fleas on domestic animals.[11] It is systemic with particular efficacy against sucking insects and has a long residual activity. Imidacloprid can be added to the water used to irrigate plants. Controlled release formulations of imidacloprid take 2–10 days to release 50% of imidacloprid in water.[12] It is applied against soil pests, seed, timber and animal pests as well as foliar treatments.

As of 2013 neonicotinoids have been used In the U.S. on about 95 percent of corn and canola crops, the majority of cotton, sorghum, and sugar beets and about half of all soybeans. They have been used on the vast majority of fruit and vegetables, including apples, cherries, peaches, oranges, berries, leafy greens, tomatoes, and potatoes, to cereal grains, rice, nuts, and wine grapes.[13] Imidacloprid is the most widely used insecticide, both within the neonicotinoids and in the worldwide market.

Regulation

United States

The US EPA operates a 15-year registration review cycle for all pesticides.[17] The EPA granted a conditional registration to clothianidin in 2003.[18] The EPA issues conditional registrations when a pesticide meets the standard for registration, but there are outstanding data requirements.[19] Thiamethoxam is approved for use as an antimicrobial pesticide wood preservative and as a pesticide; it was first approved in 1999.[20]:4 & 14 Imidacloprid was registered in 1994.[21]

As all neonicotinoids were registered after 1984, they were not subject to reregistration, but due to environmental concerns, especially concerning bees, the EPA opened dockets to evaluate them.[22] The registration review docket for imidacloprid opened in December 2008, and the docket for nithiazine opened in March 2009. To best take advantage of new research as it becomes available, the EPA moved ahead the docket openings for the remaining neonicotinoids on the registration review schedule (acetamiprid, clothianidin, dinotefuran, thiacloprid, and thiamethoxam) to FY 2012.[22] The EPA has said that it expects to complete the review for the neonicotinoids in 2018.[23]

In March 2012, the Center for Food Safety, Pesticide Action Network, Beyond Pesticides and a group of beekeepers filed an Emergency Petition with the EPA asking the agency to suspend the use of clothianidin. The agency denied the petition.[23] In March 2013, the US EPA was sued by the same group, with the Sierra Club and the Center for Environmental Health joining, which accused the agency of performing inadequate toxicity evaluations and allowing insecticide registration based on inadequate studies.[23][24] The case, *Ellis et al v. Bradbury et al*, was stayed as of October 2013.[25]

On July 12, 2013, Rep. John Conyers, on behalf of himself and Rep. Earl Blumenauer, introduced the "Save American Pollinators Act" in the House of Representatives. The Act called for suspension of the use of four neonicotinoids, including the three recently suspended by the European Union, until their review is complete, and for a joint Interior Department and EPA study of bee populations and the possible reasons for their decline.[26] The bill was assigned to a congressional committee on July 16, 2013 and did not leave committee.[27]

Europe

In 2008, Germany revoked the registration of clothianidin for use on seed corn after an incident that resulted in the death of millions of nearby honey bees.[28] An investigation revealed that it was caused by a combination of factors:

- failure to use a polymer seed coating known as a "sticker"
- weather conditions that resulted in late planting when nearby canola crops were in bloom;
- a particular type of air-driven equipment used to sow the seeds which apparently blew clothianidin-laden dust off the seeds and into the air as the seeds were ejected from the machine into the ground;
- dry and windy conditions at the time of planting that blew the dust into the nearby canola fields where honey bees were foraging;[29]

In Germany, clothianidin use was also restricted in 2008 for a short period on rapeseed. After it was shown that rapeseed treatment did not have the same problems as maize, its use was reinstated under the condition that the pesticide be fixed to the rapeseed grains by an additional sticker, so that abrasion dusts would not be released into the air.[30]

In 2009, the German Federal Office of Consumer Protection and Food Safety decided to continue to suspend authorization for clothianidin use on corn. It had not yet been fully clarified to what extent and in what manner bees come into contact with the active substances in clothianidin, thiamethoxam and

imidacloprid when used on corn. The question of whether liquid emitted by plants via guttation, which bees ingest, posed an additional risk was unanswered.[31]

Neonicotinoid seed treatment is banned in Italy, but foliar use is allowed. This action was taken based on preliminary monitoring studies showing that bee losses were correlated with the application of seeds treated with these compounds; Italy based its decision on the known acute toxicity of these compounds to pollinators.[32][33][*dead link*]

In France, sunflower and corn seed treatment with imidacloprid are suspended; imidacloprid seed treatment for sugar beets and cereals are allowed, as is foliar use.[32]

In 2012, the European Commission asked the European Food Safety Authority (EFSA) to study the safety of three neonicotinoids, in response to growing concerns about the impact of neonicotinoids on honey bees. The study was published in January 2013, stating that neonicotinoids pose an unacceptably high risk to bees, and that the industry-sponsored science upon which regulatory agencies' claims of safety have relied may be flawed and contain data gaps not previously considered. Their review concluded, "A high acute risk to honey bees was identified from exposure via dust drift for the seed treatment uses in maize, oilseed rape and cereals. A high acute risk was also identified from exposure via residues in nectar and/or pollen."[34][35] EFSA reached the following conclusions:[36][37]

- Exposure from pollen and nectar. Only uses on crops not attractive to honey bees were considered acceptable.
- Exposure from dust. A risk to honey bees was indicated or could not be excluded, with some exceptions, such as use on sugar beet and crops planted in glasshouses, and for the use of some granules.
- Exposure from guttation. The only completed assessment was for maize treated with thiamethoxam. In this case, field studies showed an acute effect on honey bees exposed to the substance through guttation fluid.

