SOIL FUMIGATION

METHODS
TREATMENTS
APPLICATOR SAFETY
REGULATORY
ALTERNATIVES

STEVE GODBEHERE
FORESTRY NURSERY SHORT COURSE
SEPTEMBER 8, 2015

TriEst
Ag Group, Inc.

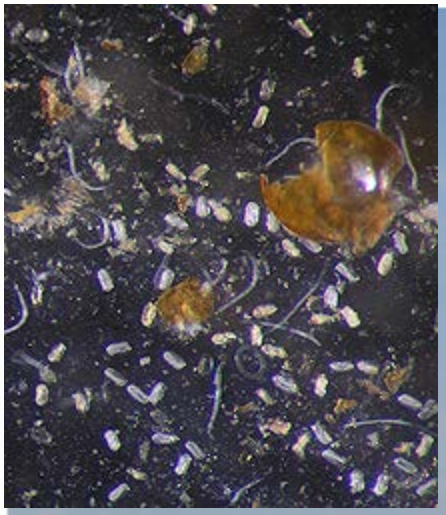
SOIL FUMIGATION

- CHEMICAL CONTROL STRATEGY USED TO REDUCE POPULATIONS OF SOIL ORGANISMS
  - NEMATODES
  - FUNGI
  - BACTERIA
  - INSECTS
  - WEED SEED
  - WEEDS

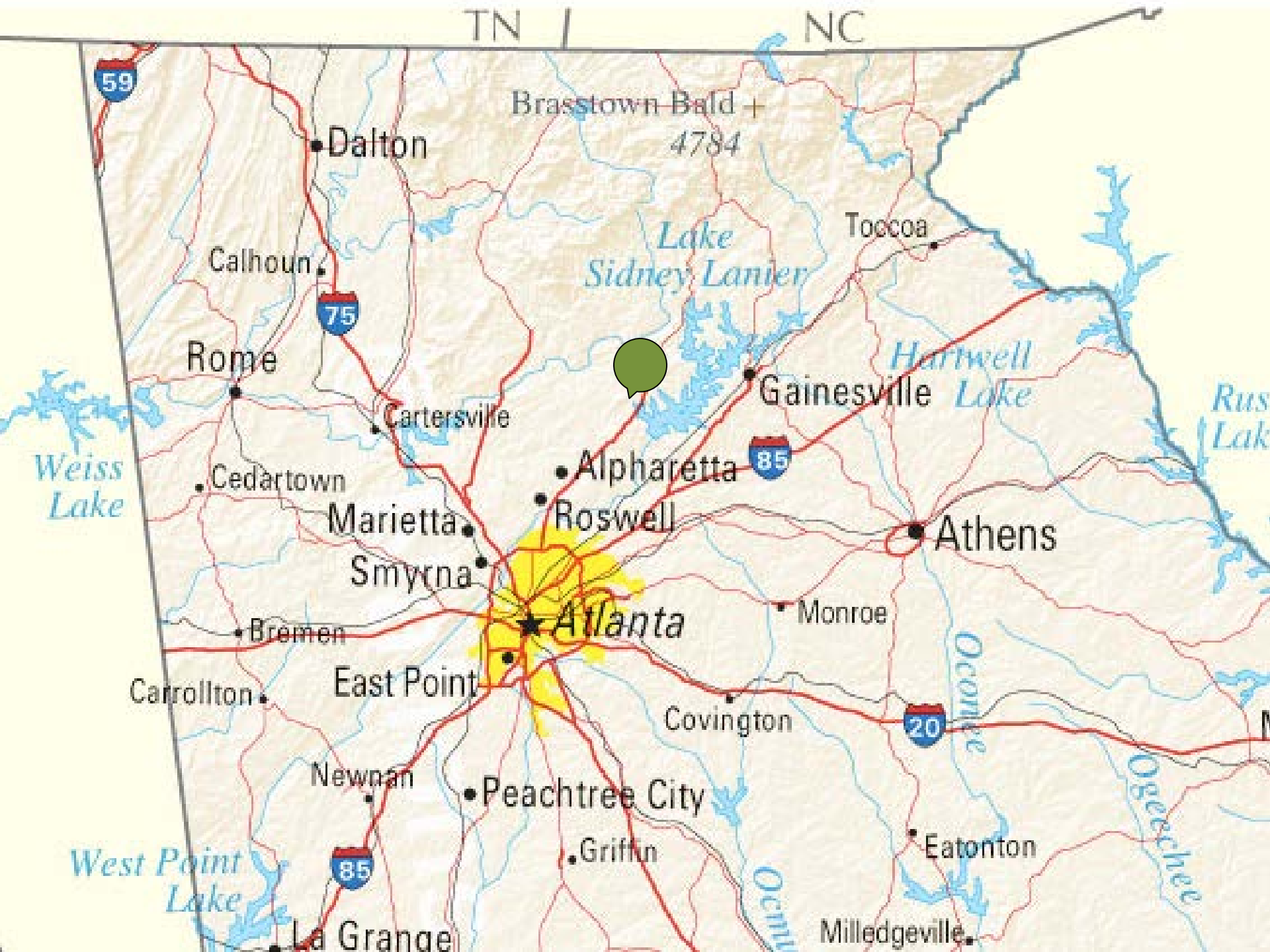

GROWER
STANDARD
- ATLANTIC -
PIC
80 lb a.i./A
IN-ROW
PIC
100 lb a.i./A
IN-ROW

SOIL FUMIGATION USES

- QUARANTINE REMEDIATION
- AGRICULTURE
- ORCHARDS
- NURSERIES
- ORNAMENTAL BEDDING
- FOREST SYSTEMS
- WILD FLOWER PROJECTS
- GOLF COURSES
- ATHLETIC FIELDS
- WHITE HOUSE LAWN




