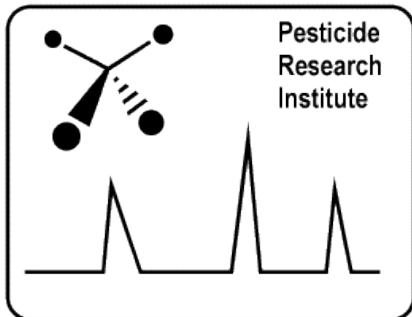


Understanding research on herbicide impacts: Toxicology resources for today's habitat restoration worker



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Overview

- Risk assessment in a nutshell
- Data sources for risk assessments
- PRiME web-based tool

Current Risk Assessment Paradigm — US EPA

- Determine the nature of the toxic effects caused by the chemical through tests on animals



- Determine the dose at which no adverse effects are observed (NOAEL)
- Account for uncertainties in toxicity studies to obtain a Reference Dose (RfD, humans) or Toxicity Reference Value (TRV, wildlife)

Current Risk Assessment Paradigm — US EPA

- Estimate anticipated exposure for humans and wildlife
- Compare RfD (or TRV) with anticipated exposure



Sources for US EPA Risk Assessments

- **Reregistration Eligibility Decisions (REDs):**
<http://www.epa.gov/pesticides/reregistration/status.htm>
- **New Pesticides Factsheets:**
<http://www.epa.gov/opprd001/factsheets/>
- **Biopesticides Factsheets**
<http://www.epa.gov/pesticides/biopesticides/ingredients/>
- **Federal Register**
<http://fdsys.gpo.gov:80/fdsys/search/advanced/advsearchpage.action>
- **E-Docket**
<http://www.regulations.gov>

Each Location is Unique

- Estimating exposure for humans, birds, fish, mammals, aquatic invertebrates, non-target plants for different pesticides and different locations can be a time-intensive and expensive process.
- Risk assessor must be familiar with methods of risk assessment for aquatic, terrestrial organisms, as well as dermal, oral and dietary risk assessment for humans.

US Forest Service Exposure Assessment Worksheets

www.fs.fed.us/foresthealth/pesticide/worksheets.shtml

- Used to assess herbicide exposures from common uses
- Varies assumptions to obtain a range of anticipated concentrations
- Uses GLEAMS model to estimate herbicide runoff
- Can be customized to local conditions: Soils, weather

PRI explanation and critique of USFS worksheets, Chapter 2:

<http://www.marinwater.org/controller?action=menuclick&id=437>



A project of the IPM Institute of North America

Project Team

Thanks to major funders to date including:

- USDA NRCS Conservation Innovation Grant Program
- Unilever
- General Mills
- US EPA Region V
- US EPA Region X

- Tom Green, IPM Institute of North America
- Chuck and Karen Benbrook, BCS-Ecologic
- Paul Jepson, Michael Guzy, Kellie Vache, Oregon State University
- Susan Kegley, Erin Conlisk, Pesticide Research Institute
- Pierre Mineau, Environment Canada
- Thomas Green, Wade Pronschinske, Amrita Batra, Abidullah Mahmood, IPM Institute of North America
- Marty Williams, Mark Cheplik, Waterborne Environmental
- Scott Martin, University of Illinois
- Jonathan Kaplan, Natural Resources Defense Council

NRCS Advisor: Joe Bagdon

- Web-based tool to help pesticide users select the least-toxic pesticide for their particular site.
- Science-based approach to assess potential risks on a site and use-specific basis.
- Identify and prioritize opportunities for risk reduction/mitigation.
- Evaluate, document performance in risk reduction over time.
- Broad access, user-friendly format.

Project Status

www.ipmprime.org

- Limited release Beta version now available
- Full version to be released in early 2011



The screenshot shows the PRiME beta website. The header includes the PRiME logo with 'beta' and 'Pesticide Risk Mitigation Engine' below it. Navigation links for Home, Contact, Donate, Help, Privacy, and Login are in the top right. A left sidebar lists About, Project Team, Project Materials, Meetings, and Resources. The main content area features a large green banner with the text 'Measure and Reduce your Pest Management Footprint'. Below this, two sections are highlighted: 'On your farm' and 'In your program'. Each section includes an image (cornfield, green apples, and various vegetables) and a 'Get Started' or 'Guided Tour' button. A paragraph at the bottom explains the tool's purpose and availability.

