SOIL FUMIGANTS: 
NEW LABEL REQUIREMENTS 
2011 Regional Technical Training 
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Overview - REDs

• EPA routinely reviews pesticide registration packages to verify compliance with current guidelines

• The following fumigants were reviewed as a cluster but separate re-registration eligibility decisions (REDs) were issued
  – Methyl Bromide
  – Chloropicrin
  – Metam Sodium/Metam Potassium
  – Dazomet
## Overview – Toxicity

<table>
<thead>
<tr>
<th>Fumigant</th>
<th>Health Effects</th>
<th>Regulatory Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metam Sodium</td>
<td>Liquid formulation that rapidly converts to MITC; Causes eye irritation &amp; respiratory problems</td>
<td>Human eye irritation study</td>
</tr>
<tr>
<td>Chloropicrin</td>
<td>Eye, nose, throat and upper respiratory irritation</td>
<td>Human eye irritation study</td>
</tr>
<tr>
<td>Methyl Bromide</td>
<td>General neurotoxic &amp; developmental effects; Depletion of ozone layer</td>
<td>Rabbit development study</td>
</tr>
</tbody>
</table>
Target Air Concentration Risks

- Methyl Bromide
  0.33 ppm (developmental rabbit study)

- Chloropicrin
  0.15 ppm (human study)

- MITC
  0.022 ppm (human study)
Overview – Toxicity

Lilly Martin Spencer (1822 – 1902)
‘Peeling Onions’ (Left) and ‘Young Wife First Stew’ (Right)
Focus = Acute Risks to Bystanders

Light or No Wind

Wind blows emissions from an application to a receptor of concern (e.g., house or school)
Exposure Assessments

• Monitoring studies
  – Concentrations measured in/around fields and within handler breathing zone

• Modeling
  – Predict concentrations under different weather and field conditions

• Information from exposure incidents
  – Effects observed are consistent with risk assessment predictions
  – Causes of exposure
Overview of Incidents

• Low incident rate, but some with severe effects
  – Major incidents involved many people
    • Most causes: equipment failure, applicator error, or atmospheric conditions
  – Workers more than bystanders

• Difficult to “reconstruct” incidents to determine exact factors involved
Data on Acute Illnesses

• Data obtained from Sentinel Event Notification System for Occupational Risks (SENSOR) -Pesticides Program and the CDPR (1998–2006)

• Cases
  – 11 states
  – 2,945 illnesses
  – 643 “drift” events (included volatilization)

• Fumigants
  – Small percent of events (8%)
  – Largest proportion (44%) of illness cases
  – Common factors: weather issues, improper measures to prevent fumigant from escaping, and applicator carelessness
# Overview – Incidents

<table>
<thead>
<tr>
<th>Data Source</th>
<th>MeBr</th>
<th>Chloropicrin</th>
<th>Metam Na⁺</th>
<th>1,3-D</th>
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<tr>
<td>CA¹ (2002-2004)</td>
<td>72</td>
<td>193</td>
<td>408</td>
<td>0</td>
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<tr>
<td>NC² (1996-2009)</td>
<td>0</td>
<td>7 (5)</td>
<td>1 (1)</td>
<td>1 (0)</td>
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</table>

¹California Pesticide Illness Surveillance Program
²NCDA&CS Incident Investigation Reports
EPA Concerns

• Current use practices and product labels were not providing workers and bystanders with adequate protection to prevent inadvertent exposure to fumes

• Need to ensure a level playing field across all soil fumigants and geographical regions
Review Questions

True or False?