EFSA's scientists identified a number of data gaps and were unable to finalize risk assessments for some uses authorized in the EU. EFSA also highlighted that risk to other pollinators should be further considered. The UK Parliament asked manufacturer Bayer Cropscience to explain discrepancies in the evidence they submitted.[38]

In response to the study, the European Commission recommended a restriction of their use across the European Union.[6] On 29 April 2013, 15 of the 27 EU member states voted to restrict the use of three neonicotinoids for two years starting 1 December 2013. Eight nations voted against the ban, while four abstained. The law restricts the use of imidacloprid, clothianidin and thiamethoxam for seed treatment, soil application (granules) and foliar treatment in crops attractive to bees.[5][6] Temporary suspensions had previously been enacted in France, Germany and Italy.[39] In Switzerland, where neonicotinoids were never used in alpine areas, neonics were banned due to accidental poisonings of bee populations and the relatively low safety margin for other beneficial insects.[40]

Environmentalists called the move "a significant victory for common sense and our beleaguered bee populations" and said it is "crystal clear that there is overwhelming scientific, political and public support for a ban."[6] The UK, which voted against the bill, disagreed: "Having a healthy bee population is a top priority for us, but we did not support the proposal for a ban because our scientific evidence doesn't support it."[6] Bayer Cropscience, which makes two of the three banned products, remarked "Bayer remains convinced neonicotinoids are safe for bees, when used responsibly and properly ... clear scientific evidence has taken a back-seat in the decision-making process."[39] Reaction in the scientific community was mixed. Biochemist Lin Field said the decision was based on "political lobbying" and could lead to the overlooking of other factors involved in colony collapse disorder. Zoologist Lynn Dicks of Cambridge University disagreed, saying "This is a victory for the precautionary principle, which is supposed to underlie environmental regulation."[6] Simon Potts, Professor of Biodiversity and

Ecosystem Services at Reading University, called the ban "excellent news for pollinators", and said, "The weight of evidence from researchers clearly points to the need to have a phased ban of neonicotinoids."[39]

Mode of action

Neonicotinoids, like nicotine, bind to nicotinic acetylcholine receptors of a cell and trigger a response by that cell. In mammals, nicotinic acetylcholine receptors are located in cells of both the central nervous system and peripheral nervous systems. In insects these receptors are limited to the central nervous system. Nicotinic acetylcholine receptors are activated by the neurotransmitter acetylcholine. While low to moderate activation of these receptors causes nervous stimulation, high levels overstimulate and block the receptors,[2][11] causing paralysis and death. Acetylcholinesterase breaks down acetylcholine to terminate signals from these receptors. However, acetylcholinesterase cannot break down neonicotinoids and their binding is irreversible.[11]

Basis of selectivity

R-nicotine (top) and desnitro-imidacloprid are both protonated in the body

Mammals and insects have different composition of the receptor subunits and the structures of the receptors.[44][45] Because most neonicotinoids bind much more strongly to insect neuron receptors than to mammal neuron receptors, these insecticides are more toxic to insects than mammals.[44][2][45]

The low mammalian toxicity of imidacloprid has been explained by its inability to cross the blood–brain barrier because of lack of a charged nitrogen atom at physiological pH. The uncharged molecule can penetrate the insect blood–brain barrier.[2]

Neonicotinoids, on the other hand, have a negatively charged nitro or cyano group, which interacts with a unique, positively charged amino acid residue present on insect, but not mammalian nAChRs.[46]

However, the breakdown product desnitro-imidacloprid, which is formed in a mammal's body during metabolism[44] as well as in environmental breakdown,[47] has a charged nitrogen and shows high affinity to mammalian nAChRs.[44] Desnitro-imidacloprid is quite toxic to mice.[48]

Chemical properties

Most neonicotinoids are water-soluble and break down slowly in the environment, so they can be taken up by the plant and provide protection from insects as the plant grows.[*citation needed*] Independent studies show that the photodegradation half-life time of most neonicotinoids is around 34 days when exposed to sunlight. However, it might take up to 1,386 days (3.8 years) for these compounds to degrade in the absence of sunlight and micro-organism activity. Some researchers are concerned that neonicotinoids applied agriculturally might accumulate in aquifers.[49]