PRiME^{beta}
Pesticide Risk Mitigation Engine

Home Contact Donate Help Privacy Login

About
Project Team
Project Materials
Meetings
Resources

Measure and Reduce your Pest Management Footprint

On your farm: Evaluate your pest management options using science-based tools.

In your program: Track performance of multiple growers in your IPM program.

A new USGS study shows concentrations of several major pesticides declined or stayed the same in "Corn Belt" waterways from 1996 to 2006. [More info.](#)

Get Started

Pesticides are invaluable tools for food and fiber production. Pesticide use presents risks that must be carefully managed. PRiME-beta is designed to help you evaluate pesticide risks using the best available science in an easy-to-use format. PRiME-beta uses your site-specific information to help you assess and reduce potential risks to workers, birds, earthworms, small mammals and aquatic environments, and evaluate options for reducing those risks. PRiME-beta can help you make more informed choices on practices and products, and track your progress in reducing risk over time.

Guided Tour

PRiME-beta is a preliminary version, most fully developed for apples, tomatoes, potatoes, green beans, strawberries and grapes. Users will find the tool useful for many crops, with more information being added on an ongoing basis. The full version of PRiME will be available in the fall of 2010. To learn more, check out our [Frequently Asked Questions](#), or take a step-by-step [Guided Tour](#).

PRiME is a risk-based – not a hazard-based indicator

- **Hazard:** *inherent property* of an agent or situation capable of having adverse effects on something. Hence, the substance, agent, source of energy, or situation having that property
- **Risk:** the *probability* of adverse effects under specified circumstances caused by an agent in an organism, a population, or an ecological system

Risk indicators included in PRiME

- **Terrestrial Environment**
 - Birds – acute
 - Birds – chronic
 - Small mammal acute
 - Earthworm acute
 - Pollinator acute
- **Aquatic Environment**
 - Crustacea – acute
 - Algae – acute
 - Fish – chronic
- **Human safety**
 - Worker – dermal
 - Bystander – inhalation
 - Consumer – food residues
 - VOC production (California)
- **In various planning stages**
 - IPM/bio-control
 - Resistance management
 - Ground-water leaching

Ecotoxicity: PRiME Uses All Available Toxicity Data

- Addresses interspecies differences in toxicological susceptibility
- Uses literature studies as well as registrant-submitted studies, many based on documented field impacts
- Guiding principle: Use of Species Sensitivity Distributions (SSDs)