1. The route of exposure that is of primary concern is acute inhalation.

2. EPA based the risk assessments on a few severe incidents.

3. It is difficult to pinpoint all factors involved in an incident.
REDs Issued

• Issued regulatory decisions July 2008 with additional public comment period on implementation aspects
• Widespread feedback that risk mitigation measures (RMM) were excessive
• Issued final amended decisions in June 2009
• RMM implemented in 2 phases
Fumigant Mitigation Summary

Phase 1

2010 Labels – 2011 Implementation

- RUP classification
- Reentry restrictions
- Safety information for handlers
- Mandatory Good Agricultural Practices (GAPs)
- Fumigant Management Plans (FMPs)
- Handler respiratory protection
Mitigation Summary
Restricted Use Pesticides (RUP)

• Methyl bromide, 1,3-dichloropropene, and chloropicrin are currently RUPs.
• EPA will reclassify metam sodium/potassium and dazomet as restricted use pesticides.
The treated area sign (currently required for fumigants) must contain the following:

- Skull and crossbones symbol
- "DANGER/PELIGRO,"
- "Area under fumigation, DO NOT ENTER/NO ENTRE,"
- "[Name of fumigant] Fumigant in USE,"
- Date and time of fumigation,
- Date and time entry prohibition is lifted
- Name of the product,
- Name, address, and telephone # of the certified applicator in charge

* Five days after application has ended for bedded, untarped treatments
Mitigation Summary – Entry Restricted Period

- For untarped applications: 5 days
- For tarped applications: 5 days plus special restrictions for tarping activities
# Mitigation Summary

## Entry Restricted Period by Scenario

<table>
<thead>
<tr>
<th>If application is…</th>
<th>and tarp is…</th>
<th>_______ days after application is completed</th>
<th>workers may enter…</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Untarped</td>
<td>-</td>
<td>-</td>
<td>5 days after application is complete</td>
</tr>
<tr>
<td>2. Tarped</td>
<td>Perforated &amp; Removed within 14 days</td>
<td>after tarp is removed</td>
<td></td>
</tr>
<tr>
<td>3. Tarped</td>
<td>Perforated BUT Not Removed within 14 days</td>
<td>48 hours after perforating tarps</td>
<td></td>
</tr>
<tr>
<td>4. Tarped</td>
<td>Perforated and/or Removed more than 14 days</td>
<td>5 days after application is complete</td>
<td></td>
</tr>
</tbody>
</table>
Mitigation Summary
Safety Information for Handlers

• Registrants must develop and disseminate basic safety information for handlers
  ➢ Provided at point of purchase
  ➢ http://www.epa.gov/fumiganttraining

• Supervisors required to ensure handlers have received the information within the 12 months preceding the application
  ➢ Information must be in a manner they can understand
Mitigation Summary

Safety Information for Handlers of Pesticide Soil Fumigants

The U.S. Environmental Protection Agency requires that certified applicators provide safety information to handlers of soil fumigants. Providing this information to handlers in a manner they can understand meets this obligation.

How do I know if I am a handler?

You are a handler if you are in an application block and/or buffer zone and your work involves:

- Assisting with applications
- Cleaning up spills
- Handling or disposing of containers
- Using, cleaning, adjusting, or repairing equipment that may have residues
- Installing, operating, repairing, or removing irrigation equipment
- Shoveling soil
- Installing perforating, removing, repairing, or monitoring tarp
- Monitoring air concentrations
- Doing any crop advisor and/or other Worker Protection Standard (WPS) handler activities

What are the common active ingredients in soil fumigants?

- Metribuzin
- Chloropicrin
- Metam sodium (Vapam)
- Metam potassium (K-Pam)
- Dazomet (Vanadis)
- 1,1-Dichloropropene (Telone)
- Iodomethane (Methane)
- Dimethyldichloride (DDM) (Fadane)

What are the signs and symptoms of exposure?

You may have been exposed to a soil fumigant if you experience signs and symptoms such as:

- Watering, burning, or irritation of the eyes, nose, or mucous membranes
- Headache, nausea, or dizziness
- Tinnitus, blurred vision, or loss of muscle coordination and/or
- A rash, burning, and/or blistering

Only trained handlers can assist with and apply soil fumigants.

What should I do if I have signs or symptoms of exposure?

If you experience signs or symptoms of exposure:

1. STOP working immediately.
2. INFORM your supervisor or employer and let them know if you need medical attention.
3. LEAVE the area, and
4. MOVE upward.

Return to work only when your employer or supervisor tells you it is safe. Your supervisor may have you wear a respirator and go back to work. If you still experience symptoms while wearing the respirator, STOP WORKING.