Toxicity

Decline in bee population

A dramatic rise in the number of annual beehive losses noticed around 2006 spurred interest in factors potentially affecting bee health.[50][51] When first introduced, neonicotinoids were thought to have low toxicity to many insects, but recent research has suggested a potential toxicity to honey bees and other beneficial insects even with low levels of contact. Neonicotinoids may impact bees' ability to forage, learn and remember navigation routes to and from food sources.[52] Separate from lethal and sublethal effects solely due to neonicotinoid exposure, neonicotinoids are also being explored with a combination with other factors, such as mites and pathogens, as potential causes of colony collapse disorder.[53]

Neonicotinoids may be responsible for detrimental effects on bumble bee colony growth and queen production.[54]

Previously undetected routes of exposure for bees include particulate matter or dust, pollen and nectar[55] Bees can fail to return to the hive without immediate lethality due to sub-nanogram toxicity, [56] one primary symptom of colony collapse disorder.[57] Separate research showed environmental persistence in agricultural irrigation channels and soil.[58]

A 2012 study showed the presence of thiamethoxam and clothianidin in bees found dead in and around hives situated near agricultural fields. Other bees at the hives exhibited tremors, uncoordinated movement and convulsions, all signs of insecticide poisoning. The insecticides were also consistently found at low levels in soil up to two years after treated seed was planted and on nearby dandelion flowers and in corn pollen gathered by the bees. Insecticide-treated seeds are covered with a sticky substance to control its release into the environment, however they are then coated with talc to facilitate machine planting. This talc may be released into the environment in large amounts. The study found that the exhausted talc showed up to about 700,000 times the lethal insecticide dose for a bee. Exhausted talc containing the insecticides is concentrated enough that even small amounts on flowering plants can kill foragers or be transported to the hive in contaminated pollen. Tests also showed that the corn pollen that bees were bringing back to hives tested positive for neonicotinoids at levels roughly below 100 parts per billion, an amount not acutely toxic, but enough to kill bees if sufficient amounts are consumed.[59]

A 2013 review concluded that neonicotinoids as they are typically used harm bees and that safer alternatives are urgently needed.[60] An October 2013 study by Italian researchers demonstrated that neonicotinoids disrupt bees' immune systems, making them susceptible to viral infections to which the bees are normally resistant.[61][62]

In April 2015 EASAC conducted a study of the potential effects on organisms providing a range of ecosystem services like pollination and natural pest control which are critical to sustainable agriculture. [63] The resulting report concludes "there is an increasing body of evidence that the widespread prophylactic use of neonicotinoids has severe negative effects on non-target organisms that provide ecosystem services including pollination and natural pest control."[64]

Other wildlife

In March 2013, the American Bird Conservancy published a commentary on 200 studies on neonicotinoids calling for a ban on neonicotinoid use as seed treatments because of their toxicity to birds, aquatic invertebrates, and other wildlife.[65]

A 2013 Dutch study determined that water containing allowable concentrations of neonicotinoids had 50% fewer invertebrate species compared with uncontaminated water.[66]

In the July 2014 issue of the journal *Nature*, a study based on an observed correlation between declines in some bird populations and the use of neonicotinoid pesticides in the Netherlands demonstrated that the level of neonicotinoids detected in environmental samples correlated strongly with the decline in populations of insect-eating birds.[67] An editorial published in the same edition[68] found the possible link between neonicotinoid pesticide use and a decline in bird numbers "worrying," pointing out that the persistence of the compounds (half-life of 1000 days) and the low direct toxicity to birds themselves implies that the depletion of the birds' food source (insects) is likely responsible for the decline and that the compounds are distributed widely in the environment. The editors write that while correlation is not the same as causation, "the authors of the study also rule out confounding effects from other land-use changes or pre-existing trends in bird declines".

From June to October 2014 a comprehensive Worldwide Integrated Assessment of the impact of Systemic Pesticides on biodiversity and ecosystems (WIA)[69] was published in the journal

Environmental Science and Pollution Research.[70] In a series of papers it concludes that these systemic insecticides pose a serious risk of harm to a broad range of non-target invertebrate taxa often below the expected environmental concentrations. Their present scale use is therefore not a sustainable pest management approach and compromises the actions of numerous stakeholders in maintaining and supporting biodiversity and subsequently the ecological functions and services the diverse organisms perform.[71]

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Appendix C – Agenda for Public Forum on Pesticide Usage in Davis

Date, Time, and Location:

Wednesday, December 7th, 7:00 PM – 9:00 PM, Davis Senior Center, 646 A Street

Agenda

Forum Moderator - Steven Westhoff, Commissioner of Davis Natural Resources Commission (NRC)

1. **Introduction** – Will Arnold, Davis City Councilmember (Former Recreation & Parks Commissioner) (5 min.)

2. **General trends in pesticide use in California cities** - Brian Leahy, Director of California Department of Pesticide Regulation (CDPR) (10 min.)

3. **Introduction to IPM** – Integrated Pest Management - Martin Guerena, City of Davis IPM Manager - (5 min.)

