PAUL R. LEPAGE
GOVERNOR

STATE OF MAINE
MAINE DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0028

WALTER E. WHITCOMB
COMMISSIONER

HENRY S. JENNINGS
DIRECTOR

BOARD OF PESTICIDES CONTROL

May 16, 2014

AMHI Complex, 90 Blossom Lane, Deering Building, Room 319, Augusta, Maine

AGENDA

8:30 AM

1. Introductions of Board and Staff

2. Minutes of the February 21, 2014 Board Meeting

   Presentation By: Henry Jennings
   Director

   Action Needed: Amend and/or Approve

3. Consideration of the Syngenta Crop Protection Company's Special Local Need [FIFRA Section 24(c)] Registration Request for Dual Magnum, EPA Reg. No. 100-816, to Reduce the Pre-plant Interval in Various Field Crops

   Syngenta Crop Protection, Inc. is requesting a Special Local Needs Registration for Dual Magnum to reduce the pre-plant interval for various field crops grown in Maine. Certain vegetable crops grown in Maine currently lack efficacious weed management options and the 60 day pre-plant interval is an impediment in this climate. The Maine Cooperative Extension is supporting this request, which has approved for other states.

   Presentation By: Mary Tomlinson
   Registrar and Water Quality Specialist

   Action Needed: Approve/Disapprove 24(c) Registration Request

4. Consideration of a Request for Variances from Chapters 22 and 29 from Asplundh Tree Expert Company–Railroad Division, to Treat Railroad Rights-of-way in Maine

   Asplundh Tree Expert Company–Railroad Division, is seeking variances from Chapter 22, Section 2(C), Identification of Sensitive Areas, and Chapter 29, Section 6, Buffer Requirements, in order to treat the St. Lawrence and Atlantic Railroad rights-of-way in Maine. Board policy indicates that first-time variance requests must be considered by the Board. Policy further stipulates that railroad variance requests need to be consistent with the Maine Department of Transportation standards.

   Presentation By: Henry Jennings
   Director

   Action Needed: Approve/Disapprove the Variance Requests

5. Review of Potential Rulemaking Concepts by Chapter

At the February and March 2014 meetings, the Board reviewed a series of potential rulemaking topics that had been discussed at various times over the previous year. At the March meeting, Board members narrowed the list of rulemaking chapters to 20, 22, 28, 31, 32, 33 and 41. The staff will present a summary of the rulemaking concepts by chapter in order to ensure that there is alignment over the precise nature of the proposed changes, prior to initiating rulemaking.

Presentation By: Henry Jennings
Director

Action Needed: Refine the Rulemaking Concepts

6. Overview of the Board of Pesticides Control Software Application Development Process Underway to Improve Work Flow Efficiency and Constituent Service

In February, the Department entered into a Memorandum of Understanding with the Office of Information Technology to undertake an information technology (IT) application development process intended to modernize and integrate the Board's IT systems and create an internet interface. Because all work processes are reviewed and analyzed as part of the development, the staff would like to provide an overview of the process to date and seek the Board's input.

Presentation By: Gary Fish
Manager of Pesticide Programs

Action Needed: Provide Input to the Staff

7. Consideration of a Consent Agreement with Remedy Compassion of Auburn, Maine

On June 3, 1998, the Board amended its Enforcement Protocol to authorize staff to work with the Attorney General and negotiate consent agreements in advance on matters not involving substantial threats to the environment or public health. This procedure was designed for cases where there is no dispute of material facts or law, and the violator admits to the violation and acknowledges a willingness to pay a fine to resolve the matter. This case involved use of pesticides inconsistent with the product labels.

Presentation By: Raymond Connors
Manager of Compliance

Action Needed: Approve/Disapprove the Consent Agreement Negotiated by Staff

8. Consideration of a Consent Agreement with Plants Unlimited of Rockport, Maine

On June 3, 1998, the Board amended its Enforcement Protocol to authorize staff to work with the Attorney General and negotiate consent agreements in advance on matters not involving substantial threats to the environment or public health. This procedure was designed for cases where there is no dispute of material facts or law, and the violator admits to the violation and acknowledges a willingness to pay a fine to resolve the matter. This case involved use of pesticides at a nursery/greenhouse operation in violation of certain state and federal pesticide laws.

Presentation By: Raymond Connors
Manager of Compliance

Action Needed: Approve/Disapprove the Consent Agreement Negotiated by Staff

9. Review of Board Authority to Direct Staff to Participate in Legislative Hearings and Work Sessions

At the March meeting, Board members expressed the importance of having the staff represent the Board at legislative policy events. At the same time, the Administration exerts supervisory authority over executive branch employees and administers polices covering legislative functions intended to maintain efficient and consistent executive branch participation. The Board has asked Assistant Attorney General Randlett to clarify the Board's authority with respect to staff participation in legislative events.

Presentation By: Mark Randlett, Assistant Attorney General

Action Needed: None, Informational Only

10. Election of Officers

The Board's statute requires an annual election of officers. The members will choose a chair and vice-chair to serve for the coming year.

Presentation By: Henry Jennings
Director

Action Needed: Nominations and Election of Officers

11. Other Old or New Business

a. ERAC update—L. Hicks
b. RWC, Inc. variance permits for Chapters 22 and 29 for railroad rights-of-way—H. Jennings
c. MDOT variance permit for chapter 29 for control of phragmites—H. Jennings
    - Sherman Marsh Phragmites Control On-Going Treatment Plan

12. Schedule of Future Meetings

June 27, August 18, and September 12, 2014, are tentative Board meeting dates. The June 27 meeting is planned to be held at Madison High School following a tour of Backyard Farms. The Board will decide whether to change and/or add dates.

Action Needed: Adjustments and/or Additional Dates?

13. Adjourn

NOTES

- The Board Meeting Agenda and most supporting documents are posted one week before the meeting on the Board website at www.thinkfirstspraylast.org.
- Any person wishing to receive notices and agendas for meetings of the Board, Medical Advisory Committee, or Environmental Risk Advisory Committee must submit a request in writing to the Board's office. Any person with technical expertise who would like to volunteer for service on either committee is invited to submit their resume for future consideration.
- On November 16, 2007, the Board adopted the following policy for submission and distribution of comments and information when conducting routine business (product registration, variances, enforcement actions, etc.):
    - *For regular, non-rulemaking business*, the Board will accept pesticide-related letters, reports, and articles. Reports and articles must be from peer-reviewed journals. E-mail, hard copy, or fax should be sent to the attention of Anne Bills, at the Board's office or anne.bills@maine.gov. In

order for the Board to receive this information in time for distribution and consideration at its next meeting, all communications must be received by 8:00 AM, three days prior to the Board meeting date (e.g., if the meeting is on a Friday, the deadline would be Tuesday at 8:00 AM). Any information received after the deadline will be held over for the next meeting.

- During rulemaking, when proposing new or amending old regulations, the Board is subject to the requirements of the APA (Administrative Procedures Act), and comments must be taken according to the rules established by the Legislature.

PAUL R. LEPAGE
GOVERNOR

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
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WALTER E. WHITCOMB
COMMISSIONER

HENRY S. JENNINGS
DIRECTOR

To: Members of the Board of Pesticides Control
From: Mary Tomlinson, Pesticides Registrar/Water Quality Specialist
RE: EPA Special Local Need (SLN) [FIFRA, Section 24(c)] application to approve the use of Dual Magnum, EPA Reg. No. 100-816, to control yellow nutsedge and hairy galinsoge in asparagus, seeded cabbage, carrots, garden beets, Swiss chard, dry bulb and green onions, spinach, and pumpkins.
Date: May 8, 2014
****

Enclosed is the above referenced Special Local Needs (SLN) [FIFRA, Section 24(c)] application and supporting documents for your consideration.

The Special Local Needs (SLN) application for use of Dual Magnum (EPA Reg. No. 100-816) expands use to asparagus, seeded cabbage, carrots, garden beets, Swiss chard, dry bulb and green onions, spinach, and pumpkins. The request is in response to the lack of effective herbicides to control yellow nutsedge (Cyperus esculentus) and hairy galinsoge (Galinsoga ciliata). The expanded use would provide Maine growers an additional control option to cultivation and hand weeding in the above listed crops.

The Section 3 label includes groundwater and surface water advisories. Depending on soil type, metolachlor is mobile to highly mobile and is persistent to moderately persistent in surface soils (EPA, 1995). Compared to metolachlor, S-metolachlor has a lower solubility and lower adsorption potential (Koc); thus, a greater potential to move through soil (Table). However, a much lower half-life in surface soil and an application rate that is approximately one-third lower than metolachlor indicate residues are less likely to appear in groundwater. In addition, the likely total acreage in Maine for the listed crops would be negligible as compared to the use of metolachlor in corn and potato production and the total pounds of material applied would be similarly negligible.

WIN-PST Results

Name	PC_CODE	SOL	KOC	HL	PLP	PSRP
S-Metolachlor	108800	480	137	43	HIGH	HIGH
Metolachlor	108801	530	200	90	HIGH	HIGH

SOL – solubility
Koc – affinity to adsorb
HL – half-life in days
PLP – pesticide leaching potential
PSRP - Pesticide solution run-off potential

Please review the attached documents and let me know if you have any questions.

- FIFRA, Section 24(c) application
- Letters of request from Patricia Dinnen, Regulatory Manager, Syngenta Crop Protection, LLC
- Two letters of support from Mark Hutton, Ph.D., Vegetable Specialist, University of Maine Cooperative Extension
- Memo to Board from Lebelle Hicks, Ph.D. DABT
- Dual Magnum multi-crop draft Maine SLN label
- Dual Magnum Section 3 label
- Dual Magnum MSDS

Citations

EPA. 1995. Reregistration Eligibility Decision Metochlor.
WIN-PST 3.1.20. Windows Pesticide Screening Tool. NRCS. Version: 3.1.0020.

Form Approved, OMB No. 2070–0055

United States Environmental Protection Agency
Office of Pesticide Programs. Registration Division (7505C)
Washington, DC 20460

Application for/Notification of State Registration of a Pesticide To Meet a Special Local Need

(Pursuant to section 24(c) of the Federal Insecticide, Fungicide, and Rodenticide Act as Amended

For State Use Only
Registration No. Assigned
Date Registration Issued

1. Name and Address of Applicant for Registration
Syngenta Crop Protection, LLC
PO Box 18300
Greensboro, NC 27419

2. Product is (Check one)

EPA-Registered	EPA Registration Number
☒	100-816
New (not EPA-registered) ☐ Attach EPA Form 8570–4, Confidential Statement of Formula for new products.	EPA Company Number 100

3. Active Ingredient(s) in Product
S-Metolachlor

4. Product Name
Dual Magnum

5. If this is a food/feed use, a tolerance or other residue clearance is required. Cite appropriate regulations in 40 CFR Part 180. 186, and/or 186. 40CFR 180.368

6. Type of Registration (Give details in Item 13 or on a separate page, properly identified and attached to this form):

- ☐ a. To permit use of a new product.
- ☒ b. To amend EPA registration for one or more of the following purposes:
  - ☐ (1) To permit use on additional crops or animals.
  - ☐ (2) To permit use at additional rates.
  - ☐ (3) To permit use against additional pests.
  - ☐ (4) To permit use of additional application techniques or equipment.
  - ☐ (5) To permit use at different application sites.
  - ☒ (6) Other (specify below) See paragraph 13

7. Nature of Special Local Need (check one)
X – See paragraph 13

- ☐ There is no pesticide product registered by EPA for such use.
- ☒ There is no EPA–registered pesticide product which, under the conditions of use within the State, would be as safe and/or as efficacious for such use within the terms and conditions of EPA registration.
- ☐ As appropriate EPA–registered pesticide product is not available.

8. If this registration is an amendment to an EPA–registered product, is it for a "new use" as defined in 40 CFR 152.3?
☐ Yes (discuss in Item 13 below) ☒ No

9. Has an EPA Registration or Experimental Use Permit for this chemical even been (check applicable box(es), if known):
☒ Sought ☒ Issued ☐ Denied ☐ Cancelled ☐ Suspended
☒ Registration ☐ Experimental Use Permit ☐ No Previous Permit Action

10. Has FIFRA section 24(c) registration for this use of the product ever, by another State, been (check appropriate box(es), if known):
☒ Sought ☒ Issued ☐ Denied ☐ Revoked

If any of the above are checked, list States in Item 13 below.

☐ No FIFRA section 24(c) Action

11. Endangered Species Act: (Give details in Item 13 or on a separate page, properly identified and attached to this form.)

Identify the counties where this pesticide will be used. If Statewide, indicate "all."
ALL
Provide a list of Federally protected endangered/threatened species which occur in the areas of proposed use.

Certification
I certify that the statements I have made on this form and all attachments thereto are true, accurate, and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law.

12. Indicate use status of Special Local Need, i.e.. planned dates of use:
From: May 2014 **To:** December 31, 2019

Signature of Applicant or Authorized Representative
Pat Dinnen

Title Pat Dinnen
Regulatory Manager

Telephone Number 336-632-2494
Date May 5, 2014

13. Comments (attach additional sheet. if needed)
Comments to Item 6.b.(6): To permit use on crops where permanent tolerances have been established for S-metolachlor (Federal Register dated xxxxxxx.

Comments to Item 10: Similar SLN's exist MA, MI, NJ, NY, OH, TX, WI

Determination by State Agency
This registration is for a Special Local Need and is being issued in accordance with section 24(c) of FIFRA, as amended. To the best of our knowledge, the information above is correct, except as noted in "Comments" below or in attachments

Name, Title. and Address of State Agency Official
Mary Tomlinson
Maine Board of Pesticides Control
28 State House Station
Augusta, ME 04333-0028

Title
Pesticides registrar/Water Quality Specialist

Telephone Number 207-287-2731
Date 5-8-2014

Comments (by State Agency Only)

Received by EPA

Patricia (Pat) Dinnen
Regulatory Manager
State Registration/State Affairs

Syngenta Crop Protection, LLC
P.O. Box 18300
Greensboro, NC 27419-8300
www.syngenta.com

Tel. 336 632 2494
Fax: 336 632 2884
pat.dinnen@syngenta.com

May 5, 2014

Ms. Mary E. Tomlinson
Pesticide Registrar and Water Quality Specialist
Board of Pesticides Control
ME Dept. of Agriculture
28 State House Station
Augusta, ME 04333-0028

Subject: Dual Magnum® Herbicide, EPA Reg. No. 100-816
SLN Request for Control of Weeds in Asparagus, Bell Pepper, Cabbage, Carrots, Garden Beets, Dry Bulb Onions, Green Onions, Spinach, Swiss Chard, Pumpkin

Dear Ms. Tomlinson:

Syngenta Crop Protection, LLC is requesting a Section 24(c) for Dual Magnum Herbicide for control of weeds, in asparagus, bell pepper, cabbage, carrots, garden beets, dry bulb onions, green onions, spinach, swiss chard, and pumpkin. The active ingredient in Dual Magnum is S-metolachlor. Dr. Mark Hutton has written a letter of support stating that S-metolachlor provides excellent control of yellow nutsedge (*Cyperus esculentus*) and hairy galinsoga (*Galinsoga citiata*).

Enclosed in support of this submission are:

- Draft SLN Label
- EPA SLN Application Form 8570-25
- Letter of support from Dr. Mark Hutton of The University of Maine
- Efficacy Data
- EPA Memorandum, DP Barcode D296904, S-metolachlor: Summary of Analytical Chemistry and Residue Data
- Federal Register Notice approving S-metolachlor tolerances dated August 31, 2005
- Federal Label for Dual Magnum Herbicide
- MSDS for Dual Magnum Herbicide

If you have any questions please do not hesitate to call me at 336-632-2494 or email me at pat.dinnen@syngenta.com.

Sincerely,

Pat Dinnen

Pat Dinnen
Regulatory Manager

Enclosures

Highmoor Farm
P.O. Box 179
Monmouth, ME 04259-0179
207-933-2100
Fax 207-933-4647
ceshmf@umext.maine.edu

May 6, 2014

Mary Tomlinson
Pesticide Registrar/Water Quality Specialist
28 State House Station
Augusta, ME 04333-0028

Dear Mary,

I am writing to request expanding the current Dual Magnum (EPA 100-816) registration for transplanted pepper and transplanted cabbage to include asparagus, seeded cabbage, carrots, garden beets, Swiss chard, dry bulb and green onions, spinach, and pumpkins.

Yellow nutsedge (Cyperus esculentus) and hairy galinsoge (Galinsoga ciliata) are two of the most difficult weeds to control in vegetable crops, particularly in the crops listed above. The lack of effective chemical herbicides for these crop/weed combinations forces growers to rely on expensive cultivation or hand weeding operations. Metolachlor provides excellent control of these species and is very cost effective compared to cultivation and hand weeding.

The current label has worked extremely well for us and I feel that it is time to add additional crops to match the options that growers in New York and Massachusetts have available to them.

Sincerely,

Mark Hutton, Ph.D.
Vegetable Specialist
Assoc. Professor Vegetable Crops
University of Maine Cooperative Extension
Highmoor Farm, P.O. Box 179
Monmouth, ME 04259-0179

cc. Mary Tomlinson, Pesticide Registrar, Maine Board of Pesticide Control

Highmoor Farm
P.O. Box 179
Monmouth, ME 04259-0179
207-933-2100
Fax 207-933-4647
ceshmf@umext.maine.edu

May 2, 2014

Dennis Kelly
Syngenta Crop Protection
410 Swing Road
Greensboro, NC 27409

Dear Dennis,

I am writing in support of expanding the current Dual Magnum registration for transplanted pepper and transplanted cabbage (EPA 100-816) to include asparagus, seeded cabbage, carrots, garden beets, Swiss chard, dry bulb and green onions, spinach, and pumpkins.

Yellow nutsedge (Cyperus esculentus) and hairy galinsoge (Galinsoga ciliata) have been two of the most difficult weeds to control in vegetable crops. Metolachlor provides excellent control of these species and is very cost effective compared to cultivation and hand weeding.

The current label has worked extremely well for us and I feel that it is time to add additional crops to match the options that growers in New York and Massachusetts have available to them.

Sincerely,

Mark Hutton, Ph.D.
Vegetable Specialist
Assoc. Professor Vegetable Crops
University of Maine Cooperative Extension
Highmoor Farm, P.O. Box 179
Monmouth, ME 04259-0179

cc. Mary Tomlinson, Pesticide Registrar, Maine Board of Pesticide Control

PAUL R. LEPAGE
GOVERNOR

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
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WALTER E. WHITCOMB
COMMISSIONER

HENRY S. JENNINGS
DIRECTOR

TO: Members of the Board of Pesticides Control
FROM: Lebelle Hicks PhD DABT
RE: Dietary Risks from the proposed Syngenta Request for a 24(c) label for Dual Magnum Herbicide (EPA# 100-816) in Maine
May 8, 2014

****

S-metolachlor is the active ingredient in Dual Magnum herbicide (EPA# 100-816). It is the active isomer of metolachlor (racemic [50:50] mixture of the R and S isomers). When Syngenta changed to S-metolachlor, the use rates decreased. The use rate for S-metolachlor is 0.63 times that of metolachlor (EPA 20003c).R-metolachlor is still present in the current formulations but at a lower concentration. EPA bridged the toxicity database for metolachlor and S-metolachlor and considers the combined toxicity database complete, with the exception of a 28-day inhalation toxicity study (EPA 2013t).

The toxicity endpoints used by EPA are presented in Table 1. These endpoints are found in EPA's most recent risk assessment and used for establishing the tolerances for S-metolachlor in food, the reference doses, and population adjusted doses. All doses are presented in mg/kg/day (EPA 2013t).

Table 1. Most Current Toxicity Endpoints for S-metolachlor (EPA 2013t)

Study	Doses [a]		Effects at LOAEL	UF [d]	RfD [e]	FQPA SF [f]	PAD [g]
	NOAEL [b]	LOAEL [c]					
Rat Develop-mental	300	1,000	Deaths, Multiple Clinical effects, ↓ Body weight gain	100	3	1	3
Dog Chronic Diet	9.7	33	↓ Body weight gain ♀	100	0.097	1	0.097
S-metolachlor is classified as a "C" possible human carcinogen based on an increase in liver tumors in female (EPA 2013t). A quantitative cancer risk assessment was not performed.							

a) All doses are in mg/kg/day
b) NOAEL = no observable adverse effect level
c) LOAEL = lowest observable adverse effect level
d) UF = uncertainty factors to account for inter-species extrapolation (10X for using animal data to determine human risk), intra-species (10X to account for variability in humans)
e) RfD = Reference dose, daily doses of a residue which may be consumed by the population and sub-populations of people with no expectation of adverse responses

f) FQPA SF = Food Quality Protection Act Safety Factor of 10X, this is reduced to 1X, when there is no evidence of increased sensitivity in the developing fetus
g) PAD = Population Adjusted Dose, specific daily exposure dose for selected subpopulations

Exposure Assessment

In addition to the S-metolachlor, food tolerances include the R-isomer and the two most common animal and plant metabolites (EPA 2013t). There are existing tolerances for S-metolachlor (40CFR180.368, 2014) in these commodities (Table 2).

Table 2. Tolerances for s-Metolachlor for Commodities Listed on the Proposed 24(c) for Dual Magnum (EPA# 100-816) (40CFR180.368)

Commodity	EPA tolerance Group (40CFR180.41)	Tolerance (ppm)
Asparagus	Not Applicable	0.1
Bell Pepper	8	0.1
Cabbage	5A	0.6
Carrot	1B	0.4
Garden Beets	1B	0.3
Dry Onion bulbs	3	0.1
Green Onions	3	2
Spinach	4A	0.5
Swiss chard	4B	0.1
Pumpkin	9B	0.1

In the 2013 risk assessment for S-metolachlor in which EPA assumed 100% of the listed crops would be treated and residues would exist at the tolerance levels (EPA 2013t), EPA states that children less than 1 year old are the most highly exposed subpopulation. This subpopulation receives a daily dose of 1.5% of the acute and 11.6% of the chronic population doses. The issuance of this 24(c) will not increase the risk from S-metolachlor and its metabolites of concern.

Citations

40CFR180.41 2007, Crop Group Tables

40CFR180.368 (a) (2), 2014 Tolerances for S-Metolachlor as of 5-2-14

EPA 2003b, S-metolachlor; Pesticide Tolerances Final Rule FR Vol 68 (63) 15845-15958

EPA 2013t, S-Metolachlor, PP#2F8115 Human Health Risk Assessment for the petition for higher tolerances on Corn, field, forage; Corn, sweet, forage; and Corn, stover

Section 24(c) Special Local Need Label

FOR DISTRIBUTION AND USE ONLY WITHIN THE STATE OF MAINE

DUAL MAGNUM
FOR WEED CONTROL IN ASPARAGUS, BELL PEPPER, CABBAGE, CARROTS, GARDEN BEETS, DRY BULB ONIONS, GREEN ONIONS, SPINACH, SWISS CHARD, PUMPKIN

EPA Reg. No. 100-816
EPA SLN No. ME-xxxxxx

This label expires and must not be distributed or used in accordance with this SLN registration after December 31, 2019

SYNGENTA'S SPECIAL CONDITIONS, RISKS OF USE AND DISCLAIMER FOR USE OF DUAL MAGNUM ON CROPS ON THIS 24(c) LABEL

IMPORTANT- READ BEFORE USE
THESE CONDITIONS RISKS OF USE AND DISCLAIMER ARE REQUIRED BY SYNGENTA CROP PROTECTION LLC AND NOT SPECIFIED BY U.S. EPA OR THE OF STATE OF MAINE

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, SYNGENTA CROP PROTECTION, LLC INTENDS THAT THE PRODUCT THAT IS THE SUBJECT OF THIS SECTION 24(c) LABEL BE PURCHASED ONLY BY END USERS WHO AGREE BY ELECTRONIC SIGNATURE ON SYNGENTA CROP PROTECTION'S INTERNET SITE TO THE TERMS AND CONDITIONS REQUIRED BY SYNGENTA CROP PROTECTION, LLC INCLUDING A WAIVER AND RELEASE FROM ALL LIABILITY AND INDEMNIFICATION BY THE USER AND/OR GROWER OF SYNGENTA AND OTHERS FOR FAILURE TO PERFORM AND FOR CROP INJURY, CROP YIELD REDUCTION, AND/OR CROP LOSS FROM USE OF DUAL MAGNUM HERBICIDE ON CROPS ON THIS 24(c) LABEL. IF SUCH TERMS AND CONDITIONS ARE UNACCEPTABLE, RETURN THE DUAL MAGNUM AT ONCE UNOPENED OR USE THE DUAL MAGNUM FOR A DIFFERENT APPROVED USE IN ACCORDANCE WITH THE LABEL AFFIXED TO THE PRODUCT CONTAINER.

USE OF DUAL MAGNUM (THE "PRODUCT") ON CROPS LISTED (THE "CROP") FOR THIS SPECIAL LOCAL NEED MAY RESULT IN CROP INJURY, CROP YIELD REDUCTION AND/OR CROP LOSS AS FURTHER DISCUSSED BELOW. READ AND UNDERSTAND THESE CONDITIONS AND RISKS OF USE FOR SPECIAL LOCAL NEED BEFORE USING THE PRODUCT ON THE CROP. SYNGENTA RECOMMENDS THAT THE USER TEST THIS PRODUCT TO DETERMINE ITS SUITABILITY FOR SUCH INTENDED USE.

Syngenta Crop Protection, LLC makes the Product available for use in the manner described in this Supplemental Labeling on the basis that, in the sole opinion of the user, the benefits and utility derived from the use of the Product on the Crop outweigh the potential risk of Crop injury, Crop yield reduction or Crop loss.

The decision to use this Product in the manner described in this Supplemental Labeling must be made by each individual user on the basis of anticipated benefits versus (i) the potential risk of Crop injury, Crop yield reduction and Crop loss, (ii) the severity of the target pest infestation, (iii) the cost and availability of alternative pest controls and (iv) any other relevant factors. Syngenta recommends that the user test this Product to determine its suitability for such intended use.

By purchasing the Product for use, or using the Product in the manner described in this Supplemental Labeling, you acknowledge and accept that, to the extent consistent with applicable law:

1) you assume all risk of Crop injury, Crop yield reduction and Crop loss;
2) Syngenta Crop Protection, LLC do not make, and do not authorize any agent or representative to make, any representations or recommendations regarding the use of this Product on the Crop other than the statements on this Supplemental labeling;
3) Syngenta Crop Protection, LLC do not make, and do not authorize any agent or representative to make, any warranties, express or implied, with respect to the use of the Product on the Crop and disclaim all warranties, expressed or implied, including any implied warranty of merchantability;
4) Syngenta Crop Protection, LLC disclaim all liability for any damages, losses, expenses, claims or causes of actions arising out of or relating to Crop injury, Crop yield reduction and/or Crop loss;
5) these conditions and Risks of Use for Special Local Need supersede any contrary representations or recommendations by Syngenta Crop Protection, LLC or their respective agents or representatives, and any provisions in or on any Product literature or labeling including any provisions on the label affixed to the Product container.

If these Conditions and Risks of Use for Special Local Need are not acceptable, the unopened Product may be returned to the seller for a refund or used for a different labeled use in accordance with the label affixed to the Product container.

FAILURE TO FOLLOW THE DIRECTIONS FOR USE AND PRECAUTIONS ON THIS LABEL MAY RESULT IN POOR WEED CONTROL, CROP INJURY, OR ILLEGAL RESIDUES.

DIRECTIONS FOR USE

- It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
- This label must be in the possession of the user at the time of application.
- Follow all applicable directions, restrictions, Worker Protection Standard requirements, and precautions on the EPA-registered label.

ASPARAGUS

Apply a single broadcast treatment of Dual Magnum at 1.33 - 2.0 pt/A after the harvest season (i.e. post-harvest treatment), or to dormant established asparagus beds in the spring, prior to asparagus emergence. In that rate range, use lower rates on soils relatively coarse- textured and higher rates on fine-textured soils. A band application may also be used, applying proportionally less spray mixture on the area actually treated. Make uniform applications in a minimum of 15 gallons of water per treated acre. Dual Magnum will not control emerged weeds. Control emerged weeds with an appropriate registered foliar herbicide or by mechanical or physical means.

Restrictions: (1) Make only one application per crop. (2) Do not harvest asparagus within 16 days following application.

Note: Applications of Dual Magnum may cause significant injury to asparagus resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower's risk.

BELL PEPPER, TRANSPLANTED

Apply a single broadcast treatment of Dual Magnum at 0.5 to 1.0 pt/A to the soil surface prior to transplanting or a broadcast application within 48 hours after transplanting bell pepper, but before weeds emerge. In that rate range, use lower rates on soils relatively coarse-textured and higher rates on fine-textured soils. Dual Magnum will not control emerged weeds. Control emerged weeds with an appropriate registered foliar herbicide or by mechanical or physical means. Weed control may be reduced on muck soils.

Restrictions: (1) Do not incorporate. (2) Do not apply to direct seeded bell peppers. (3) Do not flood or sprinkler irrigate immediately following application. (4) Do not exceed more than 1.0 pt/A Dual Magnum. (5) Do not harvest within 60 days of application of application.

Precautions: (1) In general, the risk of crop injury is less with post-transplant applications than from pretransplant surface applications, and the risk of crop injury is less with post-directed than from post over-the-top applications. To minimize the risk of crop injury, apply as a postdirected spray in a way that minimizes contact with the crop foliage. (2) Muck soils (>20%) normally require the higher use rate (1.0 pt/A), however, weed control may be reduced on muck soils. (3) The use addition of another registered herbicide as a tank mixture with Dual Magnum will increase the risk of crop injury from postemergence applications. (4) The application of Dual Magnum prior to bed formation may result in crop injury due to concentration of Dual Magnum near the transplanted crop's root system.

Note: Applications of Dual Magnum may cause significant injury to transplanted bell peppers resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower's risk.

CABBAGE, DIRECT SEEDED AND TRANSPLANTED

Apply a single broadcast treatment of Dual Magnum at 0.5-1.33 pt/A prior to transplanting or within 48 hours after transplanting, the latter often being less injurious. Apply to direct seeded cabbage only at the four-leaf stage. In that rate range, use lower rates on soils relatively coarse-textured and higher rates on fine-textured soils. Dual Magnum will not control emerged weeds. Control emerged weeds with an appropriate registered foliar herbicide or by mechanical or physical means. Weed control may be reduced on muck soils.

Restrictions: (1) Make only one application per crop. (2) Do not incorporate Dual Magnum. (3) Do not use in combination with Goal®. (4) Crop maturity may be delayed by Dual Magnum application. (5) Do not harvest cabbage within 60 days following application.

Note: Applications of Dual Magnum may cause significant injury to cabbage resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower's risk.

CARROTS

Carrots grown on mineral soils: Make a single broadcast application of Dual Magnum at 0.67 – 1.33 pt/A preemergence to clean-tilled soil. Use lower rates on coarse-textured soils and higher rates on fine-textured soils. In general, the risk of crop injury from the use of Dual Magnum on this crop is greater from preplant incorporated than from preplant non-incorporated or preemergence applications.

Note: (1) Do not apply more than 1.33 pt/A of Dual Magnum per crop. (2) Harvest at normal maturity. (3) Do not apply to Carrots grown on muck soils

Precautions: To avoid crop injury, do not apply Dual Magnum in areas where water is likely to "pond". To avoid concentration in the seed furrow, do not make broadcast applications of Dual Magnum to carrots planted in furrows more than 2 inches deep. Band applications may be made to carrots planted in furrows deeper than 2 inches, but the band width should not exceed the width of the bottom of the furrow.

Note: Applications of Dual Magnum may cause significant injury to carrots resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower's risk.

GARDEN BEETS

Make a single broadcast application of Dual Magnum at a rate of 0.67 pt/A (0.64 lb ai/acre) to the soil surface after planting, but before the weeds or crop emerge (pre-emerge). For effective weed control, Dual Magnum must be applied to clean-tilled soil where existing weeds are controlled by another labeled herbicide. Dual Magnum will not control emerged weeds.

Make uniform applications in a minimum of 15 gallons of water per treated acre. A band application may also be used, applying proportionally less spray mixture on the area actually treated. Irrigate after application to activate the herbicide if rainfall is not expected. If the crop is irrigated, use 0.5 inches of water shortly after planting to incorporate the herbicide. Excessive irrigation may increase the risk of crop injury. Do not mechanically incorporate Dual Magnum. **Do not use Dual Magnum if the planting operation creates a furrow or trough over the seed-row into which rain or irrigation water will collect and thus concentrate the herbicide over the row.**

Restrictions and Precautions

- Do not use on coarse textured soils with less than 1.5% OM. Do not use on soils with greater than 10% OM.
- Do not exceed a total of 0.67 pt/A of Dual Magnum in any single application, nor in total, per crop.
- Follow instructions for use of Dual Magnum under Application Procedures on the EPA- registered label.
- Harvest at normal timing.

Note: Applications of Dual Magnum may cause significant injury to crops on this label resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower's risk.

DRY BULB ONIONS

Fall Preplant Application

For pre-emergent control or suppression of yellow nutsedge the following spring in dry bulb onions apply 1 to 1.33 pt/A of Dual Magnum in the fall after the harvest of the previous crop but before freeze-up. Fall applications of Dual Magnum can be surface-applied or incorporated. To reduce the risk of crop injury apply at least 100 days prior to the planting of onion (seed, sets, or transplants).

Precautions: 1) In general, the risk of crop injury is greater on lighter textured soils and with higher application rates. 2) The addition of another registered herbicide as a tank mixture or in a program with Dual Magnum can increase the risk of crop injury. 3) Deep tillage in the spring may reduce the effectiveness of fall applications.

Restrictions: (1) Make no more than one fall application per crop. (2) Apply not more than 1.33 pt/A in a single fall preplant application. (3) Do not apply this product, for this use, through any types of irrigation system. (4) Do not apply to frozen ground.

Note: Applications of Dual Magnum may cause significant injury to dry bulb onions resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower’s risk.

Postemergent Application to the Crop

For suppression and control of yellow nutsedge, grass, and some broadleaf weeds (see **Weeds Controlled** on the Dual Magnum label), apply Dual Magnum at the two (2) true leaf stage of onions at rates of 0.67 - 1.33 pints (0.64-1.27 lb active ingredient) per acre, depending on soil type and target weed. Use the lower rate on light, sandy soils and where a general weed spectrum is targeted. The higher rate will provide improved yellow nutsedge control, but comes with an increase risk of crop injury. One additional application of 0.67-1.33 pints may be applied 21 days or more after the first treatment, if needed, provided no fall preplant applications of Dual Magnum were made. Dual Magnum provides good to excellent control of yellow nutsedge. **If nutsedge is not a target weed delaying Dual Magnum application until onions have three true leaves may reduce the risk of crop injury.**

Onion tolerance to Dual Magnum increases with increasing onion size. However, growers must weigh the need to control early nutsedge flushes with the potential risk of crop injury.

Restrictions: (1) Do not apply within 60 days of harvest. (2) Do not harvest green onions. (3) Do not apply this product through any types of irrigation system. (4) Do not graze animals on green forage or stubble. (5) If a fall preplant application of Dual Magnum was used for nutsedge, only one post-emergent application at a maximum rate of 1.33 pints/A is allowed. (6) Do not apply more than 2.66 pints per acre to dry bulb onions as a combined total across all application timings and use patterns to produce that crop.

GREEN ONIONS

Apply a broadcast application of Dual Magnum at 0.67-1.33 pt/A postemergence at the two true-leaf stage of the green onions. In that rate range, use lower rates on soils relatively coarse-textured and higher rates on fine-textured soils. A band application may also be used, applying proportionally less spray mixture on the area actually treated. Make uniform applications in a minimum of 15 gallons of water per treated acre. Dual Magnum will not control emerged weeds. Control emerged weeds with an appropriate registered foliar herbicide or by mechanical or physical means.

Precautions: (1) There is risk of crop injury from the use of Dual Magnum on green onions. In general, the risk of crop injury is greater on lighter textured soils and with higher application rates. (2) The addition of another registered herbicide as a tank mixture with Dual Magnum will increase the risk of crop injury.

Restrictions: (1) Make only one application per crop. (2) Do not harvest within 21 days of application.

Note: Applications of Dual Magnum may cause significant injury to green onions resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower's risk.

SPINACH

Dual Magnum will not control emerged weeds. For effective weed control, Dual Magnum must be applied to clean-tilled soil.

Apply Dual Magnum at a broadcast rate of 0.33 – 0.67 pt/A to the soil surface as a preemergence application i.e. prior to crop and weed emergence. In that rate range, use lower rates on soils relatively coarse-textured and higher rates on fine-textured soils. A band application may also be used if the crop is not planted in a trench or depressed bed, applying proportionally less spray mixture on the area actually treated. Dual Magnum will not control emerged weeds. Control emerged weeds with an appropriate registered foliar herbicide or by mechanical or physical means. For irrigated spinach: Irrigate with sprinkler or by furrow irrigation within two days of Dual Magnum application.

Restrictions: (1) Do not incorporate. (2) Do not apply this product through any type of irrigation system. (3) Only one application of Dual Magnum permitted per spinach growing season on the same ground in one calendar year. (4) Do not exceed more than 0.67 pt/A Dual Magnum. (5) Do not harvest within 50 days of application.

Note: Applications of Dual Magnum may cause significant injury to spinach resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower's risk.

SWISS CHARD

Apply a single broadcast treatment of Dual Magnum at 0.5 to 1.0 pt/A to the soil surface after planting, but before weeds or crop emerge (i.e., preemergence). In that rate range, use lower rates on soils relatively coarse-textured and higher rates on fine-textured soils. A band application may also be used, applying proportionally less spray mixture on the area actually treated. Dual Magnum will not control emerged weeds. Control emerged weeds with an appropriate registered foliar herbicide or by mechanical or physical means.

Restrictions: (1) At application, do not exceed 40-psi spray nozzle pressure. (2) Do not apply when temperatures exceed 85°F. (3) Do not apply as a tank mixture with nitrogen or fertilizer solutions, or other pesticides, as injury to the crop may result. (4) Do not flood or sprinkler irrigate immediately following application. (5) Do not exceed a total of 1.4 pt/A per year. (6) Do not harvest within 62 days of application.

Note: Applications of Dual Magnum may cause significant injury to Swiss chard resulting in reduced yields. This product is available to the end user/grower solely to the extent that the benefit and utility, in the opinion of the end user/grower, outweigh the extent of potential injury associated with the use of this product. Due to the risk of crop damage, all such use is at the end user/grower's risk.

PUMPKIN – DUAL MAGNUM ALONE

Apply Dual Magnum at a rate of 0.67 to 1.33 pt/A preemergence before crop or weeds have emerged, post-transplant (within 72 hrs) or postemergence to a crop having at least 4 true leaves following cultivation. Applications may be made broadcast or to row middles (inter-row). If Dual Magnum is applied as a broadcast spray over the planted row or hill, injury to the pumpkin crop can occur. Under heavy rain conditions, pumpkins may show significant stunting. Low rates, needed for crop safety on low organic matter soils, may not provide season-long weed control. Use the lower Dual Magnum rate on soils light in texture (loamy sand or lighter) and low in soil organic matter (less than 3%).

Restrictions:

1. Do not harvest pumpkins for 30 days following the application of Dual Magnum.
2. Do not exceed 1.33 pt/A of Dual Magnum per crop.
3. Do not apply during the fall or to frozen soils.

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24(c) Registrant:
Syngenta Crop Protection, LLC
P. O. Box 18300
Greensboro, NC 27419-8300

Label Code: ME0816019AA0514

Note: It is illegal to sell, use or distribute this product within, or into, Nassau County or Suffolk County, New York.

PULL HERE TO OPEN

Dual Magnum®
Herbicide

syngenta®

For weed control in corn; cotton; grasses grown for seed; horseradish; peanuts; beans, peas, and lentils; potatoes; pumpkin; rhubarb; safflowers; sugar beets; sunflowers; sweet, grain or forage sorghum, soybean; soybean, immature seed; and tomatoes

Active Ingredient:

S-metolachlor (CAS No. 87392-12-9)	83.7%
Other Ingredients:	16.3%
Total:	**100.0%**

Dual Magnum contains 7.62 lbs. of active ingredient per gallon.

KEEP OUT OF REACH OF CHILDREN.

CAUTION

See additional precautionary statements and directions for use inside booklet.

EPA Reg. No. 100-816 EPA Est. 070989-IA-001

Product of Switzerland Formulated in the USA

SCP 816A-L1U 1210
337398

2.5 gallons
Net Contents

™

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

CAUTION

Causes moderate eye irritation. Harmful if swallowed or absorbed through skin. Avoid contact with eyes, skin, or clothing. May cause skin sensitization reactions in certain individuals.

FIRST AID	
If in eyes	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
If on skin or clothing	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
If swallowed	• Call a poison control center or doctor immediately for treatment advice. • Do not give any liquid to the person. • Do not induce vomiting unless told to do so by the poison control center or doctor. • Do not give anything by mouth to an unconscious person.
If inhaled	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice.
Have the product container or label with you when calling a Poison Control Center or doctor, or going for treatment.	
HOT LINE NUMBER For 24 Hour Medical Emergency Assistance (Human or Animal) Or Chemical Emergency Assistance (Spill, Leak, Fire or Accident), Call **1-800-888-8372**	

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves, such as barrier laminate or Viton®
- Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Control Statements

Mixers and loaders supporting aerial applications are required to use closed systems. The closed system must be used in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)]. When using the closed system, the mixers' and loaders' PPE requirements may be reduced or modified as specified in the WPS.

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

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PRECAUTIONARY STATEMENTS (*continued*)

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Environmental Hazards

Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash water or rinsate.

Ground Water Advisory

The active ingredient in Dual Magnum has the potential to leach through soil into ground water under certain conditions as a result of agricultural use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination.

Surface Water Advisory

The active ingredient in Dual Magnum has the potential to contaminate surface water through ground spray drift. Under some conditions, the active ingredient may also have a high potential for runoff into surface water (primarily via dissolution in runoff water) for several months post-application. These include poorly draining or wet soils with readily visible slopes toward adjacent surface waters, frequently flooded areas, areas overlaying extremely shallow ground water, areas with in-field canals or ditches that drain to surface water, areas not separated from adjacent surface waters with vegetated filter strips, and areas overlaying tile drainage systems that drain to surface water.

Mixing/Loading Instructions

Care must be taken when using this product to prevent back-siphoning into wells, spills, or improper disposal of excess pesticide, spray mixtures, or rinsates.

Check-valves or antisiphoning devices must be used on all mixing and/or irrigation equipment.

This product may not be mixed or loaded within 50 ft. of perennial or intermittent streams and rivers, natural or impounded lakes and reservoirs. This product may not be mixed/loaded or used within 50 ft. of all wells, including abandoned wells, drainage wells, and sink holes. Operations that involve mixing, loading, rinsing, or washing of this product into or from pesticide handling or application equipment or containers within 50 ft. of any well are prohibited, unless conducted on an impervious pad constructed to withstand the weight of the heaviest load that may be positioned on or moved across the pad. Such a pad shall be designed and maintained to contain any product spills or equipment leaks, container or equipment rinse or wash water, and rain water that may fall on the pad. Surface water shall not be allowed to either flow over or from the pad, which means the pad must be self-contained. The pad shall be sloped to facilitate material removal. An unroofed pad shall be of sufficient capacity to contain at a minimum 110% of the capacity of the largest pesticide container or application equipment on the pad. A pad that is covered by a roof of sufficient size to completely exclude precipitation from contact with the pad shall have a minimum containment capacity of 100% of the capacity of the largest pesticide container or application equipment on the pad. Containment capacities as described above shall be maintained at all times. The above-specified minimum containment capacities do not apply to vehicles when delivering pesticide shipments to the mixing/loading site.

CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY

NOTICE: Read the entire Directions for Use and Conditions of Sale and Limitation of Warranty and Liability before buying or using this product. If the terms are not acceptable, return the product at once, unopened, and the purchase price will be refunded.

The Directions for Use of this product must be followed carefully. It is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as manner of use or application, weather or crop conditions, presence of other materials or other influencing factors in the use of the product, which are beyond the control of SYNGENTA CROP PROTECTION, LLC or Seller. To the extent consistent with applicable law, Buyer and User agree to hold SYNGENTA and Seller harmless for any claims relating to such factors.

SYNGENTA warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated in the Directions for Use, subject to the inherent risks referred to above, when used in accordance with directions under normal use conditions. To the extent consistent with applicable law: (1) this warranty does not extend to the use of the product contrary to label instructions or under conditions not reasonably foreseeable to or beyond the control of Seller or SYNGENTA, and, (2) Buyer and User assume the risk of any such use. To the extent consistent with applicable law, SYNGENTA MAKES NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS WARRANTED BY THIS LABEL.

To the extent consistent with applicable law, in no event shall SYNGENTA be liable for any incidental, consequential or special damages resulting from the use or handling of this product. **TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE EXCLUSIVE LIABILITY OF SYNGENTA AND SELLER FOR ANY AND ALL CLAIMS, LOSSES, INJURIES OR DAMAGES (INCLUDING CLAIMS BASED ON BREACH OF WARRANTY, CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, SHALL BE THE RETURN OF THE PURCHASE PRICE OF THE PRODUCT OR, AT THE ELECTION OF SYNGENTA OR SELLER, THE REPLACEMENT OF THE PRODUCT.**

SYNGENTA and Seller offer this product, and Buyer and User accept it, subject to the foregoing Conditions of Sale and Limitation of Warranty and Liability, which may not be modified except by written agreement signed by a duly authorized representative of SYNGENTA.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Dual Magnum should be used only in accordance with recommendations on this label or in separately published EPA accepted supplemental labeling recommendations for this product.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 24 hours. Exception: If the product is soil-injected or soil-incorporated, the Worker Protection Standard, under certain circumstances, allows workers to enter the treated area if there will be no contact with anything that has been treated.

continued…

AGRICULTURAL USE REQUIREMENTS *(continued)*

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:

- Coveralls
- Chemical-resistant gloves, such as barrier laminate or Viton
- Shoes plus socks

FAILURE TO FOLLOW THE DIRECTIONS FOR USE AND PRECAUTIONS ON THIS LABEL MAY RESULT IN POOR WEED CONTROL, CROP INJURY, OR ILLEGAL RESIDUES.

To avoid spray drift, do not apply under windy conditions. Avoid spray overlap, as crop injury may result.

Note: Not for sale, use or distribution in Nassau County or Suffolk County, New York.

PRODUCT INFORMATION

Observe all precautions and limitations on the labels of each product used in tank mixtures. Tank mixtures are permitted only in those states where the tank mix partner is registered. Refer to and follow the label for each tank mix product used for precautionary statements, directions for use, geographic and other restrictions.

Dual Magnum is a selective herbicide recommended as a preplant surface-applied, preplant incorporated, or preemergence treatment in water or fluid fertilizer for control of most annual grasses and certain broadleaf weeds in corn (all types); cotton; grasses grown for seed; peanuts; beans, peas, and lentils; potatoes; safflowers; sugar beets; sunflowers; grain or forage sorghum; soybeans; soybean, immature seed; and tomatoes.

Note: Do not use in nurseries, turf, or landscape plantings.

Do not apply under conditions which favor runoff or wind erosion of soil containing this product to nontarget areas.

To prevent off-site movement due to runoff or wind erosion:

- Avoid treating powdery dry or light sand soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.
- Do not apply to impervious substrates, such as paved or highly compacted surfaces.
- Do not use tailwater from the first flood or furrow irrigation of treated fields to treat nontarget crops, unless at least 1/2 inch of rainfall has occurred between application and the first irrigation.

Where directions specify a Dual Magnum tank mixture with AAtrex® formulations, other brands of atrazine may be used. Follow the rates, recommendations, and limitations on the AAtrex or respective atrazine product label if other brands of atrazine are used.

Note: Certain states may have established rate limitations for atrazine within specific geographical areas. Consult your state lead pesticide control agency for additional information. It is a violation of this label to deviate from state use regulations.

If Dual Magnum is incorporated, any supplemental tillage before planting must not exceed the depth of incorporation.

Dry weather following preemergence application of Dual Magnum or a tank mixture may reduce effectiveness. Cultivate if weeds develop.

Where reference is made to weeds partially controlled, partial control can either mean erratic control from good to poor, or consistent control at a level below that generally considered acceptable for commercial weed control.

Precaution: Injury may occur following the use of Dual Magnum under abnormally high soil moisture conditions during early development of the crop.

SOIL TEXTURES AND HERBICIDE RATES

Where rates are based on coarse-, medium-, or fine-textured soils, it is understood that soil textural classes are generally categorized as follows:

Coarse	Medium	Fine	
Sand	Loam	Sandy clay loam	Sandy clay
Loamy sand	Silt loam	Silty clay loam	Silty clay
Sandy loam	Silt	Clay loam	Clay

Within rate ranges in the rate tables and elsewhere on this label, use the lower rate on soils relatively coarse-textured or low in organic matter; use the higher rate on soils relatively fine-textured or high in organic matter.

Note: Dual Magnum may be applied preemergence alone, or in combination with tank mix partners specified on this label, following preplant incorporated herbicides when used according to their label recommendations, provided that such use is not prohibited on the respective labels.

Thoroughly clean sprayer or other application device before using. Dispose of cleaning solution in a responsible manner. Do not use a sprayer or applicator contaminated with any other materials, or crop damage or clogging of the application device may result.

DUAL MAGNUM APPLIED ALONE

WEEDS CONTROLLED

Dual Magnum is taken up by the shoots and/or roots of emerging weeds. This uptake results in the inhibition of shoot and root tissue growth soon after weed germination. Because of this, Dual Magnum will not control emerged weeds and should be applied prior to weed emergence.

If Dual Magnum is incorporated, do not exceed a 2-3 inch depth. Any tillage after the Dual Magnum incorporation and before planting should not exceed 2-3 inches.

Dry weather following application of Dual Magnum may reduce weed control. Cultivate if weeds develop.

Where reference is made to weeds partially controlled, partial control can either mean erratic control from good to poor, or consistent control at a level below that generally considered acceptable for commercial weed control. Control of these weeds can be erratic, due partially to variable weather conditions. The following procedures may improve the control of weeds listed as partially controlled in Table 1:

- Thoroughly till soil to destroy germinating and emerged weeds.
- Plant crop into moist soil immediately after tillage. If Dual Magnum is to be used preemergence, apply at planting or immediately after planting.
- If available, sprinkler irrigate within 2 days after application. Apply 1/2-1 inch of water. Use lower water volume (1/2 inch) on *coarse-textured soils* and higher volume (1 inch) on *fine-textured soils*. Also, refer to the section on **Center Pivot Irrigation Application** for this method of applying Dual Magnum.
- If irrigation is not possible and rain does not occur within 2 days after planting and application, weed control may be decreased. Under these conditions, a uniform, shallow cultivation is recommended as soon as weeds emerge.