- You may go back to work only when the
  - Symptoms go away.
  - Cartridge in the respirator has been changed.
  - Measured air concentrations are below the trigger level.

How can I prevent exposure?

Before a pesticide application:

1. Read the entire label, especially the first aid and emergency procedures.
2. Ask where to find the Fumigant Management Plan. It will have information about safety precautions and what to do if there is an emergency at your site.
3. Be familiar with first aid procedures.
4. Know where to find a telephone and phone number for medical help.

During a pesticide application:

- Always wear the proper Personal Protective Equipment (PPE) as listed on the label.

Requirements and responsibilities for handlers:

1. Be trained in the use of fumigation equipment.
2. Know first aid and emergency procedures, escape routes, and emergency contact information.
3. Read and follow the directions on the label. THE LABEL IS THE LAW. It has information for physicians and requirements for:
   - Safe handling
   - Symptoms of exposure
   - First aid
4. Use the PPE listed on the label. If you use a respirator, be fit-tested, trained on proper use, and healthy enough to wear it.
5. Be trained as a handler according to the requirements of the WPS. The information in this brochure alone does not satisfy handler training required by the WPS.

Contact your state pesticide regulatory agency to see if your state has additional requirements.

If you think that you or someone else may have gotten ill from exposure during or after the application of a fumigant, provide the following information to the applicator in charge of the fumigation and/or to the doctor:

- The name of the person who is ill
- The applicator’s name (if it isn’t the applicator in charge)
- Where and when the exposure occurred
- What happened
- Symptoms of illness
- Name of the fumigant product, active ingredient, or EPA registration number

http://www.epa.gov/fumiganttraining
Information for Handlers - EPA

Available on December 1, 2010 at:
http://www.epa.gov/fumiganttraining

Safety Information for Handlers of Pesticide Soil Fumigants

The U.S. Environmental Protection Agency requires that certified applicators provide safety information to handlers of soil fumigants. Providing this information to handlers in a manner they can understand meets this obligation.

Registrant developed information may have a different format but it must contain the essential information.
How do I know if I am a handler?

You are a handler if you are in an application block and/or buffer zone and your work involves:

- Assisting with applications
- Cleaning up spills
- Handling or disposing of containers
- Using, cleaning, adjusting, or repairing equipment that may have residue
- Installing, operating, repairing, or removing irrigation equipment
- Shoveling soil
- Installing, perforating, removing, repairing, or monitoring tarps *
- Monitoring air concentrations
- Doing any crop advisor and/or other Worker Protection Standard (WPS) handler activities

*Tarp activities are handler activities if they take place during the entry restricted period*
What are the common active ingredients in soil fumigants?

- Methyl bromide
- Chloropicrin
- Metam sodium (Vapam)
- Metam potassium (K-Pam)
- Dazomet (Basamid)
- 1,3-Dichloropropene (Telone)
- Iodomethane (Midas)
- Dimethyl disulfide (DMDS) (Paladin)
Information for Handlers - EPA

What are the signs and symptoms of exposure?

You may have been exposed to a soil fumigant if you experience signs and symptom such as:

- Watering, burning, or irritation of the eyes, nose, or mucus membranes
- Headache, nausea, or dizziness
- Tremors, slurred speech, or loss of muscle coordination; and/or
- A skin rash, burning and/or blistering
Information for Handlers - EPA

What should I do if I have signs or symptoms of exposure?

If you experience signs or symptoms of exposure:

- **STOP** working immediately;
- **INFORM** your supervisor or employer and let them know if you need medical attention,
- **LEAVE** the area, and
- **MOVE** upwind.

Return to work only when your employer or supervisor tells you it is safe. Your supervisor may have you wear a respirator and go back to work. If you still experience symptoms while wearing the respirator, **STOP WORKING**.