4. **History and current use and targets of pesticides in the City of Davis** – Alan Pryor, Commissioner of Davis Natural Resources Commission (NRC) and organic almond farmer - (10 min.)

5. **Health and environmental impacts of some pesticides** – Moderated by Jennifer House, Instructor, UC Davis Department of Agricultural and Resource Economics; Owner, Coco Ranch (a local organic farm)

   a. Effects of pesticides on humans - Cathy Dycaico, MD (Pediatrics, Davis) – (10 min.)

   b. Effects of pesticides on other species (especially pollinators) – John McNerney, City of Davis Wildlife Manager – (10 min.)

6. **Green and organic alternatives to conventional pesticide use– cultural, biological, chemical** –

   Moderated by Greg House, Commissioner of Davis Open Space & Habitat Commission and organic fruit & vegetable farmer

   a. What Davis is doing to minimize pesticide usage - Martin Guerena, City of Davis IPM Manager – (15 min.)

   b. Pesticide-free and pollinator-friendly landscape management – Derek Downey, Whole System Designs - (5 min.)

   c. A case study in a Davis neighborhood park pesticide management – Paul Steinberg, Slide Hill Park neighbor volunteer – (5 min.)

7. **Public comments and questions to expert panel** – (45 min.)

8. **Next steps and wrap-up** – (5 min.)

Appendix D – Sacramento Bee Haven Policy

Meeting Date: 3/1/2016

Report Type: Consent

Report ID: 2016-00279

SACRAMENTO

City Council Report
915 I Street, 1st Floor
www.CitvofSacramento.org

Title: Prohibiting the Use of Neonicotinoids as Part of the City's Integrated Pest Management Policies (Two-Thirds Vote Required)

Location: Citywide

Recommendation: Pass: 1) a Motion temporarily suspending the requirement in Rule 13.B.1.a of the Council Rules of Procedure that non-binding resolutions be referred to the Law and Legislation Committee [two-thirds vote required]; and 2) a Resolution a) directing the City Manager to modify the City's integrated pest management policies and landscape maintenance and procurement practices, and negotiate amendments to existing contracts, to eliminate the use of pesticides that contain neonicotinoids on City properties; b) supporting the passage of federal legislation and urging the Environmental Protection Agency to suspend registration of neonicotinoids; c) directing the City Manager to provide information to the public regarding the effects of pesticides that contain neonicotinoids; and d) supporting a national moratorium on the sale and use of such pesticides, to protect bees and other insect pollinators.

Contact: Randi L. Knott, Director of Governmental Affairs, Office of the City Manager (916) 808-5771 Presenter: None

Department: City Manager / Public Works

Division: Executive Office

Dept ID: 02001011

Attachments:

1-Description/Analysis

2-Resolution

City Attorney Review

Approved as to Form: Sheryl Patterson
2/23/2016 4:29:50 PM

Approvals/Acknowledgments

Department Director or Designee: Howard Chan - 2/22/2016 9:15:07 AM

Description/Analysis

Issue Detail: Bees and other insect pollinators, which are critical to agricultural production are facing great environmental stress and experiencing die offs and diminishing populations. Neonicotinoids are among the most widely used class of insecticides and are now increasingly under scrutiny for environmental impacts including honey-bee colony collapse and loss of birds due to a reduction in the insect population.

In 2013, European Union regulators imposed an almost total ban on three types of insecticides containing neonicotinoids. Last year, Congress re-introduced a bill titled "Saving America's Pollinator's Act" to direct the US Environmental Protection Agency (EPA) to suspend the use of neonicotinoids until a determination could be made regarding the adverse effects on pollinators.

National retailers have recently taken steps to stop selling pesticides with neonicotinoids and other cities have adopted polices to end the use of them. At this time, the City of Sacramento is considering a similar ban.

The Council is also being asked to pass a motion allowing this non-binding resolution to bypass the Law & Legislation Committee in the interest of time.

Policy Considerations: In 2015, Sacramento became officially designated as a "Honey Bee Haven". This action means that the City would take extra efforts to protect honey bees and all pollinators because of their important role in our farms, flowers and food. This resolution continues in that vein by prohibiting the use of pesticides that contain neonicotinoids for use on City-owned properties and provides for education for the public regarding the use of them in home gardens. Further, it states the City's support of the "Saving the Pollinators Act" **(HR** 1284) and urges the EPA to suspend the registration of neonicotinoids until it can complete full environmental assessments.

Economic Impacts: Not applicable

Environmental Considerations: This resolution does not constitute a project under the California Environmental Quality Act (CEQA). Further it supports the City's adopted Legislative Platform to support a healthy, sustainable and green community.

Sustainability: This resolution also supports the City's adopted Legislative Platform calling for legislative and regulatory efforts to make products that are less toxic and the City's Sustainability Plan.