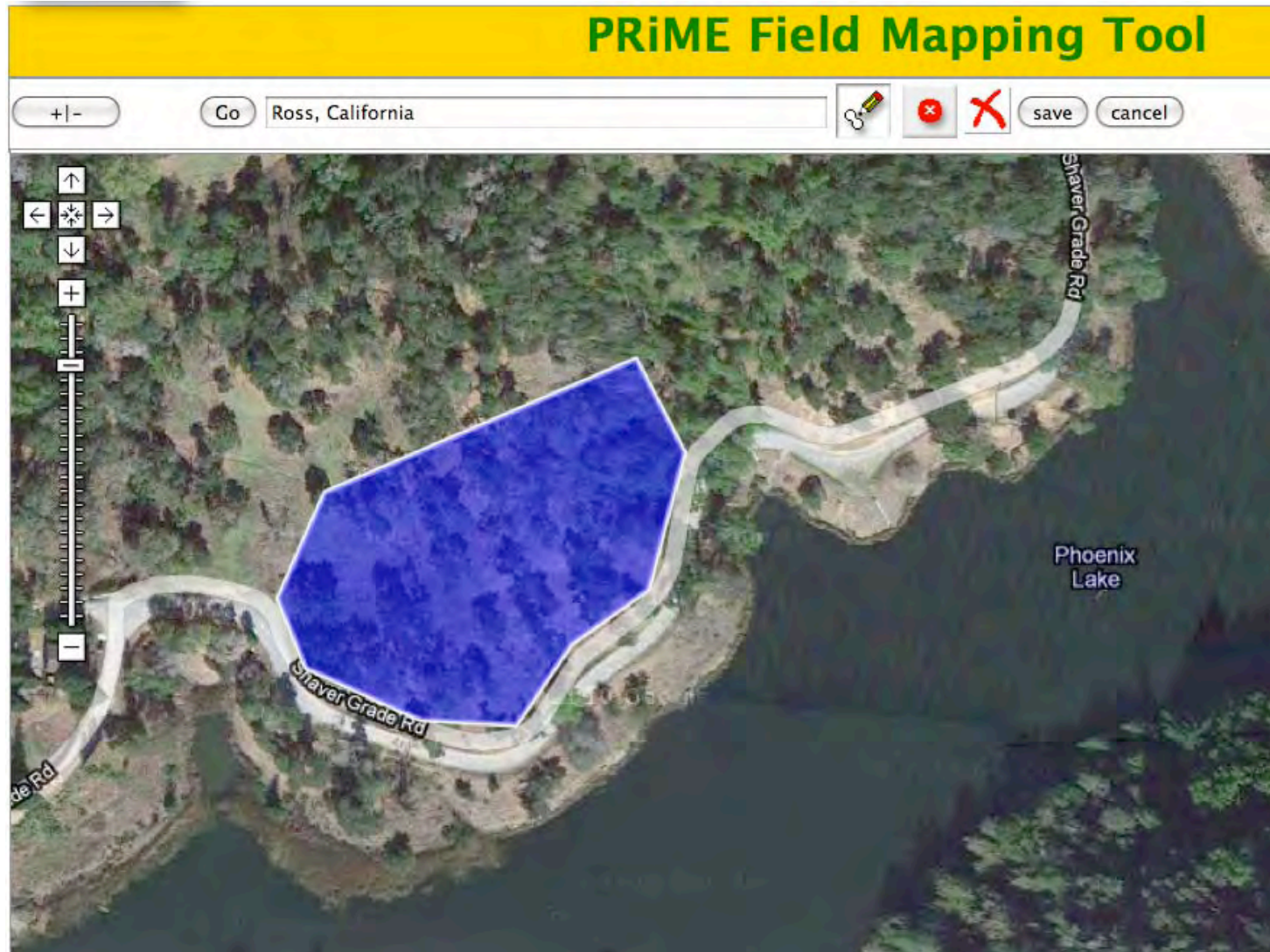


Human Indices: Dermal, Inhalation, Dietary

- Where field data not available, PRiME adopts a solution closer to regulatory assessments.
- Reference doses (RfDs) or Reference concentrations (RfCs) are used to compare to estimated exposures.



PRiME Uses Local Conditions to Produce an Individualized Risk Score



Sites

New				
	Name	Dwellings ?	Surface Waters ?	Narrative
<input checked="" type="checkbox"/>	Wade's Orchard	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Edit	Smith Orchard	<input type="checkbox"/>	<input type="checkbox"/>	
First 1 Last				

Parcels (management units) within the selected Site

New

GIS

	Name	Type	Area	AreaUnits	Lon.Centr.	Lat.Centr.	Narrative
<input type="checkbox"/> <div>Edit</div> <div>Soil</div>	Block 2	Cropping Area	29.928	acre	-89.449	42.986	
<input type="checkbox"/> <div>Edit</div> <div>Soil</div>	Block 1	Cropping Area	33.478	acre	-89.444	42.989	
<input type="checkbox"/> <div>Edit</div> <div>Soil</div>	House	Residence	3.046	acre	-89.446	42.987	

First

1

Last

Soil Attributes for ParcelId, 1951, with ParcelName, Block 2

AREASYMBOL	SPATIALVERSION	MUSYM	MUKEY	area m^2
WI025	2	PoA	753559	69575
WI025	2	PoB	753560	38305
WI025	2	WxD2	753608	2294
WI025	2	PnC2	753558	10939

cokey	compname	compct_r	slope_r	hzdept_r	hzdepb_r	om_r	sandtotal_r	silttotal_r	claytotal_r
753558:582311	Plano	100	9	0	28	4	9.5	68	22.5
753559:582312	Plano	100	1	0	28	4	9.5	68	22.5
753560:582313	Plano	100	4	0	28	4	9.5	68	22.5
753608:582373	Whalan	100	16	0	25	1.5	26.1	52.4	21.5