Table 1: Weeds Controlled or Partially Controlled by Dual Magnum Applied Prior to Weed Emergence

Common Name	Scientific Name	Weed Type	Control (C) or Partial Control (PC)
Barnyardgrass	*Echinochloa crus-galli*	Grass	C
Crabgrass, large	*Digitaria ischaemum*	Grass	C
Crabgrass, smooth	*Digitaria sanguinalis*	Grass	C
Crowfootgrass	*Dactyloctenium aegyptium*	Grass	C
Cupgrass, Prairie	*Eriochloa contracta*	Grass	C
Cupgrass, Southwestern	*Eriochloa acuminata*	Grass	C

continued…

Table 1: Weeds Controlled or Partially Controlled by Dual Magnum Applied Prior to Weed Emergence *(continued)*

Common Name	Scientific Name	Weed Type	Control (C) or Partial Control (PC)
Cupgrass, woolly	*Eriochloa villosa*	Grass	PC[1]
Foxtail, bristly	*Setaria verticillata*	Grass	C
Foxtail, giant	*Setaria faberi*	Grass	C
Foxtail, green	*Setaria viridis*	Grass	C
Foxtail, millet	*Setaria italica*	Grass	C
Foxtail, yellow	*Setaria pumila*	Grass	C
Goosegrass	*Eleusine indica*	Grass	C
Johnsongrass (seedling)	*Sorghum halepense*	Grass	PC
Millet, wild-proso	*Panicum miliaceum*	Grass	PC[1]
Panicum, fall	*Panicum dichotomiflorum*	Grass	C
Panicum, Texas	*Panicum texanum*	Grass	PC
Rice, red	*Oryza punctata*	Grass	C
Sandbur, field	*Cenchrus spinifex*	Grass	PC
Ryegrass, Italian	*Lolium multiflorum*	Grass	C
Sandbur, Southern	*Cenchrus echinatus*	Grass	PC
Shattercane	*Sorghum bicolor*	Grass	PC
Signalgrass, broadleaf	*Urochloa platyphylla*	Grass	C
Sorghum (volunteer)	*Sorghum bicolor*	Grass	PC
Witchgrass	*Panicum capillare*	Grass	C
Amaranth, Palmer	*Amaranthus palmeri*	Broadleaf	C
Amaranth, Powell	*Amaranthus powellii*	Broadleaf	C
Beggarweed, Florida	*Desmodium tortuosum*	Broadleaf	PC
Carpetweed	*Mollugo verticillata*	Broadleaf	C
Eclipta	*Eclipta prostrata*	Broadleaf	PC
Galinsoga, hairy	*Galinsoga quadriradiata*	Broadleaf	C
Galinsoga, smallflower	*Galinsoga parviflora*	Broadleaf	C
Nightshade, Eastern black	*Solanum ptychanthum*	Broadleaf	C
Nightshade, hairy	*Solanum physalifolium*	Broadleaf	PC
Pigweed, prostrate	*Amaranthus blitoides*	Broadleaf	C
Pigweed, redroot	*Amaranthus retroflexus*	Broadleaf	C
Pigweed, smooth	*Amaranthus hybridus*	Broadleaf	C
Pigweed, tumble	*Amaranthus albus*	Broadleaf	C

Common Name	Scientific Name	Weed Type	Control (C) or Partial Control (PC)
Purslane, common	*Portulaca oleracea*	Broadleaf	PC
Pusley, Florida	*Richardia scabra*	Broadleaf	C
Spiderwort, tropical	*Commelina benghalensis*	Broadleaf	C
Waterhemp, common	*Amaranthus rudis*	Broadleaf	C
Waterhemp, tall	*Amaranthus tuberculatus*	Broadleaf	C
Nutsedge, yellow	*Cyperus esculentus*	Sedge	C

[1] Refer to the corn section of this label for additional recommendations.

PREPLANT AND ROTATIONAL CROPS SECTION

Replanted Crop Directions:

This section covers replant crops that may be planted following a lost crop that has had an application of Dual Magnum.

If a crop treated with Dual Magnum is lost, any crop on this label, or on a supplemental Dual Magnum label, may be replanted immediately provided that the rate of Dual Magnum applied to the previous crop was not greater than the labeled rate for the crop to be replanted. If the first application was banded and the replant crop is planted in the center of the untreated bands, a second banded treatment may be applied at the rate for the use-pattern for the replant crop, provided the application does not overlap the first application band.

Rotational Crop Directions:

Do not rotate to food or feed crops other than those listed below. For all crops not listed, wait at least 12 months following the last application of Dual Magnum before planting.

Barley, oats, rye, or wheat may be planted 4 1/2 months following treatment.

Alfalfa may be planted 4 months following application. Clover may be seeded 9 months following application.

Important Notes: To avoid injury to rotational alfalfa or clover: 1) do not apply more than 1.9 lb. active ingredient per acre (2.0 pt. of Dual Magnum) in the previous crop, and 2) do not make lay-by or other postemergence applications of Dual Magnum in the previous crop.

Tobacco, buckwheat, and rice, may be planted in the next spring following treatment.

Below in the rotational crop subsections A through C is a listing of rotational crop options that are made possible through *S*-metolachlor tolerances which were established by the EPA as crop groupings.

Precautions: 1) Rotating to crops within these crop groupings at less than 60 days may result in crop injury. 2) If the rate of Dual Magnum applied in the previous crops was greater than the rate listed here (Sections A-C below), these crops cannot be planted until the following spring.

A. If not more than 1.33 pt./A of Dual Magnum was applied to the field, the following crops (as well as any listed under subsections B or C below) may be planted 60 days after the last application. A second application of a *S*-metolachlor containing product to the following crops is prohibited within 60 days of the original application.

Crop Subgroup 1B Root Vegetables – garden beet, edible burdock, carrot, celeriac, turnip-rooted chervil, chicory, ginseng, horseradish, turnip-rooted parsley, parsnip, radish, oriental radish, rutabaga, salsify, black salsify, Spanish salsify, skirret, and turnip.

Bulb Crops - garlic, green onion, dry bulb onion, shallot.

Winter squash (including pumpkins)

B. **If not more than 1.67 pt./A of Dual Magnum was applied to the field, the following crops (as well as any listed under subsection C below) may be planted 60 days after the last application. A second application of a *S*-metolachlor containing product to the following crops is prohibited within 60 days of the original application.**

Crop Group 8 Fruiting Vegetables, except Cucurbits and Tabasco Peppers – eggplant, groundcherry (*Physalis* spp.), pepino, peppers (bell, chili, cooking, pimento and sweet), tomatillo and tomato.

C. **If not more than 2.0 pt./A of Dual Magnum was applied to the field, the following crops may be planted 60 days after the last application. A second application of a *S*-metolachlor containing product to the following crops is prohibited within 60 days of the original application.**

Crop Subgroup 1C Tuberous and Corm Vegetables – arracacha, arrowroot, Chinese artichoke, Jerusalem artichoke, edible canna, bitter and sweet cassava, chayote (root), chufa, dasheen (taro), ginger, leren, potato, sweet potato, tanier, tumeric, yam bean, yam, true.

Bulb Crops – garlic, dry bulb and green onion, shallot.

Crop Subgroup 4B Leaf Petiole Vegetables – cardoon, celery, Chinese celery, celtuce, Florence fennel, rhubarb, and Swiss chard.

Crop Subgroup 5A Head and Stem Brassica Vegetables – broccoli, Chinese broccoli, brussel sprouts, cabbage, Chinese (napa) cabbage, Chinese mustard, cauliflower, cavalo broccolo and kohlrabi.

APPLICATION PROCEDURES

Application Timing

Dual Magnum alone or in tank mixtures with other labeled herbicides may be applied for weed control in certain crops at various times. Refer to the given crop section of the label to determine if application timings listed below are recommended.

- **Preplant Surface-Applied:** For minimum-tillage or no-tillage systems only, Dual Magnum alone and some Dual Magnum tank mixtures may be applied up to 45 days before planting certain crops. Use only split applications for treatments made 30-45 days before planting, with 2/3 the recommended broadcast rate for the crop and soil texture applied initially and the remaining 1/3 at planting. Treatments less than 30 days before planting may be made either as a split or a single application. Refer to individual crop section on this label to determine if early preplant surface application is recommended. If weeds are present at the time of treatment, apply in a tank mixture combination with a contact herbicide (for example, Gramoxone Inteon®, Touchdown® brands, or Roundup® brands). Observe directions for use, precautions, and restrictions on the label of the contact herbicide. To the extent possible, do not move treated soil out of the row or move untreated soil to the surface during planting, or weed control will be diminished.
- **Preplant Incorporated:** Apply Dual Magnum to the soil and incorporate into the top 2 inches of soil within 14 days before planting, using a finishing disk, harrow, rolling cultivator, or similar implement capable of providing uniform 2-inch incorporation. Use a preplant incorporated application if furrow irrigation is used or when a period of dry weather after application is expected. If crop will be planted on beds, apply and incorporate Dual Magnum after bed formation, unless specified otherwise.
- **Preemergence:** Apply Dual Magnum during planting (behind the planter) or after planting, but before weeds or crops emerge.
- **Postemergence:** Dual Magnum will not control emerged weeds so it must be applied to a weed-free soil surface or in tank mixture with products that provide postemergence control of weeds present at the time of application. Refer to the individual crop section of this label if a postemergence application is recommended.

Special Application Procedures

- **CA Only (Corn; Safflowers; Beans, Peas, and Lentils): Preplant Incorporated:** Broadcast Dual Magnum alone or with tank mix partners listed on this label to the soil and thoroughly incorporate with a disk or similar implement set to till 4-6 inches deep. For more thorough incorporation, till the soil in 2 different directions (cross-till). Crops may be planted on flat surface or on beds. Caution should be used when forming the beds that only soil from the Dual Magnum treated zone is used (i.e., untreated soil should not be brought to soil surface). If the application is made to preformed beds, incorporate Dual Magnum with a tillage implement set to till 2-4 inches deep. Care should be taken during tilling to keep the tilled (Dual Magnum treated) soil on the beds. **Preemergence:** Apply Dual Magnum after planting. Water with sprinkler or flood irrigation within 7-10 days.

- **Fall Application for Spring Weed Control (Only in IA, MN, ND, SD, WI, and portions of NE and IL - See specific instructions in the Corn; Soybeans; and Beans, Peas, and Lentils sections of this label for timing of application and other information):** Do not apply to frozen ground. Use on medium and fine soils with greater than 2.5% organic matter that will be planted to corn or soybeans the next spring. Ground may be tilled before or after application. Do not exceed a 2 to 3-inch incorporation depth if tilled after treatment. **Note:** If a spring application is made, the total rate of the fall plus spring applications must not exceed the maximum total rate for the specific crop, or illegal residues may result.
- **Fall Application for Italian Ryegrass Control (Corn, Cotton, Grain and Forage Sorghum, and Soybean Only – See specific instructions in the Corn, Cotton, Grain and Forage Sorghum, and Soybean sections of this label for timing of application and other information):** Dual Magnum may be applied in the fall (September 1-December 1) for residual control of glyphosate-resistant Italian ryegrass (*Lolium multiflorum*). A tillage operation may precede the application. Do not incorporate to a depth greater than 2-3 inches if tillage follows the application of Dual Magnum. **Notes:** 1) Do not apply Dual Magnum to frozen ground. 2) All crops on the Dual Magnum label may be planted the following spring after application. 3) If a spring application is made, the combined total amount of Dual Magnum applied in the fall plus the spring must not exceed the maximum seasonal *S*-metolachlor rate for the specific crop planted, or illegal residues may result. 4) Refer to the crop sections on this label for specific directions.

Ground Application: Apply Dual Magnum alone or in tank mixtures by ground equipment in a minimum of 10 gals. of spray mixture per acre, unless otherwise specified.

Use sprayers that provide accurate and uniform application. For Dual Magnum tank mixtures with wettable powder or dry flowable formulations, screens and strainers should be no finer than 50-mesh. Rinse sprayer thoroughly with clean water immediately after use.

Calculate the amount of herbicide needed for band treatment by the formula:

$$\frac{\text{band width in inches}}{\text{row width in inches}} \times \text{broadcast rate per acre} = \text{amount needed per acre of field}$$

For information on applying in lower volumes of carrier, see **Low Carrier Application** section.

For application by air or through center pivot systems, see **Aerial Drift Management** and **Aerial Drift Reduction Advisory Information** sections.

For information on impregnating dry fertilizer, see **Dry Bulk Granular Fertilizers** section.

For information on application using variable-rate technologies, see **Variable-Rate Application** section.

SPRAY EQUIPMENT

LOW CARRIER APPLICATION

For Broadcast Ground Application Only

Use sprayers, such as Ag-Chem RoGator®, Hagie, John Deere Hi-Cycle™, Melroe Spra-Coupe, Tyler Patriot™, or Willmar Air Ride®, that provide accurate and uniform application. **Only water may be used as a carrier.** Screens in suction and in-line strainers should be 50-mesh. Manufacturers may require that tip screens as fine as 100-mesh be used with some nozzles. Use a pump with capacity to: (1) maintain up to 35-40 psi at the nozzles, and (2) provide sufficient agitation in tank to keep mixture in suspension. Use a minimum of 5.0 gals. of spray mixture per acre. Maximum recommended sprayer speed is 15 mph. Rinse sprayer thoroughly with clean water immediately after each use.

Note: Low pressure nozzles are recommended to reduce drift and increase application accuracy. Care should be taken when using automatic rate controlling devices to spray the material within the rated working pressure and flow ranges of the nozzles selected. Nozzle screens should be used when recommended by the manufacturer. All nozzles should be placed on 20-inch centers, except flooding types which should be placed on 40-inch centers. When Flat Fan-type nozzles are used, angles of 80° or 110° are recommended. Always read and follow the manufacturer's directions for optimum setup and performance of their nozzles or tips.

AERIAL APPLICATION

Apply Dual Magnum in water alone or in tank mixtures with AAtrex, Lorox®, or Sencor® in a minimum total volume of 2.0 gals./A by aircraft. Dual Magnum may also be applied by air in combination with Balan®, Prowl®, or Treflan®. Avoid application under conditions where uniform coverage cannot be obtained or where excessive spray drift may occur. In order to assure that spray will be controllable within the target area when used according to label directions, make applications at a maximum height of 10 ft., using low-drift nozzles at a maximum pressure of 40 psi, and restrict application to periods when wind speed does not exceed 10 mph. To assure that spray will not adversely affect adjacent sensitive nontarget plants, apply Dual Magnum alone or Dual Magnum + AAtrex by aircraft at a minimum upwind distance of 400 ft. from sensitive plants, or apply Dual Magnum, Lorox, or Sencor at a minimum upwind distance of 300 ft. from sensitive plants.

Aerial Drift Management

The interaction of many equipment- and weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses, or to applications using dry formulations.

- The distance of the outermost nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
- Nozzles must always point backward parallel with the air stream and never be pointed downward more than 45 degrees.

Where states have more stringent regulations, they must be observed.

The applicator should be familiar with and take into account the information covered in the **Aerial Drift Reduction Advisory Information** section below.

Aerial Drift Reduction Advisory Information

Information on Droplet Size

The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see **Wind, Temperature and Humidity,** and **Temperature Inversions**).

Controlling Droplet Size

- **Volume** – Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** – Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of nozzles** – Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** – Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** – Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Application Height

Applications should not be made at a height greater than 10 ft. above the top of the largest plants, unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment

When applications are made with a crosswind, the swath will be displaced downward. Therefore, on the upwind and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller drops, etc.).

Wind

Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. **Note:** Local terrain can influence wind patterns.

Temperature and Humidity

When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is greatest when conditions are both hot and dry.

Temperature Inversions

Applications should not occur during a temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas

The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, nontarget crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Avoid application to humans or animals. Flagmen and loaders should avoid inhalation of spray mist and prolonged contact with skin.

CENTER PIVOT IRRIGATION APPLICATION

Dual Magnum alone or in tank mixture with other herbicides on this label, which are registered for center pivot application, may be applied in irrigation water preemergence (after planting, but before weeds or crop emerge) at rates recommended on this label. Dual Magnum also may be applied postemergence to the crop and preemergence to weeds in crops where postemergence applications are allowed on this label. Follow all restrictions (height, timing, rate, etc.) to avoid illegal residues. Apply this product only through a center pivot irrigation system. Do not apply this product through any other type of irrigation system. Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from nonuniform distribution of treated water. If you have questions about calibration, you should contact State Extension specialists, equipment manufacturers, or other experts. Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system, unless the pesticide label-prescribed safety devices for public water systems are in place. A person knowledgeable of the chemigation system and responsible for its operation, or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise.

Operating Instructions

- The system must contain a functional check-valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water-source contamination from backflow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check-valve to prevent the flow of fluid back toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally closed, solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.

- The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump or piston pump), effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.
- Do not apply when wind speed favors drift beyond the area intended for treatment.
- Prepare a mixture with a minimum of 1 part water to 1 part herbicide(s) and inject this mixture into the center pivot system. Injecting a larger volume of a more dilute mixture per hour will usually provide more accurate calibration of metering equipment. Maintain sufficient agitation to keep the herbicide in suspension.
- Meter into irrigation water during entire period of water application.
- Apply in 1/2-1 inch of water. Use the lower water volume (1/2 inch) on *coarse-textured soils* and the higher volume (1 inch) on *fine-textured soils*. More than 1 inch of water at application may reduce weed control by moving the herbicide below the effective zone in the soil.

Precaution for center pivot applications: Where sprinkler distribution patterns do not overlap sufficiently, unacceptable weed control may result. Where sprinkler distribution patterns overlap excessively, crop injury may result.

DRY BULK GRANULAR FERTILIZERS

Many dry bulk granular fertilizers may be impregnated or coated with Dual Magnum alone or selected Dual Magnum tank mixtures which are registered for preplant incorporated or preplant surface applications which are used to control weeds in crops on the Dual Magnum label and are not prohibited from use on dry bulk granular fertilizers.

When applying Dual Magnum or Dual Magnum mixtures with dry bulk granular fertilizers, follow all directions for use and precautions on the respective product labels, regarding target crops, rates per acre, soil texture, application methods (including timing of application), and rotational crops.

All individual state regulations relating to dry bulk granular fertilizer blending, registration, labeling, and application are the responsibility of the individual and/or company selling the herbicide/fertilizer mixture.

Prepare the herbicide/fertilizer mixtures by using any closed drum, belt, ribbon, or other commonly used dry bulk fertilizer blender. Nozzles used to spray Dual Magnum and Dual Magnum mixtures onto the fertilizer must be placed to provide uniform spray coverage. Care should be taken to aim the spray directly onto the fertilizer only and to avoid spraying the walls of the blender.

If the herbicide/fertilizer mixture is too wet, add a highly absorptive material, such as Agsorb® or Celatom MP-79®, or similar granular clay or diatomaceous earth materials, to obtain a dry, free-flowing mixture. Absorptive materials should be added only after the herbicide has been thoroughly blended into the fertilizer mixture. Best application results will be obtained by using a granule of 6/30 particle size or of a size similar to that of the fertilizer material being used. Generally, less than 2% by weight of absorptive material will be needed. Avoid using more than 5% absorptive material by weight.

Calculate amounts of Dual Magnum, AAtrex, AAtrex + Princep®, Balance® Pro, Princep, Sencor, or Sonalan® by the following formula:

$$\frac{2000}{\text{lbs. of fertilizer per acre}} \times \text{pts./A of liquid or flowable product} = \text{pts. of liquid or flowable product per ton of fertilizer}$$

$$\frac{2000}{\text{lbs. of fertilizer per acre}} \times \text{lbs./A of dry product} = \text{lbs. of dry product per ton of fertilizer}$$

Pneumatic (Compressed Air) Application (Dual Magnum Alone): High humidity, high urea concentrations, low fertilizer use rates, and dusty fertilizer may cause fertilizer mixture to build up or plug the distributor head, air tubes, or nozzle deflector plates. To minimize buildup, premix Dual Magnum with Exxon Aromatic 200 at a rate of 1.0-4.0 pts./gal. of Dual Magnum. Aromatic 200 is a noncombustible/nonflammable petroleum product. Aromatic 200 may be used in either a fertilizer blender or through direct injection systems. Drying agents should not be used when using Aromatic 200.

Notes: (1) Mixtures of Dual Magnum and Aromatic 200 must be used on dry fertilizer only. Poor results or crop injury may result if these mixtures are used in water or liquid fertilizer solutions for spraying applications. (2) When impregnating Dual Magnum in a blender before application, a drier mixture can be attained by substituting a drying agent for Aromatic 200. The use of Agsorb FG or drying agents of 6/30 particle size are recommended. (3) Drying agents are not recommended for use with On-The-Go impregnation equipment.

Precautions: To avoid potential for explosion, (1) Do not impregnate Dual Magnum or Dual Magnum mixtures on ammonium nitrate, potassium nitrate, or sodium nitrate, either alone or in blends with other fertilizers. (2) Do not use Dual Magnum or Dual Magnum mixtures on straight limestone, since absorption will not be achieved. Fertilizer blends containing limestone can be impregnated.

Application

Apply 200-700 lbs. of the herbicide/fertilizer mixture per acre. For best results, apply the mixture uniformly to the soil with properly calibrated equipment immediately after blending. Uniform application of the herbicide/fertilizer mixture is essential to prevent possible crop injury. Nonuniform application may also result in unsatisfactory weed control. In areas where conventional tillage is practiced, a shallow incorporation of the mixture into the soil may improve weed control. On fine- or medium-textured soils in areas where soil incorporation is not planned, i.e., reduced tillage situations or in some conventional till situations, make applications approximately 30 days before planting to allow moisture to move the herbicide/fertilizer mixture into the soil. On coarse-textured soils, make applications approximately 14 days prior to planting.

Precaution: To avoid crop injury, do not use the herbicide/fertilizer mixture on crops where bedding occurs.

MIXING INSTRUCTIONS

Dual Magnum Alone: Mix Dual Magnum with water or fluid fertilizer and apply as a spray. Fill the spray tank 1/2-3/4 full with water or fluid fertilizer, add the proper amount of Dual Magnum, then add the rest of the water or fluid fertilizer. Provide sufficient agitation during mixing and application to maintain a uniform emulsion.

Tank Mixtures: Fill the spray tank 1/4 full with water, and start agitation; add 2,4-D, AAtrex, Balance Pro, Balan, Banvel®, Basagran®, Butoxone®, Butyrac®, Canopy®, Caparol® 4L, Command®, Cotoran®, Eptam®, Liberty® Herbicide, Liberty ATZ Herbicide, Lorox, Marksman®, MSMA, Princep, Prowl, Pursuit®, AAtrex + Princep, Scepter®, Sencor, Sonalan, or Treflan, and allow it to become dispersed; then add Dual Magnum; then add Gramoxone Inteon, Landmaster® BW, Touchdown, or Roundup (glyphosate products) if these products are being used; and finally the rest of the water. For tank mixtures with AAtrex, Balance, Banvel, Canopy, Caparol 4L, Command, Cotoran*, Eptam, Lorox, Marksman, Princep, Prowl*, Pursuit, AAtrex + Princep, Scepter, Sencor, Sonalan, or Treflan, fluid fertilizers may replace all or part of the water as carrier, except in the AAtrex postemergence and the Banvel postemergence tank mixes. For tank mixtures with AAtrex, see additional mixing instructions on the AAtrex label. For each mixture, check compatibility with fluid fertilizer, as described below, before mixing in spray tank. For all tank mixtures, agitate during mixing and application to maintain a uniform suspension.

*See **Special Mixing Instructions** for tank mixtures with Cotoran and with AAtrex or Princep + Prowl under the appropriate tank mixture section.

For directions on how to conduct a compatibility test, see the **Compatibility Test** section.

COMPATIBILITY TEST

A jar test is recommended before tank mixing to ensure compatibility of Dual Magnum with other pesticides. The following test assumes a spray volume of 25 gals./A. For other spray volumes, make appropriate changes in the ingredients.

Note: Nitrogen solutions or complete fluid fertilizers may replace all or part of the water in the spray. Because liquid fertilizers vary, even within the same analysis, **always check compatibility with pesticide(s) before use**. Incompatibility of tank mixtures is more common with suspensions of fertilizer and pesticides.

Test Procedure

1. Add 1.0 pt. of carrier (fertilizer or water) to each of 2 one qt. jars with tight lids. **Note:** Use the same source of water that will be used for the tank mix and conduct the test at the temperature the tank mix will be applied.

2. To one of the jars, add 1/4 tsp. or 1.2 milliliters of a compatibility agent approved for this use, such as Compex or Unite (1/4 tsp. is equivalent to 2.0 pts./100 gals. spray). Shake or stir gently to mix.
3. To both jars, add the appropriate amount of pesticide(s) in their relative proportions based on recommended label rates. If more than one pesticide is used, add them separately with dry pesticides first, flowables next, and emulsifiable concentrates last. After each addition, shake or stir gently to thoroughly mix.
4. After adding all ingredients, put lids on and tighten, and invert each jar ten times to mix. Let the mixtures stand 15-30 minutes and then look for separation, large flakes, precipitates, gels, heavy oily film on the jar, or other signs of incompatibility. Determine if the compatibility agent is needed in the spray mixture by comparing the two jars. If either mixture separates, but can be remixed readily, the mixture can be sprayed as long as good agitation is used. If the mixtures are incompatible, test the following methods of improving compatibility: (a) Slurry the dry pesticide(s) in water before addition, or (b) add 1/2 the compatibility agent to the fertilizer or water and the other 1/2 to the emulsifiable concentrate or flowable pesticide before addition to the mixture. If incompatibility is still observed, do not use the mixture.
5. After compatibility testing is complete, dispose of any pesticide wastes in accordance with the **Storage and Disposal** section in this label.

CROP USE DIRECTIONS

CORN (ALL TYPES) – DUAL MAGNUM ALONE

Apply Dual Magnum, either preplant surface, preplant incorporated, preemergence, or lay-by, using the appropriate rate specified below.

PREPLANT SURFACE-APPLIED

Refer to instructions for use of Dual Magnum alone under **Application Procedures**.

Fall Application for Spring Weed Control:

- Apply after September 30 in ND, SD, MN, WI, and north of Route 30 in IA.
- Apply after October 15 north of Route 91 in NE and south of Route 30 in IA.
- Apply after October 31 north of Route 136 in IL.

In all locations, apply to crop stubble after harvest when the sustained soil temperature at a 4-inch depth is less than 55°F and falling. In minimum-till or no-tillage systems on soils having greater than 2.5% organic matter, use 1.67-2.0 pts./A on *medium-textured* and 2.0 pts./A on *fine-textured soils*. Do not apply to frozen ground. A tillage operation may precede the application. A fall and/or a spring tillage may follow application, but do not exceed an incorporation depth greater than 2-3 inches. Minimize furrow and ridge formation in the tillage operations. **Note:** If a spring application is made, the total rate of the fall plus spring applications must not exceed the maximum total rate for corn, or illegal residues may result.

Fall Application for Italian Ryegrass Control: Dual Magnum may be applied for residual control of glyphosate-resistant Italian ryegrass (*Lolium multiflorum*). Apply Dual Magnum at 1.33-1.67 pints/Acre in the fall (September 1–December 1) after harvest of the previous crop and prior to Italian ryegrass emergence. Use the lower Dual Magnum rate for coarse-textured soils and the higher rate for fine-textured soils. A tillage operation may precede the application. Do not incorporate to a depth greater than 2-3 inches if tillage follows the application of Dual Magnum. For fall applications after emergence of glyphosate-resistant Italian ryegrass, Gramoxone Inteon can be tank mixed with Dual Magnum to control emerged ryegrass. Refer to the Gramoxone Inteon label for specific rates, application instructions and restrictions. Other registered herbicides may be tank mixed with Dual Magnum for control or improved control of other weeds present at the time of application. *Precautions: (1) Do not apply Dual Magnum to frozen ground. (2) If a spring application is made, the combined total amount of Dual Magnum applied in the fall plus the spring must not exceed the maximum seasonal S-metolachlor rate for corn (3.9 pt/A depending on soil texture), or illegal residues may result.*

Fall Application for Control or Suppression of Yellow Nutsedge (ID, OR and WA only): For pre-emergent control or suppression of yellow nutsedge the following spring, apply 1.33 pt/A of Dual Magnum in the fall after the harvest of the previous crop but before freeze-up. Fall applications of Dual Magnum can be surface-applied or incorporated. **Restrictions:** (1) Make no more than one fall application per crop. (2) Apply not more than 1.33 pt/A in a single fall preplant application. (3) Do not apply to frozen ground. (4) If a spring application is made, the combined total amount of Dual Magnum applied in the fall plus the spring must not exceed the maximum seasonal *S*-metolachlor rate for corn (3.9 pt/A depending on soil texture), or illegal residues may result.

Early Preplant Applications

A. Use on medium- and fine-textured soils with minimum-tillage or no-tillage systems in CO, IA, IL, IN, KS, KY, MN, MO, MT, ND, NE, SD, TN, WI, and WY. Apply 2/3 the recommended rate of Dual Magnum (1.67 pts./A on *medium soils* and 2.0 pts./A on *fine soils*) as a split treatment 30-45 days before planting and the remainder at planting. Applications made less than 30 days prior to planting may be as either a split or single treatment. Apply 1.33 pts./A on *coarse soils* not more than 2 weeks prior to planting. **Note:** If a spring application is made, the total rate of the fall plus spring application must not exceed the maximum total rate for corn, or illegal residues may result.

B. On medium- and fine-textured soils with minimum- or no-tillage systems in CT, DE, MA, MD, ME, MI, NH, NY, OH, PA, RI, VA, VT, and WV, preplant surface applications may be applied following the directions for use above. If the amount of rainfall results in unsatisfactory length of weed control following the earlier treatment, a postemergence application of an appropriately labeled broadleaf and/or grass weed herbicide may be used, i.e., AAtrex, Beacon®, Bicep Magnum, Bicep II Magnum®, Exceed®, Accent®, Banvel, Basagran, bromoxynil (Brominal® or Buctril®), or 2,4-D. If the postemergence treatment includes the herbicide used preplant surface-applied, do not exceed the total labeled rate for corn on a given soil texture. Observe all directions for use, precautions, and limitations on the label of the postemergent herbicide.

PREPLANT INCORPORATED OR PREEMERGENCE

Follow instructions for use of Dual Magnum alone under **Application Procedures**. On *coarse soils*, apply 1.0-1.33 pts./A of Dual Magnum if organic matter content is less than 3%, or 1.33 pts./A if organic matter content is 3% or greater. On *medium soils*, apply 1.33-1.67 pts./A of Dual Magnum. On *fine soils*, apply 1.33-1.67 pts./A of Dual Magnum if organic matter content is less than 3%, or 1.67-2.0 pts./A if organic matter content is 3% or greater.

POSTEMERGENCE OR LAY-BY

To extend the duration of weed control in corn, a maximum rate of 2.0 pts./A of Dual Magnum may be applied after corn emergence until the corn plants reach 40 inches in height, following any preplant surface-applied, preplant incorporated, or preemergence herbicide application, including Dual Magnum. For best results, applications should be made to soil free of emerged weeds and directed toward the base of corn plants in excess of 5 inches tall. The total Dual Magnum rate applied on corn during any one crop year should not exceed 3.9 pts./A, depending on soil texture.

Note for all applications to corn: To avoid possible illegal residues, (1) do not graze or feed forage from treated areas for 30 days following application and (2) do not harvest sweet corn ears from treated areas for 30 days following application.

PROBLEM WEED CONTROL DIRECTIONS

Shattercane, Wild Proso Millet, Woolly Cupgrass, and Eclipta – Partial Control: For more consistent partial control of shattercane, wild proso millet, woolly cupgrass, or eclipta, apply 1.0-1.33 pts./A of Dual Magnum preplant incorporated followed by 1.0-1.33 pts./A of Dual Magnum preemergence. Make the preemergence application during or after planting, but before weeds and corn emerge. Apply the 1.33 pts./A rate of Dual Magnum when a heavy infestation of shattercane, wild proso millet, woolly cupgrass, or eclipta is expected. A shallow cultivation may be needed to control any late emerging weeds.

Woolly Cupgrass and Wild Proso Millet Control Program: For control of these species, use the following 3-step program: (1) Apply Dual Magnum early preplant, preplant incorporated, or preemergence at 1.67 pts./A on *medium soils* and 2.0 pts./A on *fine-textured soils*, up to the maximum label rate. Lightly incorporate with a rotary hoe if rainfall does not occur within 5-7 days; (2) Apply a postemergence tank mix of Beacon at 0.38 oz./A or Exceed at 1 packet per 4 acres plus Accent SP at 0.33 oz./A plus 1.0 qt. of crop oil concentrate plus 1.0 gal./A of 28% nitrogen, or the equivalent amount of ammonium sulfate, when grasses are 2-3 inches tall and the corn is at least 4 inches tall; and (3) Cultivate 14-21 days after the postemergence application.

Notes: (1) Do not apply more than the labeled application rate for a given soil texture per year, either as a single or split treatment, or illegal residues may result. (2) In corn, Dual Magnum may be used up to 2.6 pts./A as either a preplant surface, preplant incorporated, or preemergence treatment on soils having an organic matter content between 6% and 20%. (3) In the event of escape of annual weeds following a preplant surface, preplant incorporated, or preemergence treatment of Dual Magnum, follow with a postemergence application of an appropriately labeled broadleaf and/or grass weed herbicide, i.e., AAtrex, Beacon, Bicep II Magnum, Exceed, Accent, Banvel, Basagran, Brominal, Buctril, or 2,4-D. If the postemergence treatment includes the herbicide used in the earlier treatment, do not exceed the total labeled rate for corn on a given soil texture. (4) Brominal or Buctril may be applied postemergence alone or in tank mix combination with AAtrex. Do not exceed 1.2 lbs. a.i./A of AAtrex in tank mix combination with Brominal or Buctril postemergence. Refer to the AAtrex, Brominal, and Buctril labels for specific rates and precautions. (5) Do not use Dual Magnum on peat or muck soils.

CORN – DUAL MAGNUM COMBINATIONS

Dual Magnum in any tank mixture for corn may be applied in water or fluid fertilizer before corn emerges. Use only water as a carrier when Dual Magnum is applied after corn emergence.

Note: For all applications to corn, (1) do not graze or feed forage from treated areas for 30 days following application, or possible illegal residues may result and (2) do not harvest sweet corn ears from treated areas for 30 days following application.

IMPORTANT: FOR TANK MIXTURES WITH AATREX (OR OTHER BRANDS OF ATRAZINE) – If applying Dual Magnum in tank mixture with AAtrex, all the restrictions and rate limitations on the AAtrex label must be followed if more restrictive/ protective than those on this label. In addition, if AAtrex is/must be applied at rates lower than those recommended on this label, broadleaf weed control may be affected. Refer to the AAtrex label for weeds controlled at the reduced rates.

Table 2: Dual Magnum Tank Mixtures for Corn – Additional Weeds Controlled and Special Instructions

	Dual Magnum + AAtrex and/or Princep (Preplant Surface, PPI, PRE)	Dual Magnum + AAtrex (Post)	Dual Magnum + Banvel (Field Corn)	Dual Magnum + AAtrex + Lorox	Dual Magnum + AAtrex or Princep + Prowl	Dual Magnum + Marksman	Dual Magnum + Balance Pro*
Special Mixing Instructions					1		
Comments	2,3,4,5,7,8	2,3,4,5		2,3,4,5,6	2,3,4,5	7	2,3,7
Browntop panicum	●			●	●		
Cocklebur	●	O	O	●	●	●	
Common purslane	●			●	●	●	●
Hairy nightshade	●			●	●	●	
Jimsonweed		●	O			●	●
Kochia		●				●	●
Lambsquarters	●	●	●	●	●	●	●
Morningglory	●	O	O	●	●	●	
Mustard		●				●	●
Pigweed				●	●	●	●
Prickly sida		●				●	
Ragweed	●	●	●	●	●	●	●
Smartweed	●	●	●	●	●	●	●
Velvetleaf	●	●	O	●	●	●	O-●

● = control; O = partial control; O-● = partial to full control depending on ratio of products used or on weed population

*Field corn only

Comments

1. **Special Mixing Instructions for Dual Magnum + AAtrex or Princep and Prowl:** (A) Fill the spray tank 1/4 full with water or fluid fertilizer and start agitation. (B) To aid compatibility, add a compatibility agent, such as Unite or X-77®, at 4.0 pts./100 gals. of spray mixture. (C) Then add the AAtrex or Princep and allow it to become dispersed. (D) Then add Dual Magnum and Prowl 4E. (E) Add the rest of the water.
2. Although a single formulation for AAtrex or Princep is listed in the rate tables, other formulations may be substituted, using the following formula:
   - 1.0 lb. of AAtrex Nine-O® or Princep Caliber 90® = 1.8 pts. of AAtrex 4L or Princep 4L.
3. Although directions specify AAtrex formulations in tank mixture with Dual Magnum, other brands of atrazine may be used. Follow the rates, recommendations, and limitations on the atrazine label.
4. See additional mixing instructions on the AAtrex label.
5. *Precaution: Do not exceed a total of 2.5 lbs. a.i. of atrazine per acre per year. However, certain states may have established rate limitations for atrazine within specific geographical areas. Consult your state lead pesticide control agency for additional information. It is a violation of this label to deviate from state use regulations.*
6. Other formulations of Lorox can be used: 1.0 lb. of Lorox DF = 1.0 pt. of Lorox L.
7. In Minimum-Tillage and No-Tillage systems, mix with Gramoxone Inteon for control of most emerged annual weeds and suppression of perennial weeds; or with Landmaster BW for suppression of emerged field bindweed and control or suppression of annual weeds; or with Touchdown brands or Roundup brands for control of most emerged annual and perennial weeds.
8. Refer to the **Corn – Dual Magnum Combinations – Tank Mixture with AAtrex or AAtrex + 2,4-D; or AAtrex + 2,4-D + Banvel for Minimum Tillage or No-Tillage Systems** section for specific directions for 2,4-D or Banvel burndown combinations with Minimum-Tillage and No-Tillage systems.

Dual Magnum in any tank mixture for corn may be applied in water or fluid fertilizer, except as noted.

Notes: (1) For all applications to corn, do not graze or feed forage from treated areas for 30 days following application and do not harvest sweet corn ears from treated areas for 30 days following application, or possible illegal residues may result. (2) When applying Dual Magnum in tank mixture with AAtrex, do not exceed a total of 2.5 lbs. a.i. of atrazine per acre per year. (3) Refer to **Corn (All Types) – Dual Magnum Alone**, for recommended sequential postemergence treatments if escape weeds develop.

TANK MIXTURE WITH AATREX OR PRINCEP, OR AATREX + PRINCEP – PREPLANT SURFACE, PREPLANT INCORPORATED, OR PREEMERGENCE

In addition to the weeds controlled by Dual Magnum alone, Dual Magnum + AAtrex or Princep, or Dual Magnum + AAtrex + Princep, applied preplant surface, preplant incorporated, or preemergence, also controls the following weeds: browntop panicum, cocklebur, common purslane, hairy nightshade, lambsquarters, morningglory, ragweed, smartweed, and velvetleaf.

Apply Dual Magnum + AAtrex or Princep, or Dual Magnum + AAtrex + Princep either preplant surface, preplant incorporated, or preemergence.

Preplant Surface-Applied: Follow instructions for use of Dual Magnum alone under **Application Procedures** and under application instructions for Dual Magnum alone on corn. Apply Dual Magnum + AAtrex or Princep, or Dual Magnum + AAtrex + Princep on *medium soils* (1.67 pts./A of Dual Magnum + 3.2-4.0 pts./A of AAtrex 4L or Princep 4L, or AAtrex 4L + Princep 4L combined) and on *fine soils* (1.67-2.0 pts./A of Dual Magnum + 4.0 pts./A of AAtrex 4L or 4.0-5.0 pts./A of Princep 4L, or AAtrex 4L + Princep 4L combined) in minimum-tillage and no-tillage systems in CO, IA, IL, IN, KS, KY, MN, MO, MT, ND, NE, SD, TN, WI, and WY. Apply the tank mixtures as a split or single treatment in those states and as indicated in the **Dual Magnum Alone – Preplant Surface-Applied** section of the label for corn. On *coarse soils*, apply 1.33 pts./A of Dual Magnum and 3.2 pts./A of AAtrex 4L or Princep 4L, or AAtrex 4L + Princep 4L combined.

Preplant Incorporated or Preemergence: Follow instructions for use of Dual Magnum alone under **Application Procedures**. Apply Dual Magnum + AAtrex or Princep, or Dual Magnum + AAtrex + Princep, using the appropriate rates from Table 3.

Note: Do not apply more than the labeled rate for a given soil texture per year, either as a split or single treatment, or illegal residues may result.

Shattercane and Wild Proso Millet – Partial Control

For more consistent partial control of shattercane or wild proso millet, where Dual Magnum is applied in tank mixture or sequentially with other registered corn herbicides, the following applications may be made:

- Apply 1.0-1.33 pts./A of Dual Magnum + 2.0 lbs. a.i./A of AAtrex or Princep preplant incorporated, followed by 1.0-1.33 pts./A of Dual Magnum preemergence. Make the preemergence application during or after planting, but before weeds and corn emerge.
- Apply Dual Magnum at 1.33 pts./A alone or in tank mix combination with up to 2.0 lbs. a.i./A of AAtrex or Princep preplant incorporated. Do not exceed the total rate of triazine herbicide recommended in combination with Dual Magnum for corn grown on a given soil texture. Follow with a post-directed application of Evik® 80W at 2.5 lbs./A. Refer to the Evik 80W label for specific directions for the post-directed application.
- Apply Eradicane® (or equivalent EPTC or butylate formulations) at labeled rates preplant incorporated, followed by a preemergence application of Dual Magnum at 1.0-1.33 pts./A. Do not use Eradicane on soils where rapid degradation has been shown to occur. Make the preemergence application during or after planting, but before weeds and corn emerge.

Precaution: When following the application regimes in numbers 1-3 above, a shallow cultivation may be needed after the preemergence or postemergence application to help control any late emerging shattercane or wild proso millet plants.

Note: Do not exceed a total of 1.9 lbs. a.i./A (2.0 pts. of Dual Magnum) in the preplant incorporated plus preemergence application on soils with less than 6% organic matter, or crop injury may occur.

Table 3: Dual Magnum + AAtrex or Princep, or Dual Magnum + AAtrex + Princep, Preplant Incorporated or Preemergence – Corn (All Types)

Soil Texture	Broadcast Rates Per Acre					
	<3% Organic Matter			3% Organic Matter or Greater		
	Dual Magnum + AAtrex Nine-O* or Princep Caliber 90*	or	Dual Magnum + AAtrex Nine-O** + Princep Caliber 90**	Dual Magnum + AAtrex Nine-O* or Princep Caliber 90*	or	Dual Magnum + AAtrex Nine-O** + Princep Caliber 90**
Coarse	0.8-1.0 pt. + 1.1-2.2 lbs.		0.8-1.0 pt. + 0.6-1.1 lbs. + 0.6-1.1 lbs.	1.0 pt. + 1.3-2.2 lbs.		1.0 pt. + 0.7-1.1 lbs. + 0.7-1.1 lbs.
Medium	1.0-1.33 pts. + 1.3-2.2 lbs.		1.0-1.33 pts. + 0.7-1.1 lbs. + 0.7-1.1 lbs.	1.33 pts. + 1.8-2.2 lbs.		1.33 pts. + 0.9-1.1 lbs. + 0.9-1.1 lbs.
Fine	1.33 pts. + 1.8-2.2 lbs.		1.33 pts. + 0.9-1.1 lbs. + 0.9-1.1 lbs.	1.33-1.67 pts. + 1.8-2.2 lbs.***		1.33-1.67 pts. + 0.9-1.1 lbs.*** + 0.9-1.1 lbs.***
Muck or Peat (soils with >20% organic matter)	**DO NOT USE**					

*Use Princep in preference to AAtrex when heavy infestations of crabgrass or fall panicum are expected. On soils having between 6% and 20% organic matter, Dual Magnum may be used up to 2.33 pts./A in tank mix combination with 2.2 lbs./A of AAtrex Nine-O, or equivalent rates of AAtrex 4L. Refer to the AAtrex label for weeds controlled at this reduced rate.

**When using the tank mixture of Dual Magnum + AAtrex Nine-O + Princep Caliber 90, use equal rates of each as shown when heavy broadleaf weed infestations are expected. When heavy infestations of crabgrass or fall panicum are expected, use a 1:2 ratio of AAtrex + Princep instead of the 1:1 ratio given in Table 3. (*Example:* Total AAtrex Nine-O + Princep Caliber 90 = 1.2 lbs./A, use 0.4 lb. of AAtrex + 0.8 lb. of Princep, respectively.) Refer to Comment No. 2 following Table 2 for AAtrex 4L and Princep 4L conversions.

***For cocklebur, yellow nutsedge, and velvetleaf control on *fine-textured soils* above 3% organic matter, apply 2.25 lbs./A of AAtrex Nine-O, or equivalent rates of AAtrex 4L, or the same total amount of AAtrex + Princep with 1.33-1.67 pts./A of Dual Magnum.

TANK MIXTURE WITH AATREX – POSTEMERGENCE

Weeds Controlled				Weeds Partially Controlled
Barnyardgrass	giant foxtail	lambsquarters	ragweed	cocklebur
(watergrass)	green foxtail	mustard	smartweed	morningglory
crabgrass	yellow foxtail	pigweed	velvetleaf	yellow nutsedge
crowfootgrass	jimsonweed	prickly sida		
fall panicum	kochia	purslane		

Apply 1.0 pt./A of Dual Magnum + 1.3 lbs./A of AAtrex Nine-O* on *coarse soils*, 1.33 pts./A of Dual Magnum + 1.8 lbs./A of AAtrex Nine-O on *medium soils*, or 1.33-1.67 pts./A of Dual Magnum + 1.8-2.2 lbs./A** of AAtrex Nine-O on *fine soils*. Apply this tank mixture before grass and broadleaf weeds pass the 2-leaf stage and before corn exceeds 5 inches in height. Application to weeds larger than the 2-leaf stage will generally result in unsatisfactory control.

Lay-by: Apply to corn plants not more than 12 inches tall. Applications to corn in excess of 5 inches should be directed to the base of the corn plants; whereas, applications to corn plants less than 5 inches tall may be made over the top. Occasionally, some corn leaf burn may result, but this should not affect later growth or yield. Do not apply this postemergence tank mixture in fluid fertilizer, or severe crop injury may occur.

*When using AAtrex 4L, use equivalent rates. One lb. of AAtrex Nine-O = 1.8 pts. of AAtrex 4L.

**For better control of cocklebur, morningglory, velvetleaf, and yellow nutsedge on *fine-textured soils* above 3% organic matter, apply 2.2 lbs./A of AAtrex Nine-O, or equivalent rate of AAtrex 4L, with 1.33-1.67 pts./A of Dual Magnum.

Tank mixtures of Dual Magnum + AAtrex may be applied following use of any registered preplant surface-applied, preplant incorporated, or preemergence corn herbicide, including Dual Magnum + AAtrex.

Note: The total Dual Magnum rate should not exceed 3.9 pts., nor the AAtrex rate more than 2.5 lbs. a.i./A during any one crop year, or illegal residues may result. Refer to the AAtrex label for geographic, soil-texture, and rotational restrictions.

TANK MIXTURE WITH BANVEL

Preemergence: Use this tank mixture only on field corn which is flat-planted (no furrows) in CO, IA, IL, IN, KS, MN, NE, OH, SD, and WI.

In addition to the weeds controlled by Dual Magnum alone, Dual Magnum + Banvel, applied preemergence, also controls lambsquarters, ragweed, smartweed, cocklebur*, jimsonweed*, morningglory*, and velvetleaf*.

*Partially controlled.

Apply Dual Magnum + Banvel preemergence. Broadcast 1.0 pt./A of Banvel with 1.33 pts./A of Dual Magnum on *medium soils*, or with 1.33-1.67 pts./A of Dual Magnum on *fine soils*. Do not apply on *coarse soils* or on soils with less than 2.5% organic matter. Apply this tank mixture to the soil surface at planting or after planting, but before corn emerges. Plant corn at least 1.5 inches deep and apply behind planting equipment, avoiding incorporation by the planter wheel or other seed covering device. Do not incorporate before corn emergence. If it is necessary to rotary hoe to break the soil crust, do not disturb the soil more than 1/2 inch deep.

Postemergence for Control of Pigweed (Mid-Atlantic states, including DE, MD, PA, VA, and WV): Apply 1.0-1.5 pts. of Dual Magnum + 0.5-1.0 pt./A of Banvel or Clarity® by ground equipment when pigweed plants are less than 3 inches tall and before corn exceeds 5 inches in height in a minimum of 20 gals. of spray per acre. Use the lower rate on coarse-textured and low organic matter soils. Use the higher rate on fine-textured and high organic matter soils.

Precautions: (1) Avoid drift to sensitive nontarget plants, such as soybeans, during application, or injury may occur. (2) Do not apply with aircraft.

TANK MIXTURE WITH AATREX OR PRINCEP + PROWL FOR PROLONGED CONTROL OF LAMBSQUARTERS AND PIGWEED IN FIELD CORN ONLY (NORTHEAST U.S., INCLUDING MI, IN, KY, AND STATES EAST OF THESE)

For prolonged control of lambsquarters and pigweed, in addition to a broad spectrum of annual broadleaf and grass weeds, Dual Magnum in tank mix combination with AAtrex* or Princep + Prowl 4E may be applied after planting, but before corn or weeds emerge. Apply by ground equipment in a minimum of 10 gals. of water or 20 gals. of liquid fertilizer. Apply by air in a minimum of 5.0 gals. of water. Refer to Table 3 of this label for rates of Dual Magnum, AAtrex, or Princep to be applied. Apply Prowl 4E according to the following rates in Table 4.

* Do not apply Dual Magnum in tank mix combination with AAtrex 80W + Prowl, as this combination is not compatible. Other AAtrex formulations may be used.

Mixing Instructions: See Comment No. 1 following Table 2.

Table 4: Prowl 4E – Broadcast Rates Per Acre

	Percent Organic Matter in Soil		
Soil Texture	**Less Than 1.5%**	**1.5-3%**	**Over 3%**
COARSE	1.5-2.0 pts.	2.0 pts.	3.0 pts.
MEDIUM	2.0 pts.	3.0 pts.	3.0 pts.
FINE	2.0 pts.	3.0 pts.	3.0 pts.

Observe all directions for use, precautions, and limitations on the respective product labels when applying these products in tank mix combination. Refer to the Prowl 4E label for replanting instructions in the event of crop loss.

TANK MIXTURE OF DUAL MAGNUM WITH AATREX OR PRINCEP, OR AATREX + PRINCEP WITH GRAMOXONE INTEON, LANDMASTER BW, TOUCHDOWN OR ROUNDUP FOR MINIMUM-TILLAGE OR NO-TILLAGE SYSTEMS

In minimum-tillage or no-tillage systems where corn is planted directly into a cover crop, stale seedbed, established sod, or previous crop residues, the contact herbicides Gramoxone Inteon, Landmaster BW, Touchdown brands or Roundup brands should be tank mixed with Dual Magnum + AAtrex, Dual Magnum + Princep, or Dual Magnum + AAtrex + Princep. See Comment No. 7 following Table 2. The Dual Magnum, Dual Magnum + AAtrex or Princep, or Dual Magnum + AAtrex + Princep portion of the tank mixture provides preemergence control of the weeds listed on this label in the tank mixture section for **Dual Magnum, Dual Magnum + AAtrex or Princep, or Dual Magnum + AAtrex + Princep – Preplant Surface, Preplant Incorporated, or Preemergence**.