Commission/Committee Action: Not applicable

Rationale for Recommendation: The Council is asked to pass a motion temporarily suspending the requirement in Rule 13.B.1.a of the Council Rules of Procedure that non-binding resolutions be referred to the Law and Legislation Committee for which a 2/3 vote required. The City has consistently supported efforts to 'green' our community and to reduce harmful environmental impacts.

Financial Considerations: This resolution directs the City Manager to negotiate the terms of existing landscape maintenance contracts and construction contracts subject to the City Managers contracting authority if the contract costs increase due to the substitution of other pesticide products or alternative pest control practices.

RESOLUTION NO. 2016 -

Adopted by the Sacramento City Council

APPROVING PROHIBITION ON USE OF NEONICOTINOIDS INSECTICIDES AS PART OF THE CITY'S INTEGRATED PEST MANAGEMENT POLICIES AND SUPPORTING A MORATORIUM ON THE SALE AND USE OF SUCH INSECTICIDES TO PROTECT BEES AND OTHER INSECT POLLINATORS

BACKGROUND

A. The City of Sacramento has adopted and implemented Integrated Pest Management (IPM) policies to limit use of chemical pesticides (which includes insecticides and herbicides) in maintaining landscaped areas in City parks, streets and buildings. IPM practices provide that chemicals are used only when needed, and in combination with other approaches for more effective long-term control of pests and weeds. Chemicals are to be selected and applied in a way that minimizes their possible harm to the public and the environment and spray controls are used to limit the size of the treated area.

B. Bees and other insect pollinators, which are critical to agricultural production of certain types of crops, are under great environmental stress and experiencing die-offs and diminishing populations. According to the U.S. Department of Agriculture, honey bee pollinators *(apis mellifera L.)* play a critical role in producing one-third of the nation's food supply.

C. Neonicotinoids are among the most widely used class of insecticides. In agriculture, neonicotinoid are used to coat seeds or applied to the plant. The hallmark of neonicotinoids is that they are "systemic," which means they travel throughout a plant via its vascular system and distribute the chemical to all parts of the plant tissue, including its nectar and pollen. The neonicotinoid class of chemicals includes acetamiprid, imidacloprid, clothianidin, dinotefuran, nitenpyram, nithiazine, thiacloprid and thiamethoxam.

D. In the late 1990s, neonicotinoids came under increasing scrutiny over their environmental impacts. Neonicotinoid use was linked in a range of studies to adverse ecological effects, including honey-bee colony collapse disorder and loss of birds due to a reduction in insect populations. Recent research suggests that there is a possible link between pesticides that contain neonicotinoids and the die-off of plant pollinators, including honey bees, native bees, butterflies, moths and other insects. The Global Taskforce on Systemic Pesticides, a group of 29 independent scientists, examined over 800 peer-review papers on the effects of neonicotinoids on wildlife, as well as water and soil quality, over a four year period and published a report in 2014 that concluded that neonicotinoids are toxic to bee populations.

E. In 2013, European Union regulators imposed near-total bans on three types of pesticides containing neonicotinoids to allow further study of their impacts on bees and other insect pollinators. In August 2014, the United States Fish and Wildlife Service announced plans to phase out use of neonicotinoids in National Wildlife Refuges. Last summer, President Obama asked the Environmental Protection Agency (EPA) to investigate conflicting reports that pesticides containing a class of chemicals known as neonicotinoids were the probable cause of mysterious bee deaths and declining numbers of beehives.

F On March 4, 2015, Representative Conyers reintroduced Congressional bill H.R. 1284, Saving America's Pollinators Act of 2015, to direct the EPA to suspend the registration of neonicotinoid pesticides until a determination can be made if they cause an unreasonable adverse effect on pollinators, and direct the Department of the Interior to regularly monitor the heath and population status of native bees.

G. On May 19, 2015, the White House Pollinator Health Task Force issued its report, focusing on increasing habitat for pollinators and called for further extensive research into all aspects of pollinator health.

H. National retailers have recently taken steps to stop selling pesticides with neonicotinoids. Many other cities have adopted polices to end use of pesticides that include the chemical ingredient neonicotinoids in response to the declining population of bees and other insect pollinators. The City Council of the City of Sacramento desires to adopt a similar policy to ban the use of neonicotinoids on all City-owned property.

I. Neonicotinoids are included in pesticide products that are readily available to the public and application of the products in home gardens has been found to occur at a rate that is 32 times higher than what has been approved for agricultural crops. Educating the public and promoting the discontinuance of pesticide products containing neonicotinoids will benefit bees and other insect pollinators and agricultural production within the city and the surrounding region.