Showing products registered for:

Search for:

☒ Product Name
☐ Epa Registration Number

Search by:

☒ StartsWith ☐ Contains

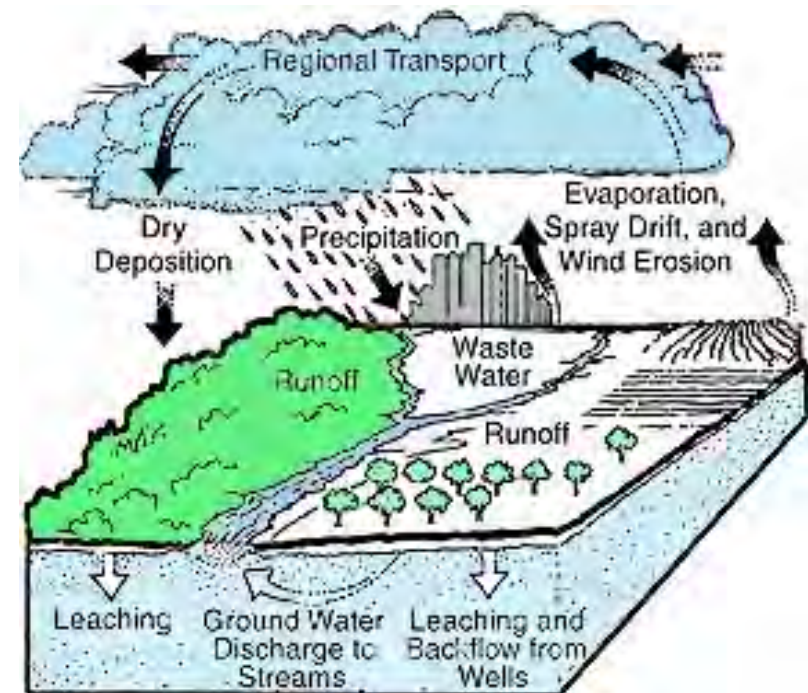
Search:

Succ

	PRODUCT_NAME	EPA_REG_NR	label_unit
<u>select</u>	Success	62719-292	gal
First 1 Last			

Example: Local estimation of aquatic runoff for aquatic indices

- EXPRESS is an *off the shelf* package
- Includes dozens of agronomic scenarios
- Define crop, soil, and climate data representative of agricultural regions and crops
- Modular: Open to expansion
- New scenarios can be created as needed



Select Application Method

- ▼ Use Pattern
 - ▼ liquid
 - ▼ spray
 - ▶ aerial
 - ▶ ground spray
 - ▼ air blast
 - ▶ foliated vineyards
 - ▶ [orchards and dormant vineyards](#)
 - ▶ pre-emergent soil spray and tarp
 - ▶ soil inject
 - ▶ chemigation
 - ▶ granular
 - ▶ gas
 - ▶ seed treated
 - ▶ pheromone
 - ▶ bait

Use Pattern Adjustment Factors (UPAFs)

Used to Adjust Risk According to Methods Used

Pre-Plant or Pre-Emergence			Post-Emergence			Aerial application
Surface or unspecified	Incorporated	Tarped	Ground Foliar Applied	Surface soil-applied between rows	Incorporated soil-applied between rows	
0.5	0.1	0	1	0.5	0.1	1



Risk Summary

- Lorsban 50-W(Chlorpyrifos at 2.000 lb/ac)
- Lorsban 50-W(Chlorpyrifos at 1.000 lb/ac)