- You may go back to work **only when** the:
  - Symptoms go away,
  - Cartridge in the respirator has been changed, and
  - Measured air concentrations are below the trigger level.
Mitigation Summary

Handler Respiratory Protection

• New labels will require handlers to stop work or use respirators if air concentrations exceed acceptable limits
  – For most activities, sensory detection triggers respiratory protection requirements
  – PPE or cease work and leave application block
• At least 1-2 handlers (depending on product) must have air-purifying respirator available
  – Fit-tested, trained & medical clearance
• At least 1 SCBA on-site & ready for emergency
  – Not required for metam sodium/potassium or dazomet
Mitigation Summary
Monitoring Devices

• Return to work area unprotected after sensory detection
  – Acceptable levels at 2 consecutive samples, 15 minutes apart
• Working with respirators
  – Verify within acceptable range every 2 hours
• Devices
  – Dräeger
  – Matheson-Kitagawa / Sensidyne
Mitigation Summary
2011 Label Update

December 31, 2010 – Only products bearing new labels with Phase 1 RMM will be allowed for sale and distribution by registrants

<table>
<thead>
<tr>
<th>Product</th>
<th>EPA Stamped Label</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Old</td>
</tr>
<tr>
<td>Vapam HL</td>
<td>13 pages</td>
</tr>
<tr>
<td>Chlor-O-Pic</td>
<td>8 pages</td>
</tr>
<tr>
<td>Telone C-17</td>
<td>15 pages</td>
</tr>
</tbody>
</table>

Read the label – the applicator needs to follow the most restrictive directions on the labels of the products they are applying.
Fumigant Mitigation Summary

Phase 2

2012 Implementation*

- Buffers and buffer posting
- BZ monitoring and/or neighbor notification
- Restrictions near difficult to evacuate sites
- Registrant-provided training for applicators and community outreach programs

*These requirements are already on products with active ingredients that were first registered in the past three years (iodomethane or dimethyl disulfide)
Mitigation Summary – Buffer Zones

- The area around the application block where bystanders must be excluded during the buffer zone period, except for people in transit (bicycles and motorized vehicles).

- The “buffer zone period” starts when a fumigant is first delivered to the soil and is in effect for 48 hours after the fumigant has stopped being delivered to the soil.
Product labels will display distances in look-up tables based on
- application rate
- field size
- application equipment and methods

Buffer zone credits may be applied for certain site conditions or application practices that reduce emissions (e.g., certain tarps)
## Buffer Zone Table

### 2012 XYZ MeBr-Pic 67/33 Soil Fumigant

**Table 1. Buffer Zone Distances for Shank Bedded with Tarps (feet)**

<table>
<thead>
<tr>
<th>Application Block Size (feet)</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<td>272</td>
<td>300</td>
<td>386</td>
<td>473</td>
</tr>
</tbody>
</table>

**Int. Application Rate (lb Plant/acre)**

- **5 lb Plant/acre:** 75
- **10 lb Plant/acre:** 323
Buffer Zone Overlap

- Buffer zones can overlap if 12 hours have elapsed from the end of an application for which a buffer is in place until the start of a subsequent application.
Buffer Credits:
Agronomic Factors – O.M. & Clay

- Same for all fumigants
- Soil Organic Matter Buffer Credits
  - 10% Credit: 1% ≤ O.M. < 2%
  - 20% Credit: 2% ≤ O.M. < 3%
  - 30% Credit: 3% ≤ O.M.
- 10% credit if soil clay content ≥ 27%
Buffer Credits:
Agronomic Factors – Soil Temperature

- **Methyl Bromide**
  - Label minimum & do not exceed 90°F

- **Chloropicrin**
  - Label minimum & do not exceed 90°F
  - 10% buffer credit if appl. temp. ≤ 50°F @ 3 in.

- **Metam Sodium**
  - Label minimum & do not exceed 90°F
  - 10% credit if appl. temp. 51°F to 70°F @ 3 in.
  - 20% buffer credit if appl. temp. ≤ 50°F @ 3 in.
Fumigant REDs: Agronomic Factors – Soil Moisture

- **MeBr**
  - Minimum – Moisture $\geq 50\%$ @ 9 in.