Application: Apply before, during, or after planting, but before the corn emerges. Add Gramoxone Inteon, Landmaster BW, Touchdown brands or Roundup brands and apply as directed on the product label.

Gramoxone Inteon: Apply as directed on the product label. This treatment will not control weeds taller than 6 inches.

Note: Do not apply combinations containing Gramoxone Inteon in suspension-type liquid fertilizers, because the activity of paraquat will be reduced.

Landmaster BW: 27-54 oz./A depending on weed species and size. See the Landmaster BW label for weeds controlled, recommended rates for specific weeds, and other information concerning use.

Touchdown Brands or Roundup Brands: See the Touchdown brand or Roundup brand labels for weeds controlled, recommended rates, and other use directions.

Apply in 20-60 gals. of water or fluid fertilizer per acre with ground equipment.

On *coarse soils*, apply 1.0 pt./A of Dual Magnum with 1.3 lbs. of AAtrex Nine-O* or Princep Caliber 90*, or with 0.7 lb. of AAtrex Nine-O** + 0.7 lb. of Princep Caliber 90**. On *medium soils*, apply 1.33 pts./A of Dual Magnum with 1.8 lbs. of AAtrex Nine-O or Princep Caliber 90, or with 0.9 lb. of AAtrex Nine-O + 0.9 lb. of Princep Caliber 90. On *fine soils****, apply 1.33-1.67 pts./A of Dual Magnum with 1.8-2.2 lbs. of AAtrex Nine-O or Princep Caliber 90, or with 0.9-1.1 lbs. of AAtrex Nine-O + 0.9-1.1 lbs. of Princep Caliber 90.

*Use Princep in preference to AAtrex when heavy infestations of crabgrass or fall panicum are expected.

**When using the tank mixture of Dual Magnum + AAtrex Nine-O + Princep Caliber 90, use equal rates of AAtrex and Princep as shown when heavy broadleaf weed infestations are expected. When heavy infestations of crabgrass or fall panicum are expected, use a 1:2 ratio of AAtrex + Princep instead of the 1:1 ratio given. (*Example*: Total AAtrex Nine-O + Princep Caliber 90 = 1.8 lbs./A, use 0.6 lb. of AAtrex + 1.2 lbs. of Princep, respectively.) Refer to Comment No. 2 following Table 2 for AAtrex 4L and Princep 4L conversions.

***For cocklebur, yellow nutsedge, and velvetleaf control on *fine-textured soils* above 3% organic matter, apply 2.25 lbs./A of AAtrex Nine-O, or equivalent rate of AAtrex 4L, or the same total amount of AAtrex + Princep, with 1.33-1.67 pts./A of Dual Magnum.

TANK MIXTURE WITH AATREX; OR AATREX + 2,4-D; OR AATREX + 2,4-D + BANVEL FOR MINIMUM-TILLAGE OR NO-TILLAGE SYSTEMS

In minimum-tillage or no-tillage systems where corn is planted directly into a cover crop, stale seedbed, established sod, or previous crop residues, Dual Magnum applied in combination with AAtrex will kill most emerged small annual weeds. Apply Dual Magnum + AAtrex before, during, or after planting, but before corn emerges, according to the rates in Table 3.

Where heavy crop residues exist, add 0.8-1.6 pts./A of an appropriately labeled 3.8 lbs. a.i./gal. of 2,4-D amine (such as Weedar 64, Weedar 64A, DMA-4 Herbicide, Weedone® 638, or Formula 40) to the spray tank last and apply in a minimum of 25 gals. of carrier per acre.

As carriers, nitrogen solutions and complete liquid fertilizers, applied before corn emergence, enhance burndown of existing weeds, and therefore are recommended instead of water. Add X-77 surfactant at 1.0-2.0 qts./100 gals. of diluted spray, or another appropriate surfactant at its recommended rate, or add crop oil concentrate plus 28% liquid nitrogen (or equivalent). Apply before weeds exceed 3 inches in height. If alfalfa is present, add Banvel to the spray mixture at 0.33-0.5 pt./A and apply before alfalfa exceeds 6 inches in height.

For fields with existing sod grasses (e.g., bromegrass, orchardgrass, rye, or timothy), when existing weeds exceed 3 inches in height or when very dry conditions exist, add Gramoxone Inteon at the rate indicated on the product label in place of or in addition to 2,4-D as indicated above. Do not apply Gramoxone Inteon in suspension-type liquid fertilizer. Observe all directions for use, precautions, and limitations on the respective product labels when applying these products in tank mix combination. Use Balance combinations only on field corn.

TANK MIXTURE WITH MARKSMAN IN CONSERVATION TILLAGE – FIELD AND SILAGE CORN

In conservation tillage systems where corn is planted directly into a cover crop or previous crop residue, Dual Magnum + Marksman will kill most emerged small annual weeds. Apply Dual Magnum + Marksman before, during, or after planting, but before corn emergence on *medium* and *fine soils* with greater than 2.5% organic matter. For fields with existing vegetation exceeding 3 inches in height or when very dry conditions exist, add Gramoxone Inteon at its standard rate. Dual Magnum + Marksman may be applied postemergence to corn less than 3 inches tall and before weedy grasses exceed the 2-leaf stage.

As carriers, nitrogen solutions and complete liquid fertilizers, applied before corn emergence, enhance burndown of existing weeds. Do not apply Gramoxone Inteon in suspension-type liquid fertilizer or use on emerged corn.

Refer to the Marksman label and follow all directions, limitations, precautions, and information regarding application and use in corn.

TANK MIXTURE WITH BALANCE PRO – FIELD CORN ONLY

Dual Magnum and Balance PRO have a complementary crop response and weed control profile which allows various tank mix rate combinations to be considered. The addition of Balance PRO will improve the control of certain problem weeds including Texas panicum, woolly cupgrass, and wild proso millet. Dual Magnum improves both the duration and spectrum of annual grass and small seeded broadleaf weed control, in particular foxtails (yellow foxtail), witchgrass, and yellow nutsedge.

To reduce the risk of an adverse crop response, the Balance PRO label does not allow applications to *coarse-textured* soils with less than 1.5% organic matter and warns about applications to all soils with less than 1.5% organic matter or with pH greater than 7.5, as well as applications made to areas in fields with clay knolls, eroded hillsides, and exposed subsoil. Dual Magnum has no adverse crop response warnings or use restrictions.

Listed below are compensating rate options for combinations of Dual Magnum and Balance PRO, i.e. higher rates of Dual Magnum are combined with lower rates of Balance PRO, and vice versa. Select a rate option for Dual Magnum plus Balance PRO by weighing the intensity of problem weed pressure (population presence and density) and your acceptance for risk of an adverse crop response. For example, where Texas panicum, woolly cupgrass, or wild proso millet are a primary target weed, use a tank mix combination with a higher Balance PRO rate for the given soil type.

Where your acceptance of an adverse crop response risk is low and/or a more general weed spectrum is targeted (especially yellow foxtail, witchgrass or yellow nutsedge), use a tank mix combination with a higher Dual Magnum rate for the given soil type. Where a target weed is listed as controlled on both product labels, a tank mix combination option including intermediate rates of both products may be used. Where a target weed is listed as controlled on only one product label, do not apply a rate of that product below what is recommended for that weed on the individual product label, or unacceptable control may result. Follow all other directions for use, rate limitations, precautions and restrictions on both the Dual Magnum and Balance PRO product labels.

Dual Magnum plus Balance PRO tank mix rate options when applied preplant (incorporated or surface applied) up to 7 days before planting or preemergence in field corn:

For *coarse-textured* soils, where 1.5 or 1.88 oz./A of Balance PRO is used, 1.0-1.33 pts./A of Dual Magnum may be applied. Do not use Balance PRO on *coarse-textured* soils with less than 1.5% organic matter.

For *medium-textured* soils, where 1.5 oz./A of Balance PRO is used, rates as low as 1.33 pts./A of Dual Magnum may be applied. Where 1.88 or 2.25 oz./A of Balance PRO is used, rates as low as 1.0 pts./A of Dual Magnum may be applied. Dual Magnum can be used in combinations with Balance PRO at rates up to 1.67 pts./A on *medium-textured* soils.

For *fine-textured* soils, where 1.5 oz./A of Balance PRO is used, rates as low as 1.33 pts./A of Dual Magnum may be applied if the soil organic matter is less than 3% – if the soil organic matter content is 3% or greater, 1.67 pts./A of Dual Magnum should be applied. Where 1.88 or 2.25 oz./A of Balance PRO is used, rates as low as 1.33 pts./A of Dual Magnum may be applied. Where 3.0 oz./A or more of Balance PRO are used, rates as low as 1.0 pts./A of Dual Magnum may be applied. Dual Magnum can be used in combinations with Balance PRO at rates up to 2.0 pts./A on *fine-textured* soils if the soil organic matter content is 3% or greater.

TANK MIXTURES FOR POSTEMERGENCE SALVAGE WEED CONTROL IN FIELD CORN ONLY

For postemergence control of weeds in specific types of field corn, the Dual Magnum combinations listed below may be used. Full season weed control from early preplant, preplant incorporated, or preemergence treatments can lead to maximum yield potential under competition-free conditions. However, if control of emerged weeds is needed, a postemergence program listed below can be applied to provide residual control for the remainder of the season.

Notes: (1) Follow all label directions, instructions, precautions, and limitations for each product used. (2) Do not use fluid fertilizer with these mixtures or corn injury may occur. (3) For each tank mixture with Dual Magnum, apply only to the specific field corn type specified on the tank mix product label. (4) In-row weed control may be reduced because of lack of coverage when applied to corn over 4 inches tall.

Dual Magnum + Liberty Herbicide or Ignite® 280 SL Herbicide: Postemergence Use in LibertyLink® Corn or Corn Warranted by Bayer CropScience as Being Tolerant to Liberty Herbicide or Ignite 280 SL Herbicide

These tank mixtures can be applied postemergence to weeds and corn from seed designated as LibertyLink or corn warranted by Bayer CropScience as being tolerant to Liberty Herbicide or Ignite 280 SL Herbicide. Liberty provides postemergence control of a broad spectrum of grass and broadleaf weeds and the Dual Magnum provides residual control of grasses and certain broadleaf weeds listed in the label section **Dual Magnum Applied Alone – Weeds Controlled**. Refer to the **Dual Magnum Alone – Preplant Incorporated or Preemergence** section and use the minimum rate per soil texture and organic matter classification for season-long residual control from this tank mix combination with Liberty. Refer to the Liberty Herbicide or Ignite 280 SL Herbicide labels for the postemergence application rates according to weed species and their maximum height at the time of postemergence application. Where multiple weed species are present, use the highest Liberty rate recommended to control the species and growth stages present.

Follow all applicable use directions, limitations, precautions, and information regarding application to corn on the Dual Magnum, and Liberty Herbicide, or Ignite 280 SL Herbicide labels. Where difficult species and/or severe weed populations are expected, use the maximum rate where rate ranges are listed.

Dual Magnum + Touchdown Brands or Roundup Brands for Postemergence Application to Glyphosate-Tolerant Corn (e.g., Roundup Ready® or Agrisure™ GT)

The tank mixture of Dual Magnum + Touchdown or Roundup brands can be applied postemergence to weeds and to corn designated as glyphosate-tolerant. Application may be applied postemergence to glyphosate-tolerant corn from emergence until corn reaches 30 inches tall or the V8 stage (8 leaves with collars), whichever comes first. This mixture will provide postemergence control of weed species on the Touchdown brand or Roundup brand label and residual control of weed species on the Dual Magnum label. Use the minimum Dual Magnum rate postemergence with Touchdown or Roundup in glyphosate-tolerant corn as specified in the **Corn – Dual Magnum Alone – Preplant Incorporated or Preemergence** section of this label according to soil texture and organic matter. Refer to the Touchdown brand or Roundup brand label and follow appropriate use directions, application procedures, precautions, and limitations. Refer to the Touchdown brand or Roundup brand label for directions for control of problem species.

Follow all applicable use directions, limitations, precautions, and information regarding application to corn on the Dual Magnum and Touchdown brand or Roundup Ultra brand labels, and on the **Supplemental Labeling of Roundup Ultra for Postemergence Application to Corn with the Roundup Ready Gene**. Where difficult species and/or severe weed populations are expected, use the maximum rate where rate ranges are listed.

Dual Magnum + Touchdown Brands or Roundup Brands + AAtrex for Postemergence Application to Glyphosate-Tolerant Corn (e.g., Roundup Ready or Agrisure GT)

The tank mixture of Dual Magnum + AAtrex + Touchdown brands or Roundup brands can be applied postemergence to weeds and to corn designated as glyphosate-tolerant. Application may be applied postemergence to glyphosate-tolerant corn from emergence up to 12 inches in height. This mixture will provide postemergence control of weed species on the Touchdown brand or Roundup brand label and residual control of weed species on the Dual Magnum + AAtrex label. Use the minimum Dual Magnum + AAtrex rate postemergence with Touchdown or Roundup in glyphosate-tolerant corn as specified in the **Corn – Dual Magnum Combinations – Tank Mixture With AAtrex or Princep, or AAtrex + Princep – Preplant Incorporated or Preemergence** section and **Table 3** of this label according to soil texture and organic matter.

Follow all applicable use directions, limitations, precautions, and information regarding application to corn on the Dual Magnum, AAtrex, and Touchdown brand or Roundup brand labels for application to glyphosate-tolerant corn. Where difficult species and/or severe weed populations are expected, use the maximum rate where rate ranges are listed.

COTTON – DUAL MAGNUM ALONE

Application: Apply Dual Magnum preemergence only in Area 1* at the rate of 0.5-1.0 pt./A on sandy loams, 0.66-1.33 pts./A on *medium soils*, or 1.0-1.33 pts./A on *fine soils*. Apply Dual Magnum preplant incorporated or preemergence in Area 2** at 1.0 pt./A on sandy loams, 1.0-1.33 pts./A on *medium soils*, or 1.33 pts./A on *fine soils*. Apply Dual Magnum postemergence to cotton and preemergence to weeds at 0.5-1.33 pts./A, according to the state rate limitations in the following **Postemergence** section. **Do not use on sands and loamy sand**.

*Area 1 = AR, KS, LA, MS, TN, and Bootheel of MO
**Area 2 = NM, OK, and TX

Fall Application for Italian Ryegrass Control: Dual Magnum may be applied for residual control of glyphosate-resistant Italian ryegrass (*Lolium multiflorum*). Apply Dual Magnum at 1.33-1.67 pints/Acre in the fall (September 1 – December 1) after harvest of the previous crop and prior to Italian ryegrass emergence. Use the lower Dual Magnum rate for coarse-textured soils and the higher rate for fine-textured soils. A tillage operation may precede the application. Do not incorporate to a depth greater than 2-3 inches if tillage follows the application of Dual Magnum. For fall applications after emergence of glyphosate-resistant Italian ryegrass, Gramoxone Inteon can be tank mixed with Dual Magnum to control emerged ryegrass. Refer to the Gramoxone Inteon label for specific rates, application instructions and restrictions. Other registered herbicides may be tank mixed with Dual Magnum for control or improved control of other weeds present at the time of application. *Precautions: (1) Do not apply Dual Magnum to frozen ground. (2) If a spring application is made, the combined total amount of Dual Magnum applied in the fall plus the spring must not exceed the maximum seasonal S-metolachlor rate for cotton (2.6 pt/A, depending on soil texture), or illegal residues may result.*

Preplant Incorporated (NM, OK, and TX Only): Apply to the soil and incorporate into the top inch of soil immediately before planting, at planting, or after planting, but before crop or weeds emerge. Use a rolling cultivator or similar implement to uniformly incorporate not more than 1 inch deep. Use a preplant incorporated application if furrow irrigation is used or when a period of dry weather after application is expected. Where furrow irrigation is used, wet the top of the bed for best results. If the crop is to be planted on beds, apply and incorporate after bed formation. Cotton should be planted below the zone of incorporation; i.e., at least 1 inch on *fine soils* and 1.5 inches on *coarse* and *medium soils*. If incorporated prior to planting, use a planter that will result in a minimum of soil disturbance.

Note: For best control of yellow nutsedge and suppression of seedling johnsongrass, apply Dual Magnum preplant incorporated at the maximum rate for the soil texture, whether applied alone or mixed with Caparol 4L.

Preemergence: Apply to the soil surface at planting or after planting, but before weeds or crop emerge.

Postemergence: Apply Dual Magnum broadcast over-the-top or directed to the soil surface according to the rate limitations listed below by state. Over-the-top postemergence application may be made not later than 100 days before harvest, and directed-postemergence application may be made not later than 80 days before harvest. Application before weeds emerge or after clean cultivation to remove existing weeds is necessary since Dual Magnum will not control emerged weeds. Dual Magnum postemergence may be applied over any previous registered herbicide treatment. In sprinkler-irrigated areas, sprinkler irrigate after application with 1/2-1 inch of water (1/2 inch on *coarse-textured soils* to 1 inch on *fine-textured soils*) to incorporate Dual Magnum. In furrow-irrigated areas, apply Dual Magnum, incorporate with a rolling cultivator or similar implement that provides uniform shallow incorporation (2 inches or less), and then irrigate. In nonirrigated areas, if at least 1/2 inch of rainfall does not occur within 10 days after application, cultivate with a rolling cultivator or similar implement that provides uniform shallow incorporation of Dual Magnum.

VA, NC, SC, GA, FL, and AL: Apply Dual Magnum postemergence at 1.0-1.33 pts./A.

TN, AR, KS, MS, MO, and LA: Apply Dual Magnum postemergence at 0.5-1.33 pts./A.

TX, OK, NM, AZ, CA, and Clay Soils in AR: Apply Dual Magnum postemergence at 1.0-1.33 pts./A before August 1.

Multiple Applications: Where weed pressure is heavy, difficult to control species are expected, or reinfestation may occur, and a weed control program is used, multiple applications of Dual Magnum are effective when used as part of the weed control program. Apply as a preplant incorporated or preemergence treatment and follow with an application postemergence to cotton before weeds emerge or after clean cultivation to remove existing weeds, since Dual Magnum will not control emerged weeds. Apply Dual Magnum postemergence over a previous preplant or preemergence Dual Magnum application as shown in the following table.

	Multiple Dual Magnum Applications to Cotton		
State	**Preplant Incorporated or Preemergence Pts./A**	**+**	**Postemergence Pts./A**
MS, LA, TN, AR, KS, MO	0.5-1.33 (Preemergence Only)	+	0.5-1.33
TX, OK, NM	1.0-1.33	+	1.0-1.33 before August 1
NC, VA	1.0-1.33 (Preemergence Only)	+	1.0-1.33

In sprinkler-irrigated areas, sprinkler irrigate after application with 1/2-1 inch of water (1/2 inch on *coarse-textured soils* to 1 inch on *fine-textured soils*) to incorporate Dual Magnum. In furrow-irrigated areas, apply Dual Magnum, incorporate with a rolling cultivator or similar implement that provides uniform shallow incorporation (2 inches or less), and then irrigate. In nonirrigated areas, if at least 1/2 inch of rainfall does not occur within 10 days after application, cultivate with a rolling cultivator or similar implement that provides uniform shallow incorporation of Dual Magnum.

Notes: For best control of yellow nutsedge and suppression of seedling johnsongrass, apply Dual Magnum preplant incorporated, preemergence, or postemergence to cotton and preemergence to weeds at the maximum rate for the soil texture, whether applied alone or in combinations. Do not apply more than a total of 2.0 pts./A on *coarse soils* or 2.6 pts./A of Dual Magnum on *medium* and *fine soils* during a growing season. These treatments may be applied over previous registered herbicide treatments.

Precautions: To avoid crop injury, (1) Do not apply Dual Magnum on sand or loamy sand soils, or in areas where water is likely to "pond" over the bed; (2) To avoid concentration in the seed furrow, do not make broadcast applications of Dual Magnum to cotton planted in furrows more than 2 inches deep. Band applications may be made to cotton planted in furrows deeper than 2 inches, but band width should not exceed the width of the bottom of the furrow; (3) In furrow-planted cotton, to avoid concentration in the furrow and potential injury, do not apply Dual Magnum postemergence until after first "knifing" or cultivation to level soil surface. (4) Do not apply over-the-top in fluid fertilizer or any other adjuvant, surfactant, oil, or other pesticide not recommended in the cotton section of this label, or injury may occur; and (5) Do not apply on Taloka silt loam. (6) Do not use in Gaines County, TX.

Note: Do not graze or feed forage or fodder from cotton to livestock, or illegal residues may result.

COTTON – DUAL MAGNUM COMBINATIONS

TANK MIXTURE WITH CAPAROL 4L

Dual Magnum tank mixtures with Caparol 4L may be applied preplant incorporated or preemergence in water or fluid fertilizer. When fluid fertilizer is used as a carrier for Dual Magnum, either alone or in combination with Caparol 4L, mix only the amount that will be sprayed in one operation. These mixtures should not be allowed to stand without agitation. Only water may be used as a carrier for postemergence-directed application.

In addition to those weeds controlled by Dual Magnum alone, Dual Magnum + Caparol 4L, applied preplant incorporated or preemergence, also controls the following weeds: junglerice, wild oats, annual morningglory, groundcherry, hairy nightshade, lambsquarters, malva, mustard, prickly sida (teaweed), purslane, ragweed, and shallow-germinating seedlings of cocklebur and coffeeweed. As a postemergence-directed application, Caparol provides postemergence control and residual control of weeds on its label, while Dual Magnum provides residual control of weed species on its label. Dual Magnum will not control emerged weeds.

Preplant Incorporated or Preemergence: Apply Dual Magnum + Caparol 4L, either preplant incorporated or preemergence, using the appropriate rate from Table 3. Cotton should be planted below the zone of incorporation; i.e., at least 1.0 inch on *fine soils* and 1.5 inches on *coarse* and *medium soils*. If incorporated before planting, use a planter that will result in a minimum of soil disturbance.

Table 5: Dual Magnum + Caparol 4L – Cotton (NM, OK, TX)

Use Areas	Soil Texture	Broadcast Rates Per Acre	
		Dual Magnum	Caparol 4L
ALL	Sand, loamy sand	DO NOT USE	
OK, Blacklands and Gulf Coast of TX	Loams	0.8-1.33 pts.	2.4 pts.
	Clays	1.33 pts.	4.8 pts.
Rio Grande Valley of TX	Loams	0.8-1.33 pts.	3.2 pts.
	Clays	1.33 pts.	4.8 pts.
NM; High Plains, Rolling Plains, Edwards Plateau of TX; and Southwest TX	Sandy loam	0.8-1.0 pt.	1.6 pts.
	Loams	0.8-1.33 pts.	2.4 pts.
	Sandy clay loams	1.33 pts.	2.4 pts.
	Other clay soils	1.33 pts.	3.2 pts.

Postemergence-Directed (AR, AZ, CA, LA, MS, NM, OK, TN, TX, and MO): Dual Magnum may be tank mixed with Caparol 4L in water and applied postemergence-directed in cotton for control of emerged weeds listed on the Caparol 4L label and residual preemergence control of weeds controlled by Dual Magnum and Caparol 4L. Or application may be made after cultivation for residual preemergence control. These treatments may be applied over previous registered treatments, including Dual Magnum, provided the maximum label rate of any product is not exceeded. Do not apply over-the-top of cotton, or injury may occur.

Apply Dual Magnum + Caparol 4L in a minimum of 20 gals. of spray volume per acre. Follow the directions, limitations, and precautions on the Caparol 4L label when Caparol is applied as a postemergence-directed application. Refer to the directions, limitations, and precautions for use of Dual Magnum under the **Cotton – Dual Magnum Alone – Postemergence** section.

Precautions: (1) To avoid concentration in the seed furrow, do not make broadcast applications of Dual Magnum + Caparol 4L to cotton planted in furrows more than 2 inches deep. Band applications may be made to cotton planted in furrows deeper than 2 inches, but band width should not exceed the width of the bottom of the furrow. To avoid crop injury, (2) Do not apply on sand or loamy sand soils, or in areas where water is likely to "pond" over the bed; (3) Do not apply in cut areas of newly leveled fields, or in areas of excess salt; (4) Do not apply to glandless cotton varieties; and (5) Do not apply on Taloka silt loam. (6) Do not use in Gaines County, TX.

Note: Do not graze or feed forage or fodder from cotton to livestock, or illegal residues may result.

Refer to the Caparol 4L label for further instructions and limitations.

TANK MIXTURE WITH COTORAN DF

Dual Magnum may be applied in tank mixture with Cotoran DF preemergence for control of those weeds controlled by Dual Magnum alone and those as listed on the Cotoran DF label. This combination will also control spotted spurge, hyssop spurge, nodding spurge, and prostrate spurge. Apply to the soil surface at planting or after planting, but before weeds or crop emerge, using the appropriate rates from Table 4. The tank mixture may be applied postemergence to cotton, but preemergence to weeds, or it may be applied postemergence to both cotton and broadleaf weeds for control of weeds on the Cotoran label. Apply as a directed, semi-directed, or over-the-top spray. Dual Magnum will not control emerged weeds, but will provide preemergence control of species on its label.

Mixing Instructions: Incompatibility may occur when tank mixing Dual Magnum and Cotoran DF. To help overcome this condition, fill the spray tank 1/4 full with water or fluid fertilizer and start agitation, add the Cotoran DF and allow it to become dispersed. Add X-77 at 0.5% volume/volume final spray (4.0 pts./100 gals.), then add the Dual Magnum and finally the rest of the water or fluid fertilizer. Agitate during mixing and application to maintain a uniform suspension. Do not use fluid fertilizer as a carrier for postemergence applications.

Table 6: Dual Magnum + Cotoran DF – Cotton

Soil Texture	Broadcast Rates Per Acre		
	Dual Magnum (pts.)		Cotoran DF*** (lbs.)
	Area 1*	Area 2**	
Sand, loamy sand	DO NOT USE		
Sandy loam	0.5-1.0	0.8-1.0	1.2
Loam, silt loam, silt	0.66-1.33	1.0-1.33	1.2-1.9
Fine soil	1.0-1.33	1.33	1.9-2.4

*Area 1 = AR, LA, MS, Bootheel of MO and TN

**Area 2 = Eastern OK, Gulf Coast, Rio Grande Valley, and Eastern TX

***When using Cotoran 4L, use equivalent rates. Multiply lbs. of Cotoran DF by 1.7 to get pts. of Cotoran 4L.

Postemergence: This tank mixture may be applied postemergence to cotton, but preemergence to weeds or postemergence to both cotton and weeds for control of weeds on the Cotoran label. Apply as a directed, semi-directed, or over-the-top spray. Dual Magnum will not control emerged weeds, but will provide preemergence control of species on its label. Where rate ranges are given for Cotoran DF, use the higher rate when applying postemergence to weeds that are 2 inches or less. These treatments may be applied over previous registered treatments, including Dual Magnum, provided the maximum label rate of any product is not exceeded.

Precautions: (1) Do not apply Dual Magnum + Cotoran on sand or loamy sand soils, or in areas where water is likely to "pond" over the bed, or crop injury may occur. (2) To avoid concentration in the seed furrow, do not make broadcast applications of Dual Magnum + Cotoran to cotton planted in furrows more than 2 inches deep. Band applications may be made to cotton planted in furrows deeper than 2 inches, but band width should not exceed the width of the bottom of the furrow. (3) The use of Cotoran following the use of a systemic insecticide at planting may result in crop injury. (4) Do not use on Taloka silt loam, or crop injury may occur. (5) Do not use in Gaines County, TX.

Refer to the Cotoran labels for further instructions, precautions, and limitations.

Note: To avoid possible illegal residues, do not feed treated forage or gin trash to livestock, or graze treated areas.

TANK MIXTURE OF DUAL MAGNUM OR DUAL MAGNUM + COTORAN WITH GRAMOXONE INTEON, TOUCHDOWN BRANDS OR ROUNDUP BRANDS FOR MINIMUM-TILLAGE OR NO-TILLAGE SYSTEMS

In minimum-tillage or no-tillage systems where cotton is planted directly into a cover crop, stale seedbed, or previous crop residues, the contact herbicides Gramoxone Inteon, Touchdown brands or Roundup brands may be added to a tank mix of either Dual Magnum or Dual Magnum + Cotoran. When used as directed, the Gramoxone Inteon portion of the tank mixture controls most emerged weeds and suppresses many perennial weeds. Touchdown or Roundup combinations will control emerged annual and perennial weeds when applied as directed on the Touchdown or Roundup label. The Dual Magnum and Dual Magnum + Cotoran portion of the tank mixture provides preemergence control of the weeds listed on this label in the Dual Magnum and Dual Magnum + Cotoran sections, respectively.

Refer to the label of each product used in combination and observe the planting details, information regarding application, geographical restrictions, and all other precautions and limitations. Refer to **Mixing Instructions** under T**ank Mixture with Cotoran DF** section.

Application: Apply before, during, or after planting, but before the cotton emerges. Apply Dual Magnum at 0.8-1.0 pt./A on sandy loams, *medium-*, and *fine-textured soils*. Refer to Table 6 for the Cotoran DF rates.

Gramoxone Inteon: Apply as directed on the product label. This treatment will not control weeds taller than 6 inches.

Note: Do not apply combinations containing Gramoxone Inteon in suspension-type liquid fertilizers, as the activity of paraquat will be reduced.

Touchdown Brands or Roundup Brands: See the Touchdown or Roundup label for weeds controlled, recommended rates, and other use directions.

Note: Do not apply Dual Magnum + Cotoran 4L + Roundup in tank mixture because of compatibility problems.

Apply in 20-60 gals. of water or fluid fertilizer per acre with ground equipment.

*Precautions: (1) If heavy rain occurs soon after application, crop injury may result, especially in poorly drained areas where water stands for several days, or where the seeding slit has not been properly closed. (2) Refer to the Cotoran labels and the **Tank Mixture with Cotoran DF** section of this label for further instructions, precautions, and limitations. (3) Do not use in Gaines County, TX.*

TANK MIXTURE WITH MSMA, MSMA + CAPAROL, OR MSMA + COTORAN

Dual Magnum may be tank mixed with MSMA in water and applied postemergence-directed for control of emerged weeds listed on the MSMA product label and residual preemergence control of weeds controlled by Dual Magnum. The addition of Caparol or Cotoran will add control of weed species on their respective labels.

Postemergence-Directed (AL, AR, AZ, CA, FL, GA, LA, MS, NC, NM, OK, SC, TN, TX, VA, and Bootheel of MO): Apply Dual Magnum + MSMA postemergence-directed to cotton at least 3 inches tall according to the directions, limitations, and precautions on the MSMA product label, as well as the directions, limitations, and precautions for use of Dual Magnum in the section for **Cotton – Dual Magnum Alone – Postemergence**. Do not apply after first cotton bloom. These treatments may be applied over previous registered treatments, including Dual Magnum, provided the maximum label rate of any product is not exceeded. Cotoran or Caparol may be added to the Dual Magnum + MSMA tank mixture according to the respective label directions for application to cotton at least 3 inches tall. When these mixtures are used, follow the mixing instructions for Dual Magnum + Caparol or Cotoran and then add the MSMA product.

Do not use Dual Magnum in tank mix with premixes of MSMA plus herbicides other than those registered for use in tank mixture with Dual Magnum on cotton.

TANK MIXTURE WITH TREFLAN FOR POST-DIRECTED FOLLOWED BY SOIL INCORPORATION APPLICATIONS

Dual Magnum may be applied as a tank mixture with Treflan in cotton for improved late-season weed control when used as an incorporated lay-by type application. This combination may be applied after the cotton is at least 3 inches tall and has reached the 4 true-leaf stage. Make the application directed to the soil surface and away from the crop foliage. Incorporate using a sweep or rolling type cultivator to provide uniform and shallow mixing into the top 2 inches of soil. Refer to each product label for the appropriate application rates by soil type and for this application timing -- and follow all product use limitations and restrictions.

TANK MIXTURE WITH TOUCHDOWN BRANDS OR ROUNDUP BRANDS FOR USE ON ROUNDUP READY COTTON ONLY

Apply Dual Magnum as a tank mixture with Touchdown or Roundup in water postemergence over-the-top or postemergence-directed for control of emerged weeds listed on the Touchdown or Roundup labels and for residual preemergence control of weeds listed on the Dual Magnum label. See the **Cotton – Dual Magnum Alone – Postemergence** section of this label for rates and timings of Dual Magnum and follow the Touchdown or Roundup label for their respective rates, application method, and application timing restrictions. Do not add additional spray adjuvants, surfactants, fertilizer additives, or pesticides to this tank mixture if applied postemergence over-the-top, or unacceptable injury may occur. Refer to the Touchdown brand or Roundup brand label and follow appropriate use directions, application procedures, precautions, and limitation.

Precaution: Do not apply this tank mixture postemergence to any cotton variety unless it is designated Roundup Ready and unless the Touchdown or Roundup formulation being used is registered for postemergence use in Roundup Ready Cotton. Postemergence over-the-top applications of this tank mixture may cause temporary injury in the form of necrotic spotting to exposed cotton leaves, which will not affect normal plant development. Do not apply Touchdown or Roundup postemergence over-the-top to cotton past the growth stage limit specified on their respective labels. Do not use on sand or loamy sand soils in Gaines County, TX.

SOYBEAN, IMMATURE SEED

Dual Magnum may be applied preplant or preemergence for the control or suppression of grass and small seeded broadleaf weeds in immature-seed soybean or other food-grade soybeans. For specific rates, see the rate table listed below.

Preplant Surface-Applied: For minimum-tillage or no-tillage systems only, Dual Magnum alone may be applied up to 45 days before planting. Use only split applications for treatments made 30-45 days before planting, with 2/3 the recommended broadcast rate for the crop and soil texture applied initially and the remaining 1/3 applied at planting. Treatments less than 30 days before planting may be made either as a split or a single application. If weeds are present at the time of treatment, apply in a tank mixture combination with a contact herbicide (for example, Gramoxone Inteon, Touchdown, or Roundup). Observe directions for use, precautions, and restrictions on the label of the contact herbicide. To the extent possible, do not move treated soil out of the row or move untreated soil to the surface during planting, or weed control will be diminished.

Preplant Incorporated: Apply Dual Magnum to the soil and incorporate into the top 2 inches of soil within 14 days before planting, using a finishing disk, harrow, rolling cultivator, or similar implement capable of providing uniform 2-inch incorporation. Use a preplant incorporated application if furrow irrigation is used or when a period of dry weather after application is expected. If crop will be planted on beds, apply and incorporate Dual Magnum after bed formation, unless specified otherwise.

Preemergence: Apply Dual Magnum during planting (behind the planter) or after planting, but before weeds emerge.

Dual Magnum Broadcast Rates Per Acre

	Percent Organic Matter in Soil	
Soil Texture	**< 3%**	**≥ 3%**
Coarse	1 – 1.33 pt	1.33 pt
Medium	1.33 – 1.67 pt	1.33 – 1.67 pt
Fine	1.33 – 1.67 pt	1.67 – 2.0 pt

Precautions: (1) Dual Magnum will not control emerged weeds. (2) Do not cut for hay within 120 days following a Dual Magnum application. (3) Do not use for forage within 60 days following a Dual Magnum application. (4) Do not apply more than 2.0 pt/A of Dual Magnum during any one crop year.

GRASSES GROWN FOR SEED (ID, OR, WA) – DUAL MAGNUM APPLIED ALONE

To control weeds and volunteer grasses in established grasses grown for seed, apply Dual Magnum to established stands of tall fescue, orchardgrass, perennial ryegrass, fine fescue, bentgrass, and Kentucky bluegrass just before, during, or immediately following the first fall rains or just before or during a late summer or early fall irrigation, but before target grasses emerge. The seed crop must have had one seed harvest or been established at least one year. The postharvest residue (straw) should be evenly spread, removed, or burned before applying Dual Magnum. Rainfall or irrigation is required after application and before weed emergence for best control. Dual Magnum will provide preemergence control/suppression of volunteer seedlings of perennial ryegrass, fine fescue spp., tall fescue, orchardgrass, bentgrass and Kentucky bluegrass. Dual Magnum will control those weed species listed in the **Dual Magnum Alone** section of the Dual Magnum label and will suppress or control rattail fescue, annual bluegrass, Italian ryegrass, California brome, downy brome, and roughstalk bluegrass.

Apply Dual Magnum by ground equipment in a minimum of 10 gallons of water per acre using the rate listed below according to grass species.

Established Grass Crop Grown for Seed	Pts./A
Fine fescue spp.	1.0
Perennial ryegrass	1.0
Bentgrass	1.0-1.33
Kentucky bluegrass	1.0-1.33
Orchardgrass	1.0-1.33
Tall fescue	1.0-1.33

Precautions: (1) Apply Dual Magnum only once per crop year. (2) Do not apply after the 15th of November or poor control may result. (3) Tank mixtures with other pesticides, or the addition of an adjuvant, can increase the risk of crop injury. (4) Application to perennial ryegrass and fine fescue stands under stress may cause crop injury. (5) If weed escapes occur following a Dual Magnum application, an application of a postemergence herbicide may be necessary to control escapes. When making such an application, follow all directions, precautions and limitations on the label of the postemergence herbicide. (6) Control may be decreased if excessive straw from the previous harvest is present at application and/or insufficient rainfall/irrigation occurs.

Notes: To avoid possible illegal residues: (1) Do not graze forage regrowth for 60 days following application west of the Cascades. (2) In areas east of the Cascades, do not graze forage regrowth for 150 days following application. (3) Hay may be harvested anytime between seed harvest and the next application of *S*-metolachlor.

HORSERADISH

Apply a single application of Dual Magnum at a broadcast rate of 1.0-1.33 pt./A to the soil surface after planting, but before weeds or crop emergence (i.e., preemergence). Use lower rates on soils relatively coarse-textured and higher rates on fine-textured soils. A band application may also be used, applying proportionally less spray mixture on the area actually treated. Dual Magnum will not control emerged weeds. Control emerged weeds with an appropriate registered foliar herbicide or by mechanical means.

Restrictions: (1) Make only one application of Dual Magnum per crop. (2) Do not apply more than 1.33 pt./A of Dual Magnum per crop. (3) Harvest horseradish at normal timing.

PEANUTS – DUAL MAGNUM ALONE

Apply Dual Magnum, either preplant incorporated, postplant incorporated, preemergence, or lay-by, using the appropriate rate specified below. **Preplant Incorporated or Preemergence:** Follow instructions for use of Dual Magnum alone under **Application Procedures**. **Postplant Incorporated:** Apply and shallowly incorporate Dual Magnum into the soil after planting, but before peanut germination. Incorporation depth and incorporating implements must be kept above the seed, or seed will be damaged. **Lay-by:** Apply Dual Magnum to the soil immediately after the last normal cultivation.

Apply Dual Magnum alone, preplant incorporated, postplant incorporated, preemergence, or lay-by, at a broadcast rate of 1.0-1.33 pts./A in the Southeast* and 0.8-1.33 pts./A in NM, OK, and TX.

*In the Southeast, use 1.33-2.0 pts./A and apply preemergence for partial control of Florida beggarweed.

Notes: (1) Dual Magnum alone may be applied as directed after any of the following preplant incorporated herbicides when used according to their label recommendations: Balan at 3.0-4.0 qts./A; Treflan E.C. at 1.0 pt./A; Sonalan at 1.25-3.0 pts./A; Pursuit at 0.25 pt./A; or Prowl at 1.0-2.0 pts./A. (2) Do not graze or feed peanut forage or fodder to livestock for 30 days following application, and (3) Do not apply within 90 days of harvest, or illegal residues may result.

PEANUTS – DUAL MAGNUM COMBINATIONS

TANK MIXTURE WITH BALAN L.C.

Dual Magnum + Balan tank mixture applied preplant incorporated controls those weeds listed under **Dual Magnum Applied Alone** and those weeds as listed on the Balan label.

Apply 1.0-1.33 pts./A of Dual Magnum + 3.0-4.0 qts./A of Balan in a minimum of 10 gals. of spray volume per acre for ground application or in a minimum of 5.0 gals. of spray volume per acre for aerial application. Follow the recommended procedures for Balan on the Balan label for soil preparation and incorporation of this tank mix. Apply and incorporate Dual Magnum + Balan up to 14 days prior to planting.

Note: Follow all restrictions and precautions on the Balan label.

Multiple Applications: Where weed pressure is heavy or where species difficult to control are expected, Dual Magnum is most effective when used as follows:

Southeast Only (AL, FL, GA, NC, SC, VA)

Preplant Incorporated: Apply Dual Magnum preplant incorporated as directed under **Peanuts – Dual Magnum Alone** or apply Dual Magnum + Balan preplant incorporated as directed previously in this section. Refer to the respective section for weeds controlled.

OR

Preemergence before "ground cracking": Apply Dual Magnum any time from preemergence up to "ground cracking" at 1.0-2.0 pts./A for extended control of weeds not yet emerged. Refer to the **Dual Magnum Applied Alone** section for a list of weeds controlled.

Follow the PPI or PRE application by:

Lay-by: Apply Dual Magnum at lay-by as directed under **Peanuts – Dual Magnum Alone**. Use only when late germinating weeds are expected to be a problem. Refer to the **Dual Magnum Applied Alone** section for a list of weeds controlled.

Notes: (1) Do not apply more than the equivalent of 2.67 lbs. of active ingredient of Dual Magnum per acre during any one year, or illegal residues may result. If Dual II Magnum is used as a sequential treatment, the lbs. of active ingredient (1.0 pt. = 0.95 lb.) plus the lbs. of active ingredient of Dual Magnum should not exceed 2.67 lbs. **Do not use Dual II Magnum, or Dual IIG Magnum after peanuts have emerged.** (2) Do not graze or feed peanut forage or fodder to livestock for 30 days following application, and (3) Do not apply within 90 days of harvest, or illegal residues may result.

Southwest Only (NM, OK, TX)

1st Application: Apply Dual Magnum preplant incorporated or preemergence or at-cracking as directed previously in this section. Refer to the respective section for weeds controlled.

2nd Application: Apply Dual Magnum at lay-by as directed under **Peanuts – Dual Magnum Alone** on that label. Use only when late germinating weeds are expected to be a problem. Refer to the **Dual Magnum Applied Alone** section for a list of weeds controlled.

Notes: (1) Do not apply more than the equivalent of 2.67 lbs. of active ingredient of Dual Magnum per acre during any one year, or illegal residues may result. If Dual II Magnum® is used as a sequential treatment, the lbs. of active ingredient (1.0 pt. = 0.95 lb.) plus the lbs. of active ingredient of Dual Magnum should not exceed 2.67 lbs. **Do not use Dual II Magnum, or Dual IIG Magnum after peanuts have emerged.** (2) Do not graze or feed peanut forage or fodder to livestock for 30 days following application, and (3) Do not apply within 90 days of harvest, or illegal residues may result.

TANK MIXTURE OR SEQUENTIALLY WITH PURSUIT

The tank mixture or sequential treatment of Dual Magnum and Pursuit controls all weeds controlled by Dual Magnum alone and by Pursuit alone. Refer to the **Dual Magnum Applied Alone** section for weeds controlled by Dual Magnum and to the Pursuit label for weeds controlled by Pursuit.

Refer to the respective labels for application methods, timing, rates, restrictions, and precautions; and use in accordance with the more restrictive label. Do not exceed the label rate of either product. Dual Magnum will not control emerged weeds.

TANK MIXTURE WITH SONALAN

The tank mixture controls all weeds controlled by Dual Magnum alone and by Sonalan alone. Refer to the **Dual Magnum Applied Alone** section for weeds controlled by Dual Magnum and to the Sonalan label for weeds controlled by Sonalan.

Apply Dual Magnum + Sonalan preplant incorporated using the appropriate rate from Table 7. Follow recommended soil preparation procedures for Sonalan.

Table 7: Dual Magnum + Sonalan – Peanuts

	Broadcast Rates Per Acre			
	Southeast		NM, OK, TX	
Soil Texture	**Dual Magnum**	**Sonalan**	**Dual Magnum**	**Sonalan**
COARSE	1.0-1.33 pts.	1.25-2.0 pts.	0.8-1.33 pts.	1.25-2.0 pts.
MEDIUM	1.0-1.33 pts.	1.75-2.5 pts.	0.8-1.33 pts.	1.75-2.5 pts.
FINE	1.0-1.33 pts.	2.25-3.0 pts.	0.8-1.33 pts.	2.25-3.0 pts.

Note: Follow all use directions, limitations, precautions, and information regarding application to peanuts on the Dual Magnum and Sonalan labels.

TANK MIXTURE WITH PROWL

Dual Magnum + Prowl applied preplant incorporated controls all weeds controlled by Dual Magnum alone plus Texas panicum, field sandbur, johnsongrass from seed, lambsquarters, kochia, annual spurge, and other species on the Prowl label. Apply Dual Magnum + Prowl by ground or by aerial equipment within 14 days before planting. Incorporate into the top 1-2 inches of soil before planting and within 7 days of application, using a finishing disk or similar implement capable of providing uniform incorporation. If peanuts will be planted on beds, apply and incorporate after bed formation. Refer to the **Incorporation** instructions of the respective labels for additional directions.

Apply Dual Magnum + Prowl preplant incorporated, using the appropriate rates from Table 8.

Table 8: Dual Magnum + Prowl – Peanuts

	Broadcast Rates Per Acre	
	NM, OK, TX	**Other Peanut Growing States**
Soil Texture	**Dual Magnum + Prowl**	**Dual Magnum + Prowl**
Sand, loamy sand	0.8 + 1.0-1.5 pts.	1.0-1.33 + 1.5-2.0 pts.
Sandy loam	0.8-1.0 + 1.0-1.5 pts.	1.0-1.33 + 1.5-2.0 pts.
Fine soil	1.33 + 1.0-1.5 pts.	1.33 + 1.5-2.0 pts.

Note: Follow all use directions, limitations, precautions, and information regarding application to peanuts on the Dual Magnum and Prowl labels.

TANK MIXTURE OR SEQUENTIALLY WITH GRAMOXONE INTEON

Dual Magnum + Gramoxone Inteon applied at ground cracking or sequentially will control or suppress small (1-6 inch) emerged annual grass and broadleaf weeds and provide residual control of weed species listed in the **Dual Magnum Applied Alone** section of this label. Apply Gramoxone Inteon plus the appropriate Dual Magnum rate from the **Peanuts – Dual Magnum Alone** section in a minimum spray volume of 20 gals./A with ground equipment. A second application of Dual Magnum + Gramoxone Inteon may be made 28 days after ground cracking. (Refer to the **Peanuts – Dual Magnum Combinations – Multiple Applications** section of this label for geographical areas where multiple applications are recommended.) Refer to the Gramoxone Inteon label and follow all directions, limitations, and restrictions.

TANK MIXTURE OR SEQUENTIALLY WITH GRAMOXONE INTEON + BASAGRAN

The addition of Basagran to the Dual Magnum + Gramoxone Inteon mixture will result in improved control of such problem broadleaf weeds as prickly sida, cocklebur, smartweed, and bristly starbur. Dual Magnum + Gramoxone Inteon + Basagran applied at ground cracking or sequentially will control or suppress small (1-6 inch) emerged annual grass and broadleaf weeds and provide residual control of weed species listed in the **Dual Magnum Applied Alone** section of this label. Apply Basagran + Gramoxone Inteon with the appropriate Dual Magnum rate from the **Peanuts – Dual Magnum Alone** section in a minimum spray volume of 20 gals./A with ground equipment. A second application of Dual Magnum + Gramoxone Inteon + Basagran may be made 28 days after ground cracking. (Refer to the **Peanuts – Dual Magnum Combinations – Multiple Applications** section of this label for geographical areas where multiple applications are recommended.) Refer to the Gramoxone Inteon and Basagran labels and follow all directions, limitations, and restrictions.

TANK MIXTURE OR SEQUENTIALLY WITH GRAMOXONE INTEON + BUTYRAC 200 OR BUTOXONE 200

The addition of Butyrac 200 or Butoxone 200 to the Dual Magnum + Gramoxone Inteon mixture will result in improved control of such problem broadleaf weeds as sicklepod, morningglory, and cocklebur. Dual Magnum + Gramoxone Inteon + Butyrac 200 or Butoxone 200 applied at ground cracking or sequentially will control or suppress small (1-6 inch) emerged annual grass and broadleaf weeds and provide residual control of weed species listed in the **Dual Magnum Applied Alone** section of this label. Apply Gramoxone Inteon + Butyrac 200 or Butoxone 200 with the appropriate Dual Magnum rate from the **Peanuts – Dual Magnum Alone** section in a minimum spray volume of 20 gals./A with ground equipment. A second application of Dual Magnum + Gramoxone Inteon + Butyrac 200 or Butoxone 200 may be made 28 days after ground cracking. (Refer to the **Peanuts – Dual Magnum Combinations – Multiple Applications** section of this label for geographical areas where multiple applications are recommended.) Refer to the Gramoxone Inteon, Butyrac 200 or Butoxone 200 labels and follow all directions, limitations, and restrictions.

TANK MIXTURE OR SEQUENTIALLY WITH BASAGRAN

Dual Magnum + Basagran applied at ground cracking or sequentially will control species on the Basagran label and provide residual control of species listed in the **Dual Magnum Applied Alone** section of this label. Apply 1.0-2.0 pts./A of Basagran in 20 gals./A, depending on weed species and stage of growth as specified on the Basagran label, with the appropriate Dual Magnum rate from the **Peanuts – Dual Magnum Alone** section. A second application of the combination may be made before peanut pegging. (Refer to the **Peanuts – Dual Magnum Combinations – Multiple Applications** section of this label for geographical areas where multiple applications are recommended.) A second Basagran application may be made in all peanut growing areas, if needed. Refer to the respective labels and follow all directions, limitations, and restrictions for each product.

TANK MIXTURE OR SEQUENTIALLY WITH BASAGRAN + BUTYRAC 200 OR BUTOXONE 200

Dual Magnum + Basagran + Butyrac 200 or Butoxone 200 applied at ground cracking or sequentially will control species on the Basagran label and on the Butyrac or Butoxone labels, especially morningglories. Apply 1.5-2.0 pts./A of Basagran + 8.0 fl. oz./A of Butyrac 200 or Butoxone 200 in 20 gals./A, depending on weed species and stage of growth as specified on the Basagran label, with the appropriate Dual Magnum rate from the **Peanuts – Dual Magnum Alone** section. A second application of the combination may be made before peanut pegging. (Refer to the **Peanuts – Dual Magnum Combinations – Multiple Applications** section of this label for geographical areas where multiple applications are recommended.) A second Basagran + Butyrac 200 or Butoxone 200 application may be made in all peanut growing areas, if needed. Refer to the respective labels and follow all directions, limitations, and restrictions for each product.