VOC Emission Potential

Inhalation

Human Dietary

Earthworm

Small Mammal Acute

Avian Reproductive

Avian Acute

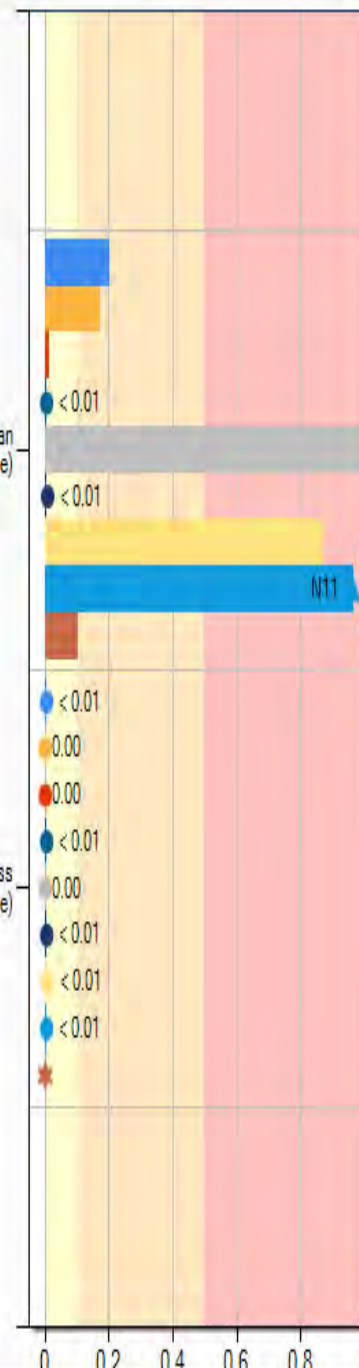
0 0.2 0.4 0.6 0.8 1

< 0.01



Lorsban 75W/G, Gowan
(Chlorpyrifos at 0.750 lb/acre)

Success
(Spinosad (mixture of Factors A and D) at 0.125 lb/acre)



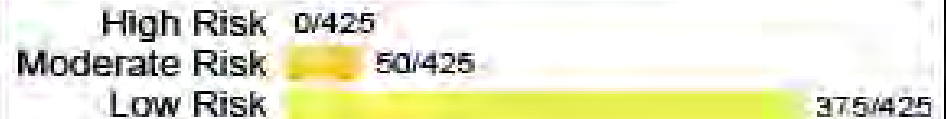
Upcoming Features

Program Evaluation for Food Producers

PRiME will display a summary showing the total number of applications falling into each risk category in a given year, allowing program managers to report progress or compare program participants.

Greensleeves Canning Company

2009 - 17 growers - 425 applications



2008 - 15 growers - 375 applications



2007 - 12 growers - 300 applications



Summary Output & Mitigation

PRiME will provide users with a risk summary of the number of indices in the low, moderate and high risk categories for each product.

Users may also be alerted to indices demonstrating moderate and high risk ratings and pathways of exposure for each product.

Figure 1



Figure 3

Endofuran (4/28/07)

Resource at risk	Risk Level	How is the pesticide getting there?
Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

☐ **Additional Mitigation Strategies**

- **General IPM:** Pest Identification, Scouting, Thresholds, Non-chemical methods - [information](#)

- **Management Practices**

- Use Alternate Pesticide - [return to pesticide selection](#) - [information](#)

☐ Reduce Application Rate: qt/ac -banded, perimeter or spot application?

- **Reduce Runoff**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> Riparian Forest Buffer	<input type="text"/> <input type="button" value="v"/>	<input type="text"/> <input type="button" value="v"/>	<input type="text" value="select sensitive site"/> <input type="button" value="v"/>	
<input type="checkbox"/> Riparian Herbaceous Cover	<input type="text"/> <input type="button" value="v"/>	--	<input type="text" value="select sensitive site"/> <input type="button" value="v"/>	
<input type="checkbox"/> Contour Buffer Strips	--	--	--	+
<input type="checkbox"/> Contour farm/orchard	--	--	--	+

- **Reduce Spray Drift**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> High-Pressure Air Induced Nozzle	--	--	--	+++
<input type="checkbox"/> Low-Pressure Air Induced Nozzle	--	--	--	++
<input type="checkbox"/> Pre-Orifice Nozzle	--	--	--	+
<input type="checkbox"/> Riparian Forest Buffer	<input type="text"/> <input type="button" value="v"/>	<input type="text"/> <input type="button" value="v"/>	<input type="text" value="select sensitive site"/> <input type="button" value="v"/>	
<input type="checkbox"/> Wind Break	<input type="text"/> <input type="button" value="v"/>	<input type="text"/> <input type="button" value="v"/>	<input type="text" value="select sensitive site"/> <input type="button" value="v"/>	

- **Reduce Leaching**

	width	height	Located between spray zone and ...	efficacy

Apply hypothetical mitigation to which application?

☒ Endofuran 3EC

☐ Azachlorazine