- **Chloropicrin**
  - Minimum – Moisture $\geq 50\%$ @ 9 in.
  - Use reduced buffer table if $\geq 75\%$.

- **Metam Sodium**
  - Must be 60-80% field capacity @ 2-6 in.
Mitigation Summary
Buffers and Residential Areas

Buffer zones may include residential areas IF

– The occupants provide written agreement to *voluntarily* vacate the buffer zone during the entire buffer zone period

*Agreement to vacate the buffer zone is not voluntary if obtained through coercion or intimidation*
Mitigation Summary
Transit Through Buffer Zones

- Vehicular and bicycle traffic on public and private roadways through the buffer zone is permitted.

- Bus stops or other locations where persons wait for public transit are not permitted within the buffer zone.
Mitigation Summary
Buffers and Agricultural Areas

Buffer zones may include agricultural areas owned/operated by someone other than the owner/operator of the application block IF

– The buffer zone will not overlap with a buffer zone from a nearby fumigation and

– The owner/operator provides written agreement that they, their employees, and others will stay out of the buffer zone.
Buffers and Roads, Rights-of-Way, and Public Areas

Buffers may include roads, rights-of-way, and public areas IF

- The area is not occupied during the buffer zone period
- Entry by non-handlers is prohibited
- Applicators comply with all local laws and regulations
- Written permission to include a road with a sidewalk, an established walking path, or a public area in the buffer zone is granted by the state/local authorities responsible for management and operation of the area
Buffer zones must be posted at usual points of entry and along likely routes of approach to the buffer unless a physical barrier such as a fence prevents access to the buffer.
Mitigation Summary
Posting Requirements

The buffer zone sign must include:
-- The “Do Not Walk” symbol

-- "DO NOT ENTER/NO ENTRE,"
-- "[Name of fumigant, name of product] Fumigant BUFFER ZONE," and
-- Contact information for the certified applicator in charge of the fumigation
Mitigation Summary
Response and Management

If occupied structures are in proximity to a buffer zone, the certified applicator must choose either

- “Buffer Zone Monitoring” or
- “Response Information for Neighbors”
Mitigation Summary

Triggers for Site-Specific Measures

Buffer zones of 25 feet do not require additional action

<table>
<thead>
<tr>
<th>If the buffer zone is:</th>
<th>AND there are residences and businesses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 25 feet and ≤ 100 feet</td>
<td>50 feet from the edge of the buffer zone</td>
</tr>
<tr>
<td>&gt; 100 feet and ≤ 200 feet</td>
<td>100 feet from the edge of the buffer zone</td>
</tr>
<tr>
<td>&gt; 200 feet and ≤ 300 feet</td>
<td>200 feet from the edge of the buffer zone</td>
</tr>
<tr>
<td>&gt; 300 feet</td>
<td>300 feet from the edge of the buffer zone</td>
</tr>
</tbody>
</table>

Then the applicator must either: monitor the site (Option 1) or provide information to neighbors (Option 2).
If the buffer zone is 125 feet, then these requirements apply to residences within 100 feet of the buffer zone.

Either the applicator must monitor the area between the plain house and the buffer zone or residents of the plain house must be provided emergency response information.

The location of the cross-hatched house would not prompt any action.
Mitigation Summary – Restrictions Near Difficult-to-Evacuate Sites

- Difficult-to-evacuate site = school, hospital, day care, prison, etc.
- Fumigant applications are not permitted within 1/8 mile of these sites if occupied during the 36-hour period following the application.
- The restricted area may be increased to 1/4 mile if the buffer zone is greater than 300 feet.
Restrictions: Difficult-to-Evacuate Sites
### Examples: 1,3-D + Chloropicrin