TANK MIXTURE OR SEQUENTIALLY WITH STORM®

Dual Magnum + Storm applied at ground cracking through 2 expanded tetrafoliate leaves or Dual Magnum applied according to the directions for **Dual Magnum Alone** and followed with an at-cracking through postemergence treatment of Storm as specified on its label will control species on the Storm label and provide residual control of species listed in the **Dual Magnum Applied Alone** section of this label. Dual Magnum will not control emerged weeds. Refer to the **Peanuts – Dual Magnum Alone** section and to the Storm label and follow all directions, limitations, and restrictions for each product.

BEANS, PEAS, AND LENTILS – DUAL MAGNUM ALONE

Beans, peas, and lentils, including garbanzo, great northern beans, kidney beans, lima beans, mung beans, navy beans, peas (English*; southern peas, such as blackeye, pinkeye, crowder, etc.), pinto beans, snap beans (green, wax, string), lentils, and lupines (sweet, white, white sweet, and grain).

Fall Application:

- Apply after September 30 in ND, SD, MN, WI, and north of Route 30 in IA.
- Apply after October 15 north of Route 91 in NE and south of Route 30 in IA.
- Apply after October 31 north of Route 136 in IL.

In all locations, apply to crop stubble after harvest when the sustained soil temperature at a 4-inch depth is less than 55°F and falling. In minimum-till or no-tillage systems on soils having greater than 2.5% organic matter, use 1.67-2.0 pts./A on *medium-textured* and 2.0 pts./A on *fine-textured soils*. Do not apply to frozen ground. A tillage operation may precede the application. A fall and/or a spring tillage may follow application, but do not exceed an incorporation depth greater than 2-3 inches. Minimize furrow and ridge formation in the tillage operations. **Note:** If a spring application is made, the total rate of the fall plus spring applications must not exceed the maximum total rate for beans, peas, and lentils, or illegal residues may result.

Spring Application:

Apply Dual Magnum, either preplant incorporated or preemergence, using the appropriate rate specified below. **Preplant Incorporated or Preemergence:** Follow instructions for use of Dual Magnum alone under **Application Procedures**. On *coarse soils* with less than 3% organic matter, apply 1.0-1.33 pts./A of Dual Magnum or 1.33 pts./A if organic matter is 3% or greater. On *medium soils*, apply 1.33-1.67 pts./A of Dual Magnum. On *fine soils*, apply 1.33-1.67 pts./A of Dual Magnum if organic matter content is less than 3%, or 1.67-2.0 pts./A if organic matter content is 3% or greater.

*On English peas, use only preemergence applications. If soils are cold and wet during pea germination and emergence, the use of Dual Magnum may delay maturity and/or reduce yields.

Notes: To avoid possible illegal residues, (1) Do not cut for hay within 120 days following a Dual Magnum application, (2) Do not use for forage within 60 days following a Dual II Magnum application, and (3) Do not apply more than 2.0 pts./A of Dual Magnum during any one crop year.

BEANS, PEAS, AND LENTILS – DUAL MAGNUM COMBINATIONS

Note: When applying Dual Magnum in combination on beans, peas, and lentils, do not cut for hay within 120 days following application, or illegal residues may result.

TANK MIXTURE AND SEQUENTIAL APPLICATIONS WITH EPTAM – BEANS (GREEN OR DRY)

This mixture controls all weeds controlled by Dual Magnum alone and by Eptam alone. Refer to the **Dual Magnum Applied Alone** section of this label for weeds controlled by Dual Magnum alone and to the Eptam label for weeds controlled by Eptam.

Preplant Incorporated: Follow instructions for use of Dual Magnum alone under **Application Procedures**. **Sequential:** Apply Eptam alone preplant incorporated, as specified on that label. Follow with a preemergence application of Dual Magnum, at rates specified for Dual Magnum alone, during planting (behind the planter) or after planting, but before the weeds or crop emerge.

Refer to the **Product Information** section of this label and to the Eptam label for weather, cultural practices, and all other precautions and limitations that affect performance of these products.

Apply 2.5-4.5 pts./A of Eptam 7E* with Dual Magnum as specified. On *coarse soils*, apply 0.8 pt./A of Dual Magnum if organic matter content is less than 3%, or 1.0 pt./A if organic matter content is 3% or greater. On *medium soils*, apply 1.0 pt./A of Dual Magnum if organic matter content is less than 3%, or 1.33 pts./A if organic matter content is 3% or greater. On *fine soils*, apply 1.33 pts./A of Dual Magnum if organic matter is less than 3%, or 1.33-1.67 pts./A if organic matter is 3% or greater.

*Refer to the Eptam label for rate limitations depending on geographical area, and for species and varietal restrictions.

Precaution: Do not exceed 3.5 pts./A of Eptam 7E on small white beans or green beans grown on coarse-textured soils.

TANK MIXTURE WITH TREFLAN – BEANS (DRY – KIDNEY, NAVY, PINTO, ETC.; LIMA; AND SNAP)

Dual Magnum + Treflan tank mix applied preplant incorporated controls those weeds listed under **Dual Magnum Applied Alone** and those weeds listed for Treflan alone on the Treflan label. Dual Magnum + Treflan may be applied by ground or by aerial equipment and incorporated up to 14 days prior to planting. Follow the recommended procedures on this label and on the respective Treflan label, using equipment that provides uniform 2-inch incorporation.

Apply Dual Magnum + Treflan tank mix using the appropriate Dual Magnum rate specified for Dual Magnum alone, and the Treflan rate from the Dry Beans, and the Lima and Snap Beans sections of the respective Treflan label. Choose the product rate for the specific soil texture/organic matter classification and weed species expected.

Note: Follow all restrictions and precautions on the respective Treflan label and in the **Beans, Peas, and Lentils – Dual Magnum Alone** section of this label.

POTATOES – DUAL MAGNUM ALONE

Apply Dual Magnum, either incorporated, preemergence, or postemergence to potatoes after hilling/lay-by, according to directions specified below for control of weeds listed under the **Product Information** section. Within a rate range, use the lower rate on soils relatively coarse-textured or low in organic matter; use the higher rate on soils relatively fine-textured or high in organic matter. Effectiveness will be reduced if later cultural practices expose untreated soil. For applications by center pivot irrigation, see the **Center Pivot Irrigation Application** section of this label.

Incorporated: Apply Dual Magnum at 1.0-2.0 pts./A to the soil and incorporate into the top 3 inches before planting, using a finishing disk, harrow, rolling cultivator, or similar implement. Planting and later cultural practices should not bring untreated soil to the surface. Postplant incorporated application may be made any time after planting to drag-off, but before potato emergence. Use an implement that evenly distributes Dual Magnum in the top 2 inches of soil. Do not damage potato seed pieces or sprouts with incorporation equipment.

Preemergence: Apply Dual Magnum at 1.0-2.0 pts./A, either after planting as a preemergence, delayed preemergence, after drag-off or hilling treatment, but before weeds emerge. Up to 2.6 pts./A of Dual Magnum alone may be used where soil organic matter is between 6% and 20%.

Postemergence After Hilling/Lay-by: Apply 1.67 pts./A of Dual Magnum postemergence to potatoes through after hilling/at lay-by to control Dual Magnum-sensitive species for remainder of the growing season. This application will not control emerged weeds. It may be applied over a previous Dual Magnum application, but do not apply more than 3.6 pts./A of Dual Magnum in a single crop season.

Precautions: (1) Do not use on muck or peat soils. If cool, wet soil conditions occur after application, Dual Magnum may delay maturity and/or reduce yield of Superior and other early maturing potato varieties. (2) These directions for use do not apply to sweet potatoes or yams. (3) Do not apply both as a preemergence and an incorporated treatment.

Note: Potatoes treated with Dual Magnum should not be harvested within 60 days after the at-planting to drag-off application, or within 40 days after a lay-by application, or illegal residues may result.

POTATOES – DUAL MAGNUM COMBINATIONS

TANK MIXTURE WITH SENCOR

In addition to those weeds controlled by Dual Magnum alone, Dual Magnum applied in tank mix combination with, or sequentially with, any of the registered Sencor formulations, also controls the following broadleaf weeds: cocklebur*, hairy nightshade*, hemp sesbania, jimsonweed*, lambsquarters, prickly sida, ragweed, smartweed, velvetleaf, Venice mallow, and wild mustard.

*Partially controlled.

Dual Magnum at 1.0-2.0 pts./A plus the labeled Sencor use rate may be used preemergence or postemergence to potatoes through after last hilling. Apply 1.0-1.33 pts./A of Dual Magnum on *coarse soils* and 1.33-2.0 pts./A on other soil textures. Within this rate range, use the lower rate on soils relatively coarse-textured or low in organic matter; use the higher rate on soils relatively fine-textured or high in organic matter. Effectiveness will be reduced if later cultural practices expose untreated soil. Dual Magnum will not control emerged weeds.

Refer to the Sencor label for precautionary statements, restrictions, application information, center pivot irrigation application, weeds controlled, and varietal limitations.

Precautions: (1) Postemergence applications to potatoes except center pivot should be made only as a directed or semi-directed spray to avoid chlorosis, minor necrosis, or leaf distortion. (2) These directions for use do not apply to sweet potatoes or yams. (3) Do not use this tank mixture on muck or peat soils.

Notes: (1) Potatoes treated with Dual Magnum in tank mixture with Sencor cannot be harvested within 60 days after application, or illegal residues may result. (2) Potatoes may not be harvested within 40 days after a lay-by application of Dual Magnum, or illegal residues may result.

DUAL MAGNUM + LOROX TANK MIXTURE (EAST OF ROCKY MOUNTAINS)

Dual Magnum may be applied in a tank mix combination with any of the registered Lorox formulations as a preemergence broadcast application to potatoes. Apply to the soil surface after planting and before emergence of the crop or after final drag-off according to the rates specified in Table 9.

Table 9: Dual Magnum + Lorox – Potatoes (East of Rocky Mountains)

	Broadcast Rates Per Acre			
	1% to Less Than 3% Organic Matter		3-5% Organic Matter	
Soil Texture	**Dual Magnum**	**Lorox***	**Dual Magnum**	**Lorox***
COARSE Sandy loam	1.0 pt.	1.0-1.5 lbs.	1.33 pts.	1.5-2.0 lbs.
MEDIUM Loam, silt loam, silt	1.33 pts.	1.5-2.0 lbs.	1.67-2.0 pts.	2.0-2.5 lbs.

***When using Lorox L or Lorox DF, use equivalent rates. One pt. of Lorox L equals 1.0 lb. of Lorox DF.

Precautions: To avoid crop injury, (1) Do not use on sands or loamy sands. (2) Do not incorporate or spray over the top of emerged potatoes.

Refer to the **Product Information** section of this label and to the Lorox label for precautionary statements, restrictions, application information, and weeds controlled.

TANK MIXTURE WITH PROWL 4E

In addition to the weeds controlled by Dual Magnum alone, this tank mixture with Prowl 4E controls such problem species as kochia, lambsquarters, purslane, annual spurge, stinging nettle, and others specified on the Prowl 4E Alone label. Apply Dual Magnum + Prowl 4E preemergence, preemergence incorporated, or early postemergence according to the specific directions on the Prowl 4E label, using the rates in Table 10.

Table 10: Dual Magnum + Prowl 4E – Potatoes

	Broadcast Rates Per Acre	
	Less Than 3% Organic Matter	More Than 3% Organic Matter
Soil Texture	**Dual Magnum + Prowl 4E***	**Dual Magnum + Prowl 4E***
COARSE	1.0-1.33 pts. + 1.0-1.5 pts.	1.0-1.33 pts. + 1.0-1.5 pts.
MEDIUM	1.33 pts. + 1.5-2.0 pts.	1.33-1.67 pts. + 2.0-3.0 pts.
FINE	1.33-1.67 pts. + 2.0-3.0 pts.	1.67-2.0 pts. + 3.0 pts.

***When using other formulations of Prowl, use equivalent rates of active ingredient.**

Refer to the Dual Magnum and Prowl 4E labels and observe all directions, timings, limitations, precautions, and restrictions concerning the use of these products on potatoes and follow the most restrictive.

TANK MIXTURE WITH PROWL 4E + EPTAM

In addition to the weeds controlled by Dual Magnum alone, this tank mixture will control those species on the Prowl 4E and Eptam labels. Refer to the Dual Magnum + Prowl 4E labels for rates of those products and add Eptam 7E at 3.5-7.0 pts./A, depending on geographical area. Refer to the respective Dual Magnum, Prowl 4E, and Eptam labels and observe all directions, limitations, precautions, and restrictions concerning the use of these products on potatoes and follow the most restrictive.

PUMPKIN – DUAL MAGNUM ALONE

Preemergence

Apply Dual Magnum preemergence (before the weeds have emerged) at 1.0 to 1.33 pint/A as an inter-row or inter-hill application in pumpkin. Leave 1 foot of untreated area over the row, or 6 inches to each side of the planted hill and/or any emerged pumpkin foliage (inter-row or inter-hill means not directly over the planted seed or young pumpkin plants). Use the lower Dual Magnum rate on soils light in texture (loamy sand or lighter) and low in soil organic matter (less than 3%). Dual Magnum applied as a broadcast spray over the planted row or hill, or applications made directly to crop foliage will increase the risk of injury to the pumpkin crop such as stand loss, delayed maturity, and loss of yield. Do not apply Dual Magnum closer than 30 days before pumpkin harvest.

Dual Magnum will not control emerged weeds, and thus should be applied before the weeds emerge. Weeds that are present should be controlled by another means, e.g., by mechanical means or by another herbicide.

RHUBARB

Apply Dual Magnum at a broadcast rate of 0.67-1.33 pt./A to the soil surface in early spring, prior to crop emergence. Use lower rates on soils relatively coarse-textured and higher rates on fine-textured soils. A band application may also be used, applying proportionally less spray mixture on the area actually treated. Dual Magnum will not control emerged weeds. Control emerged weeds with an appropriate registered foliar herbicide or by mechanical or physical means.

Restrictions: (1) Make only one application of Dual Magnum per crop. (2) Do not apply more than 1.33 pt./A of Dual Magnum per crop. (3) Do not harvest rhubarb within 62 days of the Dual Magnum application.

SAFFLOWERS – DUAL MAGNUM ALONE

Preplant Incorporated or Preemergence: Follow instructions for use of Dual Magnum alone under **Application Procedures**.

On *coarse soils*, apply 1.0-1.33 pts./A of Dual Magnum if organic matter content is less than 3%, or 1.33 pts./A if organic matter is 3% or greater. On *medium soils*, apply 1.33-1.67 pts./A of Dual Magnum. On *fine soils*, apply 1.33-1.67 pts./A of Dual Magnum if organic matter content is less than 3%, or 1.67-2.0 pts./A if organic matter content is 3% or greater.

GRAIN OR FORAGE SORGHUM (SEED TREATED WITH CONCEP®) – DUAL MAGNUM ALONE

Apply Dual Magnum preplant surface, preplant incorporated, preemergence or postemergence using the appropriate rate specified below. Apply Dual Magnum alone only when the sorghum seed has been properly treated with Concep seed treatment. Preplant or preemergence applications of Dual Magnum to sorghum not treated with Concep seed treatment will result in crop death.

Fall Application for Italian Ryegrass Control: Dual Magnum may be applied for residual control of glyphosate-resistant Italian ryegrass (*Lolium multiflorum*). Apply Dual Magnum at 1.33-1.67 pints/Acre in the fall (September 1-December 1) after harvest of the previous crop and prior to Italian ryegrass emergence. Use the lower Dual Magnum rate for coarse-textured soils and the higher rate for fine-textured soils. A tillage operation may precede the application. Do not incorporate to a depth greater than 2-3 inches if tillage follows the application of Dual Magnum. For fall applications after emergence of glyphosate-resistant Italian ryegrass, Gramoxone Inteon can be tank mixed with Dual Magnum to control emerged ryegrass. Refer to the Gramoxone Inteon label for specific rates, application instructions and restrictions. Other registered herbicides may be tank mixed with Dual Magnum for control or improved control of other weeds present at the time of application. *Precautions: (1) Do not apply Dual Magnum to frozen ground. (2) If a spring application is made, do not apply Dual Magnum or any other product containing S-metolachlor the following spring to grain or forage sorghum, or illegal residues may result.*

Preplant Surface-Applied: Refer to instructions for use of Dual Magnum under **Application Procedures** section on this label. For minimum-tillage or no-tillage systems only, Dual Magnum may be applied up to 45 days before planting in CO, IA, IL, KS, MO, NE, and SD. Use only split applications for treatments made 30-45 days prior to planting, with $^{2}/_{3}$ of the broadcast rate applied initially and the remaining $^{1}/_{3}$ at planting. Apply 1.5 pts./A of Dual Magnum on *medium soils* or 1.67 pts./A on *fine soils*. Treatments less than 30 days prior to planting may be made either as a split or single application. Apply 1.33 pts./A of Dual Magnum on *coarse soils* not more than 2 weeks prior to planting. Under dry conditions, irrigation after application is recommended to move Dual Magnum into the soil.

Preplant Incorporated or Preemergence: Refer to instructions for use of Dual Magnum under **Application Procedures** section on this label. Broadcast 1.0-1.33 pts./A of Dual Magnum on *coarse soils*, 1.33-1.5 pts./A on *medium soils*, or 1.33-1.67 pts./A on *fine soils*.

Postemergence: Refer to instructions for use of Dual Magnum under **Application Procedures** section on this label. Dual Magnum may be applied broadcast postemergence at 1.0-1.33 pt./A on *coarse soils*, 1.33-1.5 pt./A on *medium soils*, or 1.33-1.67 pt./A on *fine soils*. Dual Magnum will not control emerged weeds. Therefore, emerged weeds must be controlled by cultural or chemical means. When applied alone, Dual Magnum will be safe to emerged sorghum. The risk of sorghum injury increases when adjuvants (e.g., non-ionic, crop oil), Nitrogen sources (e.g., AMS, UAN) or fertilizers are applied with Dual Magnum.

Precautions: (1) If sorghum seed is not properly treated with Concep seed treatment, preplant and preemergence applications of Dual Magnum will severely injure the crop. (2) Under high soil moisture conditions prior to sorghum emergence, injury may occur following preplant and preemergence application of Dual Magnum. The crop will normally outgrow this effect. (3) Do not use Dual Magnum on sorghum grown under dry mulch tillage, or injury may occur. (4) Except for the split preplant surface treatment, do not make more than one application per year, or illegal residues may result. (5) Do not apply Dual Magnum postemergence within 75 days of harvest.

GRAIN OR FORAGE SORGHUM (SEED TREATED WITH CONCEP) – DUAL MAGNUM TANK MIXTURES

Dual Magnum preplant or preemergence (prior to sorghum emergence) tank mixtures with AAtrex may be applied in water or fluid fertilizer. Apply Dual Magnum preplant or preemergence tank mixtures only when the sorghum seed has been properly treated with Concep seed treatment. Preplant or preemeergence applications of Dual Magnum to sorghum not treated with Concep seed treatment will result in crop death.

IMPORTANT: FOR TANK MIXTURES WITH AATREX (OR OTHER BRANDS OF ATRAZINE) – If applying Dual Magnum in tank mixture with AAtrex, all the restrictions and rate limitations on the AAtrex label must be followed if more restrictive/protective than those on this label. In addition, if AAtrex is/must be applied at rates lower than those recommended on this label, broadleaf weed control may be affected. Refer to the AAtrex label for weeds controlled at the reduced rates.

Precautions: (1) Applications of Dual Magnum + AAtrex on highly alkaline soils or on eroded areas where calcareous subsoils are exposed may cause sorghum injury. (2) If sorghum seed is not properly treated with Concep, preplant and preemerence applications of Dual Magnum + AAtrex may severely injure the crop. (3) Under high soil moisture conditions prior to sorghum emergence, injury may occur following the use of preplant and preemergence applications of Dual Magnum + AAtrex. The crop will normally outgrow this effect. (4) Do not use Dual Magnum + AAtrex on sorghum grown under dry mulch tillage, or injury may occur. (5) Except for the split preplant surface treatment, do not make more than one application per year, or illegal residues may result.

TANK MIXTURE WITH AATREX

In addition to the weeds controlled by Dual Magnum alone, Dual Magnum + AAtrex also controls the following broadleaf weeds when applied either preplant surface, preplant incorporated, or preemergence: cocklebur, common purslane, hairy nightshade, lambsquarters, morningglory, ragweed, smartweed, and velvetleaf.

Preplant Surface-Applied: Refer to instructions for use of Dual Magnum under **Application Procedures** on this label. For minimum-tillage or no-tillage systems only, Dual Magnum + AAtrex may be applied up to 45 days prior to planting in IA, IL, eastern KS, MO, NE, and SD. Use only split applications for treatments made 30-45 days prior to planting, with 2/3 of the broadcast rate applied initially and the remaining 1/3 at planting. Apply 1.5 pts./A of Dual Magnum + 1.7-2.0 lbs./A of AAtrex Nine-O* on *medium soils* with 1.5% organic matter or greater. Apply 1.5 pts./A of Dual Magnum + 1.7-2.0 lbs./A of AAtrex Nine-O on *fine soils* with less than 1.5% organic matter, or apply 1.67 pts./A of Dual Magnum + 2.0-2.2 lbs./A of AAtrex Nine-O on *fine soils* with 1.5% organic matter or greater. Treatments less than 30 days prior to planting may be made either as a split or single application. Under dry conditions, irrigation after application is recommended to move Dual Magnum + AAtrex into the soil.

Precautions: To avoid crop injury, (1) Do not use on coarse soils. (2) Do not use on medium soils with less than 1.5% organic matter.

Preplant Incorporated or Preemergence: Refer to instructions for use of Dual Magnum under **Application Procedures** on this label. On *medium soils* with 1.5% organic matter or greater, apply 1.0 pt./A of Dual Magnum + 1.3 lbs./A of AAtrex Nine-O*. On *fine soils* with less than 1.5% organic matter, apply 1.0 pt./A of Dual Magnum + 1.3 lbs./A of AAtrex Nine-O; on *fine soils* with 1.5% organic matter or greater, apply 1.2-1.33 pts./A of Dual Magnum + 1.6-1.8 lbs./A of AAtrex Nine-O.

*When using AAtrex 4L, use equivalent rates. One lb. of AAtrex Nine-O = 1.8 pts. of AAtrex 4L.

Precautions: To avoid crop injury, (1) Do not use on coarse soils; (2) Do not use on medium soils with less than 1.5% organic matter; (3) Do not use in NM, OK, or TX, except in northeast OK and the TX Gulf Coast and Blacklands areas; and (4) Do not apply preplant incorporated in AZ or the Imperial Valley of CA.

TANK MIXTURE OF DUAL MAGNUM OR DUAL MAGNUM + AATREX WITH GRAMOXONE INTEON, LANDMASTER BW, TOUCHDOWN BRANDS OR ROUNDUP BRANDS FOR MINIMUM-TILLAGE OR NO-TILLAGE SYSTEMS

In minimum-tillage or no-tillage systems where sorghum (seed treated with Concep) is planted directly into a cover crop, stale seedbed, established sod, or previous crop residues, the contact herbicides Gramoxone Inteon, Landmaster BW, Touchdown or Roundup may be tank mixed with Dual Magnum or Dual Magnum + AAtrex. See Comment No. 7 following Table 2. The Dual Magnum or Dual Magnum + AAtrex portion of the tank mixture provides preemergence control of the weeds listed on this label under the respective sections.

Refer to the label of each product used in combination and observe the planting details, restrictions, and all other precautions and limitations.

Application: Apply before, during, or after planting, but before sorghum emerges. Add Gramoxone Inteon, Landmaster BW, Touchdown brands or Roundup brands and apply as directed on the product labels.

Gramoxone Inteon: Apply as directed on the product label. This treatment will not control weeds taller than 6 inches.

Landmaster BW: 27-54 oz./A depending on weed species and size. See the Landmaster BW label for weeds controlled, recommended rates for specific weeds, and other information concerning use.

Touchdown Brands or Roundup Brands: See the Touchdown brand or Roundup brand label for weeds controlled, recommended rates, and other use directions.

SWEET SORGHUM (SEED TREATED WITH CONCEP)

Apply Dual Magnum, preplant surface, preplant incorporated, preemergence or postemergence using the appropriate rate specified below. Apply Dual Magnum only when the sweet sorghum seed has been properly treated with Concep seed treatment. Preplant or preemergence applications of Dual Magnum to sweet sorghum not treated with Concep seed treatment will result in crop death.

Soil-Applied: Dual Magnum may be applied up to 45 days before planting. Use only split applications for treatments made 30-45 days prior to planting, with 2/3 of the broadcast rate applied initially and the remaining 1/3 at planting. Treatments less than 30 days prior to planting may be made either as a split or single application. Under dry conditions, irrigation after application is recommended to move Dual Magnum into the soil.

Dual Magnum rates for soil applications to sweet sorghum

Soil Type	30-45 days prior to planting[1]	< 30 days prior to planting	At Planting[2]
Coarse	Not Recommended	1.33 pts	1.0 - 1.33 pts
Medium	1.5 pts	1.5 pts	1.33 - 1.5 pts
Fine	1.67 pts	1.67 pts	1.33 - 1.67 pts

[1]Use only as a split application with 2/3 of the broadcast rate applied initially and the remaining 1/3 applied at planting.
[2]Preplant Incorporated or preemergence

Post-Applied: Dual Magnum may be applied postemergence to sweet sorghum for residual control of grasses and small seeded broadleaf weeds. Postemergence application to sweet sorghum may be made to crop up to 5 inches in height. Dual Magnum will not control emerged weeds. Therefore, emerged weeds must be controlled by cultural or chemical methods. When applied alone, Dual Magnum will be safe to emerged sweet sorghum. Use of adjuvants is prohibited on sweet sorghum.

Dual Magnum rates for postemergence applications to sweet sorghum

Soil Type	Postemergence Rate
Coarse	1.0 – 1.33 pts
Medium	1.33 pts
Fine	1.33 pts

Precautions: (1) If sweet sorghum seed is not properly treated with Concep seed treatment, soil applications of Dual Magnum prior to sorghum emergence will severely injure the crop. (2) Under high soil moisture conditions prior to sweet sorghum emergence, injury may occur following soil applications of Dual Magnum. The crop will normally outgrow this effect. (3) Do not use Dual Magnum on sorghum grown under dry mulch tillage, or injury may occur. (4) Only one application per season is allowed. Dual Magnum may be applied either as a soil applied treatment or a postemergence treatment but not both. (5) Do not apply Dual Magnum postemergence within 90 days of harvest.

SOYBEANS – DUAL MAGNUM ALONE

Apply Dual Magnum, preplant surface-applied, preplant incorporated, preemergence, or postemergence using the appropriate rate specified below. Follow instructions for use of Dual Magnum alone under **Application Procedures** section of this label.

Fall Application for Spring Weed Control

- Apply after September 30 in ND, SD, MN, WI, and north of Route 30 in IA.
- Apply after October 15 north of Route 91 in NE and south of Route 30 in IA.
- Apply after October 31 north of Route 136 in IL.

In all locations, apply to crop stubble after harvest when the sustained soil temperature at a 4-inch depth is less than 55°F and falling. In minimum-till or no-tillage systems on soils having greater than 2.5% organic matter, use 1.67-2.0 pts./A of Dual Magnum on *medium-textured* and 2.0 pts./A of Dual Magnum on *fine-textured soils*. Do not apply to frozen ground. A tillage operation may precede the application. A fall and/or a spring tillage may follow application, but do not exceed an incorporation depth greater than 2-3 inches. Minimize furrow and ridge formation in the tillage operations. **Note:** If a spring application is made, the total rate of the fall plus spring applications must not exceed the maximum total rate for soybeans of 2.6 pts./A depending on soil texture, or illegal residues may result.

Fall Application for Italian Ryegrass Control: Dual Magnum may be applied for residual control of glyphosate-resistant Italian ryegrass (Lolium multiflorum). Apply Dual Magnum at 1.33-1.67 pints/Acre in the fall (September 1-December 1) after harvest of the previous crop and prior to Italian ryegrass emergence. Use the lower Dual Magnum rate for coarse-textured soils and the higher rate for fine-textured soils. A tillage operation may precede the application. Do not incorporate to a depth greater than 2-3 inches if tillage follows the application of Dual Magnum. For fall applications after emergence of glyphosate-resistant Italian ryegrass, Gramoxone Inteon can be tank mixed with Dual Magnum to control emerged ryegrass. Refer to the Gramoxone Inteon label for specific rates, application instructions and restrictions. Other registered herbicides may be tank mixed with Dual Magnum for control or improved control of other weeds present at the time of application. *Precautions: (1) Do not apply Dual Magnum to frozen ground. (2) If a spring application is made, the combined total amount of Dual Magnum applied in the fall plus the spring must not exceed the maximum seasonal S-metolachlor rate for soybeans (2.6 pt/A, depending on soil texture), or illegal residues may result.*

Preplant Surface – Spring Applied: Use on *medium* and *fine soils* with minimum-tillage or no-tillage systems in CO, CT, DE, IA, IL, IN, KS, KY, MA, MD, ME, MI, MN, MO, MT, ND, NE, NH, NY, OH, PA, RI, SD, TN, VA, VT, WI, WV, and WY. Apply $^{2}/_{3}$ the recommended rate of Dual Magnum (1.67 pts./A on *medium soils* and 2.0 pts./A on *fine soils*) as a split treatment 30-45 days prior to planting and the remainder at planting. Applications made less than 30 days before planting may be as either a split or single treatment. Apply 1.33 pts./A of Dual Magnum on *coarse soils* not more than 2 weeks prior to planting.

Note: (1) On soybeans, Dual Magnum may be used up to 2.6 pts./A as a preplant surface treatment on soils having organic matter content between 6% and 20%. (2) The total Dual Magnum rate applied to soybeans during any one crop should not exceed 2.6 pts./A. (3) Do not graze or feed treated soybean forage, hay, or straw to livestock 30 days following treatment, or illegal residues may result.

Preplant Incorporated or Preemergence: On *coarse soils*, apply 1.0-1.33 pts./A of Dual Magnum if organic matter content is less than 3%, or 1.33 pts./A if organic matter content is 3% or greater. On *medium soils*, apply 1.33-1.67 pts./A of Dual Magnum. On *fine soils*, apply 1.33-1.67 pts./A of Dual Magnum if organic matter content is less than 3%, or 1.67-2.0 pts./A if organic matter content is 3% or greater.

Note: (1) On soybeans, Dual Magnum may be used up to 2.6 pts./A as a preplant incorporated or preemergence treatment on soils having an organic matter content between 6% and 20%. (2) The total Dual Magnum rate applied to soybeans during any one crop should not exceed 2.6 pts./A. (3) Do not graze or feed treated soybean forage, hay, or straw to livestock 30 days following treatment, or illegal residues may result.

Postemergence: Apply 1.0-1.33 pts./A of Dual Magnum as a postemergence treatment to soybeans from emergence up through the third trifoliate leaf stage. Dual Magnum will not control emerged weeds so it must be applied to a weed-free soil surface or in a tank mixture with products that provide postemergence control of weeds present at the time of application.

Dual Magnum can also be applied as part of a sequential soybean weed control program. If Dual Magnum was applied as a preplant surface, preplant incorporated, or a preemergence treatment, a second treatment of Dual Magnum can be applied postemergence provided that the total Dual Magnum rate during any one crop does not exceed 2.6 pt./A.

Note: (1) Do not apply more than 1.33 pts./A of Dual Magnum postemergence to soybeans. (2) The total Dual Magnum rate applied preplant, preemergence or postemergence to soybeans during any one crop should not exceed 2.6 pt./A (2.5 lb. a.i./A of *S*-metolachlor). (3) Make postemergence applications at least 90 days before harvest. (4) Do not graze or feed treated forage or hay from soybeans to livestock following a postemergence application of Dual Magnum.

SOYBEANS – DUAL MAGNUM COMBINATIONS

Water or fluid fertilizer may be used as carrier for Dual Magnum in combination with Sencor, Lorox, Canopy, Pursuit, Scepter, Sonalan, or Command.

Note: For all of the following combinations, Dual Magnum may be used up to 2.33 pts./A on soils having an organic matter content between 6% and 20%. The total Dual Magnum rate applied to soybeans during any one crop year should not exceed 2.6 pts./A.

TANK MIXTURE WITH SENCOR

In addition to those weeds controlled by Dual Magnum alone, Dual Magnum + Sencor, when applied as directed, also controls the following broadleaf weeds: cocklebur*, hairy nightshade, hemp sesbania, jimsonweed*, lambsquarters, prickly sida, ragweed, smartweed, velvetleaf, Venice mallow, and wild mustard.

*Partially controlled.

Apply Dual Magnum and Sencor preplant incorporated or preemergence, using the appropriate rates from Table 11. **Preplant Incorporated or Preemergence:** Follow instructions for use of Dual Magnum alone under **Application Procedures**.

Sequential: Apply Dual Magnum alone **Preplant Incorporated**, as specified in Table 11 for this tank mixture. Follow with a preemergence application of Sencor during planting (behind the planter) or after planting, but before weeds or soybeans emerge.

Refer to the Sencor label for planting details and soybean variety restrictions.

Table 11: Dual Magnum + Sencor – Soybeans

	Broadcast Rates Per Acre					
	0.5% to Less Than 3% Organic Matter			3% Organic Matter or Greater		
Soil Texture**	**Dual Magnum**	**+**	**Sencor DF***	**Dual Magnum**	**+**	**Sencor DF***
COARSE Loamy sand (over 2% organic matter), sandy loam	0.8-1.0 pt.	+	0.33 lb.	1.0 pt.	+	0.5 lb.
MEDIUM	1.0-1.33 pts.	+	0.5 lb.	1.33 pts.	+	0.67 lb.***
FINE	1.33 pts.	+	0.67 lb.	1.33-1.67 pts.	+	0.67 lb.
Mississippi Delta only Silty clay, clay	1.33 pts.	+	1.0 lb.	1.33-1.67 pts.	+	1.0 lb.
Muck or Peat (soils with more than 20% organic matter)	DO NOT USE					

*When using Sencor 4, multiply lbs. of DF by 1.5 to get pts./A.

**On all sand and on loamy sand with less than 2% organic matter, do not use this tank mixture preemergence, or the sequential treatment. Do not use the tank mixture preplant incorporated on any sand, loamy sand, or sandy loam, or crop injury may occur.

***Use 0.5 lb./A if applied preplant incorporated.

Precautions: (1) Do not use the tank mix or sequential application on soil with less than 0.5% organic matter or on alkaline soil with a pH over 7.4, or crop injury may occur. (2) If heavy rain occurs soon after application, crop injury may result, especially in poorly drained areas where water stands for several days.

Note: Follow most restrictive limitations and precautions on the **Dual Magnum – Soybeans Alone** section of the Dual Magnum label and the Soybean directions on the Sencor label.

TANK MIXTURE WITH LOROX

In addition to those weeds controlled by Dual Magnum alone, Dual Magnum + Lorox, applied preemergence, also controls the following broadleaf weeds: cocklebur*, jimsonweed*, lambsquarters, morningglory*, prickly sida, ragweed, smartweed, velvetleaf*, Venice mallow, and wild mustard.

*Partially controlled.

Preemergence: Apply during planting (behind planter) or after planting, but before weeds or soybeans emerge. Refer to the Lorox label for planting details. Apply the appropriate rates from Table 12.

Precaution: Do not use on soil with less than 0.5% organic matter, or crop injury may occur.

Table 12: Dual Magnum + Lorox – Soybeans

	Broadcast Rates Per Acre					
	0.5% to Less Than 3% Organic Matter			3% Organic Matter or Greater		
Soil Texture*	**Dual Magnum**	**+**	**Lorox DF*** **	**Dual Magnum**	**+**	**Lorox DF*** **
COARSE**	0.8 pt.	+	1.0 lb.	1.0 pt.	+	1.0-1.5 lbs.
MEDIUM	1.0 pt.	+	1.0-1.5 lbs.	1.33 pts.	+	1.5-2.0 lbs.
FINE	1.33 pts.	+	2.0 lbs.	1.33-1.67 pts.	+	2.5-3.0 lbs.
Muck or Peat (soils with more than 20% organic matter)	DO NOT USE					

*Do not use on sand, gravelly soils, or exposed subsoils.

**Do not use on loamy sand, except in the northeastern U.S. on loamy sand with over 1% organic matter.

***When using Lorox L or Lorox DF, use equivalent rates. One pt. of Lorox L equals 1.0 lb. of Lorox DF.

Note: Follow the most restrictive limitations and precautions on the **Dual Magnum – Soybeans Alone** section of the Dual Magnum label and the Soybean directions on the Lorox labels.

TANK MIXTURE WITH TREFLAN

Dual Magnum + Treflan tank mix applied preplant incorporated controls those weeds listed under the **Dual Magnum Applied Alone** section and those weeds listed for Treflan Alone on the Treflan label. Dual Magnum + Treflan may be applied by ground or by aerial equipment and incorporated up to 14 days before planting. Follow the recommended procedures on the Treflan and Dual Magnum labels, using equipment that provides uniform 2-inch incorporation.

Apply Dual Magnum + Treflan tank mix using the appropriate rate from the **Soybeans – Dual Magnum Alone** section of this label and the Treflan Alone section of the Treflan label for the specific soil texture/organic matter classification and weed species expected.

To control DNA-resistant goosegrass* and other species on the respective labels where the soil organic matter is 3% or less, apply the rate in Table 13.

Table 13: Dual Magnum + Treflan – Organic Matter Content Less Than 3%

Soil Texture	Broadcast Rates Per Acre		
	Dual Magnum	Treflan E.C.**	
	Organic Matter Less Than 3%	Organic Matter	
		Less Than 2%	2-3%
COARSE*	0.8-1.0 pt.	1.0 pt.	1.5 pts.
MEDIUM	1.0 pt.	1.5 pts.	1.5 pts.
FINE	1.33 pts.	2.0 pts.	2.0 pts.

***Where a range of rates is given for Dual Magnum, use the minimum rate where DNA-resistant goosegrass is the predominant species.

****When Treflan MTF or Treflan 5 is used, use comparable rates. Multiply pts. of Treflan E.C. by 1 for Treflan MTF and by 0.8 for Treflan 5.

Note: Follow the most restrictive limitations and precautions on the **Dual Magnum – Soybeans Alone** section of the Dual Magnum label and the Soybean directions on the Treflan labels.

TANK MIXTURE WITH SCEPTER

This tank mixture controls all weeds controlled by Dual Magnum alone and by Scepter alone. Refer to the **Dual Magnum Applied Alone** section for weeds controlled by Dual Magnum and to the Scepter label for weeds controlled by Scepter. Refer to the Scepter label for geographical locations where this tank mixture may be applied.

Apply Dual Magnum + Scepter preplant incorporated or preemergence, using rates in Table 14. Follow use directions under **Application Instructions** on the Scepter label. For preplant incorporated applications, apply and incorporate within 30 days before planting. Observe all other precautions and limitations on the Scepter labels.

Table 14: Dual Magnum + Scepter – Soybeans

Soil Texture	Broadcast Rates Per Acre			
	Less Than 3% Organic Matter		3% or More Organic Matter	
	Dual Magnum	Scepter	Dual Magnum	Scepter
COARSE	0.8 pt.	0.67 pt.	1.0 pt.	0.67 pt.
MEDIUM	1.0 pt.	0.67 pt.	1.33 pts.	0.67 pt.
FINE	1.33 pts.	0.67 pt.	1.33-1.67* pts.	0.67 pt.
Muck or Peat (soils with more than 20% organic matter)	DO NOT USE			

***Use the higher rate of Dual Magnum if heavy weed infestations are expected.

Note: Follow the most restrictive limitations and precautions on the **Dual Magnum – Soybeans Alone** section of the Dual Magnum label and the Soybean directions on the Scepter labels.

TANK MIXTURE WITH CANOPY

This tank mixture controls all weeds controlled by Dual Magnum alone and by Canopy alone. Refer to the **Dual Magnum Applied Alone** section for weeds controlled by Dual Magnum and to the Canopy label for weeds controlled by Canopy.

Apply preplant incorporated or preemergence, using the appropriate rates from Table 15. **Preplant Incorporated:** Apply within 2 weeks of planting. Uniformly incorporate into the top 1-2 inches of soil before planting soybeans. **Preemergence:** Apply after planting, but before soybeans emerge.

Note: Follow the most restrictive limitations and precautions on the **Dual Magnum – Soybeans Alone** section of the Dual Magnum label and the Soybean directions on the Canopy labels including varietal restrictions.

Table 15: Dual Magnum + Canopy – Soybeans

	Broadcast Rates Per Acre		
	Less Than 3% Organic Matter	3% or More Organic Matter	
Soil Texture	**Dual Magnum**	**Dual Magnum**	**Canopy**
COARSE	0.8 pt.	1.0 pt.	*
MEDIUM	1.0 pt.	1.33 pts.	*
FINE	1.33 pts.	1.33-1.67 pts.	*

*Refer to the Canopy label for appropriate rate, according to geographical location, soil and organic matter classification, and pH limitations.

Precaution: Do not apply to sand, or to any soil with less than 0.5% organic matter, or to any soil with pH greater than 7.0, except as noted on the Canopy label.

TANK MIXTURE WITH COMMAND

This tank mixture controls all weeds controlled by Dual Magnum alone and by Command alone. Refer to the **Dual Magnum Applied Alone** section for weeds controlled by Dual Magnum and to the Command label for weeds controlled by Command.

Apply Dual Magnum + Command preplant incorporated, using rates in Table 16. Follow all Command application instructions as to incorporation interval, geographical location, equipment operation, soil moisture conditions, etc.

Note: Follow the most restrictive limitations and precautions on the **Dual Magnum – Soybeans Alone** section of the Dual Magnum label and the Soybean directions on the Command labels including rotational restrictions.

Table 16: Dual Magnum + Command – Soybeans

	Broadcast Rates Per Acre			
	Dual Magnum		Command 4E	
Soil Texture	0.5-3% Organic Matter	Greater Than 3% Organic Matter	Northern Area	Southern Area
COARSE	0.8 pt.	1.0 pt.	1.5-2.0 pts.	2.0-2.5 pts.
MEDIUM	1.0 pt.	1.33 pts.	1.5-2.0 pts.	2.0-2.5 pts.
FINE	1.33 pts.	1.33-1.67 pts.	1.5-2.0 pts.	2.0-2.5 pts.

TANK MIXTURE WITH SONALAN

This tank mixture controls all weeds controlled by Dual Magnum alone and by Sonalan alone. Refer to the **Dual Magnum Applied Alone** section for weeds controlled by Dual Magnum and to the Sonalan label for weeds controlled by Sonalan.

Apply Dual Magnum and Sonalan preplant incorporated, using the appropriate rates from Table 17.

Preplant Incorporated: Follow recommended soil preparation procedures for Sonalan.

Sequential: Apply Sonalan alone preplant incorporated as specified on the Sonalan label. Follow with a preemergence application of Dual Magnum during planting (behind the planter) or after planting, but before weeds or soybeans emerge.

Table 17: Dual Magnum + Sonalan – Soybeans

Soil Texture	Broadcast Rates Per Acre			
	Less Than 3% Organic Matter		3% or More Organic Matter	
	Dual Magnum	Sonalan	Dual Magnum	Sonalan
COARSE	1.0-1.33 pts.	1.25-2.0 pts.	1.33 pts.	1.25-2.0 pts.
MEDIUM*	1.33-1.67 pts.	1.75-2.5 pts.	1.33-1.67 pts.	1.75-2.5 pts.
FINE*	1.33-1.67 pts.	2.25-3.0 pts.	1.67-2.0 pts.	2.25-3.0 pts.
Muck or Peat (soils with more than 20% organic matter)	DO NOT USE			

*For eastern black nightshade on these soils, apply Sonalan at 3.0 pts./A on *medium-* and 3.5 pts./A on *fine-textured soils*, and follow with 2 incorporation passes.

Note: Follow the most restrictive limitations and precautions on the **Dual Magnum – Soybeans Alone** section of the Dual Magnum label and the Soybean directions on the Sonalan labels.

TANK MIXTURE WITH PURSUIT

This tank mixture controls all weeds controlled by Dual Magnum alone and by Pursuit alone. Refer to the **Dual Magnum Applied Alone** section for weeds controlled by Dual Magnum and to the Pursuit label for weeds controlled by Pursuit. Refer to the Pursuit label for geographical locations where this tank mixture may be applied.

Apply Dual Magnum + Pursuit early preplant, preplant incorporated, or preemergence after planting, using rates in Table 18. Application can be made in water or liquid fertilizer. Follow all use directions under Soil Applications on the Pursuit label. For early preplant and preplant incorporated applications, apply within 30 days before planting.

Note: Follow the most restrictive limitations and precautions on the **Dual Magnum – Soybeans Alone** section of the Dual Magnum label and the Soybean directions on the Pursuit labels including rotational restrictions.

Table 18: Dual Magnum + Pursuit – Soybeans

	Broadcast Rates Per Acre		
	Less Than 3% Organic Matter	3% or More Organic Matter	Less Than 3% - 3% or More Organic Matter
Soil Texture	**Dual Magnum**	**Dual Magnum**	**Pursuit**
COARSE	0.8 pt.	1.0 pt.	0.25 pt.
MEDIUM	1.0 pt.	1.33 pts.	0.25 pt.
FINE	1.33 pts.	1.33-1.67 pts.	0.25 pt.

Sequential: Apply Dual Magnum early preplant, preplant incorporated, or preemergence after planting at 0.8 pt./A on *coarse soils* and 1.0 pt./A on *medium-* and *fine-textured soils*. Follow with a sequential postemergence application of Pursuit to control emerged weeds according to the Pursuit label. Dual Magnum will improve the consistency and level of control from Pursuit on most grass species. Refer to the Pursuit postemergence label for a listing of weeds controlled, application rate, and growth stage limitations.

TANK MIXTURE WITH SENCOR, SCEPTER, LOROX, CANOPY, OR PURSUIT, PLUS GRAMOXONE INTEON, TOUCHDOWN BRANDS OR ROUNDUP BRANDS FOR MINIMUM-TILLAGE OR NO-TILLAGE SYSTEMS

In minimum-tillage or no-tillage systems where soybeans are planted directly into a cover crop, stale seedbed, established sod, or previous crop residues, the contact herbicides Gramoxone Inteon, Touchdown brands or Roundup brands may be added to a tank mix of either Dual Magnum + Sencor, Dual Magnum + Scepter, Dual Magnum + Lorox, Dual Magnum + Canopy, or Dual Magnum + Pursuit. When used as directed, the Gramoxone Inteon portion of the tank mixture controls most emerged weeds and suppresses many perennial weeds. Touchdown or Roundup combinations will control emerged annual and perennial weeds when applied as directed on the Touchdown or Roundup label. The Dual Magnum + Sencor, Scepter, Lorox, Canopy, or Pursuit portion of the tank mixture provides preemergence control of the weeds listed on this label in the tank mixture section for Dual Magnum + Sencor, Dual Magnum + Scepter, Dual Magnum + Lorox, Dual Magnum + Canopy, and Dual Magnum + Pursuit, respectively.

Refer to the label of each product used in combination and observe the planting details, soybean variety restrictions, information regarding application to soybeans, geographical restrictions, and all other precautions and limitations.

Application: Apply before, during, or after planting, but before the soybeans emerge. Add Gramoxone Inteon, Touchdown brands or Roundup brands and apply as directed on the product labels.

Gramoxone Inteon: Apply as directed on the product label. This treatment will not control weeds taller than 6 inches.

Note: Do not apply combinations containing Gramoxone Inteon in suspension-type liquid fertilizers, as the activity of paraquat will be reduced.

Touchdown or Roundup: See the Touchdown brand or Roundup brand label for weeds controlled, recommended rates, and other use directions.

Apply in 20-60 gals. of water or fluid fertilizer per acre with ground equipment.

Dual Magnum + Sencor + Gramoxone Inteon, Touchdown Brands or Roundup Brands

On loamy sand with over 2% organic matter, apply 1.0 pt./A of Dual Magnum + 0.33-0.5 lb./A of Sencor DF. On *medium soils*, apply 1.33 pts./A of Dual Magnum + 0.5-0.67 lb./A of Sencor DF. On *fine soils*, apply 1.33-1.67 pts./A of Dual Magnum + 0.67 lb./A of Sencor DF.

*****When using Sencor 4, multiply lbs. of DF by 1.5 to get pts./A.

Precautions: To avoid crop injury, (1) Do not use this tank mixture on soil with less than 0.5% organic matter, on alkaline soil with a pH over 7.4, or on all sand and on loamy sand with less than 2% organic matter. (2) If heavy rain occurs soon after application, crop injury may result, especially in poorly drained areas where water stands for several days, or where the seeding slit has not been properly closed.

Dual Magnum + Scepter + Gramoxone Inteon, Touchdown Brands or Roundup Brands

On *coarse soils*, apply 1.0 pt./A of Dual Magnum + 0.67 pt./A of Scepter. On *medium soils*, apply 1.33 pts./A of Dual Magnum + 0.67 pt./A of Scepter. On *fine soils*, apply 1.67 pts./A of Dual Magnum + 0.67 pt./A of Scepter.

Note: (1) Do not apply within 90 days of harvest, and (2) Do not graze or feed treated soybean forage, hay, or straw to livestock, or illegal residues may result.

Dual Magnum + Lorox + Gramoxone Inteon, Touchdown Brands or Roundup Brands

On *coarse soils******, apply 1.0 pt./A of Dual Magnum + 1.0-1.5 lbs./A of Lorox DF******. On *medium soils*, apply 1.33 pts./A of Dual Magnum + 1.0-2.0 lbs./A of Lorox DF. On *fine soils*, apply 1.33-1.67 pts./A of Dual Magnum + 2.0-3.0 lbs./A of Lorox DF.

*****Do not use on loamy sand, except in the northeastern U.S. on loamy sand with over 1% organic matter, or injury may occur. Do not use on sand, gravelly soils, or exposed subsoils, or injury may occur.

******When using Lorox L or Lorox DF, use equivalent rates. One pt. of Lorox L equals 1.0 lb. of Lorox DF.

Precaution: Do not use on soil with less than 0.5% organic matter, or crop injury may occur.

Dual Magnum + Canopy + Gramoxone Inteon, Touchdown Brands or Roundup Brands

Use only where soils have 0.5-5% organic matter. On *coarse soils* (except sand), apply 1.0 pt./A of Dual Magnum, on *medium soils*, apply 1.33 pts./A of Dual Magnum, and on *fine soils*, apply 1.33-1.67 pts./A of Dual Magnum. Refer to the Canopy label for appropriate rate, according to geographical location, soil and organic matter classification, pH limitations, and all other use directions.

Precaution: Do not apply to sand, or to any soil with less than 0.5% organic matter, or to any soil with pH greater than 7.0, except as noted on the Canopy label.

Dual Magnum + Pursuit + Gramoxone Inteon, Touchdown Brands or Roundup Brands

On *coarse soils*, apply 1.0 pt./A of Dual Magnum + 0.25 pt./A of Pursuit. On *medium soils*, apply 1.33 pts./A of Dual Magnum + 0.25 pt./A of Pursuit. On *fine soils*, apply 1.67 pts./A of Dual Magnum + 0.25 pt./A of Pursuit.