BASED ON THE FACTS SET FORTH IN THE BACKGROUND, THE CITY COUNCIL RESOLVES AS FOLLOWS:

Section 1. The City Manager is hereby authorized and directed to modify the City's Integrated Pest Management policies, landscape maintenance standard specifications, and procurement practices to eliminate the use of, and ban the purchase of, pesticides that contain neonicotinoids unless no alternative pesticide or pest control practice is available

Section 2. The City Manager or his designee is hereby authorized and directed to negotiate the terms of amending existing landscape maintenance contracts and construction contracts to ban the application of pesticides that contain neonicotinoids on all City-owned properties. The City Manager or his designee is authorized to execute such contract amendments and change orders to allow for substituting pesticides that do not contain neonicotinoids or alternative pest control practices, subject to the City Manager's contracting authority limitations set forth in the Sacramento City Code and the Department budgets if the contract costs will increase due to the substitution of other pesticide products or alternative pest control practices.

Section 3. The Mayor and City Council supports the passage of the Saving America's Pollinators Act (H.R. 1284) and urges the Environmental Protection Agency to suspend the registration of neonicotinoids until it can complete its environmental assessments.

Section 4. The City Manager is hereby authorized and directed to post information on the City's website to educate the public regarding the effects of pesticides that contain neonicotinoids on bee populations and promote the use of other pesticide products and/or alternative pest control practices, as well as planting bee-friendly plants. Residents should be advised to avoid spraying plants in their garden with insecticides, and never spray the flowers.

Section 5. The Mayor and City Council support a national moratorium on the sale and use of pesticides that contain acetamiprid, imidacloprid, clothianidin, dinotefuran, nitenpyram, nithiazine, thiacloprid, thiamethoxam and any other neonicotinoids and urges businesses to take immediate steps to ensure that no plants, seeds, or products containing such chemicals are purchased, sold, or used within the City of Sacramento.

Appendix E – List of Most Restrictive Municipal IPM Policies & Ordinances in California, Pesticide-Free Park Policies & Ordinances in the Western US, and Pollinator Protection Policies & Ordinances in Western US

Information on the Most Organically-Based and Pesticide-Restrictive Municipal IPM Policies and Ordinances in California

(based on the assessment of the Beyond Pesticides and Organic Consumers Association)

California Cities with Organic-Based IPM Policies

San Francisco CA
Policy Covers: Public Property
Policy type: Specified Restrictions - Restricts use of toxic pesticides on public property in favor of alternative, organic methods
http://www.amlegal.com/nxt/gateway.dll/California/environment/chapter3integratedpestmanagementprogram?f=templates$fn=default.htm$3.0$vid=amlegal:sanfrancisco_ca

Richmond CA
Policy Covers: Public Property
Policy type: Organic Methods - Restricts use of toxic pesticides on public property in favor of alternative, organic methods
http://beyondpesticides.org/assets/media/documents/documents/Richmond%20Resolution%2019-15a.pdf

Fairfax CA
Policy Covers: Public Property
Policy type: Organic Methods - Restricts use of toxic pesticides on public property in favor of alternative, organic methods
http://www.pesticidefreezone.org/Fairfax%20ordinance.htm

Irvine CA
Policy Covers: Public Property
Policy type: Organic Methods -Restricts use of toxic pesticides on public property in favor of alternative, organic methods
http://irvine.granicus.com/MetaViewer.php?view_id=&event_id=1097&meta_id=70534

Information on Pesticide-Free Park Policies and Ordinances in Western US

(based on the assessment of the Beyond Pesticides and Organic Consumers Association)

Western US Cities with Public Park Organic Policies

San Carlos CA
Policy Covers: Pesticide-Free Park
Policy type: Park Policy - Pilot pesticide-free parks program

http://www.cityofsancarlos.org/depts/pr/prksfac/park_information/vista_park/default.asp

Portland, OR
Policy Covers: Pesticide-Free Parks
Policy type: Establishes a pesticide free parks program
https://www.portlandoregon.gov/parks/47501

Eugene, OR
Policy Covers: Pesticide-Free Parks
Policy type: Establishes a pesticide free parks program
https://www.eugene-or.gov/638/Integrated-Pest-Management

King Co., WA
Policy Covers: Pesticide-Free Parks
Policy type: Establishes a Pesticide-Free and "Reduced Pesticide" Parks Program at multiple county parks - displayed on a map
http://www.hazwastehelp.org/pfparks/index.aspx

Shoreline, WA
Policy Covers: Pesticide-Free Parks
Policy type: Establishes a Pesticide-Free Parks Program at multiple city parks
https://www.google.com/url?q=http://forevergreen.shorelinewa.gov/file_viewer.php%3Fid%3D409&sa=U&ved=0ahUKEwi8yoiyyPjMAhVMdj4KHQbJBjcQFggEMAA&client=internal-uds-cse&usg=AFQjCNHUVvCuFjrj2L5xbg-T0Zmd_UNu4A

Information on Neonicotinoid-Restrictive Municipal Pollinator Protection Policies and Ordinances in Western US

(based on the assessment of the Beyond Pesticides and Organic Consumers Association)

Pollinator Protection Policies

Sacramento CA
Policy Covers: Pollinator Protection
Policy type: Pollinator Protection - Recognizes the importance of bees; officially declares Sacramento a Honey Bee Haven
http://sacramento.granicus.com/MetaViewer.php?view_id=21&event_id=2569&meta_id=431947