<table>
<thead>
<tr>
<th>Product</th>
<th>Telone C-35</th>
<th>Telone C-35</th>
<th>Telone C-35</th>
<th>Telone C-35</th>
<th>Telone C-17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Size</td>
<td>10 acres</td>
<td>5 acres</td>
<td>5 acres</td>
<td>10 acres</td>
<td>10 acres</td>
</tr>
<tr>
<td>Method</td>
<td>Untarp-Brdcst</td>
<td>Untarp-Brdcst</td>
<td>Shank-Bedded</td>
<td>Tarped-Bedded</td>
<td>Shank-Bedded</td>
</tr>
<tr>
<td>Rate</td>
<td>35 Gal/A</td>
<td>35 Gal/A</td>
<td>17.5 Gal/A</td>
<td>35 Gal/A</td>
<td>10.5 Gal/A</td>
</tr>
<tr>
<td>1,3-dichloropropene</td>
<td>249 lb/A</td>
<td>249 lb/A</td>
<td>125 lb/A</td>
<td>249 lb/A</td>
<td>108 lb/A</td>
</tr>
<tr>
<td>Chloropicrin</td>
<td>136 lb/A</td>
<td>136 lb/A</td>
<td>68 lb/A</td>
<td>136 lb/A</td>
<td>19 lb/A</td>
</tr>
<tr>
<td>Buffer Zone - RED</td>
<td>375 ft</td>
<td>230 ft</td>
<td>113 ft</td>
<td>25 ft</td>
<td>25 ft</td>
</tr>
<tr>
<td>Buffer Zone - 1,3-D*</td>
<td>100 ft</td>
<td>100 ft</td>
<td>100 ft</td>
<td>100 ft</td>
<td>100 ft</td>
</tr>
<tr>
<td>Notification Zone**</td>
<td>300 ft</td>
<td>200 ft</td>
<td>100 ft</td>
<td>not required</td>
<td>not required</td>
</tr>
<tr>
<td>DTE Site Distance***</td>
<td>1320 ft</td>
<td>660 ft</td>
<td>660 ft</td>
<td>660 ft</td>
<td>660 ft</td>
</tr>
</tbody>
</table>

* "An application ... shall not be made within 100 feet of an occupied structure"

** Or monitor buffer zone for evidence of detectable fumes

*** DTE = Difficult-to-evacuate site (school, hospital, day care, prison, etc.)
Mitigation Summary – Training for Supervisors of Fumigations

• Registrants must develop and disseminate training for certified applicators in charge of fumigations

• Certified applicators required to receive registrant soil-fumigant training every three years

• Must be documented in the FMP
The Agency agrees that for states that have existing soil fumigation certification programs that address the same training elements required of the registrant soil fumigant training programs, as outlined in this section of the RED addendum, applicators should be able to complete the state certification program in lieu of completing the registrant soil fumigation training. For the state soil fumigation certification program to qualify, both EPA and the state must agree that the program satisfies the applicator training elements required in the RED Chloropicrin Amended RED 2009
Mitigation Summary
N.C. Cert. & Lic. for Soil Fumigant Appl.

• No separate categories for soil fumigation
• Private Pesticide Applicator – General certification (no subcategories)
• Commercial Applicators – Certified in the appropriate specialty
  – Agricultural Pest Control – Plant (O)
  – Ornamental and Turf Pest Control (L)
  – Regulatory Pest Control (I)
  – Right-of-Way Pest Control (H)
State Pesticide Applicator Certification

Separate Soil Fumigation Category

22 States With Soil Fumigation Category / 28 States Without
Implementation of Risk Mitigation Measures for Soil Fumigant Pesticides

Current as of December 2010

Soil Fumigant Toolbox

Welcome to the Soil Fumigant Toolbox which provides training, outreach, and other resource materials for applicators and handlers, communities, state and local agencies, and others interested in understanding and implementing the current requirements for safe use of soil fumigants. Learn what's new in the toolbox.
Questions?

Bob Bruss: 919-733-3556

Structural Pest Control & Pesticides Division
North Carolina Department of Agriculture & Consumer Services
Steve Troxler – Commissioner
Cutting Onions
Risk Mitigation Measures
Fumigant Mitigation Summary
Phase 1

2010 Labels – 2011 Implementation

- RUP classification
- Reentry restrictions
- Safety information for handlers
- Mandatory Good Agricultural Practices (GAPs)
- Fumigant Management Plans (FMPs)
- Handler respiratory protection