POSTEMERGENCE USE ON SOYBEANS – DUAL MAGNUM TANK MIXTURES

Tank Mixture with Glyphosate Products (e.g., Touchdown Brands or Roundup Brands)

Dual Magnum at 1.0-1.33 pts./A may be tank mixed with glyphosate products at labeled rates and applied from emergence up through the third trifoliate leaf stage of Roundup Ready or glyphosate-tolerant soybeans. Dual Magnum alone will not control emerged weeds. Use this treatment only on soybeans designated for use with glyphosate (e.g., Roundup Ready or glyphosate-tolerant soybeans). The glyphosate product must be registered for postemergence use in Roundup Ready or glyphosate-tolerant soybeans.

Tank Mixture with Pursuit

Dual Magnum at 1.0-1.33 pts./A may be tank mixed with Pursuit at labeled rates and applied from emergence up through the third trifoliate leaf stage of soybeans. Dual Magnum alone will not control emerged weeds.

Tank Mixture with Liberty Herbicide or Ignite 280 SL

Dual Magnum at 1.0-1.33 pts./A may be tank mixed with Liberty Herbicide or Ignite 280 SL Herbicide at labeled rates and applied from emergence up through the third trifoliate leaf stage of soybeans. Dual Magnum alone will not control emerged weeds. Use this treatment only on soybeans designated for use with glufosinate (e.g., LibertyLink).

Note: Follow the tank mix product label for adjuvant recommendations. The use of COC or UAN with Dual Magnum may result in temporary crop injury. To avoid possible illegal residues when Dual Magnum is applied postemergence to soybeans: (1) Do not apply more than 1.33 pts./A postemergence. (2) Make postemergence applications at least 90 days before harvest. (3) Do not graze or feed treated forage or hay from soybeans to livestock following a postemergence application of Dual Magnum.

SUGAR BEETS – DUAL MAGNUM ALONE

Postemergence Applications

Dual Magnum may be applied postemergence to sugar beets after the sugar beets have reached the first true leaf stage. However, because Dual Magnum is primarily a soil-active herbicide, it must be applied prior to weed emergence in order to provide consistent control of listed weeds. As such, weeds that are emerged with or before the crop, or that are present at the time Dual Magnum is applied, must be controlled with another appropriately labeled herbicide. Apply Dual Magnum at 1 pt./A on *coarse soils*, 1.33 pts./A on *medium soils*, and 1.67 pts./A on *fine soils*. More than one postemergence application may be applied, but the total should not exceed 2.6 pts./A. Weeds present at the time of application will not be controlled.

Note: To avoid possible illegal residues: (1) Do not apply more than 2.67 pts./A postemergence. (2) Do not harvest within 60 days after the last application.

Precaution: In coarse soils, Dual Magnum applied before emergence of sugar beets (i.e., other than postemergence) may cause injury.

SUGAR BEETS – DUAL MAGNUM TANK MIX COMBINATIONS

Dual Magnum may tank mixed with Assure® II, Betamix®, Betanex®, Poast®, Progress®, Select®, Stinger™, or Upbeet® and applied to sugar beets. Tank mixtures of these products with Dual Magnum will increase the risk of crop injury over that of either product applied alone, as the Dual Magnum formulation has some adjuvant properties. The addition of a spray adjuvant such as crop oil concentrates (COC's) or methylated seed oils (MSO's) can further increase the risk of crop injury. Injury risk can be reduced by using the lowest effective rate of the tank mix partner(s) and/or adjuvant and by avoiding applications under adverse growing conditions or high soil or air humidity. Refer to the individual product labels and follow all use restrictions and limitations.

SUNFLOWERS – DUAL MAGNUM ALONE

Preplant Incorporated or Preemergence

Within the rate ranges given below. Use the higher rate of Dual Magnum if heavy weed infestations are expected. On *coarse soils* with organic matter of less than 3%, apply 1.0-1.33 pts./A of Dual Magnum; 1.33 pts./A if organic matter is 3% or greater. On *medium soils*, apply 1.33-1.67 pts./A of Dual Magnum. On *fine soils* with organic matter of less than 3%, apply 1.33-1.67 pts./A of Dual Magnum; 1.67-2.0 pts./A if organic matter content is 3% or greater.

Note: To avoid possible illegal residues: (1) Do not allow livestock to graze or feed in treated area. (2) Do not exceed the maximum label rates given above for sunflowers for the soil type.

TOMATOES – DUAL MAGNUM ALONE

Transplanted

Dual Magnum may be applied preplant incorporated or preplant before transplanting. If the latter method is used, keep soil disturbance to a minimum during the transplanting operation. Application may also be made post-directed to transplants after the first settling rain or irrigation. When an application is made post-directed, apply in a minimum of 20 gallons of water per acre and minimize contact with tomato plants. Dual Magnum will not control emerged weeds. In bedded transplanted tomatoes, apply Dual Magnum preplant non-incorporated to the top of the pressed bed, as the last step, prior to laying plastic. Dual Magnum may also be used to treat row-middles in bedded tomatoes, as long as the total amount of Dual Magnum does not exceed the maximum allowed per crop.

Seeded

Dual Magnum may be applied post-directed to direct seeded tomatoes. Tomato plants must be at least 4 inches tall at the time of application and the product must be applied in a minimum of 20 gallons of water per acre. Minimize spray contact with tomato plants. Dual Magnum will not control emerged weeds.

Tomato Use Rates: On *coarse soils*, apply 1.0-1.33 pts./A of Dual Magnum if organic matter content is less than 3% or 1.33 pts./A if organic matter is 3% or greater. On *medium soils*, apply 1.33-1.67 pts./A of Dual Magnum. On *fine soils*, apply 1.33-1.67 pts./A of Dual Magnum if organic matter content is less than 3% or 1.67-2.0 pts./A if organic matter content is 3% or greater.

Precautions: (1) Do not apply to varieties or cultivars with unknown tolerance to Dual Magnum. (2) Dual Magnum may damage transplants that have been weakened by any cause. To prevent damage, plant only healthy transplants. Do not plant when wet, cool, or unfavorable growing conditions exist. (3) In transplanted tomatoes, if Dual Magnum is applied preplant incorporated, incorporate to a depth less than the depth of transplanting, and use the lower end of the rate range for the given soil type, or damage may occur. (4) For row middle applications where tomatoes are grown on sandy soils and where high soil moisture conditions can exist (e.g., low binding and high evaporation conditions), as may be found in the States of Florida, Georgia, Maryland, and Virginia, there is potential for crop injury in the form of leaf epinasty. The risk of this type of injury can be reduced by: a) incorporating the Dual Magnum immediately following application, b) applying the Dual Magnum seven or more days before transplanting (but only after the beds have been formed), c) minimizing the application of Dual Magnum onto the plastic of the bed, or d) any combination of the above.

Note: To avoid possible illegal residues: (1) Do not exceed the maximum label rate for the soil texture per year. (2) Apply only by ground application.

Restrictions:

90 Day PHI - If the single application rate of Dual Magnum is greater than 1.33 pt./A (up to 2.0 pt./A) do not harvest tomatoes within 90 days of application.

30 Day PHI - If the application rate of Dual Magnum does not exceed 1.33 pt./A do not harvest tomatoes within 30 days of application.

When applying at 1.33 pt./A with a 30 day PHI, the following restrictions apply:

- **Do not exceed two applications per growing season.**
- **The use of adjuvants is prohibited.**
- **Applications may be made using ground equipment, in concentrated spray volumes.**
- **Applications may be made as a foliar broadcast spray to the soil within a week of transplanting and again at blooming/fruiting to the row middles as a banded/directed application 38-77 days after the first treatment.**

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

Pesticide Storage

This product may be stored at temperatures down to 30 degrees below 0°F.

Pesticide Disposal

Open dumping is prohibited. Wastes resulting from the use of this product are toxic. Improper disposal of unused pesticide, spray mixture, or rinsate is a violation of federal law. Pesticide, spray mixture, or rinsate that cannot be used according to label instructions must be disposed of according to federal, state, or local procedures. For guidance in proper disposal methods, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office.

Container Handling [less than 5 gallons]

Non-refillable container. Do not reuse or refill this container. Offer for recycling if available. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use and disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Container Handling [Bulk/Mini-Bulk]

Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

For minor spills, leaks, etc., follow all precautions indicated on this label and clean up immediately. Take special care to avoid contamination of equipment and facilities during cleanup procedures and disposal of wastes. In the event of a major spill, fire, or other emergency, call 1-800-888-8372, day or night.

AAtrex®, AAtrex Nine-O®, Beacon®, Bicep II Magnum®, Caparol®, Concep®, Dual Magnum®, Dual II Magnum®, Dual IIG Magnum®, Eptam®, Eradicane®, Evik®, Exceed®, Gramoxone Inteon®, Princep®, Princep® Caliber 90®, Touchdown®, the ALLIANCE FRAME the SYNGENTA Logo and the PURPOSE ICON are Trademarks of a Syngenta Group Company

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For non-emergency (e.g., current product information) call
Syngenta Crop Protection at 1-800-334-9481.

Manufactured for:
Syngenta Crop Protection, LLC
P. O. Box 18300
Greensboro, North Carolina 27419-8300

SCP 816A-L1U 1210
337398

Note: It is illegal to sell, use or distribute this product within, or into, Nassau County or Suffolk County, New York.

Dual Magnum®

Herbicide

For weed control in corn; cotton; grasses grown for seed; horseradish; peanuts; beans, peas, and lentils; potatoes; pumpkin; rhubarb; sugar beets; sunflowers; safflowers; sweet, grain or forage sorghum; soybean; soybean, immature seed; and tomatoes

Active Ingredient:
S-metolachlor
(CAS No. 87392-12-9) 83.7%

Other Ingredients:	16.3%
Total:	100.0%

Dual Magnum contains 7.62 lbs. of active ingredient per gallon.

See directions for use in attached booklet.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. Refer to supplemental labeling under "Agricultural Use Requirements" in the Directions for Use section for information about this standard.

EPA Reg. No. 100-816
EPA Est. 070989-IA-001

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Manufactured for:
Syngenta Crop Protection, LLC
P. O. Box 18300
Greensboro, North Carolina 27419-8300

SCP 816A-L1U 1210
337398

BAR CODE # IS
(01) 0 07 02941 53275
LAST DIGIT IS CHECK DIGIT
UCC/EAN 128

2.5 gallons

Net Contents

KEEP OUT OF REACH OF CHILDREN.

CAUTION

Precautionary Statements

Hazards to Humans and Domestic Animals

Causes moderate eye irritation. Harmful if swallowed or absorbed through skin. Avoid contact with eyes, skin, or clothing. May cause skin sensitization reactions in certain individuals.

FIRST AID

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

If swallowed: Call a poison control center or doctor immediately for treatment advice. Do not give any liquid to the person. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a Poison Control Center or doctor, or going for treatment.

HOT LINE NUMBER: For 24 Hour Medical Emergency Assistance (Human or Animal) or Chemical Emergency Assistance (Spill, Leak, Fire or Accident), Call **1-800-888-8372**.

Environmental Hazards: Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment wash water or rinsate.

Ground Water Advisory: The active ingredient in Dual Magnum has the potential to leach through soil into ground water under certain conditions as a result of agricultural use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination.

Surface Water Advisory: The active ingredient in Dual Magnum has the potential to contaminate surface water through ground spray drift. Under some conditions, the active ingredient may also have a high potential for runoff into surface water (primarily via dissolution in runoff water) for several months post-application. These include poorly draining or wet soils with readily visible slopes toward adjacent surface waters, frequently flooded areas, areas overlaying extremely shallow ground water, areas with in-field canals or ditches that drain to surface water, areas not separated from adjacent surface waters with vegetated filter strips, and areas overlaying tile drainage systems that drain to surface water.

Mixing/Loading Instructions: Care must be taken when using this product to prevent back-siphoning into wells, spills, or improper disposal of excess pesticide, spray mixtures, or rinsates.

Check-valves or antisiphoning devices must be used on all mixing and/or irrigation equipment.

This product may not be mixed or loaded within 50 ft. of perennial or intermittent streams and rivers, natural or impounded lakes and reservoirs. This product may not be mixed/loaded or used within 50 ft. of all wells, including abandoned wells, drainage wells, and sink holes.*

*For exceptions to this restriction, see the **Environmental Hazards** section of the **Precautionary Statements** in attached booklet.

Aerial Drift Management Requirements: Do not apply this product by air, unless the supplemental labeling on **Aerial Drift Management** in attached booklet is followed.

Chemigation: Refer to supplemental labeling in attached booklet for use directions for chemigation. Do not apply this product through any irrigation system, unless the supplemental labeling on chemigation is followed.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

Pesticide Storage: This product may be stored at temperatures down to 30 degrees below 0°F.

Pesticide Disposal: Open dumping is prohibited. Wastes resulting from the use of this product are toxic. Improper disposal of unused pesticide, spray mixture, or rinsate is a violation of federal law. Pesticide, spray mixture, or rinsate that cannot be used according to label instructions must be disposed of according to federal, state, or local procedures. For guidance in proper disposal methods, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office.

Container Handling: Non-refillable container. Do not reuse or refill this container. Offer for recycling if available. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use and disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.

For minor spills, leaks, etc., follow all precautions indicated on this label and clean up immediately. Take special care to avoid contamination of equipment and facilities during cleanup procedures and disposal of wastes. In the event of a major spill, fire, or other emergency, call 1-800-888-8372, day or night.

To be used in accordance with directions for use in Dual Magnum label booklet. See Dual Magnum label booklet for pesticide disposal instructions.

syngenta®

MATERIAL SAFETY DATA SHEET

Syngenta Crop Protection, Inc.
Post Office Box 18300
Greensboro, NC 27419

In Case of Emergency, Call
1-800-888-8372

1. PRODUCT IDENTIFICATION

Product Name: **DUAL MAGNUM** Product No.: A9793D

EPA Signal Word: Caution

Active Ingredient(%): s-Metolachlor (83.7%) CAS No.: 87392-12-9

Chemical Name: Acetamide, 2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl]-,(S)

Chemical Class: Chloroacetanilide Herbicide

EPA Registration Number(s): 100-816 **Section(s) Revised: 14**

2. HAZARDS IDENTIFICATION

Health and Environmental

Harmful if inhaled. May be harmful if swallowed or in contact with skin. Irritating to eyes and skin. May cause an allergic skin reaction. May cause drowsiness or dizziness. May be harmful if swallowed and enters airway.

Hazardous Decomposition Products

None known.

Physical Properties

Appearance: Golden brown liquid

Odor: Sweet

Unusual Fire, Explosion and Reactivity Hazards

During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Material	OSHA PEL	ACGIH TLV	Other	NTP/IARC/OSHA Carcinogen
Petroleum Solvent	Not Established	Not Established	100 mg/m³ (15-17 ppm) TWA *	No
1,2,4-Trimethylbenzene (< 1%)	Not Established	25 ppm TWA	25 ppm TWA **	No
Naphthalene (< 1%)	10 ppm TWA	10 ppm TWA (skin)	10 ppm TWA **	See "Toxicity", Sec. 11
s-Metolachlor (83.7%)	Not Established	Not Established	10 mg/m³ TWA ***	No

* recommended by manufacturer

** recommended by NIOSH

*** Syngenta Occupational Exposure Limit (OEL)

Ingredients not precisely identified are proprietary or non-hazardous. Values are not product specifications.
Syngenta Hazard Category: C, S

4. FIRST AID MEASURES

Have the product container, label or Material Safety Data Sheet with you when calling Syngenta (800-888-8372), a poison

contol center or doctor, or going for treatment.

Ingestion:	If swallowed: Call Syngenta (800-888-8372), a poison control center or doctor immediately for treatment advice. Do not give any liquid to the person. Do not induce vomiting unless told to do so after calling 800-888-8372 or by a poison control center or doctor. Do not give anything by mouth to an unconscious person.
Eye Contact:	If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after 5 minutes, then continue rinsing eye. Call Syngenta (800-888-8372), a poison control center or doctor for treatment advice.
Skin Contact:	If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call Syngenta (800-888-8372), a poison control center or doctor for treatment advice.
Inhalation:	If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call Syngenta (800-888-8372), a poison control center or doctor for further treatment advice.

Notes to Physician

There is no specific antidote if this product is ingested.

Treat symptomatically.

Persons suffering a temporary allergic reaction may respond to treatment with antihistamines or steroid creams and/or systemic steroids.

Contains petroleum distillate - vomiting may cause aspiration pneumonia.

Medical Condition Likely to be Aggravated by Exposure

None known.

5. FIRE FIGHTING MEASURES

Fire and Explosion

Flash Point (Test Method):	> 200°F (Setaflash)	
Flammable Limits (% in Air):	Lower: Not Applicable	Upper: Not Applicable
Autoignition Temperature:	Not Available	
Flammability:	Not Applicable	

Unusual Fire, Explosion and Reactivity Hazards

During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion.

In Case of Fire

Use dry chemical, foam or CO2 extinguishing media. Wear full protective clothing and self-contained breathing apparatus. Evacuate nonessential personnel from the area to prevent human exposure to fire, smoke, fumes or products of combustion. Prevent use of contaminated buildings, area, and equipment until decontaminated. Water runoff can cause environmental damage. If water is used to fight fire, dike and collect runoff.

6. ACCIDENTAL RELEASE MEASURES

In Case of Spill or Leak

Control the spill at its source. Contain the spill to prevent from spreading or contaminating soil or from entering sewage and drainage systems or any body of water. Clean up spills immediately, observing precautions outlined in Section 8. Cover entire spill with absorbing material and place into compatible disposal container. Scrub area with hard water detergent (e.g. commercial products such as Tide, Joy, Spic and Span). Pick up wash liquid with additional absorbent and place into compatible disposal container. Once all material is cleaned up and placed in a disposal container, seal container and arrange for disposition.

7. HANDLING AND STORAGE

Store the material in a well-ventilated, secure area out of reach of children and domestic animals. Do not store food, beverages or tobacco products in the storage area. Prevent eating, drinking, tobacco use, and cosmetic application in areas where there is a potential for exposure to the material. Wash thoroughly with soap and water after handling.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

THE FOLLOWING RECOMMENDATIONS FOR EXPOSURE CONTROLS/PERSONAL PROTECTION ARE INTENDED FOR THE MANUFACTURE, FORMULATION AND PACKAGING OF THIS PRODUCT.

FOR COMMERCIAL APPLICATIONS AND/OR ON-FARM APPLICATIONS CONSULT THE PRODUCT LABEL.

Ingestion:	Prevent eating, drinking, tobacco usage and cosmetic application in areas where there is a potential for exposure to the material. Wash thoroughly with soap and water after handling.
Eye Contact:	Where eye contact is likely, use chemical splash goggles. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
Skin Contact:	Where contact is likely, wear chemical-resistant gloves (such as barrier laminate, butyl rubber, nitrile rubber or Viton), coveralls, socks and chemical-resistant footwear.
Inhalation:	A respirator is not normally required when handling this substance. Use effective engineering controls to comply with occupational exposure limits. In case of emergency spills, use a NIOSH approved respirator with any R, P or HE filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Golden brown liquid
Odor:	Sweet
Melting Point:	Not Applicable
Boiling Point:	Not Available
Specific Gravity/Density:	1.09 g/cm³ @ 68°F (20°C)
pH:	5 - 7 (1% solution in H2O @ 77°F (25°C))

Solubility in H2O

s-Metolachlor:	0.48 g/l @ 77°F (25°C)

Vapor Pressure

s-Metolachlor:	2.8 x 10(-5) mmHg @ 77°F (25°C)

10. STABILITY AND REACTIVITY

Stability:	Stable under normal use and storage conditions.
Hazardous Polymerization:	Will not occur.
Conditions to Avoid:	None known.
Materials to Avoid:	None known.
Hazardous Decomposition Products:	None known.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity/Irritation Studies (Finished Product)

Ingestion:		
	Oral (LD50 Rabbit) :	3425 mg/kg body weight
Dermal:		
	Dermal (LD50 Rat) :	> 2000 mg/kg body weight
Inhalation:		
	Inhalation (LC50 Rat) :	> 2.61 mg/l air - 4 hours
Eye Contact:	Moderately Irritating (Rabbit)	
Skin Contact:	Slightly Irritating (Rabbit)	
Skin Sensitization:	Sensitizing (Guinea Pig)	

Reproductive/Developmental Effects

s-Metolachlor: None observed.

Chronic/Subchronic Toxicity Studies

s-Metolachlor: None observed.

Carcinogenicity

s-Metolachlor: Benign liver tumors at high dose levels (female rats).

Other Toxicity Information

None

Toxicity of Other Components

1,2,4-Trimethylbenzene (< 1%)

Test results reported in Section 11 for the final product take into account any acute hazards related to the 1,2,4-trimethylbenzene in the formulation.

Naphthalene (< 1%)

Test results reported in Section 11 for the final product take into account any acute hazards related to the naphthalene in the formulation.
Chronic overexposure to naphthalene can affect the liver, kidney, respiratory tract and blood.
Carcinogen Status:
NTP: Anticipated Carcinogen
IARC: Group 2B Possible Human Carcinogen

Petroleum Solvent

May cause irritation to the eyes, skin and respiratory system. Excessive inhalation causes headache, dizziness, nausea and loss of motor skills.

Target Organs

Active Ingredients

s-Metolachlor: Liver

Inert Ingredients

1,2,4-Trimethylbenzene: Not Applicable

Naphthalene: Liver, kidney, respiratory tract, blood

Petroleum Solvent: Eye, skin, respiratory system, central nervous system

12. ECOLOGICAL INFORMATION

Ecotoxicity Effects

s-Metolachlor:

Fish (Rainbow Trout) 96-hour LC50 11.9 ppm

Green Algae 5-day EC50 0.008 ppm

Bird (Bobwhite Quail) LD50 Oral > 2510 mg/kg

Invertebrate (Water Flea) 48-hour EC50 26 ppm

Environmental Fate

s-Metolachlor:

The information presented here is for the active ingredient, s-metolachlor.
Low bioaccumulation potential. Not persistent in soil. Stable in water. Sinks in water (after 24 h).

13. DISPOSAL CONSIDERATIONS

Disposal

Do not reuse product containers. Dispose of product containers, waste containers, and residues according to local, state, and federal health and environmental regulations.

Characteristic Waste: Not Applicable

Listed Waste: Not Applicable

14. TRANSPORT INFORMATION

DOT Classification

Ground Transport - NAFTA

Packages < 1700 gal. - Not regulated.

Packages > 1700 gal.

Proper Shipping Name: RQ Other Regulated Substances, Liquid, N.O.S. (Naphthalene)

Hazard Class or Division: Class 9

Identification Number: NA 3082

Packing Group: PG III

Comments

Water Transport - International

Proper Shipping Name:

< 1700 gal.

Environmentally Hazardous Substance, Liquid, N.O.S. (s-Metolachlor), Marine Pollutant

> 1700 gal.

RQ Environmentally Hazardous Substance, Liquid, N.O.S. (s-Metolachlor, Naphthalene), Marine Pollutant

Hazard Class or Division: Class 9

Identification Number: UN 3082

Packing Group: PG III

IMDG EMS #: F-A, S-F

Air Transport - International

Proper Shipping Name: Environmentally Hazardous Substance, Liquid, N.O.S. (s-Metolachlor)

Hazard Class or Division: Class 9

Identification Number: UN 3082

Packing Group: PG III

Note: This product is currently not regulated for airfreight within the NAFTA region. However, effective 01/01/2011 the above classification must be used.

15. REGULATORY INFORMATION

EPCRA SARA Title III Classification

Section 311/312 Hazard Classes:	Acute Health Hazard Chronic Health Hazard
Section 313 Toxic Chemicals:	1,2,4-Trimethylbenzene (< 1%) (CAS No. 95-63-6) Naphthalene (< 1%) (CAS No. 91-20-3)

California Proposition 65

Not Applicable

CERCLA/SARA 302 Reportable Quantity (RQ)

Report product spills > 1,700 gal. (based on naphthalene [RQ = 100 lbs.] content in the formulation)

RCRA Hazardous Waste Classification (40 CFR 261)

Not Applicable

TSCA Status

Exempt from TSCA, subject to FIFRA

16. OTHER INFORMATION

NFPA Hazard Ratings		HMIS Hazard Ratings	
Health:	2	Health:	2
Flammability:	1	Flammability:	1
Instability:	0	Reactivity:	0

0	Minimal
1	Slight
2	Moderate
3	Serious
4	Extreme

For non-emergency questions about this product call:

1-800-334-9481

Original Issued Date: 9/26/1996
Revision Date: 7/13/2010 Replaces: 6/11/2010

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein.

End of MSDS

BOARD OF PESTICIDES CONTROL
APPLICATION FOR VARIANCE PERMIT
(Pursuant to Chapter 22 of the Board's Regulations)

I. Gerald L. Blase (215) 603-1841
Name Telephone Number

Asplundh Tree Expert Co- Railroad Division
Company Name

740 County Road 400 Ironton OH 45638
Address City State Zip

II. Gerald L. Blase CMA 1303
Master Applicator License Number

919 Phillips Rd Warminster PA 18974
Address City State Zip

III. Area(s) where pesticide will be applied:

St Lawrence and Atlantic Railroad Right of Way-24' pattern(12' each side of center of track) leaving a minimum of 10' buffer zone from Lakes, Streams, Rivers and flowing surface water

IV. Pesticide(s) to be applied:
Accord XRTII (EPA# 62719-517) 1-2 pts/ac ; Esplanada 200SC (EPA#432-1516) 3-4oz/ac
Streamline (EPA# 352-848) 6 oz/ac ; Oust Extra (EPA# 352-622) 3-4 oz/ac
all products mixed and applied in 25-30 gal of water / acre

V. Purpose of pesticide application:
The purpose of the application is to maintain the rail ballast and shoulder adjacent to the ballast vegetation free for the following reasons including: 1) to allow for proper safety inspection of the ties, switches,and rails.2) to maintain proper drainage. 3) to allow for the inspection of trains. 4) to remove health and safety hazzards for the employees and public. 5) to improve working conditions. 6) to reduce fire hazzards. 7) to improve visibility at road crossings.

VI. Approximate dates of spray application:

Between mid May -2014 through September 2014

VII. Application Equipment:

Hy-Rail Truck equipment with fixed mounted booms approximately 18" above the rail

VIII. Standard(s) to be varied from:

Section 2C of Chapter 22

C Identification and Recording Sensitive Areas

IX. Reason for variance:

Asplundh has chosen to use products that are proven to maintain the ballast weed free by using the lowest use rates possible to achieve the results. By following the State of Maine regulations with regard to buffer zones in which no spraying will occur and the lowest use rates and incorporating a good IPM program including track maintainence, the risk to the Public and the Environment will be minimized

X. Method to assure equivalent protection:

Asplundh will monitor weather conditions in advance of applications and cancel application when rainfall is predicted. The railroad will supply an advance hy-rail truck in which the patrolman will have the track charts that show river and stream crossings, ponds, and grade crossings. Radio communication between the patrolman and the truck operator will allow advance notice to the operator of bridges, culverts, and water courses. Asplundh will leave a minimum 10' buffer from lakes, streams, rivers, and flowing surface water. The railroad will employ alternative methods to control vegetation in those skipped areas if required. Asplundh uses a drift control product (41-A) in every mix, a sticker product (like New Film IR) will also be used to help the mixture "stay in place" on the rail bed, and NO surfactants will be added to any mixture. Asplundh also employs low pump pressures (20-40 psi) and large droplet spray nozzles with check valves at each nozzle tip.

Newspaper ads will be run in five (5) newspapers of statewide circulation.

Signed:_____Date:_____

Return completed form to: **Board of Pesticides Control, 28 State House Station, Augusta, ME 04333-0028**

OR E-mail to: pesticides@state.me.us

BOARD OF PESTICIDES CONTROL
APPLICATION FOR VARIANCE PERMIT
(Pursuant to Chapter 29, Section 6 of the Board's Regulations)

I. Gerald L. Blase — (215) 603-1841
Name — Telephone Number

Asplundh Tree Expert Co.- Railroad Division
Company Name

740 County Rd 400 — Ironton — OH — 45638
Address — City — State — Zip

II. Gerald L. Blase — CMA 1303
Master Applicator (if applicable) — License Number

919 Phillips Rd — Warminster — PA — 18974
Address — City — State — Zip

III. **As part of your application, please send digital photos showing the target site and/or plants and the surrounding area, particularly showing proximity to wetlands and water bodies, to pesticides@maine.gov**

IV. Area(s) where pesticide will be applied:

St Lawrence & Atlantic Railroad Right of Way- 24' pattern (12' each side of Center of track) leaving a minimum of 10' buffer zone from Lakes, Streams, Rivers, and flowing Surface water.

V. Pesticide(s) to be applied:
Accord XRTII (EPA# 62719-517) 1-2 pts/ac ; Esplanada 200SC(EPA#432-1516) 3-4oz/ac; Streamline(EPA#352-848) 6oz/ac; Oust Extra(EPA#352-622) 3-4oz/ac
all products mixed and applied in 25-30 gal of water/ acre

VI. Purpose of pesticide application:
The purpose of the application is to maintain the rail ballast and shoulder adjacent to the ballast vegetation free for the following reasons including: 1) To allow for proper safety inspection of the ties,switches,and rails 2) to maintain proper drainage. 3) To allow for the inspection of trains. 4) to remove health and safety hazzards for the employees and public. 5) to improve working conditions. 6) To reduce fire hazzards. 7) To improve visibility at road crossings.

VII. Approximate dates of spray application:
between Mid-May2014 through September 2014

VIII. Application Equipment:
Hy-Rail Truck Equipment with fixed mounted booms approximately 18" above the rail

IX. Standard(s) to be varied from:
Refer to Section 2: Standards of conduct for Pesticide Applications

D. Identification of Sensitive Areas

Asplundh has chosen to use products that are proven to maintain the ballast weed free by using the lowest use rates possible to achieve the results. By following the State of Maine regulations with regard to buffer zones in which no spraying will occur and lowest use rates, and incorporating a good IPM program including track maintainence, that the risk to the Public and the Environment will be minimized.

X. Method to ensure equivalent protection:
Asplundh will monitor weather conditions in advance of applications cancel applications when rainfall is predicted. The railroad will supply an advance hy-rail truck in which the patrolman will have the track charts that show river and stream crossings, ponds, and grade crossings. Radio Communicationbetween the patrolman and the spray truck operator will allow advance notice to the operator of bridges , culverts, and water courses. Asplundh will leave a minimum 10' buffer from lakes, streams, rivers, and flowing surface water. The railroad will employ alternative methods to control vegetation in those skipped ares if required. Asplundh uses a drift control product (41-A) in every mix. A sticker product (like New Film IR) will also be used to help the mixture "stay in place" on the rail bed, and NO surfactants will be added to any mixture. None of the proposed herbicides are volatile. Asplund will run newspaper advertisements in five (5) newspapers encompassing the treatment areas, and notify the towns through which the railroad passes, and include a pesticide application form which can be posted concerning the spray program.

Signed:_____ Date:_____

Return completed form to: **Board of Pesticides Control, 28 State House Station, Augusta, ME 04333-0028**
OR E-mail to: pesticides@maine.gov

SPEED
LIMIT
5

Dead River
Company

PAUL R. LEPAGE
GOVERNOR

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0028

WALTER E. WHITCOMB
COMMISSIONER

HENRY JENNINGS
DIRECTOR

Memorandum

Date: May 6, 2014
To: Board
From: Henry Jennings
Subject: Description of Rulemaking Concepts

At the March meeting, the Board selected a list of rulemaking topics and directed the staff to further refine and develop the proposed concepts. The table below attempts to summarize the conceptual changes that the Board has discussed.

BPC Rule	Reason for Change	What Language Would Be Changed
20	The Board has a policy requiring the positive identification of the application site. This cannot be enforced unless it's incorporated into a rule. Also, the current policy conflicts in some ways with the verifiable authorization requirements.	A new paragraph would be added to Section 6 stating that applicators must positively identify application sites in a manner approved by the Board.
22 Section 2C	Every year, the Board grants to companies a series of variances from the requirement to identify sensitive areas doing vegetation management along rights-of-way. Since these variances always contain the same requirements (drift reduction & public notice), it may make more sense to just change the rule to reflect what the Board is requiring through a variance.	A new paragraph would be added to Section 2C which would exempt linear rights-of-way applications from the requirement of identifying sensitive areas provided that the applicator implement a drift management plan and publish public notice about the project.
22 Section 2C	When the Board first adopted Chapter 22 and the requirement to identify sensitive areas, it exempted certain types of "residential" pesticide applications from the sensitive area requirement, based on the logic that sensitive areas are a given when conducting residential applications. Instead, outdoor residential applications require the applicator to post the site, which the Board reasoned would provide greater public benefit. However, since the Board adopted the rule, other types of residential applications have become common. Consequently, there is defensible logic to suggest that all common residential applications should be treated equally.	The "residential" exemption for identifying sensitive areas contained in Section 2C would be expanded to include Category 7E – Biting Fly and Other Arthropod Vectors, and non-linear applications under Category 6B – Industrial/Municipal Vegetation Management.

BPC Rule	Reason for Change	What Language Would Be Changed
28 Section 3	If the Board elects to make the second proposed change to Chapter 22 described above, it would then require a change to Chapter 28 to expand the list of categories requiring posting instead of identification of sensitive areas.	The list of application categories requiring posting contained in Section 3 would be expanded to include Category 7E and non-linear applications made under Category 6B.
31 Section 1E	The Board has adopted policies to exempt adults applying repellents to children from the commercial licensing requirements and to exempt persons installing antimicrobial metal hardware from the licensing requirements. Such exemptions are better incorporated into rule when the applicable chapter is undergoing revisions.	A paragraph would be added to section 1E to exempt adults applying repellents to children provided that their parents provide written consent. Another paragraph would be added to 1E to exempt persons installing antimicrobial hardware from the licensing requirement.
31 Section 4	While Title 22 allows the Board to recognize substantially equivalent applicator certification from other states, Section 4 specifies that certified master applicators must pass a written exam covering Maine regulations. When circumstances indicate a need for out-of-state aerial applicators to assist with urgent pest problems, the Board has been forced to adopt an emergency rule to allow out-of-state applicators to quickly assist. An emergency exemption clause may be a more efficient and logical way to address this concern.	A new paragraph would be added to section 4A, which would exempt aerial applicators certified in other states from passing a written regulation exam when the staff determines that an urgent pest issue exists, and when the staff verbally reviews important and pertinent Maine laws with the applicator prior to issuing a reciprocal license.
31 Section 5A(V)a,b	The Board has expressed some concern about the hardship created by the 14 and 30 day waiting periods required when an applicant fails an exam once or twice respectively.	The wait periods would be revised per Board consensus.
32 Section 2A(4)a,b	The Board has expressed some concern about the hardship created by the 14 and 30 day waiting periods required when an applicant fails an exam once or twice respectively.	The wait periods would be revised per Board consensus.
33 Section 2A(4)a,b	The Board has expressed some concern about the hardship created by the 14 and 30 day waiting periods required when an applicant fails an exam once or twice respectively.	The wait periods would be revised per Board consensus.
41 Section 3	Darin Hammond of Jasper Wyman and Son wrote the Board requesting that the special restrictions on hexazinone contained in Section 3 be repealed since all growers producing more than $1,000 worth of plants for human consumption will need to be certified after April 1, 2015, negating the need for the certification requirement in this section.	The Board could repeal all of Section 3 or just the part requiring applicator and dealer licensing.

Proposed Administrative Consent Agreement
Background Summary

Subject: Timothy Smale
Remedy Compassions
730 Center Street
Auburn, Maine 04210

Date of Incident(s): 2012 through April 3, 2013

Background Narrative: On March 5, 2013, a Board inspector completed a marketplace inspection at a pesticide retailer in southwestern Maine. Through the inspection, it was determined that Remedy Compassions, a licensed medical marijuana growing facility purchased four different pesticides during the above time frame, some on multiple occasions. On April 3, 2013, a Board inspector conducted a joint inspection with Dept. of Health and Human Resources personnel at the company's Auburn cultivation site.

From that inspection, Board staff documented that three of the pesticides known to have been purchased were found on site. These were: Milstop Broad Spectrum Foliar Fungicide, Greenshield Disinfectant & Algicide and Oxidate Broad Spectrum Bactericide/Fungicide. PyGanic Crop Protection EC 1.4 was not found on site. Although company owners denied purchase and use of these pesticides at this site, based on the evidence the Board concluded that pesticide applications were made to the medical marijuana.

Neem Oil for the Garden was also applied once every two weeks to control aphids, thrips and mites.

Summary of Violation(s):

CMR 01-026 Chapter 20 Section 1(B), 7 U.S.C. § 136j (a)(2)(G), 7 M.R.S.A. § 606 (2)(B) and 22 M.R.S.A § 1471-D(8)(F) Prohibits the use of registered pesticides for other than registered uses

22 M.R.S.A. §1471-D (8)(C). Using a pesticide in a careless, negligent or faulty manner in violation

22 M.R.S.A. §1471-D (8)(D) Prohibits storing, transporting or otherwise distributing pesticides in a careless, faulty or negligent manner or in a manner which is potentially harmful to the environment or to the public health, safety or welfare.

CMR 01-026 Chapter 20 Section 1(A). Prohibits the use of any pesticide not registered by the Maine Board of Pesticides Control.

CMR 01-026 Chapter 20 Section 1(A) and (B) and 22 M.R.S.A § 1471-D(8)(F). Not wearing all the personal protective equipment required by the pesticide label

22 M.R.S. § 1471-D (8)(C).Used or supervised the use of pesticides applied in a manner which is potentially harmful to the public health

Worker Protection Standard, 40 CFR, Part 170 (WPS).Non-compliance with the Federal Worker Protection Standard

Rationale for Settlement: The staff considered the number and duration of pesticide applications. None of the pesticides were registered for use on medical marijuana and one of the pesticides was not registered in Maine. The pesticide applications were potentially harmful to patients using the medical marijuana.

Attachments: Proposed Consent Agreement

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION, AND FORESTRY
BOARD OF PESTICIDES CONTROL

MAR 2 0 2014
Ck# 1272
Ck Date: 2-26-14
Amt 5500.00

Timothy Smale Remedy Compassions 730 Center Street Auburn, Maine 04210	))))	ADMINISTRATIVE CONSENT AGREEMENT AND FINDINGS OF FACT

This Agreement, by and between Remedy Compassions (hereinafter called the Company) and the State of Maine Board of Pesticides Control (hereinafter called the "Board"), is entered into pursuant to 22 M.R.S.A. §1471-M (2)(D) and in accordance with the Enforcement Protocol amended by the Board on June 3, 1998.

The parties to this Agreement agree as follows:

1. That the Company operates a medical marijuana cultivation site and dispensary in Maine and its office is located in Auburn, Maine.

2. That on March 5, 2013, a Board inspector conducted a marketplace inspection at a pesticide dealer in Southwestern Maine.

3. That from the inspection described in paragraph two, it was determined that the company purchased four different pesticides in 2012 and 2013.

   - Milstop Broad Spectrum Foliar Fungicide (EPA reg. # 70870-1-68539) on two occasions in 2012, ten pounds in February, and five pounds in December.
   - PyGanic Crop Production EC 1.4 (EPA reg. # 1021-1771) on two occasions, once in 2012 and once in 2013. The first Pyganic purchase was for one quart, the second was for two quarts.
   - Greenshield Disinfectant & Algicide (EPA reg. # 499-368), one gallon in 2012, four gallons in 2013
   - Oxidate Broad Spectrum Bactericide/Fungicide (EPA reg. # 70299-2), two and a half gallons, one occasion in 2012.

4. That on April 3, 2013, a Board inspector conducted a joint inspection with DHHS personnel at the Company's Auburn cultivation site.

5. That from the inspection described in paragraph four, the inspector documented that three of the pesticides described in paragraph three were found on site. Pyganic, the fourth pesticide listed in paragraph three was not found on site.

6. That the Company's owners denied purchasing or using Pyganic on medical marijuana plants at this facility. An employee also denied ever applying this pesticide to medical marijuana plants at the facility

7. That from the sales records that were obtained that were related to the market place inspection described in paragraph two, the Board concludes that the evidence indicates that the Company did purchase and use PyGanic Crop Production EC 1.4 (EPA reg. # 1021-1771) on medical marijuana at the Company's Auburn facility.

8. That CMR 01-026 Chapter 20 Section 1(B) prohibits the use of registered pesticides for other than registered uses and 7 U.S.C. § 136j (a)(2)(G), 7 M.R.S.A. § 606 (2)(B) and 22 M.R.S.A § 1471-D(8)(F) prohibit the use of a pesticide inconsistent with its label.

9. That PyGanic Crop Production EC 1.4 (EPA reg. # 1021-1771) is not registered for use on medical marijuana.

10. That the circumstances in paragraphs one through nine constitute violations of CMR 01-026 Chapter 20 Section 1(B), 7 U.S.C. § 136j (a)(2)(G), 7 M.R.S.A. § 606 (2)(B) and 22 M.R.S.A § 1471-D(8)(F).

11. That from the inspection described in paragraph four, when a Company employee was asked about his use of Milstop Broad Spectrum Foliar Fungicide, he only acknowledged mixing one tablespoon of Milstop Broad Spectrum Foliar Fungicide in two gallons of water and applying some of the mixture to one medical marijuana plant leaf on one occasion approximately three months prior to the date of the inspection. The employee said the remaining mixture (almost 2 gallons), was poured down the sink at the facility. The inspector observed that three quarters of the contents of the original container of Milstop Broad Spectrum Foliar Fungicide container was gone when he documented the original container. The container did not have a label affixed to it that met the minimal container label requirement.

12. That the Board finds, based on the evidence obtained from the sales records summarized in paragraph three, the inspectors observation in paragraph eleven, and the fact that there is no other use in a greenhouse setting specified on the Milstop Broad Spectrum Foliar Fungicide label other than its use as a foliar plant fungicide, that Milstop Broad Spectrum Foliar Fungicide was routinely applied to medical marijuana at the Company's Auburn facility. Milstop Broad Spectrum Foliar Fungicide is not registered for use on medical marijuana.

13. That the circumstances in paragraphs one through four, eight, eleven, and twelve, constitute a violation of CMR 01-026 Chapter 20 Section 1(B), 7 U.S.C. § 136j (a)(2)(G), 7 M.R.S.A. § 606 (2)(B) and 22 M.R.S.A § 1471-D(8)(F).

14. That pouring excess tank mixed pesticides down the drain of a structure's plumbing system is not a legal method of disposing of pesticides and is using a pesticide in a careless, negligent, or faulty manner.

15. That 22 M.R.S.A. §1471-D (8)(C) prohibits the use of pesticides applied in a careless, negligent or faulty manner or in a manner which is potentially harmful to the public health, safety or welfare or the environment

16. That the circumstances described in paragraphs eleven, fourteen, and fifteen constitute using a pesticide in a careless, negligent or faulty manner in violation of 22 M.R.S.A. §1471-D (8)(C).

17. That 22 M.R.S.A. §1471-D (8)(D) prohibits storing, transporting or otherwise distributing pesticides in a careless, faulty or negligent manner or in a manner which is potentially harmful to the environment or to the public health, safety or welfare.

18. That storing pesticides in a container that lacks the minimum container label requirements is careless, faulty or negligent and could be potentially harmful to the environment or to the public health, safety or welfare.

19. That the circumstances described in paragraphs four, eleven, seventeen and eighteen constitute a violation of 22 M.R.S.A. §1471-D (8)(D)

20. That from the inspection described in paragraph four, the inspector also found and documented an additional pesticide on site. Neem Oil for the Garden (No EPA #). This product makes a pesticidal claim on the label and according to Timothy Smale it was used to control aphids, thrips, and mites on the medical marijuana plants. A Company employee told the inspector that the neem oil was applied once every two weeks.

21. That CMR 01-026 Chapter 20 Section 1(A) prohibits the use of any pesticide not registered by the Maine Board of Pesticides Control.

22. That the Board's pesticide registrar reviewed the registration status of Neem Oil for the Garden and determined that it is not registered in the state of Maine.

23. That the circumstances in paragraphs one, four, eight, twenty, and twenty-one, constitute a violation of CMR 01-026 Chapter 20 Section 1(A).

24. That Neem Oil for the Garden is not registered for use on medical marijuana.

25. That the circumstances in paragraphs one, four, eight, twenty, and twenty-four constitute violations of CMR 01-026 Chapter 20 Section 1(B), 7 U.S.C. § 136j (a)(2)(G), 7 M.R.S.A. § 606 (2)(B) and 22 M.R.S.A § 1471-D(8)(F).

26. That wearing the label-required personal protective equipment is specified in 7 U.S.C. § 136j (a)(2)(G), 7 M.R.S.A. § 606 (2)(B) and 22 M.R.S.A § 1471 D (8)(F).

27. That from the inspection in paragraph four, it was determined that on March 3, 2013, Greenshield Disinfectant & Algicide was mixed, loaded and applied to plastic containers by a Company employee.

28. That Greenshield Disinfectant & Algicide requires a chemical resistant apron and chemical resistant footwear when mixing and chemical resistant footwear when applying it.

29. That a chemical resistant apron and chemical resistant footwear when mixing and chemical resistant footwear were not worn when mixing and applying the Greenshield Disinfectant & Algicide.

30. That the circumstances described in paragraphs four, and twenty-six through twenty-nine constitute violations of CMR 01-026 Chapter 20 Section 1(A) and (B) and 22 M.R.S.A § 1471-D(8)(F).

31. That the Company raises a commercial agricultural crop at a greenhouse business that utilized pesticides bearing language requiring conformance with the federal Worker Protection Standard, 40 CFR, Part 170 (WPS).

32. That the Company employs one or more workers and handlers as defined under 40 CFR, Part 170.3 to assist in the production of the crops described in paragraph one.

33. That from the inspection done in paragraph four, it was determined that the workers and handlers did not receive WPS training, there was no central information display informing employees which areas were treated, treated areas were not posted, and workers and handlers were not stopped from entering treated areas during restricted entry intervals.

34. That the circumstances described in paragraphs one, four, and thirty-one through thirty-three constitute multiple violations of the federal Worker Protection Standard, 40 CFR, Part 170 (WPS).

35. The Board finds that the use of pesticides in the production of medical marijuana was potentially harmful to the public health, in violation of 22 M.R.S. § 1471-D (8)(C).

36. That the Board has regulatory authority over the activities described herein.

37. That the Company expressly waives:

a. Notice of or opportunity for hearing;

b. Any and all further procedural steps before the Board; and

c. The making of any further findings of fact before the Board.

38. That this Agreement shall not become effective unless and until the Board accepts it.

39. That in assessing a penalty in this circumstance, the Board recognized that the Company was producing a medicinal product intended for use by patients with serious and/or chronic illnesses. The Board further finds the number of violations alleged against the Company and the frequency of the applications as documented by the Board inspections showed a pattern of consistent pesticide applications on the medical marijuana in violation of the pesticide laws.

40. That, in consideration for the release by the Board of the causes of action which the Board has against the Company resulting from the violations referred to in paragraphs ten, thirteen, sixteen, nineteen, twenty-three, twenty-five, thirty, thirty-four, and thirty- five, the Company agrees to pay to the State of Maine the sum of $5,500 (Please make checks payable to Treasurer, State of Maine.)

IN WITNESS WHEREOF, the parties have executed this Agreement of four pages.

REMEDY COMPASSIONS

By: Timothy M. Smale Date: 3/15/14

Type or Print Name: Timothy M. Smale

BOARD OF PESTICIDES CONTROL

By: _____ Date: _____

Henry Jennings, Director

APPROVED

By: _____ Date: _____

Mark Randlett, Assistant Attorney General

Remedy
Compassion Center

March 15, 2014

Raymond Connors
Manager of Compliance
Maine Board of Pesticides Control
State of Maine
Maine Department of Agriculture, Conservation, and Forestry
Augusta, ME 04333-0028

Dear Mr. Connors:

Thank you for your follow up in the matter relating to Remedy Compassion Center. Please contact me if I can be of any further assistance.

Warmest regards,

Timothy Smale
Executive Director

720 Center St. 1-C, Auburn – Tel: 207-312-5798 – Email: info@remedycompassioncenter.org

Proposed Administrative Consent Agreement
Background Summary

Subject: Hammon Buck
Plants Unlimited
629 Commercial Street
Rockport, Maine 04856

Date of Incident(s): June 26, 2011 and 2012 growing season

Background Narrative: On May 2, 2012, a Board inspector completed an inspection at this nursery/greenhouse business. Through the inspection, it was determined that a pesticide application of an outdoor labeled insecticide was made inside a greenhouse.

In addition, no pesticide application records were kept for the 2012 growing season and workers were not trained as required by the Federal Worker Protection Standard.

Summary of Violation(s):

- CMR 01-026 Chapter 50 Section 1 A: No pesticide application records for 2012 season.
- Federal Worker Protection Standard, 40 CFR, Part 170.
- 7 U.S.C. § 136j (a)(2)(G), 7 M.R.S.A. § 606 (2)(B) and 22 M.R.S.A § 1471 D (8)(F). Using a pesticide inconsistent with its label directions

Rationale for Settlement: The staff compared the violation to similar cases settled by the Board.

Attachments: Proposed Consent Agreement

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION, AND FORESTRY
BOARD OF PESTICIDES CONTROL

In the Matter of:	)	
Hammon Buck	)	ADMINISTRATIVE CONSENT AGREEMENT
Plants Unlimited	)	AND
629 Commercial Street	)	FINDINGS OF FACT
Rockport, Maine 04856	)	

This Agreement by and between Plants Unlimited (hereinafter called the "Grower") and the State of Maine Board of Pesticides Control (hereinafter called the "Board") is entered into pursuant to 22 M.R.S.A. §1471-M (2)(D) and in accordance with the Enforcement Protocol amended by the Board on June 3,1998.

The parties to this Agreement agree as follows:

1. That the Grower produces agricultural crops for commercial purposes at a greenhouse/nursery business that utilizes pesticides bearing language requiring conformance with the federal Worker Protection Standard, 40 CFR, Part 170 (WPS).

2. That the Grower employs one or more workers as defined under 40 CFR, Part 170.3 to assist in the production of the crops described in paragraph one.

3. That a Board inspector conducted an inspection at the Grower's on May 2, 2012, for the Grower's application of Bayer Advanced All-In-One Rose & Flower Care (EPA Reg. No. 72155-21).

4. That from the inspection done in paragraph three, it was determined that the Grower did not train his agricultural workers, and there was no information at a central information display as required by the federal Worker Protection Standard, 40 CFR, Part 170.

5. That the circumstances in paragraphs one through four constitute multiple violations of the federal Worker Protection Standard, 40 CFR, Part 170.

6. That CMR 01-026 Chapter 10 Section 2 H, specifies that a commercial agricultural producer "means, for the purposes of Chapter 50, any person who produces an agricultural commodity for commercial purposes".

7. That CMR 01-026 Chapter 50 Section 1 A, requires that commercial agricultural producers shall maintain pesticide application records.

8. That from the inspection done in paragraph three, it was determined that the Grower did not maintain pesticide application records as required by CMR 01-026 Chapter 50 Section 1 A for 2012 applications.