Boulder, CO
Policy Covers: Pollinator Protection
Policy type: Prohibits the use of neonicotinoid insecticides on public property with limited exceptions
https://www-static.bouldercolorado.gov

Boulder County CO
Policy Covers: Pollinator Protection
Policy type: Prohibits the use of neonicotinoid insecticides on public property with limited exceptions
http://beesafeboulder.org/bouldercountyresolution/

Milwaukie, OR
Policy Covers: Pollinator Protection
Policy type: Prohibits the use of neonicotinoid insecticides on public property with limited exceptions
http://www.milwaukieoregon.gov/sites/default/files/fileattachments/r49-2016.pdf

Seattle, WA
Policy Covers: Pollinator Protection
Policy type: Prohibits use of bee-toxic neonicotinoids on public property
http://clerk.seattle.gov/~scripts/nph-brs.exe?s1=&s3=31548&s2=&s4=&Sect4=AND&l=20&Sect5=RESNY&Sect6=HITOFF&d=RESF&p=1&u=%2F~public%2Fresny.htm&r=1&f=G

Spokane, WA
Policy Covers: Pollinator Protection
Policy type: Prohibits use of bee-toxic neonicotinoids on public property
https://static.spokanecity.org/documents/citycouncil/advance-agendas/2014/06/city-council-advance-agenda-2014-06-16.pdf

Thurston County, WA
Policy Covers: Pollinator Protection
Policy type: Prohibits use of bee-toxic neonicotinoids on public property
http://www.co.thurston.wa.us/health/ehipm/pdf/IPMResolution15098Adopted121614.pdf

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Reference

The Map of US Municipal Pesticide Reform Policies - https://www.google.com/maps/d/viewer?mid=1VLpVWvifO2JOrgxf1-d1DLyDruE&ll=35.59105584645422%2C-119.67889197890622&z=9

Released by Beyond Pesticides and Organic Consumers Association, The Map of Local Pesticide Reform Policies currently spotlights over 115 communities in 21 states that have taken local action

Appendix F – Minutes of Natural Resources Commissions, Open Space and Habitat Commission, and Recreation and Parks Commission Requesting Review of IPM Policies in Davis

From Recreation and Parks Commission Minutes of Meeting of April 21

"*A motion was made by W. Arnold, seconded by S. Koop, to recommend to the City Council that a 2x2x2 Task Force, in conjunction with members of the Natural Resources Commission, the Open Space and Habitat Commission, to further determine the appropriate level of use of the specific chemicals including glyphosate (Round Up) and Neonicotinoids for ongoing treatment of Hackberry trees within the City's inventory. The Commission also requested that the Task Force establish a City standard for public noticing of any pesticide spraying in public areas. The motion passed 7-0-1-0.*"

From Open Space and Habitat Commission Minutes of Meeting of June 6

"*Discussion and Action – Recommendation to the City Council to establish a 2x2x2 with the Natural Resources Commission and the Recreation and Park Commission to investigate the feasibility of banning insecticides containing neonicotinoids and the herbicide glyphosate on City property Tracie Reynolds, assigned staff to the Commission, said this item was on the agenda at the request of Commissioner Millstein. Commissioner Huber said he supported the establishment of such a 2x2x2 and nominated Commissioners House and Millstein, a member of the pollinators working group, to serve on the 2x2x2 if such a group was created by the City Council. Commissioners House and Millstein accepted the nomination. On a motion by Commissioner Aptekar, seconded by Commissioner House, the Commission voted 5-0-1-0 to recommend to the City Council that it establish a 2x2x2 with the Natural Resources Commission and the Recreation and Park Commission to investigate the feasibility of banning insecticides containing neonicotinoids and the herbicide glyphosate on City property, and, if such a 2x2x2 is established, to appoint Commissioners House and Millstein as the representatives of the Open Space and Habitat Commission on the 2x2x2 (AyesMinutes April 25 -- Huber, House, Millstein, Aptekar, Bone; Noes – None; Absent – Hoshovsky; Abstentions – None). Ms. Reynolds said the Commission's action would be reported in a staff report to the City Council in July. The staff report to the City Council would also report similar actions by the Natural Resources Commission and the Recreation and Park Commission*".

From Natural Resources Commission Minutes of Meeting of April 26

"Integrated Pest Management Annual Report. City Integrated Pest Management Specialist, Martin Guerena, presented the annual IPM report and responded to questions. Commissioners raised concerns related to the use of herbicides in designated "Fair Zones" of parks, quality control related to contractor maintenance of parks/greenbelts, and proposals for use of neonicotinoids. The Commission supported coordination with the Rec and Park and Open Space and Habitat Commissions on IPM implementation and transitioning the authority of the IPM Manager from advisory to overseeing the application of herbicide/pesticides. Following discussion, on a motion by Pryor, seconded by Braly, the NRC recommended the City Council support staff recommendation. Motion passed 7-0. "

Appendix G - French parks and public gardens bid adieu to pesticides

Source: Mother Nature Network (mnn.com) – January 11, 2017

(http://www.mnn.com/your-home/organic-farming-gardening/blogs/french-parks-and-public-gardens-bid-adieu-pesticides)

Romantique strolls through Parisian parks have never been healthier.