9. That the circumstances described in paragraphs three and six through eight, constitute a violation of CMR 01-026 Chapter 50 Section 1 A.

10. That the Bayer Advanced All-In-One Rose & Flower Care label specifies that it is for outdoor residential use only.

11. That from the inspection in paragraph three it was determined that the Bayer Advanced All-In-One Rose & Flower Care was applied inside greenhouse numbers two and six.

12. That the circumstances described in paragraphs three, ten, and eleven constitute use of a pesticide inconsistent with the product labeling and in violation of 7 U.S.C. § 136j (a)(2)(G), 7 M.R.S.A. § 606 (2)(B) and 22 M.R.S.A § 1471 D (8)(F).

13. That the Board has regulatory authority over the activities described herein.

14. That the Grower expressly waives:

    a. Notice of or opportunity for hearing;

    b. Any and all further procedural steps before the Board; and

    c. The making of any further findings of fact before the Board.

15. That this Agreement shall not become effective unless and until the Board accepts it.

16. That in consideration for the release by the Board of the causes of action which the Board has against the Grower resulting from the violations referred to in paragraphs five, nine, and twelve the Grower agrees to pay to the State of Maine the sum of $250. (Please make checks payable to Treasurer, State of Maine).

IN WITNESS WHEREOF, the parties have executed this Agreement of two pages.

PLANTS UNLIMITED

By: _____ Date: 3/20/14

Type or Print Name: HANNAH J. BULK

BOARD OF PESTICIDES CONTROL

By: _____ Date: _____
Henry Jennings, Director

APPROVED:

By: _____ Date: _____
Mark Randlett, Assistant Attorney General

PAUL R. LEPAGE
GOVERNOR

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0028

WALTER E. WHITCOMB
COMMISSIONER

HENRY S. JENNINGS
DIRECTOR

April 25, 2014

Brian Chateauvert
RWC, Inc.
P.O. Box 876
248 Lockhouse Road
Westfield, MA 01086-0876

RE: Variance permits for CMR 01-026, Chapters 22 and 29

Dear Mr. Chateauvert:

This letter will serve as your 2014 variance permits covering Section 2 (C) of Chapter 22 and Section 6 of Chapter 29 for vegetation control within railroad right-of-ways.

The Board appreciates your efforts to reduce off-target movement of pesticides, including the choice of products, equipment and methods.

I will alert the Board at its May 16, 2014 meeting that the variance permits have been issued. If you have any questions concerning this matter, please feel free to contact me at 287-2731.

Sincerely,

Henry Jennings

Henry Jennings
Director
Maine Board of Pesticides Control

PAUL R. LEPAGE
GOVERNOR

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0028

WALTER E. WHITCOMB
COMMISSIONER

HENRY S. JENNINGS
DIRECTOR

April 25, 2014

Deane Van Dusen
Maine Department of Transportation (MDOT)
Environmental Office
16 State House Station
Augusta, ME 04333

RE: 2014 Chapter 29 Variance Permit

Dear Mr. Van Dusen:

Thank you for sending us the On-Going Treatment Plan for Sherman Marsh Phragmites Control. We appreciate your hard work in this area, and I'm sure the Board will be very interested in seeing the detailed plans and preparations that you have made. In making the new policy, their concern was that, if pesticides are used, that they are effective in eliminating the problem long-term, and your plan clearly illustrates that that is your goal.

This letter will serve as your agency's Chapter 29 variance permit for your vegetation control program associated with MDOT wetland mitigation activities until December 2016, with the condition that you notify us if you decide to use any products not listed on the application. Please bear in mind that MDOT's variance permit requires agency contractors and personnel to adhere to the measures outlined in Section IX of the permit application. Also, please ensure that all products are registered for use in Maine.

We will alert the Board at its May 16, 2014 meeting that the variance permit has been issued. If you have any questions concerning this matter, please feel free to contact me at 287-2731.

Sincerely,

Henry Jennings

Henry Jennings
Director
Maine Board of Pesticides Control

Sherman Marsh Phragmites Control

On-Going Treatment Plan

In October 2007, USM researchers reported finding the invasive species common reed (*Phragmites australis* – hereafter *Phragmites*) in small patches within the upper reaches of the marsh. At that time, some plants in several of the patches had formed tassels. The source of *Phragmites* (it was not known to occur in or around the shoreline of Sherman Lake and none has been identified within the immediate vicinity of the marsh or along Route 1) and the timing of the first appearance are uncertain. The *Phragmites* present in Sherman Marsh has been identified by USM students as the introduced genotype.

The salinity levels and the plant assemblages identified in Sherman Marsh to date show that brackish to salt marsh conditions are developing through succession in response to the disturbance caused by the breach of the dam. This suggests that Sherman Marsh is at an increased risk of colonization by *Phragmites* which often occurs in marshes with salinities less than 22 ppt.

During the summer of 2008 research staff from USM, and interns and staff from the MaineDOT Environmental Office continued to map the locations of *Phragmites* patches. Patch location was recorded using a Trimble GeoXT handheld GPS unit with submeter accuracy. As of September 2008, approximately 270 patches of *Phragmites* covering a total area of approximately 1 acre have been identified within the marsh (see attached map). The patches range in size from point locations (< 25 ft^2) up to approximately 1700 ft^2. Most of the patches are located in the uppermost (southern) section of the marsh with fewer known patches occurring in the middle and lower sections closer to the Route 1 bridge. *Phragmites* was found near the upland edge and near the banks of the secondary and main tidal channels with no clear pattern to its distribution within the marsh. In most of the patches, *Phragmites* was growing up through an understory of native salt marsh vegetation, or in association with cattails, however in some areas bare soil was present in all or a portion of the patch.

In 2008 an Interim Treatment Plan was implemented to determine application methods on a group of Phragmites patches and how a marsh wide control plan would be carried out in the future. This Plan is summaries below:

Treatment Plan Herbicide will be applied to *Phragmites* plants growing in selected representative patches within areas of vegetated marsh. Approximately 13 patches will be treated as shown on the attached map. Each treatment patch will be paired with an untreated control patch at a similar elevation.

- The purpose of this trial is to begin to evaluate different application techniques and to determine the relative effectiveness of the treatments. Nearby untreated patches will provide experimental controls. The trial will allow for comparisons between herbicides, application methods and of treated versus non-treated areas.
- Herbicide application will be made in accordance with label directions regarding mix concentrations and appropriate application rates as shown in Table 1.

- Two different application methods will be used: Foliar wick/wipe-on and cut stem treatment. For the foliar wick/wipe-on technique, the herbicide will be applied by hand using commercially available wick applicators, sponges and/or with cotton gloves (worn over rubber or nitrile gloves) sprayed with herbicide and rubbed over the stems and leaves. For the cut stem technique, individual *Phragmites* stems will be cut 2 to 3 feet above the ground (or below the first leaf on the plant), and a small quantity (approx. 3 ml) of herbicide will be dripped into the hollow, cut stem. Cut stems will be bagged and removed from the site to prevent them from being dispersed during a high tide and potentially taking root in a new location. These techniques will significantly reduce or eliminate the potential for herbicide to drift onto other non-target vegetation or into surface water. MaineDOT anticipates that each technique will be tested with each herbicide.
- Herbicide will only be applied using the wick/wipe technique during low wind conditions to minimize the potential for *Phragmites* stems to come into contact with non-target species or the applicator.
- Herbicide will not be applied during periods when spring high tides flood the marsh surface (i.e. tides higher than approximately 10.5 feet as listed on the NOAA tide chart for Portland) or during rain events that lead to runoff from the plants.
- The proposed herbicide application will be conducted in a manner that will not impair water quality within the upper Marsh River.

Table 1. Herbicide Concentration (percent solution)/Treatment Method Matrix

HERBICIDE	BACK PACK APPLICATION
Habitat™ (imazapyr)	1.5 %
Rodeo™ (glyphosate)	33%

Timing of Application

- The initial herbicide treatment took place during the last week of September and/or the first week of October 2008 weather depending. Rodeo™ is most effective when applied to green foliage after the tasseling stage when the plant is supplying nutrients to the rhizomes. Application of Habitat™ toward the end of the growing season will limit the potential for damage to adjacent non-target plants via root grafts or by exudates or through movement of soil particles.
- MaineDOT reported the application took no more than two working days.

Applicator/Agent

- Interim treatment herbicide was applied by MaineDOT personnel under the supervision of MaineDOT staff with Masters and Commercial Level Pesticide Applicators licenses in the Aquatics Category issued by the Maine Board of Pesticide Control (BPC). All spray operations were conducted in accordance with the Plan, as approved by MaineDEP, and all applicable BPC requirements.

Future Control Plan

This Phragmites Control Plan (hereafter the "Plan") describes the herbicide treatments proposed by MaineDOT to control the spread of *Phragmites* within Sherman Marsh from the fall of 2008 into the future. The Plan has been developed in response to the conditions described in the Maine DEP Fact Sheet, Use of Herbicides in Wetlands in Maine, dated April 2006; and in accordance with the terms of a MaineDOT consultation letter, dated July 11, 2008, with NOAA NMFS pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, regarding the proposed Marsh River bridge rehabilitation project.

The Plan addresses the conditions listed in the Maine DEP Fact Sheet that must be met in order to apply aquatic pesticides within wetlands in Maine. It is MaineDOT's understanding that if the Plan satisfactorily addresses the conditions stated in the Fact Sheet and is implemented accordingly, then the proposed treatments will be exempt from Maine DEP Waste Discharge Licensing.

DEP Conditions

The following sections address the conditions listed in the DEP Fact Sheet and include a description of the need for *Phragmites* control at Sherman Marsh, the materials proposed for use, and the herbicide treatment plan.

Demonstration of Need

- The breach of the Route 1 dam resulted in an unprecedented opportunity to restore tidal hydrology to over 200 acres of former salt marsh. Restoration of salt marsh at this site is supported by the state and federal resource and regulatory agencies.
- MaineDOT's involvement stems from its initial decision to allow restoration to proceed rather than replace the roadbed/dam. MaineDOT's decision to take on monitoring and management responsibility at Sherman Marsh is in anticipation that, at a later date, the marsh could be proposed for addition to a statewide MaineDOT wetland mitigation bank.
- Vegetative monitoring of the marsh by research staff from USM identified the presence of numerous patches of non-native *Phragmites* scattered throughout the marsh by the end of the 2007 growing season.
- Hydrologic and salinity data collected in the marsh to date by MaineDOT and USM show that salinity levels within the marsh are often below the 22 ppt *Phragmites* tolerance threshold commonly used as a target in salt marsh restoration projects.

- The increasing prevalence of Phragmites in New England salt marshes is well documented. Phragmites is known to have invaded numerous salt marshes in Maine, notably Scarborough Marsh, and fringing marshes along the Presumpscot and Royal Rivers. Marshes with a dominant cover of Phragmites are functionally impaired and provide fewer ecosystem services.
- There are a limited number of effective *Phragmites* control measures. Treatment with herbicide is a commonly used approach that has successfully reduced *Phragmites* cover and restored important wetland functions in many environmental restoration and wildlife management areas in the United States.

Materials Used

- MaineDOT is planning to control *Phragmites* in Sherman Marsh through the targeted application of herbicide. Two chemicals will be used: 1) Rodeo TM (active ingredient glyphosate), and 2) Habitat TM (active ingredient imazapyr). Both Rodeo and Habitat are registered for the control of invasive emergent vegetation in aquatic settings by the USEPA (Rodeo EPA Reg. No. 62719-324; Habitat EPA Reg. No. 241-426) and the Maine Dept. of Agriculture.
- Rodeo TM is a non-selective systemic herbicide used to control undesirable herbaceous and woody vegetation growing in or near bodies of fresh and brackish water, including estuaries. It is a water-soluble liquid which mixes readily with water and requires the addition of a non-ionic surfactant. Rodeo TM does not control plants which are completely submerged or have a majority of their foliage under water. After application, it moves through the plant from the foliage to the root system where it inhibits enzyme synthesis at points of growth. The effects include gradual wilting and yellowing of the plant and deterioration of underground plant parts.
- Toxicological evaluations reported by the USEPA and others have shown that glyphosate, the active ingredient in Rodeo, has very low potential to accumulate in aquatic food chains; is no more than slightly toxic to wild birds (primarily through ingestion of recently treated plant material); and is practically non-toxic to fish, aquatic invertebrates, and honeybees. Glyphosate binds strongly to soil particles, and suspended organic matter and clay particles in water. Once bound to soil particles it becomes relatively immobile which limits the potential for uptake by aquatic organisms and prevents uptake by the roots of non-target plants. It is broken down by microbial degradation. Application to extensive areas of aquatic plants can result in fish kills due to oxygen depletion from decomposition of dead plant material, especially in shallow water (< 6 inches). The Phragmites patches in Sherman Marsh are small and localized; making it unlikely that plant decomposition would pose a significant risk to fish.
- Rodeo surfactant will be applied. Some surfactants are often highly toxic to fish and wildlife, much more than glyphosate alone. Selection of surfactant should favor materials with little to no toxicity to aquatic organisms.
- Habitat TM is a non-selective herbicide used for the control of a broad range of weeds including emergent aquatic species. It is labeled for use in and around standing and flowing water, including estuarine areas. Habitat TM is an aqueous solution that is mixed with water and a surfactant and applied as a spray solution

to control vegetation. It is applied to the emergent foliage of the target vegetation and has little to no effect on submerged aquatic vegetation. Habitat is absorbed through the leaves and stems and is translocated rapidly throughout the plant, with accumulation in the meristematic tissues. It is also translocated into and kills underground tissues preventing regrowth. Habitat TM inhibits a plant-specific enzyme, causing the plant to stop growing and die as its food and energy reserves are exhausted. This enzyme is not found in animals or humans.

- The environmental fate of imazapyr, the active ingredient in Habitat TM, varies with pH. At pH greater than 5 (i.e. field conditions likely to occur in Sherman Marsh) it does not bind strongly to soil particles and can remain available for plant uptake (soil active), increasing the potential for damage to non-target species. It has also been reported that surrounding vegetation may also be affected by movement of imazapyr via root grafts or exudates. Imazapyr is slowly degraded by microbial degradation in soils, but rapidly by sunlight in aquatic solutions. Given these porperties Habitat TM must be applied carefully to avoid unintended damage to non-target plant species.

Treatment Plan

- Rodeo TM and Habitat TM will be applied to *Phragmites* plants growing in selected patches within areas of vegetated marsh according to a random stratified experimental design (See previous section on Treatment Goals for treatment thresholds).
- Application of Habitat TM and Rodeo TM will be made in accordance with label directions regarding mix concentrations and appropriate application rates. A 1 to 2% solution of Habitat TM mixed with an aquatic surfactant will be used for foliar spray treatment. A 1.5 to 2% solution of Rodeo TM mixed with an aquatic surfactant will be used for foliar spray treatment.
- Application method(s) – Low volume foliar spray application technique will be used. To maximize effectiveness Habitat TM must be applied in a manner that ensures 100% coverage. The best results are achieved when the herbicide covers the crown. Rodeo TM must be applied in a manner that wets at least 80% of the foliage and covers all of the plant growing tips.
- Herbicide will only be applied during low wind conditions (winds < 10 mph at ground level).
- Applications of Habitat TM are rainfast one hour after treatment. The effectiveness of Rodeo TM may be reduced by rainfall up to 6 (one source said 12) hours after application.
- Protection for non-target species will be maintained through the use of low pressure backpack sprayer with a micro-jet applicator.
- Address tidal conditions – e.g. treatment only during mid-tide or below; or treatment discontinued within 2 hours of high tides.
- Violation of State Water Quality Laws – all estuarine and marine waters lying within the boundaries of the State and which are not otherwise classified are Class SB waters (MRS Title 38, Chap 3, Subchapter 1, Article 4-A, subsection 469, Classification of estuarine and marine waters.)

Timing of Application

- The initial interim herbicide treatment will take place in mid-September to October 2008. Habitat TM is applied to actively growing, green foliage after full leaf elongation. Habitat TM can be applied early in the growing season, but adjacent non-target plants may are more susceptible to damage by earlier treatments. Rodeo TM is most effective when applied to green foliage after the tasseling stage when the plant is supplying nutrients to the rhizomes.
- Follow up treatments in future years will be applied in the late summer early fall after the initial treatment depending on the effectiveness as determined by post-treatment monitoring.

Applicator/Agent

- The herbicide will be applied by a landscape contractor certified and licensed in Aquatic Pesticide Control by the Maine Board of Pesticide Control (BPC) under contract to the MaineDOT Environmental Office. MaineDOT anticipates contracting with Municipal Pest Management Services, Inc. of Kittery, Maine to conduct all spray work at Sherman Marsh. The contract will require that the contractor conduct all spray operations in accordance with the Plan, as approved by MaineDEP, and all applicable BPC requirements. Only applicators who are licensed or certified as aquatic pest control applicators and are authorized by a government agency can apply Habitat TM
- MaineDOT staff with a Commercial Pesticide Applicator's license – Master Level - in the Aquatics category will also be applying herbicide as needed and will oversee the implementation of the herbicide treatment and will inspect the Contractor's work for conformance with the contract requirements.

Duration of Application

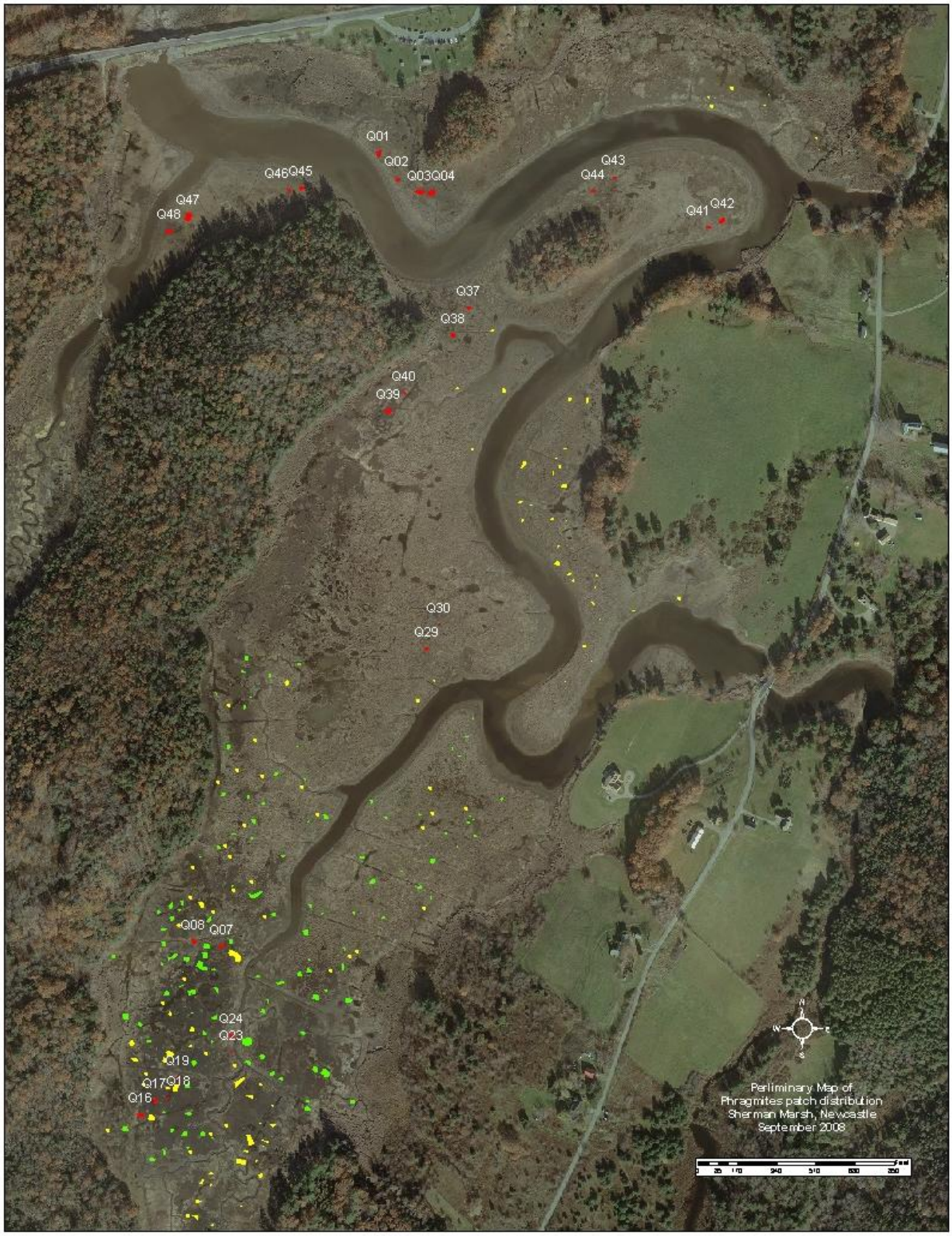
- MaineDOT anticipates conducting spot treatments in late summer/early fall of 2009 and beyond. The results of yearly post-treatment monitoring will be used to determine whether or not additional follow-up treatments are warranted to control existing or new patches.

Photo 1. Typical small patch of *Phragmites* in Sherman Marsh mapped as a point location. August 2008.

Photo 2. Small *Phragmites* patch adjacent to a tidal ditch. August 2008.

Photo 3. Typical small *Phragmites* patch with low stem density in vegetated marsh zone. August 2008.

Photo 4. Phragmites stems showing development of tassels (seed heads) on old dead stems and current years growth. August 2008.



Map showing location of Phragmites patches mapped in 2007 and 2008.

Maine Board of Pesticides Control

Miscellaneous Pesticides Articles and Correspondence May 2014

(identified by Google alerts or submitted by individuals)

courant.com/news/connecticut/hc-pesticide-violation-enforcement-0312-20140321,0,1878369.story

Courant.com

State Pesticide Compliance: Hundreds of Complaints, Few Fines

11:44 AM EDT, March 21, 2014

advertisement

Over the past three years, Connecticut regulators issued fines or other penalties 20 times against people and companies found to have violated pesticide laws, despite receiving more than 430 complaints.

State records obtained by the Courant show those 20 cases resulted in financial penalties totalling $69,320 between 2011 and the end of 2013, with a single company accounting for nearly $20,000 in fines for repeated violations.

"That amount of total penalties seems very small for something as important as pesticide enforcement," said Roger Reynolds, legal director for the Connecticut Fund for the Environment. He said improper use of pesticides can poison drinking water, rivers, streams, yards and homes. "Pesticide enforcement is a direct public health issue," Reynolds added.

The Courant reported last month that a lack of staff and funding for Connecticut's pesticide management unit means the state has no way to regularly monitor the use of the more than 11,000 pesticides registered for use in this state.

State law requires the more than 5,000 state-licensed pesticide applicators in Connecticut to file annual reports on their use of these chemicals, but officials admit they have never had enough staff to actually read those reports. Some companies ignore the reporting requirements for years or file incomplete information, while other paper records have been lost or misfiled.

The state's pesticide control unit staff has been cut by 25 percent over the past decade, and now numbers just nine people, including five field inspectors, state officials say. Meanwhile, registered pesticide companies now total 1,072, a figure officials say is growing every year.

"I think there is absolutely a lot more [pesticide law violations] going on that they're not finding," said Jerome Silbert, executive director of the Watershed Partnership, another environmental watchdog group.

Enforcement files show that some illegal operators used potentially toxic pesticides on Connecticut homes and properties for years before getting caught by state regulators. Other companies and a few municipalities were charged with improperly spreading pesticides on school grounds, dumping them in storm drains, or failing to file required reports about what types of chemicals they are using and how much is being used.

Diane Jorsey, an analyst with the state Department of Energy and Environmental Protection (DEEP), says most of the complaints the agency investigates involve unregistered and unlicensed individuals or businesses. Pest-control industry insiders claim unlicensed, untrained, fly-by-night operations are able to work here because of inadequate enforcement.

Across the nation, there are growing concerns about how pesticide use and misuse may be damaging public health, contributing to massive declines in honey bees and butterflies, polluting waterways and impacting agriculture and our food supply. Activists say those fears are a major reason for the dramatic growth in

organic agriculture in Connecticut.

Brad Robinson, head of DEEP's pesticide control unit, said his staff sends out about 70 warning letters a year to individuals and companies believed to be violating Connecticut pesticide laws and regulations. Approximately 90 percent of those violators take corrective action to avoid fines or license suspensions, according to Robinson.

Formal enforcement actions involving financial penalties or suspensions only result if those warning letters are ignored, Robinson said.

The pesticide unit is a division in the state Department of Energy and Environmental Protection. DEEP spokesman Dennis Schain said the goal is to "bring people into compliance… and that's not a bad outcome."

Schain said having a pesticide operator agree to halt unsafe or unlicensed practices is far better than to "have the misuse of pesticide continuing" while the state takes time-consuming enforcement action.

Activists and some state lawmakers have complained for years that continual budget cuts have severely damaged the state's ability to enforce environmental laws and regulations like those governing the use of pesticides.

Staffing at the pesticide control unit has dropped from 12 full-time staffers in 2003 to nine people today. Much of the unit's work is dedicated to certification and licensing of pesticide applicators.

Schain said the pesticide budget has also been reduced by about 25 percent since 2003. Exact numbers for what the state is spending to enforce its pesticide laws and regulations are apparently hard to come by because the unit is part of a larger budget section, Schain says.

According to department records, complaints to the state about licensed pesticide applicators have been averaging more than 140 per year. Robinson said the number of licensed applicators in Connecticut has been growing steadily for the past decade.

DEEP officials say there is no additional funding being requested for pesticide control in Gov. Dannel Malloy's proposed budget that is now being considered by the General Assembly.

Enforcement records for cases serious enough to warrant fines or suspensions show a wide variety of violations by pest-control companies, landscapers, tree-trimming operators, and even municipalities.

In November 2013, New Haven city officials agreed to a $2,475 penalty for putting anti-mosquito pesticides in storm drains. The chemical was one banned by the state in shoreline areas in an effort to protect marine animals like Long Island Sound's lobsters.

"The city's policy and practice with regard to pesticide use is strict adherence to applicable state and federal law and regulation," said Laurence Grotheer, spokesman for New Haven Mayor Toni Harp's administration.

Cheshire school officials signed a consent agreement in August 2013 requiring a $2,250 penalty involving an improper "emergency application of lawn-care pesticide" to control bees and poison ivy at two local schools. The money will go toward a University of Connecticut program to educate people about environmentally safe pest control.

Vincent Masciana, director of management services for Cheshire's school system, said the violations resulted from officials failed attempts to comply with complex state standards for using those types of pesticides around schools. Masciana says Cheshire doesn't use any pesticides on school properties except in very isolated cases, and has even received an award for its avoidance of pesticides.

The heaviest fines issued in the past three years hit a single operator, Charles Pucilauskas, doing business as Bug Busters Inc., and based in Naugatuck and Ansonia.

In December 2011, Pucilauskas signed a consent agreement involving pesticide violations that occurred during a bed-bug control application at Anna L. LoPresiti Elementary School in Seymour in 2010. The agreement carried penalties totaling $8,974.

State inspectors recorded new violations by Bug Busters Inc. at a private home in Westport in March 2012, according to the consent agreement signed last year by Pucilauskas. To settle those violations, the operator agreed to $10,845 in penalties. Pucilauskas failed to respond to repeated requests for comment for this story.

"It is unusual," Robinson said of the circumstance of finding multiple violations by a company so soon after that operation had been hit with significant fines. "Some people take longer to get the message than others."

The largest single penalty proposed in the past several years by state pesticide regulators, $12,000 against a Stratford-based man named Eddie Servance Jr., was never actually imposed. According to a 2012 consent agreement, Servance violated multiple pesticide regulations over a three year period, including failing to get proper state certification.

A state official said a determination was made that it was unlikely Servance would be able to pay the proposed fine. Instead, Servance agreed not to seek state pesticide licensing for at least three years. Efforts to reach Servance for comment on this story were unsuccessful.

Anthony Bruckner of Enfield, who was doing business as Target Pest Control, signed a consent agreement in February 2013 that involved paying $5,000 in penalties for long-standing violations.

State records show Bruckner was operating his pesticide business between 2005 and 2012 without proper state licenses and certification. The consent agreement also cited Bruckner for failing to file legally required annual reports on what types of pesticides he was using between 2000 and 2005.

"It was just a matter of not doing the paperwork on time," Bruckner said. "And I'm paying the price for it."

Environmentalists and some lawmakers have complained for years that DEEP's enforcement units have been badly hit by budget cuts in recent years.

"I think there's just not enough people to do the monitoring," said Silbert. He also believes the staffing problems in DEEP go far beyond the pesticide control unit to almost every enforcement area of the agency.

"People out there are going to comply to the extent there's real enforcement," said Reynolds. "Pesticides would seem to be a pretty big priority and a pretty serious enforcement issue."

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Print Page

By Gerry Tuoti
By Marc Larocque

March 23. 2014 10:40PM

Local researcher is shining a light on fireflies

Researchers hope a Museum of Science study will shed some light on fireflies.

PHOTO/ CONTRIBUTED | DON SALVATORE

A firefly munches on a leaf. Some people are wondering if fireflies are vanishing across the country and in Massachusetts. Researcher Don Salvatore, a science educator at the Boston Museum of Science has created a network of spotters to check how many of the tiny creatures are around.

Suspecting the glow-in-the dark insects are disappearing, Don Salvatore, a science educator at the Boston Museum of Science, launched the Firefly Watch in 2008. The project has more than 5,000 volunteer firefly spotters in 40 states and six Canadian provinces.

"Five years is not enough to tell whether the numbers are going up or down, but we think they're going down," Salvatore said.

Salvatore, a Pembroke resident, said he got the idea to launch the project after hearing people wonder if fireflies were vanishing across the country, including in Massachusetts.

"Many people had that perception," he said. "If you're going to act on something like that, you're going to need data. One reason we started the project was to find out if they are disappearing, and if they are, why."

He stressed that it's too soon to make any conclusions about firefly populations based on the data that's poured in from the volunteers, whose names are kept private.

"We can't tell in a short time," he said. "They seem to vary a lot year to year depending on the weather conditions. There seems to be a correlation between the temperatures we've gotten and when fireflies first come out."

Salvatore expects to see a late start to firefly season this year, given the long, cold winter that has gripped much of the country. Firefly season typically lasts from May through the summer.

Many people are unaware of fascinating facts about fireflies, Salvatore said. The insects live underground as larvae for two years, then come above ground in adult form to mate. They typically live for just a few weeks above ground, dying after they reproduce.

There are several species of fireflies, each with its own unique flash pattern, which it uses to attract mates, Salvatore said.

Human interference, including light pollution, weed-killers and pesticides, likely has hurt firefly populations, he said.

Public mosquito control projects, which work to combat mosquito-borne illnesses like Eastern equine encephalitis and West Nile virus, likely do not have an effect on fireflies, said East Middlesex Mosquito Control director David Henley.

The larvicides, he said, are only applied to water, making it unlikely that firefly larvae, which live underground, would be exposed.

Public mosquito-control projects use other pesticides, such as sumithrin, in such low concentrations that they would not likely kill an insect as large as a firefly, Henley said. Jennifer Dacey, superintendent of the Taunton-based Bristol County Mosquito Control Project, said she has no knowledge about sumithrin's effect on fireflies, but said that "we are very easy targets" for blame and that the pesticide is "very low in toxicity," making it not harmful to bees or birds that eat insects.

But an Easton-based environmentalist said despite what mosquito control specialists or pesticide producers might say, sumithrin does kill fireflies in flight and other insects that are larger than mosquitoes. While no comprehensive studies of the effect of sumithrin on insects has been conducted, all indications show that the pesticide does in fact kill more than just mosquitoes, whether administered through ground or aerial spraying, said Kyla Bennett, director of New England Public Employees for Environmental Responsibility.

"There is plenty of anecdotal evidence that Anvil (sumithrin) does kill fireflies," Bennett said. "You have to think of it this way: Fireflies are out at night, like mosquitoes are. They spray at night. They are out at same time of year, June through August when they are spraying most of time, and when it's not raining. And, they like the same habitat. Pesticide like Anvil is not species-specific. It's going to kill other non-intended targets. Indeed that could be one of the reasons we are seeing fewer fireflies."

Bennett acknowledged the validity of other theories about the suspected disappearance of fireflies, such as light pollution and habitat destruction, but said that she believes sumithrin also plays a significant role as local mosquito control projects pump it into the environment.

"The reason no one studies it is because there's no money to study it, because pesticide companies and the state won't fund it, because they don't want to hear the answer," she said.

Bennett pointed to anecdotal evidence reported by an Illinois entomologist in the summer of 2012 who claimed to witness the twinkling of fireflies being extinguished after a spray truck rolled through.

Bennett also said in the summer of 2006, environmental groups in Massachusetts were asked to conduct a "bed sheet test" right before aerial spraying, to show

what insects were being killed by the sumithrin. The result of the bed sheet test was that it turned up more than 100 insects that were much larger than mosquitoes, including beatles and spiders, she said.

“We put sheets out right here in Easton, and put one out in the woods and one out in grassy area, and there were two mosquitoes on the bed sheet and over 100 other insects, some of which were much, much bigger,” said Bennett, whose husband is an entomologist.

Salvatore is hopeful the firefly watch project, which compiles data online at mos.org/fireflywatch, will yield answers.

“We need to keep taking data and hopefully one day we’ll have enough to make some theories about what’s going on,” he said.

Gerry Tuoti is the Regional Newsbank Editor for GateHouse Media New England. Marc Larocque, reporter For the Taunton Daily Gazette, contributed Taunton-area information to this story.

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http://www.tauntongazette.com/article/20140323/NEWS/140328332

Print Page

HEAVY COSTS

WEIGHING THE VALUE OF NEONICOTINOID INSECTICIDES IN AGRICULTURE

CENTER FOR
FOOD SAFETY

MARCH 2014

ABOUT CENTER FOR FOOD SAFETY

CENTER FOR FOOD SAFETY (CFS) is a non-profit public interest and environmental advocacy membership organization established in 1997 for the purpose of challenging harmful food production technologies and promoting sustainable agriculture. CFS combines multiple tools and strategies in pursuing its goals, including litigation and legal petitions for rulemaking, legal support for various sustainable agriculture and food safety constituencies, as well as public education, grassroots organizing, and media outreach.

ACKNOWLEDGEMENTS

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This report was made possible by generous funding from: CERES TRUST, HARRIET CROSBY, BELLWETHER FOUNDATION, & CORNELL DOUGLAS FOUNDATION.

Photographs: Special thanks to JIM DOAN (page 10) and to AARON SCHMIDT (page 14) for the use of their photos.

Graphic Design: ELIZABETH COLE

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EXECUTIVE SUMMARY

This report tackles the question: **Are neonicotinoid insecticidal seed treatment products beneficial or not?** Center for Food Safety reviewed and summarized 19 articles from scientific journals that studied the relationship between neonicotinoid treatments and actual yields of major US crops: canola, corn, dry beans, soybeans, and wheat. In sum, we found that numerous studies show neonicotinoid seed treatments do not provide significant yield benefits in many contexts. European reports of crop yields being maintained even after regional neonicotinoid bans corroborate this finding. Opinions from several independent experts reinforce that neonicotinoids are massively overused in the US, without a corresponding yield benefit, across numerous agricultural contexts. The bottom line is that toxic insecticides are being unnecessarily applied in most cases.

Neonicotinoids have acute and sublethal effects on honey bees and other pollinators and are considered a major factor in colony collapse. It appears that in approving these insecticide products, the Environmental Protection Agency (EPA) has overvalued the "insurance" neonicotinoids offer against the mere risk of pest pressures, which are often not realized. This has led to heavy costs to the agricultural community and the nation as a whole. "Pre-sterilizing" fields has, in effect, rendered integrated pest management (IPM), in which pesticides are only used if economic pest damage thresholds are exceeded, obsolete for many major field crops.

RECOMMENDATIONS

In order to fully evaluate future insecticide registration applications and comply with EPA's mandate to account for both benefits and costs, the agency should:

- Fully weigh both quantifiable and unquantifiable values in assessments of proposed systemic insecticide products, including at a minimum these foreseeable cost categories:
    1) honey bee colony impacts and resulting reduced yields of pollinated crops,
    2) reduced production of honey and other bee products,
    3) financial harm to beekeepers and consumers,
    4) loss of ecosystem services, and
    5) market damage from contamination events.
- Require verification by independent scientists and economists (preferably published in peer-reviewed journals) for claims of efficacy, crop yields, and economic benefits associated with all products.
- Reject applications to register any prophylactic insecticides that undermine basic IPM principles, may harm organic farm production, or are not cost-effective, either for the farmer or the nation as a whole.
- For all insecticidal seed treatment products, repeal the agency's waiver for "product performance data" in the EPA Product Performance regulation at 50 CFR § 158.400(e)(1) because of their prophylactic overuse, lack of efficacy, unique persistence, and high overall costs. Related to that, EPA also should promptly enforce the mandate in its regulation that: "each registrant must ensure through testing that his [sic] product is efficacious when used in accordance with label directions and commonly accepted pest control practices."

In light of the findings of this report, EPA should suspend all existing registrations of neonicotinoid seed treatment products whose costs and benefits have not been adequately weighed until this accounting is completed.

EVALUATING THE RISKS OF NEONICOTINOIDS

Neonicotinoids are a class of insecticides that damage the central nervous system of insects, causing tremors, paralysis, and death at very low doses. The primary neonicotinoids registered for use in the US are six relatively new (within the last 20 years) active ingredients: acetamiprid, clothianidin, dinotefuran, imidacloprid, thiacloprid, and thiamethoxam. All are "systemic," meaning they are absorbed into treated plants and distributed in their vascular systems with water that moves up through the plant. Treating a plant or just coating a seed with neonicotinoids can render parts of the plant—including the roots, leaves, stem, flowers, nectar, pollen, and guttation fluid—toxic to insects. The toxicity of the plant varies over time depending on the part of the plant, the amount of neonicotinoid applied, and other factors. Neonicotinoids are persistent in soil and easily transported via air, dust and water to habitats in or near crop fields.[1] There, they can kill or weaken beneficial invertebrates, as well as birds and other wildlife, through direct and indirect effects.[2] Sublethal doses can result in honey bee (*Apis mellifera*) colony damage through chronic effects, including compromising the behavior, health, and immunity of colonies, thus causing them to collapse due to pathogens and parasites.[3]

The risks of using neonicotinoid pesticides are widely reported in the literature—evidence of their harms to pollinators and other beneficial insects is abundant—but what about the *benefits* of using these compounds? Seed of major crops in the US is widely treated with neonicotinoids, ostensibly to protect emerging seedlings from pests and thus improve yields. Almost all of the corn seed and approximately half of the soybeans in the US are treated with neonicotinoids.[4] More than 90% of the canola seeded in North America is treated.[5] This prophylactic pre-planting application occurs regardless of the pest pressure expected in the field, as typically there is no monitoring or sampling of crop fields for pest presence prior to application. Neonicotinoid treated seeds are commonly the only option for farmers purchasing seed. Despite marketing of these products that promotes their benefits to farmers, many peer-reviewed studies show little or no yield benefit associated with their use on crops, especially where there is low or moderate pest pressure. The studies reviewed in this report suggest that farmers are frequently investing in crop protection that is not providing them with benefits. In addition to the short-term economic costs, this presents long-term risks to sustainability for American farmers and the rural environment.

Despite their extensive use, there is a relatively small body of independent literature examining neonicotinoid use on crops. In 2011, scientists noted "there have been few peer-reviewed studies on seed-applied insecticide/fungicides probably because of the recent commercialization of these products."[6] This report surveys peer-reviewed literature that evaluates the efficacy of neonicotinoid seed treatments and finds that they are not providing a benefit to farmers for pest management across numerous agricultural contexts. The studies reviewed address major commodity crops grown in the US and Canada, but reports from other countries also show that neonicotinoids may not be providing a benefit. These studies were conducted in several regions, representing a range of climatic conditions and pest pressure levels encountered by American farmers.

WEIGHING COSTS AND BENEFITS

The Environmental Protection Agency (EPA) has the authority to approve or deny new pesticides under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).[7] FIFRA directs EPA to evaluate whether the use of pesticides (including neonicotinoids) proposed for registration presents "any unreasonable risk to man or the environment, taking into account the economic, social, and environmental *costs* and *benefits* [emphasis added]."[8] If EPA's weighing of the foreseeable costs of a proposed product exceeds its foreseeable benefits, then FIFRA compels the agency to deny registration.

Although not all records are public, to date, no indication exists that EPA has *ever* formally denied a full registration for any proposed neonicotinoid product because its foreseeable costs exceeded its benefits.[9] Since the late 1990s, the agency has approved neonicotinoid products whose applications are estimated to now exceed 150 million acres and very likely more than 200 million acres in annual applications nationwide.[10] It is estimated that more than 500 different neonicotinoid products exist, approved for more than 150 crop, landscape, ornamental, and other uses such as structures, poultry litter, pets, and termite control. In short, it is apparent that EPA routinely judges the foreseeable costs of neonicotinoids to be outweighed by the benefits they will provide to farmers and other users. Indeed, EPA's own Product Performance regulation has waived the obligation for pesticide manufacturers to demonstrate that new pesticide products are efficacious before they are registered, with limited exceptions.[11] This indicates the agency's weighing of the products' costs versus benefits is not rigorous.

Although there is no doubt that neonicotinoids are highly toxic to insects, this does not mean they are routinely effective in pest management. This report aims to answer the question: **Are neonicotinoid insecticidal seed treatment products beneficial or not?** Center for Food Safety reviewed and summarized 19 peer-reviewed articles from scientific journals that studied the relationship between neonicotinoid treatments and actual yields of major US crops: canola, corn, dry beans, soybeans, and wheat. In sum, we found that numerous studies have documented that neonicotinoid insecticides do not provide significant crop yield benefits in many contexts. The risks and costs of using neonicotinoid seed treatments outweigh their potential benefits.

The scope of this inquiry is limited to *agricultural* benefits, because such benefits have a ready measure: relative units of crop yield. While yield is not the only possible benefit, it is certainly the one that garners the most attention from crop producers and impacts their planting decisions. It should be noted that neonicotinoids are also used in scores of landscaping, ornamental, and other non-agricultural contexts where quantification of benefits is typically infeasible because it includes aesthetics and other largely subjective measures. Deploying powerful insecticides—particularly persistent systemic compounds—in gardening and ornamental uses has been heavily criticized because of the potential for harm to beneficial insects and other positive environmental attributes.[12] Without yield as a measure, EPA's weighing of benefits, or the lack thereof, necessarily is more qualitative than quantitative for non-agricultural uses, but accurate accounting remains vitally important.

ASSESSING THE LITERATURE

This literature review compiles independent peer-reviewed studies on the use of neonicotinoid seed treatments, and concludes that in many cases, the compounds are not providing a yield or economic benefit to farmers. The studies represent a wide range of locales and weather patterns, demonstrating that the results are robust across various agricultural contexts and growing conditions. In cases where there was moderate or low pest pressure, the reviewed studies found that neonicotinoids were even less likely to provide a yield benefit. The findings indicate there is often no economic justification for using neonicotinoids as a prophylactic control measure because the cost of treatment tends to exceed that of other control options that can be used when pests reach economic levels.

The following are the major findings from this literature review:

- **Neonicotinoids either did not provide a yield benefit (8 studies[13]), or provided an inconsistent yield benefit (11 studies[14]).**
- **Using neonicotinoids frequently does not provide an economic benefit to farmers compared to alternative control methods or not treating fields when pest pressure is minimal.**
- **Efficacy of neonicotinoids varies and is difficult to predict, especially for pests that emerge around the same time in the season that the bioactivity of neonicotinoids declines.**

Several authors concluded that using neonicotinoids at best provided sporadic pest control and, for some pest species, were typically ineffective. Although neonicotinoids occasionally provided benefits in terms of reduced pest damage or other growing season parameters, in many cases these observed benefits did not translate into increased yield at the end of the season. For pests like soybean aphid, which typically emerge at an economic level after the neonicotinoids are no longer active in the plants, scientists recommend that "management should be based on scouting and applying an insecticide only when populations exceed the economic threshold."[15] They also note that the prophylactic nature of neonicotinoid seed treatments means farmers are paying to treat a threat that may or may not exist, as "producers incur a control cost prior to the manifestation of pest pressure, and this cost is not recouped with higher yield if economically damaging populations of herbivores do not occur prior to loss of bioactivity."[16] It is evident that prophylactically treating crops for pests is not benefitting farmers in terms of yield or economics when pest pressure is uncertain. Given the demonstrated harmful effects of neonicotinoids on honey bees and other beneficial insects, it is clear that they are widely overused in American agriculture to the detriment of pollination services, farmers, and the environment.

METHODOLOGY

Studies included in this review were identified by conducting online scientific literature searches for independent research that evaluated yield of major North American crops in response to neonicotinoid seed treatments.[17] This report does not provide all studies that have assessed yield and we recognize that several other studies have found benefits. However, these studies are often neither published in a peer-reviewed journal nor independent of pesticide manufacturer funding. We identified four studies that showed yield benefits from neonicotinoids in independent literature,[18] and also located industry-sponsored papers and presentations that mention yield benefits but do not include full data or methodology.[19] Benefits of neonicotinoid seed treatments have been promoted by their manufacturers, and the EPA does not require independent testing to ensure their efficacy before registering the insecticides. Given the widespread adoption of neonicotinoid seed treatments, it is concerning that there is such a small body of independent literature assessing the efficacy of the products, especially considering that many of the published studies cast doubt on their benefits.

CORN

Cox et al. (2007) evaluated the use of clothianidin seed treatment on corn in the northeastern United States, where there is occasional early-season pest pressure. The experiment included two levels of clothianidin treatment and a control without insecticides (all seed was treated with fungicides), and found that neither crop development nor grain yield were affected by clothianidin seed treatment. Weather conditions varied in the two years of the study, representing the growing conditions faced in the region. Clothianidin's use in the absence of strong pest pressure did not increase corn yields, and thus was not beneficial to farmers. The authors concluded that "we do not recommend clothianidin seed treatment as inexpensive insurance against early-season soil insect damage when corn follows soybean in the northeastern United States."

Jordan et al. (2012) tested a method of fall sampling to predict spring white grub infestations in Virginia corn fields, as well as the use of clothianidin seed treatment. The fall sampling method was able to predict the level of pest population in the spring, and thus the amount of insect damage that could be expected, which could help farmers make an informed decision about using crop protection products. Clothianidin was applied at two rates to seeds in test plots, along with untreated control seeds. Seed treatment did increase corn stand (quantity of viable plants) in two of the three years. Despite this improved stand, there was only a yield benefit in one of the three years (at the higher application rate), when the below-threshold fields were removed from the analysis. The lower application rate for clothianidin was not different from the control in this year, despite the fact that the low rate is labeled for control of white grubs. There was no yield benefit in the second and third years of the experiment (even when the below-threshold fields were excluded). When the nine fields that had below-threshold pest populations were evaluated, there was no yield difference between treated and untreated seed. These results suggest that clothianidin treatment does not improve yields in the absence of pest pressure, and is not consistently effective with pest pressure.

Petzold-Maxwell et al. (2013) investigated the use of *Bacillus thuringiensis* (Bt) corn and clothianidin seed treatment alone and in combination to control rootworm populations at sites in the midwestern United States (Iowa, Nebraska, and Illinois). There was no significant difference between the control seeds (which were treated with a low rate of thiamethoxam to manage other corn pests) and the clothianidin treatment for the survival of western corn rootworm. Although clothianidin did not significantly reduce adult survival for western corn rootworm, it did affect northern corn rootworm. Root injury levels did not differ amongst Bt varieties, but were lower in non-Bt plots treated with clothianidin versus the control. Despite this reduction in root injury, there was no yield benefit from using clothianidin in either Bt or non-Bt crops. The authors note that "the additional cost of an insecticide may not have offered farmers any economic benefits."

Wilde et al. (2007) evaluated the effects of clothianidin and thiamethoxam seed treatment on corn fields in several Kansas locations. In the absence of noticeable insect pressure, no consistent effect on yield was identified at either high or low application rates, with no significant yield difference across all plots. In those locations where there were differences, control plots occasionally had higher yields than the treated plots, suggesting that the effects of the neonicotinoids are inconsistent at best. There was no consistent effect of treatment at any application rate on grain moisture, days to silk, plant population, or yield. Experiments were also conducted in infested fields for various pests, with variable results. Some plots had increased yields from treatment, and others reduced plant damage but did not see a yield benefit. Greenhouse tests to measure emergence and growth parameters found no significant effect of

treatment. While the experiments showed that clothianidin and thiamethoxam are effective against some corn pests, they failed to demonstrate a consistent yield benefit during field trials in the absence of pest pressure. The authors concluded that their tests "did not detect significant differences in plant growth of corn that resulted in consistent increases in yield."

SOYBEANS

Cox et al. (2008) evaluated the use of thiamethoxam, imidacloprid, and fungicide seed treatments to manage soybean pests in fields in New York. Seed treatments did not affect plant density, pod density, and seed yield; and had inconsistent effects on seeds per pod and seed mass. The thiamethoxam/fludioxnil treatment produced the most seeds per pod, but the authors did not attribute this result to the effects of the compounds because they are no longer active in the plant by the time soybean reaches late reproductive stages and seed development begins. The results showed a limited effect of neonicotinoids on soybeans, thus indicating that insecticide/fungicide seed treatment is not required for soybean production in the northeastern US.

Cox and Cherney (2011) treated soybeans with clothianidin or imidacloprid and fungicides in plots following corn in New York to explore the effects of seed treatment and planting rate. Interactions between sites and seed treatment for emergence showed that the results are highly variable and site-dependent, with no clear trend of benefits. Seed treatment had inconsistent effects, increasing plant densities at some sites (up to 22%), but not at others. In terms of yield, the plots showed less than 4%, or no, increases with seed treatment. In the economic analysis, the authors suggest "there appears to be no significant advantage in partial return when using seed-applied insecticide/fungicides vs. untreated seed after adjusting for the respective optimum seeding rates." The lower seed cost from reducing planting rates was offset by the cost of treating the seed, so the switch to lower rates and treated seed was not financially beneficial. Soybean seed cost averaged $2.29/kg in 2009-2010, and the average cost of seed treatment was $0.485/kg. The authors concluded that "growers should not expect a big or consistent response to seed-applied insecticide/fungicides under typical growing conditions in the Northeast United States."

Esker and Conley (2012) explored the economic considerations for seed treatment by looking at the probability that the yield response will cover the cost of treatment. They evaluated one fungicide-only treatment and a fungicide with thiamethoxam against an untreated control for soybeans grown in Wisconsin. The primary insecticidal targets in Wisconsin are aphids, bean leaf beetle, and seed corn maggot. The more expensive thiamethoxam treatment provided a 50% or greater probability of breaking even in 22-56% of the plots analyzed. The responses were very dependent on the cultivar, and it is difficult to predict how cultivars will respond because new ones are introduced so rapidly. The authors found that there were no strong conclusions to be made from their results, noting "the complexity of the results regarding the probability of breaking even with the application of seed treatments suggests that making specific recommendations is difficult."

Johnson et al. (2009) evaluated thiamethoxam seed treatment, a prescribed insecticide/fungicide foliar spray (regardless of pest pressure), and an integrated pest management (IPM) strategy for control of soybean aphid in the midwest. IPM relies on scouting fields for insect populations and only applying foliar sprays when the economic damage threshold is reached. All three treatments protected yield and reduced aphid pressure compared to the

control, but there was no significant difference in yield between the three treatments. The authors assessed the cost effectiveness of each treatment and found that the IPM strategy had the highest probability of being cost effective. Neonicotinoid efficacy is typically diminished by the time aphid densities increase (they lose effectiveness 35-42 days after planting). Given that the occurrence of soybean aphid outbreaks is highly variable, IPM strategies are the best choice because they avoid treating fields that are not susceptible to economic damages from pest pressure. "Although there was little difference in yield among the three insecticide treatments, there was a large difference among the probability of recouping treatment costs," and neonicotinoid treatment had the lowest probability of recouping its cost. "The IPM approach was clearly the most profitable in our break-even analysis, which fits with findings across [a] broad range of US crops where IPM practices have been adopted."

McCornack and Ragsdale (2006) trialed thiamethoxam seed treatment to manage soybean aphid populations in Minnesota. Their results showed that thiamethoxam significantly reduced aphid pressure and reproduction but was only effective at causing aphid mortality and reducing reproduction during early vegetative growth stages. Late season aphid infestations cannot be controlled with seed treatment, and cannot be predicted at planting, so could require additional foliar applications, negating any advantage from using treated seed. Thiamethoxam did not significantly increase yield in years with low aphid density, but did increase yield in one year with high aphid pressure as compared to the untreated control (but was not significantly different from foliar spray plots). "In terms of yield, there was no advantage using a seed treatment over a foliar applied insecticide in any location-year." The authors concluded "at-planting application of thiamethoxam for soybean aphid control provides little consistent benefit to the grower."

Magalhaes et al. (2009) investigated the efficacy of imidacloprid and thiamethoxam seed treatments to control soybean aphids in Nebraska. The first year of the study had low aphid pressure (all below the economic threshold), and there were no differences in yield amongst the treatments. Aphid pressure was greater in the second year, and yield was higher in the treated plots than the untreated controls. Thiamethoxam kept aphid densities below the economic threshold, and imidacloprid reduced aphid densities, but not below the economic threshold. In fields managed based on threshold spraying, this would have resulted in a foliar spray still being applied to the imidacloprid treatment, negating the use of the neonicotinoid. While there was some yield benefit seen in this study, the planting dates were later, so systemic neonicotinoids were still active in the plants when aphid populations increased—this is not typically the case with soybean planting dates. Higher aphid pressures may overwhelm seed treatments and require secondary management strategies. Despite the moderate yield increases associated with neonicotinoid use in some portions of this study, the authors do not recommend their use, instead noting that "Nebraska soybean farmers would likely receive more consistent economic return by scouting fields and applying foliar insecticides only when necessary as indicated by economic thresholds."

Ohnesorg et al. (2009) utilized imidacloprid and thiamethoxam seed treatments to control soybean aphids in fields in Iowa. They compared seed treatments to foliar insecticides and an untreated control. The plots with foliar insecticides had lower soybean aphid populations and higher yields than those with seed-applied insecticides. During the first year of the experiment, some of the seed treatments provided significant yield benefits compared to the untreated control. In both years, the untreated control and seed treatment plots had the greatest exposure to aphid pressure, and in the second year, with moderate aphid pressure, there was no yield advantage from treating fields for aphids. The neonicotinoid seed treatments "provided limited, inconsistent yield protection to soybean that was occasionally not significantly different from the untreated control."

Reisig et al. (2012) investigated imidacloprid and thiamethoxam seed treatments (all treated seed also included fungicides) for the control of thrips in soybean fields in Virginia and North Carolina. Thrips are the primary early season pest of soybeans in the region. The neonicotinoid seed treatments reduced the larval and adult thrips abundance, and thiamethoxam was more effective than imidacloprid at reducing adult thrips density. Despite this, there was no difference in yield between any treatments, and no yield benefit from neonicotinoid treatment. The authors note that "very little data have been published regarding the impact of insecticidal seed treatments, despite their widespread use in the mid-South."

Seagraves and Lundgren (2012) evaluated imidacloprid and thiamethoxam seed treatments in lab trials and field conditions (South Dakota) for their effects on soybean crops and insects. Lab experiments showed that seed treatment bioactivity was gone by 46 days after planting, which would typically be prior to aphid populations damaging crops in the field. There was no consistent effect of insecticidal seed treatments on soybean aphids, thrips, and grasshoppers, but bean leaf beetles were more abundant in the untreated plots in field experiments. In South Dakota, soybean aphid typically only exceeds economic thresholds after August 1, which is well beyond the bioactivity of seed treatments. Over the two years of the study, there was no yield benefit from using treated seeds. Insecticidal seed treatment is estimated to cost producers $12-15/acre, which is a cost that will not be recouped with additional yield if economically damaging pest populations do not occur while the compounds are active. The authors conclude that this research "not only confirms that insecticidal seed treatments have little effect on the key pest of soybeans, but also suggests that this prescriptive use of some of these insecticides may harm long-term IPM of soybean pests by reducing the abundance of their key natural enemies."

Tinsley et al. (2012) investigated the control of soybean aphids provided by aphid-resistant soybean lines and by thiamethoxam seed treatment. Soybean aphids reached economically significant levels in both years. Resistant plants experienced fewer cumulative aphid days, but yields were not significantly different. Thiamethoxam also reduced cumulative aphid days in one year of the study, but not the second year, and did not provide a yield benefit. "Evidence for the ability of thiamethoxam to reduce densities of soybean aphids in this experiment was inconclusive." Seed treatments are less effective against late-season pests—thiamethoxam's utility is limited and dependent on the timing of the infestation because the bioactivity of the compound declines throughout the season. This study "reinforces the economic utility of scouting for soybean aphids and only applying a foliar insecticide when densities reach economically threatening levels."

CANOLA, DRY BEANS, AND WHEAT

Soroka et al. (2008) investigated the efficacy of acetamiprid and clothianidin seed treatments to control flea beetle damage on canola in Manitoba and Saskatchewan. The authors compared various percentages of treated seeds in the planting mix to assess whether farmers could reduce the percentage of treated seed they are planting and still maintain yields. Decreasing treated seeds by one-third (67% treated) had no consistent effect on damage, yield, or cash return. Yields for 100% treated seed were only consistently above those with 67% treated seed under very heavy flea beetle pressure. In most trials, the damage levels on the 100% treated seed exceeded the economic threshold, which would have triggered a foliar insecticide application. In the year with the least pest pressure, feeding levels did not correlate with the amount of treated seed, suggesting that efficacy is reduced in moderate years and

neonicotinoids are not providing benefits in those years. The authors concluded "reducing the proportion of treated seed sown by one third can be an effective means of reducing pesticide load to the environment while maintaining efficacy, especially in situations of low-to-medium flea beetle feeding pressure."

Pynenburg et al. (2011a) studied thiamethoxam seed treatment's ability to alleviate stress from weed pressure and white mold in dry bean fields in Ontario. The authors noted "no known published literature was found that studied the effect of thiamethoxam on plant vigor" and pesticide manufacturer representatives said that "more consistent benefits of thiamethoxam on plant vigor have been observed in dicot than monocot crops, and the benefits were more pronounced under abiotic stress conditions." Thiamethoxam had inconsistent effects with respect to plant emergence and vigor, harvested weight, seed weight, and economic returns. Each of these parameters was increased in some thiamethoxam plots and decreased in others compared to the controls, suggesting that overall, "the plant growth benefits of thiamethoxam are unclear and hard to quantify."

Pynenburg et al. (2011b) evaluated thiamethoxam seed treatment's plant enhancement abilities for dry bean production in Ontario to combat the stresses of annual weed pressure and anthracnose. Thiamethoxam increased emergence and vigor at only one location, contradicting reports of benefits from treatment. Seed quality was improved by thiamethoxam when results were pooled over all locations, but the authors could not explain this result because anthracnose severity was not reduced in thiamethoxam plots. Thiamethoxam had no effect on net yield or economic return. The authors concluded "thiamethoxam's potential to increase plant vigor was not clearly demonstrated, as it did not affect plant height, disease severity, net yield, or net economic return."

Royer et al. (2005) investigated the ability of imidacloprid seed treatment to control pests in hard red winter wheat grown in Oklahoma with several planting dates. Applying imidacloprid had varying results for aphid abundance, and in some cases the aphid abundance was not different from the untreated control. Grain yields increased with increased rates of imidacloprid application, but the economic return from imidacloprid was not usually positive. The lowest imidacloprid rate was the only rate to consistently provide a positive economic return across all planting dates. The authors note that "these data show how difficult it is to predict whether a prophylactic insecticide seed treatment will consistently pay for itself."

Wilde et al. (2001) evaluated thiamethoxam and imidacloprid seed treatments for insect control in winter wheat fields in Kansas. No yield benefit was seen in the field experiments, which had low to no pest pressure. Control of early season pests was demonstrated in greenhouse experiments with infested plants, but late season pest control was less effective and inconsistent. While the authors note that seed treatment could be useful in fields with chronic pressure from several pests, they conclude that "the use of seed treatments is economically risky where insect populations are variable" and that foliar treatments based on action thresholds are a better option.

EXPERTS WEIGH IN ON LACK OF YIELD BENEFITS

Summary reports from France and Italy show neonicotinoids provide little if any economic benefit in many contexts. Unlike North American reports, these provide detailed *before* and *after* case studies because these countries have restricted neonicotinoid use on various crops. These examples support the limited yield benefits from neonicotinoids shown in North American research:

- France banned the use of imidacloprid on sunflowers in 1999 and on corn in 2004, but the yield trends for both crops through 2007 show that the productivity was not harmed by the loss of seed treatment as a pest control measure.[20]
- The Italian Ministry of Health announced in June 2012 that it would continue the suspension of clothianidin and thiamethoxam on corn originally imposed in 2009 in response to mass bee kills that clearly resulted from neonicotinoid use. Researchers found no evidence that the suspensions caused any economic harm in Italy; corn farmers there have seen no serious pest attacks on untreated seed crops and have maintained their yields.[21]
- In 2013, the European Union voted for a two-year minimum suspension of clothianidin, thiamethoxam, and imidacloprid on bee-attractive crops and limited ornamental use to approved applicators. This may provide another broad case study to assess yield impacts if reliable follow-up monitoring occurs. However, the potentially short duration of the suspension may not provide enough time to identify changes in honey bee health as the neonicotinoids persist in soil and may be taken up by subsequent crops.

Professor David Goulson's 2013 review of impacts, after documenting the lack of any identifiable crop yield increases in the United Kingdom associated with the introduction of neonicotinoids, states:

> "Given their widespread use, it is surprising that few studies have attempted to compare the effectiveness of neonicotinoids with alternative means of pest control. Bueno et al. (2011) compared managing soya pests in Brazil using either an IPM approach or prophylactic use of insecticides (the latter primarily based on imidacloprid). Crop yields were indistinguishable in the two treatments, but pesticide use and costs were much lower in the IPM treatment, demonstrating that this remains the best alternative in this system. In North America, Seagraves & Lundgren (2012) compared yield of either imidacloprid or thiamethoxam seed dressings on soya with untreated controls and found no difference in yield in either of the 2 years of their study, but populations of beneficial natural enemies were depressed in treated plots. In this system, the evidence would suggest that the cost of seed treatment (~$30 ha) is not being recouped by the farmer. This is in accordance with a several similar studies of soya which found either no yield benefits (McCornack & Ragsdale 2006; Cox, Shields & Cherney 2008; Ohnesorg, Johnson & O'Neal 2009) or yield benefits below those which could be achieved more economically using foliar insecticides applied only when pests exceeded a threshold (McCornack & Ragsdale 2006; Johnson et al. 2009). Similarly, studies of the efficacy of imidacloprid dressing of winter wheat in North America suggest that yield benefits are small (compared to unprotected, control crops) and often exceeded by the cost of the pesticide (Royer et al. 2005)."[22]

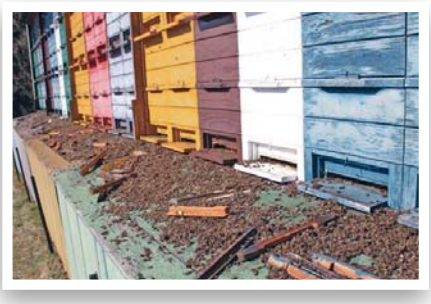
Other respected experts concur with Dr. Goulson's overview:

- Dr. Christian Krupke, Department of Entomology, Purdue University, stated: "Part of the mission of my research and extension program is annual evaluation of pest management technologies in corn and soybeans—this is a critical source of unbiased efficacy data for growers. We attempt to challenge these technologies by placing them in fields with histories of pest damage. We have not demonstrated a consistent yield benefit of neonicotinoid seed treatments in either case, over many sites and many years. This is not because the products are not toxic; it is because insect pressure at the time that neonicotinoids are active (a brief window extending only a few weeks after planting) is either absent, or too high for neonicotinoids to effectively reduce pest damage. Because there is no demonstrable benefit in the vast majority of fields/years we have surveyed, it is apparent that seed treatments are dramatically overused in these crops (all corn and the majority of soybeans are treated)."[23]
- Dr. Jonathan Lundgren, a leading USDA Agricultural Research Service entomologist studying the effects of neonicotinoids, stated: "Farmers should question whether applying neonicotinoid seed treatments are more harmful than helpful on their farms. Public sector research on insecticidal seed treatments in soybeans from across the US consistently shows that spraying pests when they exceed thresholds is more profitable than prophylactic use of insecticidal seed treatments. In corn, I have not seen evidence that there are insect pests—beyond those targeted by Bt—that warrant consistent and prophylactic management. Finally, pest management decisions need to account for the costs that insecticides have against non-target organisms like predators and pollinators."[24]
- Tracy Baute, an Ontario Ministry of Agriculture and Food entomologist and IPM expert, stated: "Based on my experience, only 10 to 20% of the corn and soybean acres are actually at risk of most of the soil pests on the [neonicotinoid] product labels."[25] In other words, 80 to 90% of the use is unnecessary. Ontario's corn and soybean growing practices are similar to those in the northern portions of the US midwest corn and soybean regions.
- Dr. Christy Morrissey, Department of Biology, University of Saskatchewan, stated: "Although the dogma that has been promoted is that we really need these chemicals in order to protect crops…there actually is very little evidence to support the extremely widespread use of these chemicals."[26]

COSTS AND DETRIMENTAL IMPACTS OF NEONICOTINOIDS

The use of neonicotinoid seed treatments is associated with a wide range of detrimental impacts, the majority of which are not fully considered by EPA as the agency evaluates proposed product registrations. These market and other impacts, summarized below, are not without additional consequences. Major financial institution reports indicate that neonicotinoid harms to honey bees and related pollinator declines could depress stock values of some publicly-held companies and harm critical agricultural sectors.[27] Farmers are paying unnecessarily for pest protection that in many cases they are not receiving. EPA must weigh all of the costs, both documented and foreseeable, along with the lack of significant crop yield benefits.

HONEY BEE COLONY IMPACTS



Science has linked neonicotinoid use to honey bee and bumblebee impacts.[28] Hundreds of documented reports detail acute mass honey bee kills via contaminated dust (graphite and talc) from planting treated corn seeds. Further, chronic ingestion of neonicotinoids can harm their foraging success and colony strength, as honey bees are social insects that rely heavily on memory, cognition, and communication. Researchers "clearly demonstrate[d] an increase in pathogen growth within individual bees reared in colonies exposed to one of the most widely used pesticides worldwide, imidacloprid, at below levels considered harmful to bees," suggesting that nonlethal effects to honey bees from low exposure levels may be extremely damaging.[29]

Prior to 2006—when neonicotinoids were beginning to be used on a nationwide scale—commercial beekeepers and honey producers typically anticipated losing fewer than 10% of their bees each year, mostly due to overwintering mortality. Losses of that magnitude were sustainable because they could be recovered by splitting hives, adding new queens, and other measures. Since 2006, however, overwintering losses have risen dramatically. While this correlation does not equate to causation, the trend is remarkable. Surveys conducted by the Department of Agriculture (USDA) show that 28% to 33% of total honey bee colonies died each winter from 2007 to 2011.[30] Winter losses dipped to 22% in 2012, but the 2013 survey indicated 31% of colonies died.[31] Compounding these overwintering losses is a marked increase in summer mortality, the season when bee populations should be thriving. According to USDA, "since 2006 an estimated 10 million bee hives at an approximate current value of $200 each have been lost, and the total replacement costs of **$2 billion dollars** has been borne by the beekeepers alone [emphasis added]."[32] That statement refers to a six-year period, thus a rough estimate of annual replacement cost is **about $300 million per year.** This magnitude of annual uninsured losses is unsustainable.

The role of neonicotinoids in honey bee decline continues to be debated. Just as there is no unassailable scientific study, there is no "smoking gun" to point to as the cause of honey bee decline. Honey bees are impacted negatively by many interacting, and sometimes synergistic, stressors. However, there are many studies across various scales that clearly demonstrate that neonicotinoids negatively affect honey bees. Whether this role is large or small may depend on the intensity of neonicotinoid use in a given region. However, when this is balanced against the reality that neonicotinoids provide little tangible benefit across the cropping systems where they are most widely used, it rapidly becomes apparent that the status quo can, and should, change.

REDUCED CROP POLLINATION BY HONEY BEES

The nationwide decline of honey bee colonies is not only a financial and personal crisis for commercial beekeepers and honey producers; it is also a direct hazard to the nation's food supply. Scientists estimate that one-third of the food people eat—and an even greater proportion of high value nutrient and vitamin sources—comes from crops that will not make fruit or seed unless they are pollinated.[33] As summarized by USDA:

> "It is imperative that we increase honey bee survival both to make beekeeping profitable but more importantly to meet the demands of US agriculture for pollination and thus ensure food security.… Currently, the survivorship of honey bee colonies is too low for us to be confident in our ability to meet the pollination demands of US agricultural crops."[34]

A prominent USDA researcher has warned that, unless trends are reversed, "[w]e are one poor weather event or high winter bee loss away from a pollination disaster."[35]

In weighing the costs to pollinators and other beneficial insects, EPA must consider the role of neonicotinoids in relation to managed honey bee and other pollinator populations. These have been valued by Kansas State University at **$12.8 billion**, based on documented average annual yield benefits for ten major crops.[36] There are more than 100 crops in North America that benefit from pollinators.[37] Kansas State researchers found that through 2010, the value of US agriculture declined by approximately **$75 million per year** compared to 1986 values due to declining pollinator numbers for the major crops they assessed. While recognizing several factors in these declines, they identified neonicotinoids as key drivers:

> "Insecticides and pesticides are applied not only on agricultural fields, but also on golf courses, in residential areas, across rangelands, etc. These pesticides and insecticides generally do not kill pollinators outright, but instead impair their development and behavior (Johnson 2010); for example, agrochemicals cause impaired odor discrimination and abnormal communication dances, which can cause mistakes in estimating distances and direction to food sources (Kearns and Inouye 1997; Thompson 2003). Gill et al. (2012) reported reduced worker foraging performance, especially pollen collecting efficiency, with chronic exposure of neonicotinoid and pyrethroid pesticide in bumblebees. Also they showed field-level exposure of these pesticides caused reduction in brood development and colony success. When agrochemical use is associated with reduced use of crop rotations, crop diversity and availability of other pollen sources are also lessened, which compounds the negative impacts on pollinators."[38]

These findings of pollinator impacts have been consistently observed and confirmed by independent scientists. According to EPA's and USDA's estimates, pollination contributes **$20 to $30 billion** in crop production annually to the US economy.[39] These massive and declining pollinator-driven crop yield benefits must be weighed against the often marginal or illusory neonicotinoid-driven crop yield benefits. The values in the Kansas State and the EPA and USDA estimates, are national-level and omit accounting for lost earnings and other financial damage to commercial beekeepers themselves, who create the bulk of that crop yield enhancement through their pollination services and colony management. Compounding the sting of these losses is the fact that EPA currently lacks a complete accounting of the economic benefits of honey bees as the agency weighs the costs insecticides pose to beekeepers.[40]

The ongoing operational and financial damage to the small cadre of fewer than 1,000 major commercial pollinating beekeepers nationwide is jeopardizing **tens of billions of dollars** of national crop-yield benefit from pollination. As bee losses mount, beekeepers must replace them to fulfill pollination contracts and raise their prices accordingly, the costs of which are, in turn, passed on to producers and consumers. If the aging and dwindling beekeeper workforce continues to struggle financially and fades away, major shockwaves would reverberate through the agricultural economy.[41]

Given the data we review in this report, over many years, locations, and cropping systems, there are no consistent benefits from using treated seeds in pest management. Coupled with EPA and USDA's own estimates, it is unreasonable for EPA's pesticide registration department to continue to allow the pursuit of non-existent or insignificant yield benefits for corn, soybeans, and other crops while contributing to mass declines in pollinators, major yield reductions in pollinator-dependent crops, and financial damages to beekeepers.

REDUCED PRODUCTION OF HONEY & OTHER BEE PRODUCTS

The impacts of neonicotinoids on honey and other bee product declines are complex. It is clear that total US honey production has dropped by more than 25% since 1994, when the first neonicotinoid (imidacloprid) was registered for use.[42] The national crop from 2013 is expected to be the *smallest honey crop ever reported* by a large margin, with a mid-range estimate of 114 million pounds compared to a mid-range estimate of 135 million pounds in 2012.[43] The average bulk wholesale value of the lost production of **21 million pounds** compared to 2012 was approximately **$38 million**.

Analysis of crop reductions over time indicates that the states with drastic honey crop declines in recent years are those in the Corn Belt with the most widespread use of neonicotinoid treated seeds, including, but not limited to, Illinois, Indiana, Iowa, Kansas, Missouri, and Nebraska.[44] Honey production in Florida, which as recently as 2000 was very high, has dropped roughly in half since the citrus psyllid was found and orange grove infections led to massive increases in use of neonicotinoids and other insecticides.[45] While statistical certainty on the causes of declines across a broad industry sector will remain elusive, the apparent contributing role of neonicotinoid-induced colony losses in huge reductions in honey, beeswax, and other valuable bee products must be taken into account.

LOSS OF ECOSYSTEM SERVICES

EPA must weigh the frequent lack of neonicotinoid yield benefits against the tremendous environmental and economic benefits and ecosystem services that neonicotinoids are jeopardizing. This goes far beyond more readily-quantified reductions in managed honey bees and bee products. Acute and chronic effects similar to those impacting honey bees can harm bumblebees and other valuable, beneficial invertebrates such as lady bugs, ground beetles, earthworms, and parasitoid wasps.[46] Beneficial invertebrates are essential, often unnoticed, components of healthy agricultural fields, landscapes, gardens, and natural systems.

In 2006, researchers estimated the value of native insect pollination for US crops at **$3.07 billion**.[47] More recently, in California alone, researchers estimated wild pollinators produce between **$937 million and $2.4 billion** per year in economic value.[48] Beyond crop pollination, beneficial predatory and parasitic insects and other arthropods provide natural pest suppression to farms, an ecosystem service valued at more than **$4.5 billion** per year, as well as to natural areas and developed landscapes.[49] Water contamination from neonicotinoids has been identified in several agricultural regions and linked to detrimental impacts in aquatic ecosystems.[50]

There are sweepingly important indirect benefits—virtually beyond calculation—gained by non-crop plant communities sustained through pollination.[51] These include the aesthetic values of flowers and ornamental plants, reduction of soil erosion, food and forage for wildlife, and maintenance of forest, grassland, desert, and other broad ecological dynamics. In 2006, Losey and Vaughan calculated the value of ecosystem services to humans from all wild insects in the US to reach **$60 billion**.[52]

MARKET DAMAGE FROM CONTAMINATION EVENTS

New financial harm from neonicotinoids has also surfaced. In February 2014, exports from Canada to Japan of the specialty, high-value grain buckwheat, were rejected due to levels of thiamethoxam contamination exceeding Japan's maximum residue limit.[53] The buckwheat farmers apparently did not use thiamethoxam on that crop—it persisted in contaminated soil from earlier plantings of other crops or was carried into their fields via air or dust. This sole incident led to the costly rejection of two container loads of buckwheat and is an ongoing problem could lead to the loss of additional export markets.[54]

CONCLUSIONS

It appears EPA has overvalued the "insurance" neonicotinoids offer against often non-existent or insignificant pest pressures in many contexts. This overuse, a direct result of EPA's regulatory approval process, imposes heavy costs to the agricultural community and the nation as a whole. "Pre-sterilizing" fields has, in effect, rendered integrated pest management, in which pesticides are only used if economic pest damage thresholds are exceeded, obsolete for those crops:

> "The widespread adoption of neonicotinoids as seed dressings has led to a move away from integrated pest management (IPM), a philosophy of pest management predicated on minimizing use of chemical pesticides via monitoring of pest populations, making maximum use of biological and cultural controls, applying chemical pesticides only when needed and avoiding broad-spectrum, persistent compounds."[55]

A 2014 report by the multi-stakeholder Corn Dust Research Consortium on neonicotinoid seed treatments and their impacts on honey bees contains these related recommendations:

- Minimize unnecessary use of seed treatment insecticides. Use them only when needed, such as where historic pest infestations are above threshold or high risk factors for pest pressure have been anticipated or determined.
- Follow the principles of integrated pest management.[56]

The broadly-supported Corn Dust Research Consortium report undercuts EPA's history of enabling unrestricted neonicotinoid use and promotes IPM as the better alternative. However, exhortations and voluntary recommendations will not change the reality of overuse spurred by advertising campaigns promoting these products directly to seed dealers and farmers. The market for seeds is heavily monopolized by a few companies.[57] In reality, US farmers often have almost no choice—untreated seeds are simply not available in most markets. It must also be recognized that synthetic neonicotinoid insecticides are not approved in organic agriculture. The harms neonicotinoids pose in and around conventional farm fields can damage nearby organic operations that rely on healthy ecosystems.

In conclusion, recent reports evaluated here examining the benefits of neonicotinoid seed treatments for crop yields in North America found they were largely illusory. European reports of crop yields being maintained even after regional neonicotinoid bans corroborate this finding. Opinions from several independent experts reinforce that neonicotinoids are massively overused in the US, without a corresponding yield benefit, across numerous agricultural contexts. The bottom line is that toxic insecticides are being unnecessarily applied in most cases.

RECOMMENDATIONS

In order to fully evaluate future insecticide registration applications and comply with the FIFRA mandate to account for costs and benefits, EPA should:

- Fully weigh both quantifiable and unquantifiable values in assessments of proposed systemic insecticide products, including at a minimum these foreseeable cost categories:
  1) honey bee colony impacts and resulting reduced yields of pollinated crops,
  2) reduced production of honey and other bee products,
  3) financial harm to beekeepers and consumers,
  4) loss of ecosystem services, and
  5) market damage from contamination events.
- Require verification by independent scientists and economists (preferably published in peer-reviewed journals) for claims of efficacy, crop yields, and economic benefits associated with all products.
- Reject applications to register any prophylactic insecticides that undermine basic IPM principles, may harm organic farm production, or are not cost-effective, either for the farmer or the nation as a whole.
- For all insecticidal seed treatment products, repeal the agency's waiver for "product performance data" in the FIFRA Product Performance regulation at 50 CFR § 158.400(e)(1) because of their prophylactic overuse, lack of efficacy, unique persistence, and high overall costs. Related to that, EPA also should promptly enforce the mandate in that regulation that: "each registrant must ensure through testing that his [sic] product is efficacious when used in accordance with label directions and commonly accepted pest control practices."

In light of the findings of this report, EPA should suspend all existing registrations of neonicotinoid seed treatment products whose costs and benefits have not been adequately weighed until this accounting is completed.

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[7] 7 U.S.C. § 136 *et seq.*
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[9] This conclusion is from a review of orders in the Federal Register (www.federalregister.gov) and the lack of any "Notices of Denial" for registration applications for products of the six active neonicotinoid ingredients. It is possible EPA has made some denial decisions via internal deliberations that never reached the formal order stage.
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Mar 26, 2014 08:13 AM EDT

Pesticides Have Devastating Effect On Earthworms

By Kamal Nayan

Earthworm

Pesticides might be helpful for crops but their effect on earthworms living in the soil under the plants is devastating, according to a new study. The worms in such conditions only grow to half their normal weight and become incapable of reproduction.

"We see that the worms have developed methods to detoxify themselves, so that they can live in soil sprayed with fungicide. They spend a lot of energy on detoxifying, and that comes with a cost: The worms do not reach the same size as other worms, and we see that there are fewer of them in sprayed soil. An explanation could be that they are less successful at reproducing, because they spend their energy on ridding themselves of the pesticide," said researchers, Ph. D. student Nicolas Givaudan and associate professor, Claudia Wiegand, in the press release.

Researchers set up an experiment to study the behavior of the earthworm species Aporectodea caliginosa. They observed how the fungicide-exposed worms adopted to the toxic environment. They added that over the generation worms have developed a method to detoxify themselves.

Researchers also noted that there were 2-3 times more earthworms in unsprayed

soil than in sprayed soil.

"The fungicide increased metabolism rate in the worms, both the adapted worms and the not adapted worms. In the not adapted worms we saw that their energy reserve of glycogen was used faster. Contrastingly, only in the adapted worms we saw that amino acids and protein contents increased, suggesting a detoxification mechanism. They also increased their feeding activity, possibly to compensate for the increase in energy demand," researchers added.

The research was conducted by a Danish/French research team and will be published in *Soil Biology and Biochemistry*.

Food Safety News
Breaking news for everyone's consumption

EPA Stops Sale of Food Containers Made With Nano Silver

By News Desk | April 2, 2014

The U.S. Environmental Protection Agency (EPA) has ordered Pathway Investment Corporation of Englewood, NJ, to stop selling plastic food containers made with nano silver because it's an unregistered pesticide.

The company claims that the nano silver – an active ingredient in Kinetic Go Green Premium Food Storage Containers, Kinetic Smartwist Series Containers, TRITAN Food Storage and StackSmart Storage – helps reduce the growth of mold, fungus and bacteria.

But these claims can only be made on products that have been properly tested and registered with EPA, and Pathway's containers were never registered.

"Unless these products are registered with the EPA, consumers have no information about whether the claims are accurate," said EPA Regional Administrator Judith A. Enck. "The EPA will continue to take action against companies making unverified public health claims."

Some pesticides have been linked to various forms of illnesses in people, ranging from skin and eye irritation to cancer. Some pesticides may also affect the hormone or endocrine systems. In many situations, there are non-chemical methods that will effectively control pests.

EPA has also issued warning letters to Amazon, Sears, Walmart and other large retailers directing them not to sell the products. These vendors have been selling Kinetic Food Storage Containers through their websites.

The Center for Food Safety commended the agency on its action.

"This is the first time a nanotechnology-based product used on food has been withdrawn from the market, and is a major victory in protecting consumers from a technology whose health and environmental effects are still unknown, "said Jaydee Hanson, CFS senior policy analyst.

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More Headlines from Government Agencies »

EPA Authorizes Companies to Make Pesticide Labels Available on Internet

Monday, April 7, 2014

from Chemical Regulation Reporter ® FREE TRIAL >>

By Patrick Ambrosio

April 4 --The Environmental Protection Agency will now allow pesticide registrants to make legally valid product labels accessible on the Internet.

The EPA released a pesticide registration notice, posted on the agency's website April 4, outlining a voluntary process for posting legally valid, enforceable pesticide labeling material on the Internet. Prior to issuance of the notice, which is effective immediately, no form of labeling posted on the Internet was legally valid, the EPA said.

All pesticide products still must be accompanied by a physical copy of EPA-approved labeling, but the new process will allow pesticide registrants to include a reference to a website from which pesticide applicators can download enforceable labeling. Applicators could then go to that website and download a "streamlined" version of the pesticide label, containing all necessary hazard and first aid statements and any relevant state- or site-specific use directions.

Pesticide applicators would be responsible for complying with all instructions either from the Web-distributed label or the physical label on a pesticide, according to the notice. The EPA added that pesticide users also would be responsible for complying with any state regulations or other applicable requirements requiring applicators to maintain a copy of the labeling used for applications.

The EPA said in an April 4 statement that physical product labels on pesticide packaging will not be shortened in any way due to the launch of Web-distributed labeling.

Increased Compliance, Faster Updates

The EPA said that the Web-based labeling initiative could result in several benefits, including increased compliance with federal pesticide law.

The agency said that the availability of streamlined pesticide labels on the Internet, which would still contain all relevant information for a user's specific state and intended site of the pesticide use, could make labels clearer for applicators to understand. That could improve compliance with pesticide label requirements, protecting human health and the environment from pesticide misuse, according to the EPA.

The EPA also said the adoption of Web-distributed labeling could allow the agency to modify labels and implement label-based risk mitigation measures more quickly.

Industry Reviewing Process

CropLife America told Bloomberg BNA in an April 4 e-mail that the association still needs to fully review the pesticide registration notice. CropLife is a trade association representing more than 60 developers, manufacturers and distributors of crop protection products, including BASF Corp., Dow AgroSciences LLC and Monsanto Co.

"We don't know that the potential conflicts with state laws and regulations have all been worked out yet," CropLife said.

Section 24(b) of the Federal Insecticide, Fungicide and Rodenticide Act prohibits states from imposing labeling requirements in addition to or different from those required under FIFRA.

CropLife, in comments submitted to the EPA in 2013 on a draft version of the pesticide registration notice, suggested that the EPA change any references to "state-specific labeling" to "regional" or "geographic" labeling to indicate regional or geographic restrictions or directions that are already included on EPA-approved labeling.

The final version of the pesticide registration notice maintains the references to "state-specific" labeling.

To contact the reporter on this story: Patrick Ambrosio in Washington at pambrosio@bna.com

To contact the editor responsible for this story: Larry Pearl at lpearl@bna.com

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The pesticide registration notice on Web-distributed labeling is available at http://www.epa.gov/PR_Notices/pr2014-1.pdf.

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From: Nancy Oden [mailto:cleanearth@tds.net]
Sent: Tuesday, April 01, 2014 2:19 PM
To: Jennings, Henry
Subject: Colony Collapse Disorder: European Bans on Neonicotinoid Pesticides | Pesticides | US EPA

Henry - I'm asking you to attach this (below) to the other neonic article I sent.....this is the EPA reporting on the European Commission restricting several neonicotinoids for a period of time.

The Board should take similar action, and I'm requesting that they do so. How many more years of poisoning bees shall we endure? Until they're all gone?

There is no replacement for Apis Mellifera, only poor substitutes. We need our bees, and the Board needs to act responsibly, not in the interests of the chemical companies to which some are in bondage.
http://www.epa.gov/pesticides/about/intheworks/ccd-european-ban.html

http://www.epa.gov/pesticides/about/intheworks/ccd-european-ban.html
Last updated on Thursday, August 15, 2013

About Pesticides

Colony Collapse Disorder: European Bans on Neonicotinoid Pesticides

Quick Resources

- Honeybee Colony Collapse Disorder
- Pollinator Protection

The European Commission has adopted a proposal to restrict the use of three pesticides belonging to the nenicotinoid family (clothianidin, imidacloprid and thiametoxam) for a period of two years.

The Commission's action was in response to the European Food Safety Authority's (EFSA) scientific report EXIT Disclaimer, which identified "high acute risks" for bees as regards exposure to dust in several crops such as corn, cereals and sunflowers, to residues in pollen and nectar in crops like oilseed rape and sunflower and to guttation in corn.

Main elements of the Commission's proposal to Member States:

1. The proposal would restrict the use of three neonicotinoids (clothianidin, imidacloprid and thiametoxam) for seed treatment, soil application (granules) and foliar treatment on bee attractive plants and cereals.
2. The remaining authorized uses would be available only to professionals.
3. Exceptions would be limited to the possibility of treating bee-attractive crops in greenhouses, in open-air fields only after flowering.
4. The restrictions would apply beginning December 1, 2013.
5. As soon as new information is available, at the latest within two years, the Commission would review the conditions of approval of the three neonicotinoids taking into account relevant scientific and technical developments.

Based on currently available data, the EPA's scientific conclusions are similar to those expressed in the EFSA report with regard to the potential for acute effects and uncertainty about chronic risk. However, the EFSA report does not address risk management, which, under U.S. federal law, is a key component of the EPA's pesticide regulatory scheme.

The EPA is not currently banning or severely restricting the use of the neonicotinoid pesticides. The neonicotinoid pesticides are currently being re-evaluated through registration review, the EPA's periodic re-evaluation of registered pesticides to ensure they meet current health and safety standards. The EPA bases its pesticide regulatory decisions on the entire body of scientific literature, including studies submitted by the registrant, journal articles and other sources of peer-reviewed data.

For more information

- Find out more about colony collapse disorder from the USDA Agricultural Research Service
- Learn about EPA's Pollinator Protection efforts
- EPA Responds to NRDC's 2008 Freedom of Information Act complaint

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Parkinson's Disease and Pesticides: What's the Connection?

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Apr 8, 2014 | By Bret Stetka |

The pesticide Parkinson's connection

Thinkstock

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What exactly causes Parkinson's disease is far from figured out. But a clue has been lurking in cornfields for years.

The data confirm it: farmers are more prone to Parkinson's than the general population. And pesticides could be to blame. Over a decade of evidence shows a clear association between pesticide exposure and a higher risk for the second most common neurodegenerative disease, after Alzheimer's. A new study published in *Neurology* proposes a potential mechanism by which at least some pesticides might contribute to Parkinson's.

Regardless of inciting factors — and there appear to be many — Parkinson's ultimately claims dopamine-releasing neurons in a small, central arc of brain called the "substantia nigra pars compacta." The nigra normally supplies dopamine to the neighboring striatum to help coordinate movement. Through a series of complex connections, striatal signals then find their way to the motor cortex and voila, we move. But when nigral neurons die, motor function goes haywire and the classic symptoms set in, including namely tremors, slowed movements, and rigidity.

Pesticides first came under suspicion as potentially lethal to the nigra in the early 1980s following a tragic designer drug debacle straight out of Breaking Bad. Patients started showing up at Northern California ERs nearly unresponsive, rigid, and tremoring — in other words, severely Parkinsonian. Savvy detective work by neurologist Dr. William Langston and his colleagues, along with the Santa Clara County police, traced the mysterious outbreak to a rogue chemist and a bad batch. He'd been trying to synthesize a "synthetic heroin" — not the snow cone flavorings he claimed — however a powder sample from his garage lab contained traces of an impurity called MPTP. MPTP, it turned out, ravages dopaminergic neurons in the nigra and causes what looks like advanced Parkinson's. All of the newly Parkinsonian patients were heroin users who had injected the tainted product. And MPTP, it also turned out, is awfully similar in structure to the widely used herbicide paraquat, leading some neurologists to turn their attention to farms and fields.

In 2000, a meta-analysis linked confirmed and presumed pesticide exposure with increased risk of Parkinson's. Subsequent work supported this connection, including a large 2006 study that followed patients for nine years. The patients exposed to pesticides had a 70% higher incidence of Parkinson's when the study ended; the risk was the same for exposed farmers and exposed non-farmers, hence

some other farm-related factor wasn't to blame. The study didn't report on specific toxins, but more recent work out of The Parkinson's Institute in Sunnyvale, CA, founded by Langston after the MPTP discovery, did. The authors took detailed occupational and exposure histories from farmers and their families. Paraquat upped Parkinson's risk 2.5-fold. Rotenone was also red-flagged.

Pesticides exert their neurotoxicity in a number of ways. Both paraquat and rotenone appear to wither dopaminergic neurons via free radical production. Free radicals are atoms or molecules with an unpaired electron looking for a partner; they do major cellular damage by pilfering electrons from other molecules, impairing their function. Rotenone may also interfere with the normal neuronal clearance of damaged or degraded proteins. Faulty proteins accumulate, derailing various cellular processes.

The new study, from a team at UCLA, proposes yet another mechanism by which some pesticides might contribute to Parkinson's. It might also provide a major lead in understanding the disease. The team had previously found that the fungicide benomyl was associated with increased Parkinson's risk and damaged the brain by inhibiting an enzyme called ALDH that normally helps metabolize fats, proteins and toxins like alcohol (certain ALDH mutation carriers have to take it easy at the bar). ALDH also detoxifies the dopamine metabolite DOPAL. When the enzyme isn't working properly, DOPAL builds up in neurons and may explain the loss of dopaminergic neurons in Parkinson's. This time around the authors tested 26 pesticides, first for their influence on ALDH activity in rat neurons and next for any epidemiologic association with Parkinson's. Eleven pesticides inhibited ALDH at the concentration tested, eight of which could be included in the study based on available histories from 360 rural Californian patients. All eight were associated with an increased Parkinson's risk and genetic variation in the ALDH2 subtype of the enzyme increased the risk further in those exposed. The findings not only point to new culprit compounds, but reflect the growing appreciation of Parkinson's as a multifactorial disease, in many cases due to the collusion of both genetic and environmental factors.

At least 10% of Parkinson'cases are now thought to be due primarily to specific gene variants, and estimates suggest that genetics may contribute to upwards of 20% to 50%. Patients with a few specific mutations — common in people of Mediterranean descent — carry a nearly 100% chance of developing the disease. Though, as lead author Dr. Jeff M. Brontstein commented to Scientific American, while a minority of cases might be primarily due to a specific genetic or environmental risk factor, ultimately many if not most cases are likely due to gene-environment interactions. This may explain why there isn't an epidemic of Parkinson's in rural areas. Despite the large number of people regularly exposed to pesticides, not everyone has a genetic susceptibility.

This gets incredibly complicated when you consider the possibility of multiple genetic and environmental risk factors working together. It's clear that pesticides wreak havoc on the brain through a variety of mechanisms. Hence farmers and others regularly exposed are at risk for a multipronged, possibly cumulative attack. Certain industrial solvents also appear to bump up Parkinson's vulnerability. Head trauma, in combination with a particular mutation, does too. And diets high in omega-3 fatty acids, found in fish, plant and seed oils, appear to protect against the disease. The laundry list of risk factors and contributors could explain the varied symptoms experienced by Parkinson's patients. Some present early in life, some late. For many the classic motor symptoms predominate; others present with non-motor findings like sleep disturbances, constipation and depression. No two cases are identical.

The confusion isn't just clinical. Recent evidence positions Parkinson's as one of a number of related neurodegenerative disorders marked by the accumulation of abnormal proteins in the brain, including Alzheimer's disease and ALS. They all appear partially genetic, partially environmental and probably in many cases both. Neuronal protein accumulations called Lewy bodies — a pathologic hallmark of Parkinson's — are also found in the brains of Alzheimer's patients; PD-afflicted brains often contain the amyloid protein aggregates common to Alzheimer's. It's a Venn diagram of neurodegeneration.

The new findings further confirm that those whose livelihood relies on repelling pests should pay mind to their increased risk for Parkinson's, particularly if they have other known risk factors, and take precautions. They can limit exposure and avoid the riskier compounds. They can wear masks, clean up spills and wash up vigorously. Moreover, implicating ALDH in Parkinson's pathology could represent an important step toward determining a final common pathway on which the various risk factors converge, a potential holy grail for drug development, and ultimately for patients. Rarely are neurologic diseases straight forward, and Parkinson's has proved no different. But a terribly unfortunate outcome for many in search of heartier, healthier crops may have brought medicine one notch closer to deciphering a frustratingly complex disease.

Are you a scientist who specializes in neuroscience, cognitive science, or psychology? And have you read a recent peer-reviewed paper that you would like to write about? Please send suggestions to Mind Matters editor Gareth Cook, a Pulitzer prize-winning journalist

and regular contributor to NewYorker.com. Gareth is also the series editor of Best American Infographics*, and can be reached at garethideas AT gmail.com or Twitter @garethideas.*

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Senate OKs Ban On Genetically Modified Lawn Seed

But House Speaker's Opposition Likely To Mow It Down

By GREGORY B. HLADKY, ghladky@courant.com

The Hartford Courant

8:33 PM EDT, April 9, 2014

advertisement

Legislation to ban the sale or use of genetically modified lawn seed in Connecticut won state Senate approval Wednesday even though GMO grass isn't expected to be available here for at least one to two years.

The bill had the strong support of the Senate's top Democratic leader, Donald Williams Jr. of Brooklyn. But the legislation now heads to the House, where it faces opposition from that chamber's top Democrat, House Speaker Brendan Sharkey of Hamden, a fact likely to derail the bill.

Questions about what the House would do with the GMO seed ban didn't deter its Senate supporters, nor did claims by critics that such a prohibition was premature and unsupported by scientific evidence. The bill passed the Senate on a mostly party-line 25-11 vote, with three Republicans voting in favor.

Advocates of the ban warned that use of the herbicide- and pesticide-resistant GMO grass seed would encourage homeowners and businesses to use far more potentially harmful weed-killing chemicals on their lawns.

"One of the great threats to us in this country today is the invasion of pesticides," said state Sen. Edward Meyer, D-Guilford. He said allowing the use of GMO seeds in this state would result in the use of "huge quantities of pesticides" because homeowners could spread those chemicals all over their lawns without damaging the grass.

Williams said the GMO seeds being developed by Monsanto and Scott's make the grass resistant to the popular weed-killer Roundup. The primary herbicide in Roundup is glyphosate, which some studies have linked to a variety of pollution and health problems.

"All of the organic farmers I've talked to are wildly in favor of this [ban]," Williams said. He explained the great fear of organic farmers is that the GMO grass could spread to their properties and crops, while environmentalists worry about the pollution effects of increased herbicide use.

Opponents of the ban said the scientific evidence is unclear on GMO grass and that there is the possibility that it could result in less use of pesticides, herbicides and fertilizers.

Senate Republican Leader John McKinney of Fairfield urged lawmakers to adopt a two-year moratorium on the sale of GMO seed rather than an outright ban. He said the state should "take a more cautious approach" and require further study before enacting a ban.

The Senate rejected McKinney's proposal on a 23-13 vote.

State Sen. John A Kissel, R-Enfield, warned that a ban on GMO seed could hurt many of the sod farmers in his region by limiting their access to new technology to improve their farms and sales.

Other Republicans protested that the GMO seed ban hadn't had a formal legislative hearing.

The most important opposition to the ban, however, may be Sharkey's. He effectively controls what legislation will come up for a vote in the House.

Sharkey said he's concerned about bringing up a potentially controversial bill with just a month left in this legislative session. "I'm concerned about enacting legislation this year that looks to preemptively ban a product that doesn't yet exist without allowing the public and experts to weigh in," Sharkey said.

Connecticut last year became the first state in the nation to require the labeling of GMO food products, but made the law conditional on passage of similar legislation in at least four other states with populations totaling 20 million.

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MOMS ACROSS AMERICA

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Comments On Glyphosate Results

GLYPHOSATE TEST RESULTS

Glyphosate Testing Full Report: Findings in American Mothers' Breast Milk, Urine and Water.

Conducted by Moms Across America and Sustainable Pulse

April 7, 2014

Zen Honeycutt, Moms Across America | Henry Rowlands, Sustainable Pulse

Supporter: Lori Grace, Environmental Arts & Research

Download pdf of report here

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(1) World's Number 1 Herbicide Discovered in U.S. Mothers' Breast Milk

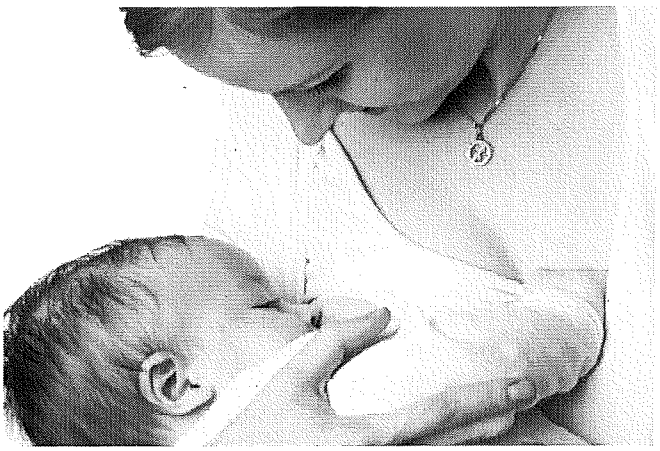
Urine Testing also Shows Levels over 10 Times Higher than in Europe

Water Testing shows 70% of American household's drinking water positive for above detectable levels

In the first ever testing on glyphosate herbicide in the breast milk of American women, Moms Across America and Sustainable Pulse have found 'high' levels in 3 out of the 10 samples tested. The shocking results point to glyphosate levels building up in women's bodies over a period of time, which has until now been refuted by both global regulatory authorities and the biotech industry.

The levels found in the breast milk testing of 76 ug/l to 166 ug/l are 760 to 1600 times higher than the European Drinking Water Directive allows for individual pesticides **(Glyphosate is both a pesticide and herbicide)**. They are however less than the 700 ug/l maximum contaminant level (MCL) for glyphosate in the U.S., which was decided upon by the U.S. Environmental Protection Agency (EPA) based on the now seemingly false premise that glyphosate was not bio-accumulative.

Glyphosate-containing herbicides are the top-selling herbicides in the world and are sold under trademarks such as Monsanto's 'Roundup'. Monsanto's sales of Roundup jumped 73 percent to $371 million in 2013 because of its increasing use on genetically engineered crops (GE Crops).



The glyphosate testing commissioned by Moms Across America and Sustainable Pulse, with support from Environmental Arts & Research, also

analyzed 35 urine samples and 21 drinking water samples from across the US and found levels in urine that were over 10 times higher than those found in a similar survey done in the EU by Friends of the Earth Europe in 2013.

The initial testing that has been completed at Microbe Inotech Labs, St. Louis, Missouri, is not meant to be a full scientific study. Instead it was set up to inspire and initiate full peer-reviewed scientific studies on glyphosate, by regulatory bodies and independent scientists worldwide.

The initial testing was done using ELISA tests and due to a high minimum detection level in breast milk and urine, it is possible that even those samples which tested negative contained 'worrying' levels of glyphosate.

Moms Across America Founder and Director, Zen Honeycutt, stated Monday, "When I was told by several doctors and labs that I could not test my own or my children's urine for the most widely used herbicide in the world over a year ago, I became determined to find a way. Parents and citizens deserve the ability to be able to take care of themselves and their families by finding out if herbicides could be impacting their health. The purpose of this glyphosate testing project is to shed light upon the presence of glyphosate in our water, children's bodies and mother's breast milk, hopefully inspiring further scientific studies to support the world in being a healthy, safe place to live.

> **"It is important to note that the mothers and supporters who participated in this project are mostly familiar with GMOs and glyphosate. The majority of them have been trying to avoid GMOs and glyphosate for several months to two years, so the findings are alarming. We can only wonder what the levels of glyphosate are in those who are not aware of GMOs and glyphosate," Honeycutt added.**

High Glyphosate Levels – Danger for Infants?

There is currently no regulatory limit for the amount of glyphosate in breast milk anywhere in the world. However, the EPA has set a legally enforceable maximum contaminant level (MCL) for glyphosate of 700 ug/l in drinking water, which is 7,000 times higher than the MCL in Europe.