Matt Hickman
January 5, 2017, 12:45 p.m.

Parks and green spaces in Paris, and across all of France, are now sans pesticides used for landscaping. (Photo: CJ/flckr)

France, a seemingly magical land where after-work emails are strictly verboten and wasting food is an unlawful act, has officially given the boot to harmful chemicals in outdoor places where young children, crucial pollinators and the general public frequently gather.

As reported by the Associated Press, France's pesticide ban applies to all public parks, gardens and forests including famed Parisian green spaces like Jardin des Tuileries, Bois de Vincennes and Jardin de Luxembourg. For now, pesticides can still be freely used — but one would hope in respectful moderation — at French cemeteries. The manicured turf found at sports stadiums is also off the hook and can continue to be treated with pesticides.

In 2019, the law will expand from public green spaces to private gardens when the over-the-counter sale of pesticides to non-professionals becomes a thing of the past. While private residential green spaces are generally more compact than their public brethren, instances of abuse and misuse of pesticides by amateur gardeners is common. In other words, pesticide use in modest backyard gardens can be just as high extensive as in large municipal parks and, in turn, pose just as high — or even higher —of risk to birds, bees and other beneficial critters.

Last spring, France's National Assembly voted to usher in a controversial bill calling for an outright ban on neonicotinoid-based pesticides. Although experts have linked neonicotinoids to large-scale bee die-offs in Europe and beyond, opponents of the widespread ban warn that such extensive limitations would ultimately be detrimental to the livelihood of French farmers. Groups rallying against an outright ban on pesticides including farming organizations and agricultural chemical behemoth Bayer, which has never outright denied that European honeybees are in peril but has aggressively downplayed the role that neonicotinoids have in the matter.

France, by the way, is the second largest user of pesticides in Europe, second only to Spain. A significant amount of chemical pesticides are applied to vineyards in the country's famed wine-producing regions, although the market for wine produced sans pesticides is growing steadily.

French towns blaze the pesticide-free trail

Organic wine and the plight of bees aside, the protection of human health has also been a top concern in France's anti-pesticide movement. In May 2016, the small farming community of Saint-Jean in Haute-Garrone, southwestern France, became the first French town to ban pesticide use within 50 meters (164 feet) of private homes.

Saint-Jean's trailblazing anti-pesticide crusade was led by doctor and deputy mayor Gerard Bapt, who links pesticide use to a wide array of serious ailments including cancer:

> Research shows that people living near areas where pesticides are used are more affected by some diseases: endocrinal hormone disruption, diabetes and obesity, hormone-dependent cancers, cancer of the blood, male and female fertility problems and birth defects.
>
> Recently pesticides were sprayed next to homes where vulnerable people such as pregnant women or young children might have been exposed. The pesticides used are found in water, with traces of pesticides in nine out of 10 rivers and streams in France.

As far as banning pesticides in non-agricultural environments such as public parks and ornamental gardens, it would appear that France is the first place to enact such a measure on a nationwide level. Individual cities like Lyon, however, have been striving to reduce — or completely eliminate — pesticides in parks and public green spaces for some time now.

English-language French newspaper The Connexction recently praised the city of Lyon, France's third largest, for keeping all 300 of its public parks and gardens — a swath of urban green space totaling over 1,000 acres — pesticide-free since 2008. By ditching chemicals and relying on natural pest-control methods such as aphid-munching ladybugs and beer traps to keep slugs in check, Lyon has enticed once-scarce bees, butterflies and other wildlife to return to certain city parks.

In 2008, another sizable French city, Strasbourg, also launched a zero-pesticide policy for all public green spaces. Since then, the Alsatian economical and cultural capital has employed chemical-free forms of weed management as well as embraced new and less fussy gardening techniques. The city itself describes the blanket ban on pesticides at parks and publicly accessible open spaces as being "a popular success."

Outside of France, parks departments in other major cities have made strides in going pesticide-free. Seattle Parks and Recreation, for example, boasts an extensive pesticide reduction scheme in which chemical-free green spaces are bestowed with a special "Pesticide-free Parks" designation. Spread out across the city, a total of 14 Seattle parks have been completely pesticide-free since 2001, with plans to expand that number to 22. And while some parks are still treated with chemical pesticides, all Seattle

Parks and Recreation-maintained spaces are free of neonictotinoid-based insecticides. The city's neonicotinoid-free status earned it designation as a Bee City, U.S.A. in May 2015.

Back in France, the country's newly enacted ban on pesticides in public parks and gardens is just one several environmental-minded national measures including a groundbreaking ban on disposable plastic plates, cups and cutlery