Monsanto and regulatory bodies worldwide have based all of their regulations on the assumption that glyphosate is not bio-accumulative. Senior Monsanto scientist, Dan Goldstein, even recently stated (1) , **"If ingested, glyphosate is excreted rapidly, does not accumulate in body fat or tissues, and does not undergo metabolism in humans. Rather, it is excreted unchanged in the urine."**

The discovery of levels of glyphosate in breast milk that are much higher than any reported results for urine samples is a source of concern to both the general public and government regulators worldwide, as the data suggests that glyphosate is bio-accumulative; **building up in people's bodies over a period of time.**

Earth Open Source Research Director Claire Robinson said, "Regulators and industry always say it is the dose that makes the poison, and even the increasing levels of glyphosate currently found in food and feed and the environment are not a problem. However, that argument only holds true if glyphosate doesn't build up in the human body and is excreted as fast as we take it in. These breast milk results suggest glyphosate may bio-accumulate. That means that our body tissues might be exposed to higher levels than the so-called safe levels set by regulators. So the regulations are not protecting us."

From a total of 10 samples sent in by mothers from states across the U.S., 3 women had detectable levels of glyphosate in their breast milk. The highest glyphosate level was detected in a mother from Florida (166 ug/l) and the other two mothers with 'positive' results were from Virginia (76 ug/l) and Oregon (99 ug/l).

> **Dr Angelika Hilbeck, senior scientist at the Institute of Integrative Biology in Zurich, stated,**
>
> **"If confirmed in a full investigation, it seems that glyphosate has become a ubiquitous chemical in terms of presence and persistence. This data also offers a first indication of potential accumulation in the human body, giving newborns a substantial dose of synthetic chemicals as a 'gift' for their start into life, with unknown consequences. This is reckless and irresponsible conduct in a democratic society, which still has a living memory of previous reckless chemical contaminations, such as DDT. It seems we either did not learn, or we have forgotten, our lessons from Rachel Carson!"(2)**

Honeycutt added, "Moms Across America feels very strongly that breast milk should still be the number one choice for mothers and certainly preferred over GMO soy formula ingredients. We just urge all mothers to eat as organic as possible, especially avoiding meat, dairy, oils and grains that are sprayed with glyphosate at harvest as a drying agent."

"What we have found encouraging is that the women who have been eating organic and non-GMO food only, for several months to two years, did not find detectable levels of glyphosate in their breast milk."

Why Are Glyphosate Levels in Urine Higher than in Europe?

In 2013 people in 18 countries across Europe were found to have traces of glyphosate in their urine by a test commissioned by Friends of The Earth Europe (3). The maximum levels of glyphosate found in the tests ranged from 0.16 ug/l in Switzerland to 1.82 ug/l in Latvia.

Shockingly, the new US testing by Moms Across America and Sustainable Pulse, with support from Environmental Arts & Research, found maximum glyphosate levels in urine over 8 times higher than those found in Europe.

From the 35 samples received from across the U.S., 13 samples were above the minimum detectable level. The three highest levels were all found in women, with the highest in Oregon (18.8 ug/l). Other positive results were found in samples from the states of California, Washington, Maryland, Colorado and Hawaii.

Experts point to the GE Crop industry as being to blame for the results in both breast milk and urine, due to the amount of glyphosate used on 'Roundup-Ready GE Crops' in the U.S.

The U.S. has a high percentage of its farmland controlled by the GE crops industry, with many varieties of GE soybeans, GE corn, GE cotton and others, whereas Europe has only allowed one GE Crop – Monsanto's MON810 maize – which is still not grown in most EU states due to health and environmental concerns.

A 2012 study published by Washington State University research professor Charles Benbrook (4) found that the use of glyphosate in the production of three genetically modified herbicide-tolerant crops - cotton, soybeans and corn - has increased. Benbrook's analysis was the first peer-reviewed, published estimate of the impacts of genetically engineered (GE) herbicide-resistant (HT) crops on pesticide use.

Benbrook's response to the findings: "Most genetically engineered soybeans now moving through trade channels worldwide contain 2 ppm to over 10 ppm of glyphosate plus its major metabolite, AMPA. These are extraordinarily high residues that raise concerns, given that many people are exposed to glyphosate through drinking water, the air, and a variety of foods. I am particularly worried by exposures during pregnancy and through the first years of a child's life, when the risk of harm to developing organ systems is greatest. More research is urgently needed on glyphosate's capacity to disrupt normal development," Benbrook stated.

Glyphosate in U.S. Drinking Water

In this initial testing phase 21 samples of drinking water were tested for glyphosate from across the Unites States individually by Moms Across

America supporters.

13 of the samples contained glyphosate levels of between 0.085 ug/l and 0.33 ug/l. This is well below the levels found in both urine and breast milk but is still cause for concern, as the European (EU) maximum allowed level for glyphosate in drinking water is 0.1 ug/l.

Regulatory Bodies Urged to Act – Further Testing Needed

The US Environmental Protection Agency (EPA), U.S. Department of Agriculture (USDA), European Food Safety Authority (EFSA), Food Standards Australia New Zealand (FSANZ) and other regulatory bodies around the world are being urged to act following the release of this initial testing data, to prevent what is a dangerous public health situation.

Sustainable Pulse Director Henry Rowlands stated, "Regulatory bodies and governments worldwide need to act fast to ban all glyphosate-based herbicides as a temporary measure, while further long-term testing is completed by both them and independent scientists. This is the only way that they can regain the trust and protect the health of mothers, infants and the general public as a whole."

"It was a huge mistake by both the U.S. government and the biotech industry to promote and release products without long-term independent studies. What we are now looking at with glyphosate-based herbicides is a similar situation to what we all faced in the 20th Century with PCBs, DDT and Agent Orange," Rowlands concluded.

Due to the testing results and skyrocketing health issues, as a matter of precaution, Moms Across America calls for a cease and desist of the practice of spraying glyphosate on GE foods and as a drying agent on food crops, increasing the consumption of glyphosate in our food, including but not limited to, wheat, corn, soy, sugar, rice, dry peas and beans and tea. The EPA lists over 160 foods with allowable levels of glyphosate that are unacceptable to mothers.

Moms Across America and Sustainable Pulse are also calling for:

Adequate long-term independent testing to ensure that glyphosate herbicide formulations as sold and used are not persistent, bio-accumulative or toxic. This testing must include the outcomes most relevant to children's health. The U.S. Congress should supply funding for urgently needed long-term independent research on glyphosate herbicide formulations, including their health effects, how they get into the human body, and current levels of accumulation in people, animals and the environment. Studies performed

for regulatory authorisation up until now have only tested the isolated ingredient glyphosate, not the complete formulations as sold and used, even though the formulations have been found in many studies to be much more toxic than the isolated ingredient. Also these studies are funded by the agrochemical industry, i.e. they are not independent. Finally, they are kept secret under commercial confidentiality rules, so cannot be scrutinized by independent scientists and the public.

PCB Similarities

This case of finding high levels of glyphosate in breast milk is a re-run of the Polychlorinated biphenyls (PCBs) scandal (5) in the 1970s, which ended up in the toxic chemical compound's production being banned by the U.S. Congress in 1979.

Before the ban Monsanto, the only North American producer, had marketed PCBs under the trade name Aroclor from 1930 to 1977 and had insisted that it was not toxic.

It was not until levels of PCBs in breast milk were found to be 10 times those in blood, obtained from residents in the Osaka Prefecture of Japan (6), that the toxicity of PCBs was questioned by regulators, leading to the 1979 ban.

According to the EPA, PCBs, which were widely used for over 40 years as dielectric and coolant fluids, have now been shown to cause cancer in humans.

Is it not time that regulators learned lessons from past mistakes?

(2) What is Glyphosate?

Glyphosate is the presumed active ingredient of Roundup and other commercial glyphosate herbicide formulations. Glyphosate was developed by John E. Franz of Monsanto Company. It was first used in 1972 as a non-selective, water-soluble herbicide with a specific mechanism of action: the directed interruption of plant development through metabolic poisoning. The chemical is a specific inhibitor of the plant enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), which does not exist in mammals, including humans. Based on this known mechanism of toxicity, the herbicide has been claimed to have low toxicity for mammalian species. However, glyphosate and its formulations have other mechanisms of toxicity.

Monsanto's US patent for Roundup expired in 2000 and it ceased production in 2007. Other glyphosate herbicides manufactured by Monsanto, such as PROMAX and WeatherMAX, are in current use. Moreover, numerous generic

glyphosate formulations (e.g. Clearout 41) are now produced by at least 100 manufacturers worldwide.

Glyphosate is:

#1: A Patented Antibiotic – USPTO # 7777136. Leading to concerns about possible harm, including the killing of beneficial gut bacteria which causes immune system damage.

http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=1&p=1&f=G&l=50&d=PTXT&S1=7771736&OS=7771736&RS=7771736

#2: Chelating Agent - Although glyphosate can be rapidly immobilized in soil (also spray tank mixtures, and plants) through chelation with various cat-ions (Ca, Mg, Cu, Fe, Mn, Ni, Zn), it is not readily degraded and can accumulate for years (in both soils and perennial plants). Glyphosate's chelation properties may lead to possible harm such as vitamin and mineral deficiencies.

http://www.archpatent.com/patents/3160632

Glyphosate has been shown in several recent studies to be an endocrine disruptor. According to the National Institutes of Health, endocrine disruptors could have long-term effects on public health, especially reproductive health. And the "dose makes the poison" rule does not apply to endocrine disruptors, which wreak havoc on our bodies at low doses.

Most genetically modified (GM) crops are engineered to tolerate the herbicide Roundup, Monsanto's best-selling product. The main active ingredient in Roundup is glyphosate. A number of glyphosate-resistant crops are also produced by Monsanto.

Health Risks

Laboratory and epidemiological studies confirm that Roundup and glyphosate pose serious health and environmental hazards, including possible endocrine (hormone) disruption, cell death, DNA damage, cancer, birth defects, and neurological disorders.

Some of these toxic effects are observed at low, realistic doses that could be found as residues in food and feed crops and in drinking water.

People are exposed to glyphosate though contaminated food, water and air, often as a result of the herbicides application to fields. This is not only the case in rural areas, where 'Roundup Ready' GM crops are grown on a large scale. Glyphosate-based herbicides are widely used by municipal authorities on roadsides, pavements, and in public parks and school grounds. It is also widely used by home gardeners.

Roundup and glyphosate and their residues have been detected in previous testing in air, rain, groundwater and even circulating in women's blood.

Not Enough Safety Tests

Roundup and other glyphosate herbicide formulations as sold and used have been found in studies to be more toxic than the isolated ingredient, glyphosate. However, only glyphosate alone is tested in long-term safety tests for regulatory authorizations. This is a fundamental problem affecting all pesticide authorizations.

The 'safe' dose for Roundup exposure set by regulators is not based on up-to-date objective evidence. So, current regulations do not protect the public.

The chemicals used in the GM model of farming are toxic, and the model of farming itself is unsustainable and damaging to the environment – with an increase in herbicides significantly increasing pollution and health risks for citizens, and contributing to biodiversity loss. The only people who stand to gain from this model are those that produce the herbicide-resistant crop the chemicals required to grow them.

The chemicals used in the GM model of farming are toxic, and the model of farming itself is unsustainable and damaging to the environment – with an increase in herbicides significantly increasing pollution and health risks for citizens, and contributing to biodiversity loss. The only people who stand to gain from this model are those that produce the herbicide-resistant crops and the chemicals required to grow them.

(3) Quotes from Scientists on Testing

Dr. Don M. Huber, Professor Emeritus, Purdue University.

"It is well established in the scientific literature that glyphosate disrupts the endocrine hormone system, and is toxic to liver and kidney tissues, a strong mineral chelator, and a potent antibiotic that kills essential microorganisms in the gastro-intestinal tract. The levels observed in breast milk and urine in

this preliminary survey indicate that intake of this chronic toxin is highly biologically significant and almost 100 times the amounts documented in peer-reviewed scientific studies to cause birth defects, kidney and liver damage, hormonal disruption, and predispose to cancer. Much higher levels of glyphosate in breast milk than urine indicate a concentration factor that can especially compromise the health and development of an infant through direct toxicity, deprivation of essential mineral nutrients, and dysbiosis of the microbiome essential for immune, neural and physical development. Additional testing is essential to confirm the validity of this data on a larger scale if we are to avoid compromising the health and well-being of an entire generation."

Jack Heinemann, Professor of genetics and molecular biology in the School of Biological Sciences at the University of Canterbury, Christchurch, New Zealand.

> "We have an inadequate knowledge of the effects of real life exposures to the many potentially and actually toxic chemicals that are part of daily modern life. This snapshot of just one pervasive chemical, glyphosate, in the fluids of human bodies is therefore important and timely. No single study of this type or scale is enough to determine if this chemical alone or in combination with the many other "approved as safe if exposed below certain amounts" cause harm. But that this study was initiated by a grassroots campaign rather than government or funded by the industries that profit from mass release of these compounds, says to me how neglected this area of public good research is.
>
> "Glyphosate was measured in parts per billion in urine and breast milk. Are these levels too low to cause harm in people after a lifetime of constant low level exposure? Possibly, but possibly not.
>
> "What does this mean for women who choose to breastfeed? In my opinion, the many good things that breastfeeding does for babies far outweighs the risk of the low level exposures to this pesticide. But it is also my opinion that, until such low level exposures to nursing babies can be determined to be safe there should be an obligation placed on the pesticide industry and the relevant government agencies to reduce exposures that are sufficient to cause accumulation of the pesticide in breast milk.
>
> **"Urban lawns and roadsides as well as the farm in America and many other places have become addicted to these agrochemicals. There is far too little emphasis on providing**

services to agriculture that reduce this dependency and too much emphasis on innovation dependent upon it. Let's wean the farmer from these chemicals rather than our babies from their milk."- Heinemann

Anthony Samsel, a former private environmental U.S. government contractor as well as a member of the Union of Concerned Scientists

"Everyone eating the western diet of food grown, sprayed and desiccated with Monsanto's Roundup herbicide can expect to find its active ingredient glyphosate in their body. Glyphosate chelates chemical elements important to our existence, disrupts vitamin synthesis and detoxification enzymes like glutathione and CYP 450 enzymes, as well as many essential amino acids. Glyphosate is an antibiotic, capable of killing hundreds of species of bacteria which are directly responsible for our immune function and overall health. It is a chronic toxin, a chemical weapon like no other, which is capable of killing organisms both directly and indirectly. Monsanto's Roundup-glyphosate based herbicide may in fact be, the most disruptive chemical to our biology and our environment.

"The glyphosate in humans data recently collected from volunteers across the USA serves as a snapshot of the general population... Breast milk samples contained levels from 76 to 166 ug/L, levels that can cause harm. The thought of babies receiving glyphosate through their mother's milk is particularly troubling as it demonstrates that there is no escape from this antibiotic chemical.

"If the HPLC method was used (High Pressure Liquid Chromatography), it would have yielded an increased statistical result, as this method has a lower range of detection. However, there is a higher cost associated with the method which would have made it prohibitive for many participants. The result of my own urine test in this group was below the detection level, as were over 50% of the participants. Dietary exposure is an obvious function in this regard. Not all glyphosate ingested is passed in the urine and feces, a small portion is metabolized to AMPA another toxin. The remainder of the glyphosate continues to circulate in the blood and cerebral fluid where it travels to the cells and causes cumulative, chronic damage. It is deposited in the body's tissues which include but are not limited to the liver, kidneys, pancreas, heart and other muscles.

"We have got to get glyphosate out of the food supply. Our

health and the health of those we love may be in grave danger from exposure to this chemical. It is urgent that people know and time is of the essence. Every moment lost will be a new health casualty."- Samsel

(4) Quotes from Mothers on Testing

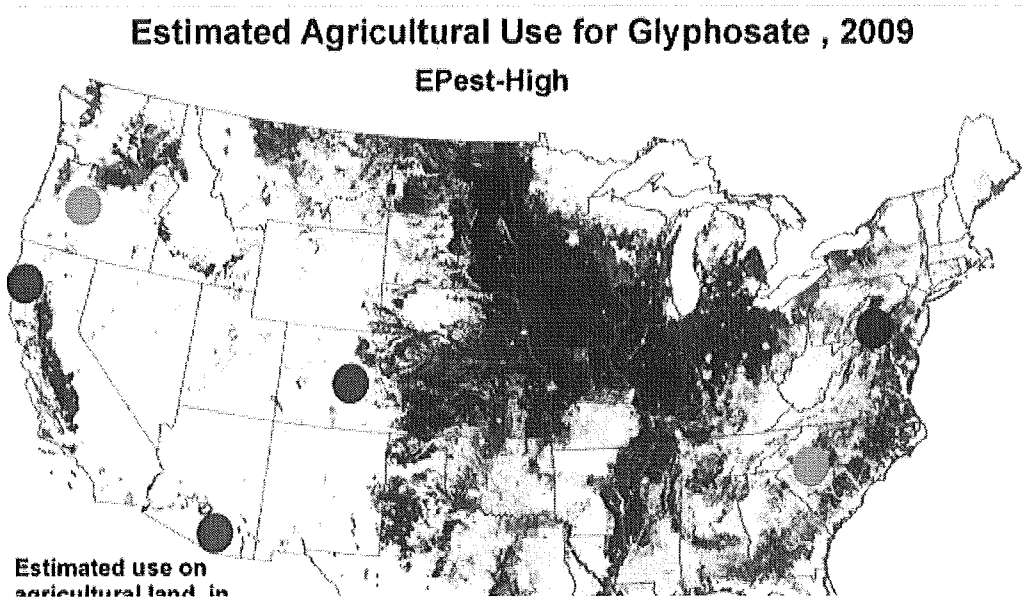
Jessica M. from Virginia:

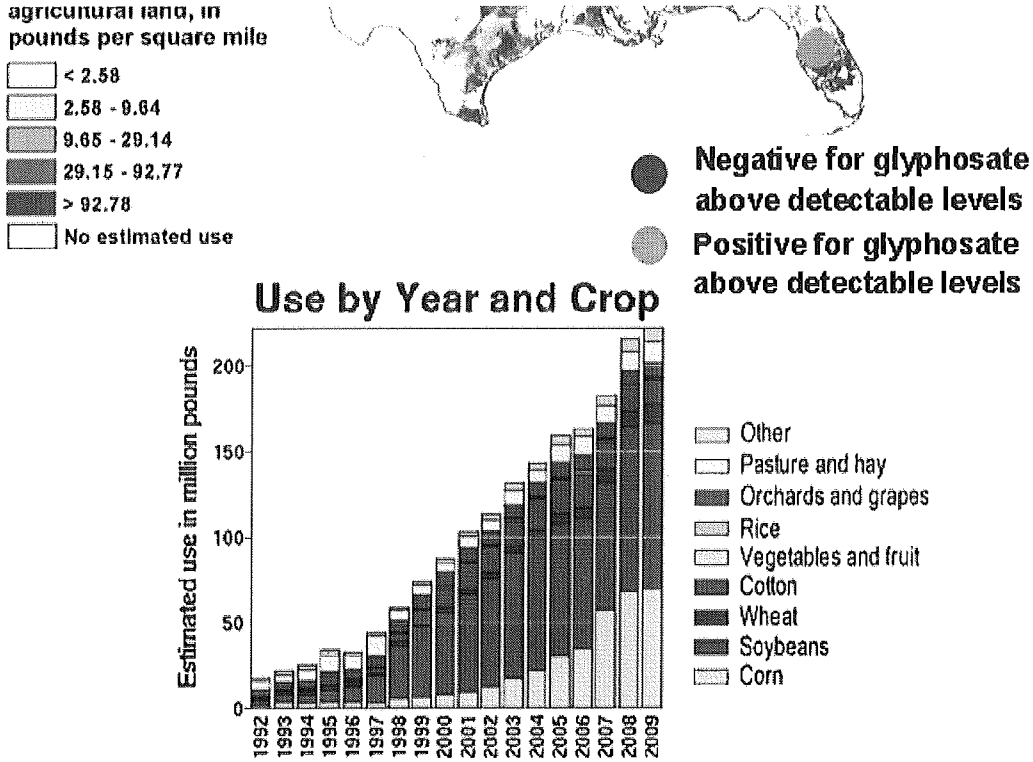
"It is frightening to see any glyphosate in my body, especially in my breast milk that will then contaminate my son's growing body. It's particularly upsetting to test positive for glyphosate because I go to great lengths to eat organic and GMO free. I do not consume any meats or seafood and only very rarely eat dairy. This really shows me, and should show others, just how pervasive this toxin is in our food system."

Rachel T. from Illinois:

"I tested negative. I am relieved to know that the time, money, and effort we have spent to source good quality, organic, GMO-free food over the past several years has paid off. This should offer hope and encouragement to many families; that what we eat truly does affect us. I hope that someday in the future the knowledge of how to source these foods becomes more main stream so that others can benefit and heal their bodies from the countless health problems caused by GMO laden foods."

Most recent map of glyphosate use in America with Breast Milk results. Red-Negative, Green Positive.




agricultural land, in pounds per square mile
< 2.58
2.58 - 9.64
9.65 - 29.14
29.15 - 92.77
> 92.78
No estimated use
Negative for glyphosate above detectable levels
Positive for glyphosate above detectable levels
Use by Year and Crop
Estimated use in million pounds
0
50
100
150
200
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Other
Pasture and hay
Orchards and grapes
Rice
Vegetables and fruit
Cotton
Wheat
Soybeans
Corn

ng.

Moms Across America discovered that the quantity of local glyphosate spraying at farms does NOT correlate to positive or negative glyphosate detectable levels in mothers, suggesting the glyphosate is coming from another source, such as national brands of food, which are not connected to local environmental conditions. Manufacturers must be responsible and conduct further testing.

(5) Similar testing on Urine in Europe

Two full-scale glyphosate testing projects have been carried out in Europe over the last year on urine in humans.

The first was organized by Friends of the Earth Europe and the second was led by Dr. Monika Krüger of the University of Leipzig in Germany.

When looking at the data from both of these tests please keep in mind that the **U.S glyphosate testing has already detected glyphosate levels in urine of between 8.1 ug/l and 18.8 ug/l** with a much smaller survey.

Determination of Glyphosate residues in human urine samples from 18 European countries: (Medical Laboratory Bremen commissioned by Friends of the Earth Europe)

http://www.gmoevidence.com/wp-content/uploads/2013/06/glyphosate_studyresults_june12.pdf

In this study, 182 urine samples received from 18 European countries were analyzed for glyphosate and AMPA residues using a new GC-MSMS method. With a LOQ of 0.15 ug/l, on average 44 % and 36 % of the urine samples analyzed were found to contain quantifiable levels of glyphosate and AMPA,

respectively. However the frequency of detection calculated for each individual EU-state ranged from 10% to 90%. **The highest glyphosate concentration was 1.8 ug/L (Latvia),** the highest AMPA concentration was 2.6 ug/L (Croatia). All in all 12 (6.6%) participants of the study significantly exceeded the tentative reference value of 0.8 ug/L for glyphosate.

Detection of Glyphosate Residues in Animals and Humans: Dr. Monika Krüger

http://omicsonline.org/open-access/detection-of-glyphosate-residues-in-animals-and-humans-2161-0525.1000210.pdf

In this study glyphosate residues were tested in urine and different organs of dairy cows as well as in urine of hares, rabbits and humans using ELISA and Gas Chromatography-Mass Spectroscopy (GC-MS). Cows kept in genetically modified free area had significantly lower glyphosate concentrations in urine than conventional husbandry cows. Also glyphosate was detected in different organs of slaughtered cows as intestine, liver, muscles, spleen and kidney. Fattening rabbits showed significantly higher glyphosate residues in urine than hares.

Glyphosate was significantly higher in the urine of humans who didn't eat organic food. Furthermore, chronically ill humans showed significantly higher glyphosate residues in urine than in the healthy population.

The glyphosate levels detected Kruger's study were all under 2 ug/l in human urine.

(6) Independent Science on Glyphosate

There have been a large number of independent studies carried out on glyphosate and Roundup which show why the public and media should be concerned over the possible harm that the herbicide is causing.

Below is a small selection of these studies. For a wider selection please visit here: http://www.gmoevidence.com/location/roundup-evidence/

2014: Glyphosate, Hard Water and Nephrotoxic Metals: Are They the Culprits Behind the Epidemic of Chronic Kidney Disease of Unknown Etiology in Sri Lanka?: Dr. Jayasumana (Sri Lanka)

The Sri Lankan President has put a ban on all glyphosate-based pesticides following this study.

The study published in the International Journal of Environmental Research and Public Health links glyphosate (Roundup) to a series of mysterious epidemics of fatal chronic kidney disease of unknown origin (CKDu) affecting several poor farming regions around the world. The current death toll from CKDu is 20 000 and the number of those with the disease number over 400 000.

Full Paper Here: http://www.mdpi.com/1660-4601/11/2/2125

2013: Glyphosate induces human breast cancer cells growth via oestrogen receptors: Dr. Thongprakaisang (Thailand)

This study shows that glyphosate exerted proliferative effects only in human hormone-dependent breast cancer, T47D cells, but not in hormone independent breast cancer, MDA-MB231 cells, at 10-12 to 10-6 M in estrogen withdrawal condition.

Full Paper Here: http://www.ncbi.nlm.nih.gov /pubmed?term=Thongprakaisang%20S%5BAuthor%5D&cauthor=true& cauthor_uid=23756170

2010: Glyphosate Based Herbicides Produce Teratogenic Effects on Vertebrates by Impairing Retinoic Acid Signalling: Dr. Andres Carrasco (Argentina)

This study, by a team led by Prof Andres Carrasco at Buenos Aires University , found that glyphosate and Roundup cause birth defects in frog and chicken embryos at extremely low doses.

http://www.gmwatch.eu/images/pdf/Carrasco_research_paper.pdf

More information on glyphosate's possible links to birth defects can be found here: http://www.earthopensource.org/files/pdfs/Roundup-and-birth-defects /RoundupandBirthDefectsv5.pdf

2012: Teratogenic Effects of Glyphosate-Based Herbicides: Divergence of Regulatory Decisions from Scientific Evidence: Dr. Michael Antoniou (UK)

Malformations were seen from the administration of glyphosate to rabbits and rats in studies commissioned by industry for regulatory purposes. These effects were not found only at high maternally toxic doses but also at lower

doses. Statistical significance was not always achieved at lower doses because too few animals are used in such tests. "Historical control data" and other excuses were used to dismiss the findings.

Full paper here: http://omicsonline.org/2161-0525/2161-0525-S4-006.php?aid=7453

2004: Neural Tube Defects and Maternal Residential Proximity to Agricultural Pesticide Applications: Dr. Rull (US)

This study evaluated the effects of maternal environmental exposure to 59 agricultural pesticides on neural tube defects (NTDs) in babies born in California between 1987 and 1991. Maternal residential proximity within 1,000 meters of crop pesticide applications occurring around the month of conception was assessed using a model based on linking California Pesticide Use Reports (PUR) and land-use survey maps. The study found an association between glyphosate exposure and anencephaly, a type of neural tube defect.

Full paper here: http://journals.lww.com/epidem/Fulltext/2004/07000/Neural_Tube_Defects_and_Maternal_Residential.499.aspx

2002: Birth defects, season of conception, and sex of children born to pesticide applicators living in the Red River Valley of Minnesota, USA: Dr. Garry (U.S.)

An epidemiological study carried out in Minnesota, USA found that the children of pesticide applicators exposed to glyphosate herbicides had an increased incidence of neurobehavioral disorders, including ADHD (attention deficit hyperactivity disorder). This suggests that glyphosate herbicide impacts neurological development.

Full paper here: http://www.ncbi.nlm.nih.gov/pubmed/12060842

2007: Evaluation of DNA damage in an Ecuadorian population exposed to glyphosate: Dr. Paz-y-Miño (Ecuador)

Ecuadorian people exposed to aerial glyphosate herbicide spraying on coca crops showed a much higher degree of DNA damage in blood cells than a control population living 80 km away. The researchers ruled out tobacco, alcohol, non-prescription drugs and asbestos as causes. None of the individuals had used or been exposed to other herbicides or pesticides when

the samples were taken. The study also found acute poisoning reactions to the glyphosate spraying, including intestinal pain and vomiting, diarrhoea, fever, heart palpitations, headaches, dizziness, numbness, insomnia, burning eyes, blurred vision, difficulty in breathing, and skin rash.

Full paper here: http://www.scielo.br/pdf/gmb/v30n2/a26v30n2.pdf

1997: Male Pesticide Exposure and Pregnancy Outcome: Dr Savitz (Canada)

A study of farming families in Ontario, Canada found a higher than normal rate of late miscarriages and pre-term deliveries associated with glyphosate exposure.

Full paper here: http://aje.oxfordjournals.org/content/146/12/1025.full.pdf

2005: Differential effects of glyphosate and roundup on human placental cells and aromatase: Dr Seralini (France)

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1257596/

2006: Time- and Dose-Dependent Effects of Roundup on Human Embryonic and Placental Cells: Dr Seralini (France)

http://www.gmoseralini.org/wp-content/uploads/2013/01/Benachoural.AECT_2007.pdf

In these in vitro experiments, glyphosate was found to be toxic to human placental cells and Roundup formulation was more toxic. Glyphosate and Roundup damaged human embryonic cells and placental cells in vitro in concentrations well below those recommended for agricultural use. The study's authors concluded that Roundup may interfere with human reproduction and embryonic development.

(7) Testing Method

Glyphosate Testing Method: Glyphosate Plate Assay

The testing of drinking water, urine and breast milk was carried out by Microbe Inotech Laboratories, Inc. (MiL inc.)

For the detection and quantitation of glyphosate in water (groundwater,

surface water, well water), urine and breast milk, the MiL inc. uses a 96 well microtiter plate assay. For soil, crop, and foods, additional preparation steps are required but can be processed at a small additional fee. This assay applies the principles of enzyme linked immunosorbent assay methodology (ELISA) to the determination of glyphosate.

The sample to be tested is derivatized and then added, along with an antibody (binding protein) specific for glyphosate to microtiter wells coated with Goat Anti-Rabbit Antibody and incubated for 30 minutes. A glyphosate enzyme conjugate is then added.

This particular format is known as a competitive ELISA assay since, at this point in the procedure, a competitive reaction occurs between the glyphosate which may be in the sample and the enzyme labeled glyphosate analog for the antibody binding sites on the microtiter well.

The reaction is allowed to continue for sixty minutes. After a washing step and addition of a substrate (color solution), a color signal (blue color) is generated. The presence of glyphosate is detected by adding the "Color Solution", which contains the enzyme substrate (hydrogen peroxide) and the chromogen (3,3',5,5'-tetramethylbenzidine). The enzyme-labeled glyphosate bound to the glyphosate antibody catalyzes the conversion of the substrate/chromogen mixture to a colored product.

After an incubation period, the reaction is stopped and stabilized by the addition of a diluted acid (Stopping Solution). Since the labeled glyphosate (conjugate) was in competition with the unlabelled glyphosate (sample) for the antibody sites, the color developed is inversely proportional to the concentration of glyphosate in the sample.

Six concentrations (0, 0.75, 0.2, 0.5, 1.0, 4.0 ppb) of glyphosate standards in distilled water with a non-mercury preservative and stabilizers are used to generate a standard response curve. A control solution at approximately 0.75 ppb of glyphosate is included in every run and treated in the same manner as unknown samples to serve as a positive control within the assay. The color absorbance is read using a microplate reader (see Figure).

Any results obtained with a calculated glyphosate concentration of less than 0.05 ppb is assumed to be below the detection limit of the assay with glyphosate reported as being absent (7.5 ppb detection limit for Urine) (75 ppb detection limit for Breast Milk).

(8) Test Results

Test Results for the presence of Glyphosate in American Mother's Breast Milk

Partial display. Interactive Map at **http://batchgeo.com /map/9bcabad4abf8e4c4fafa883251c6754d**

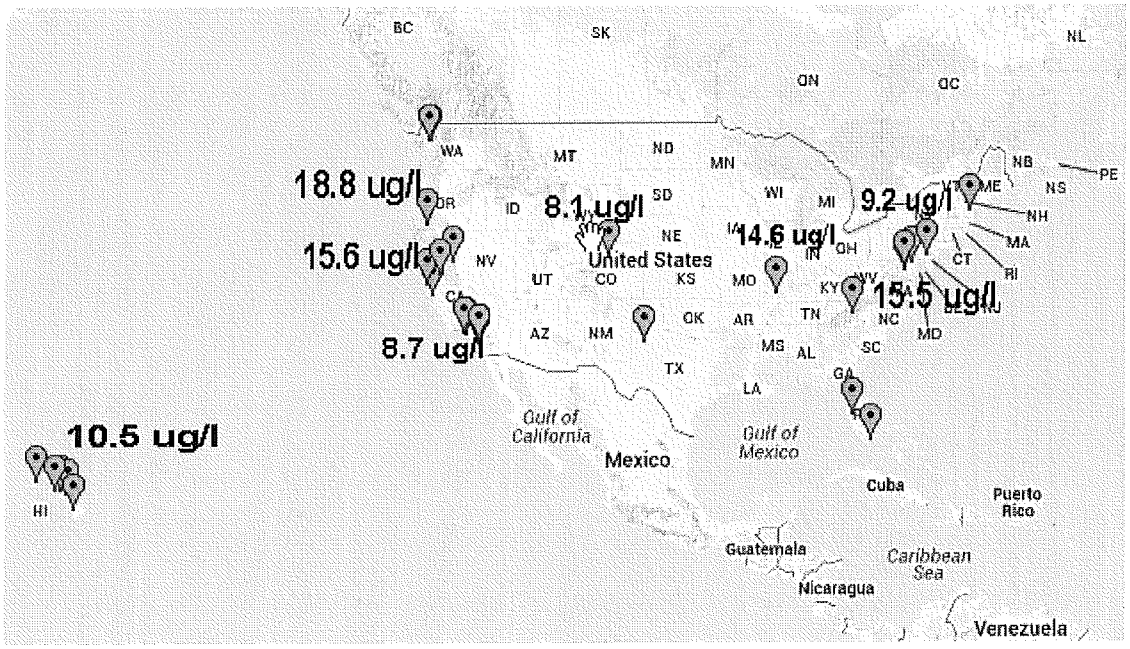
Test Results for the presence of Glyphosate in American Mothers' Breast Milk

Project #	Sample #	Test Results	Age	Gender	Weight	State	Zip
062A	1	<75 ug/L	26	F	105	IL	62521
062B	1	<75 ug/L	43	F	225	NV	89109
062C	1	<75 ug/L	32	F	113	CA	95521
062D	1	<75ug/L	26	F	110	AZ	85741
062E	1	**99 ug/L**	28	F	165	OR	97202
62F	1	**76 ug/L**	22	F	100	VA	23220

062G	1	**166 ug/L**	30	F	180	FL	32726
062H	1	<75 ug/L	39	F	145	CO	80229
062I	1	<75 ug/L	29	F	130	IA	50031
062J	1	<75 ug/L	30	F	125	PA	17601

Test Results for the presence of Glyphosate in the urine of American adults and children.

Partial display. Interactive Map link to Urine Test results for glyphosate **http://batchgeo.com/map/997080dd3f0dbc59b5de665f4ea04bf1**



Of the 35 initial samples sent in 34% of the people tested positive for detectable levels of glyphosate in their urine. 85% of all participants noted that they were actively avoiding GE foods and pesticides in their diet.

Test Results for the presence of glyphosate in the urine of American people and children.

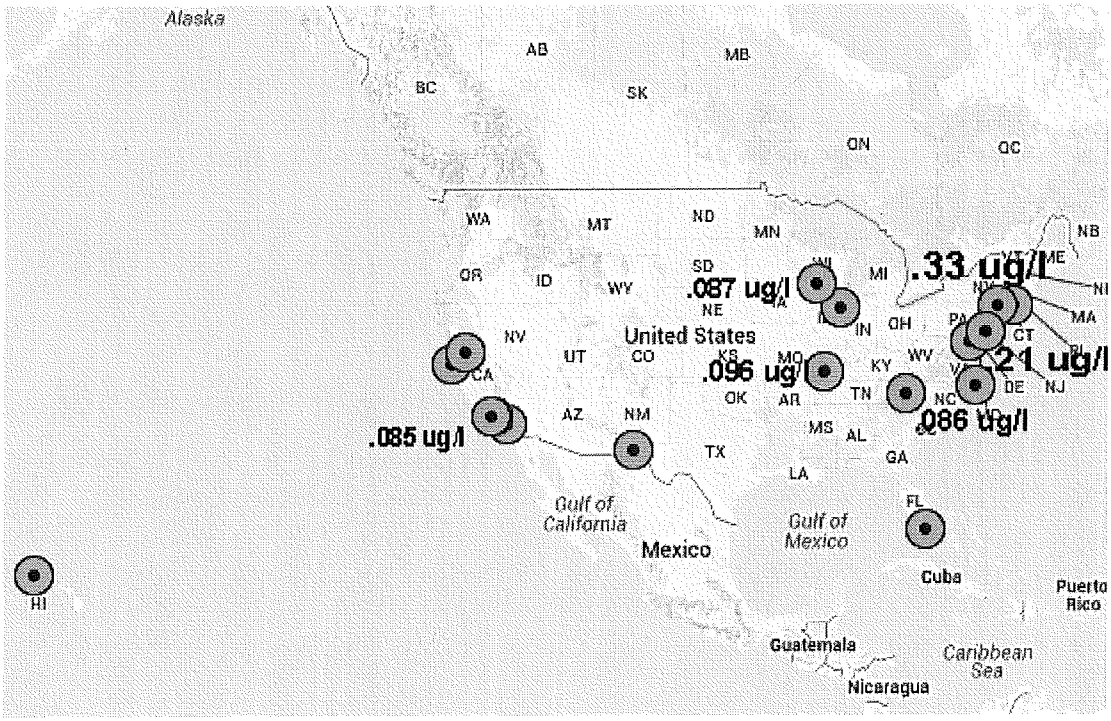
Project #	Sample	Matrix	Test	Age	Gender	Weight	State	Zip

	#	(Water/Urine)	Results			(lbs)		
glyph001	1	U	**8.7 ug/L**	8	M	52	CA	92691
glyph002	1	U	<75 ug/L	67	F	130	HI	96821
glyph004	1	U	**8.5 ug/L**	13			CA	91320
glyph007	2	U	<7.5 ug/L	44	F	180	FL	33030
glyph014	2	U	<7.5 ug/L	39	F	130	PA	19072
glyph016	2	U	**15.5 ug/L**	52	F	140	NC	28711
glyph018	2	U	**15.6 ug/L**	69	F	127	CA	95608
glyph023	1	U	**9.2 ug/L**	65	M	210	MD	20874
glyph020	3	U	<7.5 ug/L	45	F	125	MD	21022
glyph037	1	U	<7.5 ug/L	64	M	140	NH	03037
glyph 036	1	U	<7.5 ug/L	53	F	120	CA	91377
glyph 038	2	U	<7.5 ug/L	68	F	129	CA	91361

The highlighted urine glyphosate test results are after a positive glyphosate result in initial testing of one family member and then 2-6 weeks of switching to 100% organic diet. The negative detection of glyphosate coincides with the disappearance of recorded inflammation and autism symptoms in the 8 year old boy after 6 weeks of an organic diet and 2 weeks of Reverse Osmosis Filtered water which tested negative for detectable levels of glyphosate.

Test Results for the presence of Glyphosate in the water of American households.

Partial display. Interactive Map at **http://www.batchgeo.com /map/8b5b606dab90cba4e8fe828fe0dedeb5**



Test Results for the presence of Glyphosate in the water of American households.

Project #	Matrix (Water/Urine)	Level	State	Zip
glyph001	W	**0.085 ug/L**	CA	92691

glyph002	W	**0.123 ug/L**	CO	96821
glyph004	W	**0.17 ug/L**	CA	91320
glyph007	W	<0.05 ug/L	FL	33030
glyph014	W	**0.167 ug/L**	PA	19072
glyph016	W	**0.086ug/L**	NC	28711
glyph018	W	**0.087 ug/L**	WI	53588
glyph020	W	**0.140 ug/L**	CA	95608
glyph020	W	**0.151 ug/L**	CA	95608
glyph027	W	**0.212 ug/L**	MD	21022
glyph027	W	**0.116ug/L**	MD	21022
glyph028	W	<0.05 ug/L	IL	60441
glyph 036	W	<0.05 ug/L	CA	91377
glyph038	W	<0.05 ug/L	CA	91361
glyph039	W	**0.33 ug/L**	NY	12561
glyph042	W	<0.05 ug/L	CA	94920
glyph 064	W	**0.096 ug/L**	MO	63701
glyph071	W	**0.22 ug/L**		

glyph072	W	<0.05 ug/L	CT	06105
glyph080	W	<0.05 ug/L		96741
glyph082	W	<0.05 ug/L	NC	27973
glyph083	W	<0.05 ug/L	CA	92691

These results are from Multipure (.17 ug/l) and Pursanova (<.0.05 ug/l) Reverse Osmosis Sytems. Showing that not all Reverse Osmosis Systems remove glyphosate at a lower then detectable level.

(9) Contacts:

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Zen Honeycutt, Founder and Director of Moms Across America, www.momsacrossamerica.com, info@momsacrossamerica.com, Skype: zen.honeycutt. Moms Across America is presented by the non profit CA State Grange and is a national coalition of unstoppable Moms. "Empowered Moms, Healthy Kids."

Microbe Inotech Labs, Inc. 11754 Westline Industrial Dr., St. Louis, MO 63146-3402 Phone: 1-800-688-9144 www.microbeinotech.com

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Vermont Senate Votes 26-2 for GMO Labeling

April 16th, 2014

Vermont one step closer to becoming first state to enact such a law

Burlington Free Press (http://www.burlingtonfreepress.com/article/20140415/NEWS03/304150009/Vermont-Senate-votes-26-2-GMO-labeling)
by Terri Hallenbeck

MONTPELIER — The Senate gave a decisive 26-2 vote Tuesday for a bill that would require labeling of foods that contain genetically modified ingredients, a strong indication that Vermont could become the first state in the nation to enact such a law.

"We are saying people have a right to know what's in their food," said Senate President (http://www.burlingtonfreepress.com/article/20140415/NEWS03/304150009/Vermont-Senate-votes-26-2-GMO-labeling#) Pro Tempore John Campbell, D-Windsor.

Campbell and other supporters argued that they believe they have written a bill that is legally defensible. They nonetheless created a fund in the legislation to help pay the state's legal bills, as many assume that food manufacturers will sue.

The bill would require food sold in Vermont stores that contain genetically modified ingredients to be labeled starting July 2016. The legislation is up for another vote in the Senate Wednesday before it goes back to the House (http://www.burlingtonfreepress.com/article/20140415/NEWS03/304150009/Vermont-Senate-votes-26-2-GMO-labeling#) , which passed a slightly different version last year. Gov. Peter Shumlin has indicated he's likely to sign the bill.

Two other states — Connecticut and Maine — have passed labeling laws, but both delayed implementation until neighboring states join them, a strategy designed to insulate them from being sued. Voters in Washington and California defeated labeling measures there.

Supporters said they hoped Vermont would lead the way on the issue. "Vermont's always first," said Will Allen, an organic farmer from Fairlee, citing the state's ban on slavery, passage of civil unions and same-sex marriage as other firsts.

Many foods, including an estimated 88 percent of the corn crop in the United States, contain ingredients that have plants or animals that were genetically modified, typically to increase disease resistance or extend shelf life. Opponents argue that the process may be harmful to humans. Supporters contend there is no evidence of that. Sixty countries, including the European Union, require labeling.

Sen. David Zuckerman, P/D-Chittenden, noted as he introduced the bill on the Senate floor Tuesday that questions remain about the safety (http://www.burlingtonfreepress.com/article/20140415/NEWS03/304150009/Vermont-Senate-votes-26-2-GMO-labeling#) of the genetically modified foods because the U.S. Food and Drug Administration relies on testing done by the food producers rather than independent sources.

Sens. Peg Flory, R-Rutland, and Norm McAllister, R-Franklin, were the only votes of dissent Tuesday.

Flory, a lawyer, noted that Attorney General Bill Sorrell has said the state is likely to be sued. Senate Judiciary Committe Chairman (http://www.burlingtonfreepress.com/article/20140415/NEWS03/304150009/Vermont-Senate-votes-26-2-GMO-labeling#) Richard Sears, D-Bennington, conceded under questioning from Flory that if Vermont loses the case, as it did with a similar law that sought to require labeling of milk containing bovine growth hormones, the legal bills are estimated to be as high as $8 million.

McAllister, a farmer, argued that labeling will do nothing but mislead consumers into believing there must be something bad about GMOs, which he believes is untrue. "This labeling bill will not tell them anything other than 'GMO something'," McAllister said. "This does not educate them about what they're eating. The nutritional value is exactly the same."

Some senators who had been skeptical of GMO labeling said they were persuaded that their constituents want the information (http://www.burlingtonfreepress.com/article/20140415/NEWS03/304150009/Vermont-Senate-votes-26-2-GMO-labeling#) clarified on the food they buy. Senators said they were flooded with emails and calls from people urging them to pass the bill.

Sen. Joe Benning, R-Caledonia, said he came to view labeling of GMOs as akin to the label that tells him how many carbohydrates are in a bottle of tea. That label gives him information without declaring that carbohydrates are evil, he said. “I know what carbohydrates can do to my body,” he said. “Some people in this room that’s exactly how they feel about GMOs.”

Under the bill, Benning said, the wording declaring that a product (http://www.burlingtonfreepress.com/article/20140415/NEWS03/304150009/Vermont-Senate-votes-26-2-GMO-labeling#) contains GMOs could be as small as the carbohydrate listing typically found on food packages.

Sen. Bobby Starr, D-Essex/Orleans, chairman of the Senate Agriculture Committee, said he, too, had been unenthusiastic about GMO labeling, but at every public meeting he heard from Vermonters who wanted a labeling law. “Lo and behold, GMOs would float to the top of the debate within those meetings (http://www.burlingtonfreepress.com/article/20140415/NEWS03/304150009/Vermont-Senate-votes-26-2-GMO-labeling#) ,” he said.

(http://www.linkwithin.com/)

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Andy Alfaro / <252>The Modesto Bee

Bees pollinate almond trees blooming in the Modesto area in February. Tens of thousands of bee colonies died or showed damage this year after pollination.

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Beekeepers search for answers as colonies show up damaged after almond farm

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pollination

By Edward Ortiz
eortiz@sacbee.com
Published: Saturday, Apr. 19, 2014 - 9:09 pm
Last Modified: Sunday, Apr. 20, 2014 - 9:07 am

As many as 80,000 bee colonies have died or been damaged this year after pollinating almond trees in the San Joaquin Valley, and some beekeepers are pointing to pesticides used on almond orchards as a possible cause.

The damaged colonies are the latest worry in the beekeeping community, which is already struggling to deal with colony collapse disorder, a phenomenon in which beekeepers open hives after pollination and find them empty, with the bees nowhere to be found.

The damaged hives are a significant agricultural issue. Ninety percent of honeybees that pollinate crops in the United States are used during the California almond bloom. And there is a cascading effect. Bees used to pollinate almond trees typically are moved to pollinate other crops, such as apples, cranberries, cherries and watermelons.

It's not clear why the damaged hives are showing up this year, as opposed to prior years.

"We're a little mystified," said John Miller, a beekeeper based in Newcastle. "We have some colonies that looked like they've been through some kind of brood die-off. It's puzzling because it is intermittent and random."

Miller keeps about 12,000 colonies of bees, which pollinate trees at almond farms in Newcastle. He said the damage he has incurred is moderate compared with what he has seen other beekeepers suffer – whole colonies damaged or dead.

Almond pollination in California requires the use of 1.6 million bee colonies, almost all brought in from other states by an army of 1,300 commercial beekeepers.

Damage to the hives this spring was so pronounced that it forced an impromptu meeting March 24 in Los Banos between beekeepers and the U.S. Environmental Protection Agency. In that meeting, 75 beekeepers weighed in and said three-quarters of their hives showed damage. That equals nearly 80,000 damaged hives, said Michele Colopy, program director with the Pollinator Stewardship Council, an advocacy group for beekeepers.

At the meeting of beekeepers, bee brokers and managers from the EPA's Office of Pesticide Programs, the practice of almond growers engaging in "tank mixing" of insecticides was raised as a major issue, Colopy said.

Almond growers typically apply one or a mix of pesticides – which can include clothianidin, dinotefuran, imidacloprid and thiamethoxam – and now are applying two new products, tolfenpyrad and cyantraniliprole, Colopy said.

She suggested that mixing certain insecticides is to blame for the damage to hives, along with the practice of applying insecticides during the early daytime hours when bees are foraging.

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“Our best practices recommend almond growers avoid application of insecticides during bloom and minimize exposure to bees and pollen,” said Bob Curtis, associate director of agricultural affairs with the Almond Board of California.

The board’s recommendations include spraying at midafternoon and in the evening, Curtis said.

Los Banos beekeeper Gene Brandisaid the pesticides used by growers do not have explicit label warnings about their possible effects on bee. The EPA assessed their toxicity, but only to adult bees, and found them to be nontoxic.

“Nonetheless, these chemicals affect the bee colony by affecting the brood,” Brandi said, adding, “The damaged hives are a significant number, and enough to cause alarm.”

Liz Purchia, an EPA spokeswoman, said the agency “understands the concerns of the beekeepers and growers, and will continue to work with them.”

“There are general instructions on pesticide labels regarding tank mixing,” Purchia said. “However, EPA does not currently require any specific language for tank mixing fungicides for use on almond farms.”

Instructions on labels only direct farmers to follow the most restrictive instructions for any chemical and advise against mixing products whose labels prohibit tank mixing.

Purchia said the EPA is considering improvements in pollinator-protection language to reduce the risk that bees face from pesticides applied during the almond bloom.

State pesticide agencies may require additional label instructions for tank mixing of pesticides within their jurisdictions, Purchia said.

In California, the state Department of Pesticide Regulation oversees the use and regulation of pesticides. “The department is working with beekeepers to look into the issue,” said spokeswoman Charlotte Fadipe. “However, there is no specific rule prohibiting tank mixes – unless the pesticide label states such.”

Beekeepers want language added to labels that warns of possible effects to bees of tank mixing, as well as an effort to end daytime applications of the insecticides. But, despite the evidence of bee colony damage, beekeepers don’t have scientific data linking the colony damage to tank mixing.

The pesticides and fungicides used on almond farms affect colonies most by contaminating the brood. This happens when bees bring pollen laden with insecticides back into the hive, said Denise Qualls, a bee pollination broker based in Danville.

“I think this is happening to everybody, it’s just that some people are paying more attention to it than other people are,” Qualls said. “Some get the hives back and see 10 percent loss and they just move on, but for some of these beekeepers, a 10 percent loss can be 600 hives. That’s a lot,” she said.

This year, Qualls saw a 10 percent damage rate among the 9,000 colonies she brokered and placed on almond farms for pollinating.

The price tag for replacing that many bees: $180,000.

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