07/12/2010


TN
NC
59
Dalton
Brasstown Bald + 4784
Lake Sidney Lanier
Toccoa
Calhoun
75
Rome
Cartersville
Hartwell Lake
Gainesville
Weiss Lake
Cedartown
Alpharetta
85
Roswell
Marietta
Athens
Smyrna
Atlanta
Monroe
Bremen
East Point
Carrollton
Covington
20
Ocmulgee
Ogeechee
Newnan
Peachtree City
Griffin
Eatonton
West Point Lake
85
La Grange
Milledgeville

Phytophthora ramorum/Sudden Oak Death


DANGER PELIGRO
PESTICIDES PESTICIDAS
Area Under Fumigation
KEEP OUT
NO ENTRE
APOLLO
AED6500S
6 12:53PM


6 2:50PM


DANGER PELIGRO
Area Under Fumigation
KEEP OUT
NO ENTRE
6 2:51PM


In North Carolina and Georgia, researchers are conducting trials on pre

SOIL FUMIGATION

- Solid Tarp
- Row or Bed
- Hot Gas
- Greenhouse
- Replanting Orchard Sites


INHALATION
HAZARD

KEYS TO SUCCESSFUL SOIL FUMIGATION

Soil Preperation

- Soil Temperature

- Soil Moisture

KEYS TO SUCCESSFUL SOIL FUMIGATION

- Soil Preparation
- Soil Temperature
- Soil Moisture
- Fumigant

KEYS TO SUCCESSFUL SOIL FUMIGATION

- Soil Preparation
- Soil Temperature
- Soil Moisture
- Fumigant
- Injection Depth

KEYS TO SUCCESSFUL SOIL FUMIGATION

- Soil Preparation
- Soil Temperature
- Soil Moisture
- Fumigant
- Injection Depth
- Sealing

KEYS TO SUCCESSFUL SOIL FUMIGATION

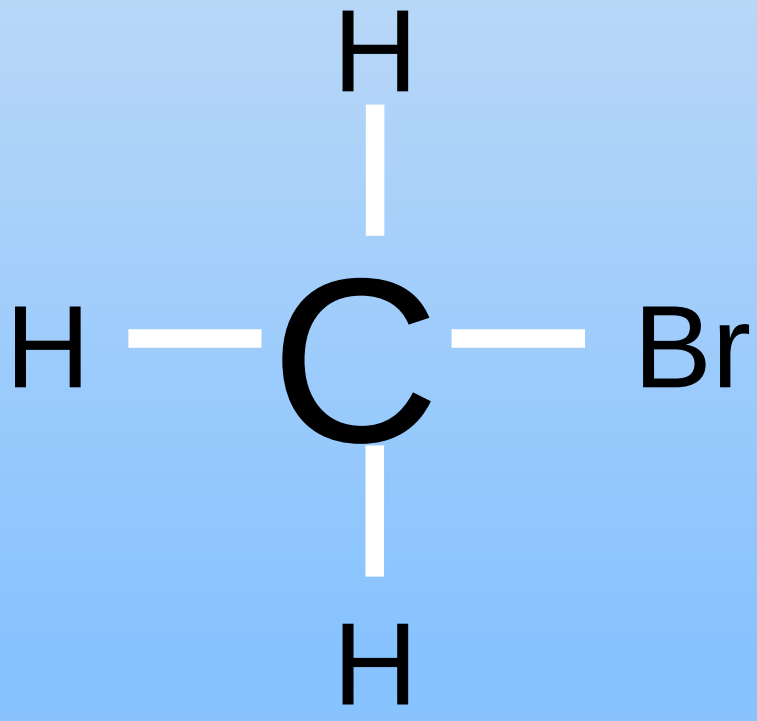
- Soil Preparation
- Soil Temperature
- Soil Moisture
- Fumigant
- Injection Depth
- Sealing
- Soil Aeration

- Soil Preparation
- Soil Temperature
- Soil Moisture
- Fumigant
- Injection Depth
- Sealing
- Soil Aeration
- Waiting Period

FUMIGATION SAFETY

- Characteristics of Methyl Bromide and Chloropicrin
- Potential Hazards
- Prevention / Protection
- First Aid / Emergency Response

METHYL BROMIDE



METHYL BROMIDE

- Naturally occurring molecule
- Non-flammable
- Boils at 38.5 degrees F
- 3.27 times heavier than air
- Practically insoluble
- Odorless and Colorless

DANGER

This product contains CHLOROPICRIN as a warning odorant. Chloropicrin may be irritating to the upper respiratory tract, and may cause painful irritation to the eyes, producing watering. If the symptoms occur, leave the fumigation area immediately.

CHLOROPICRIN

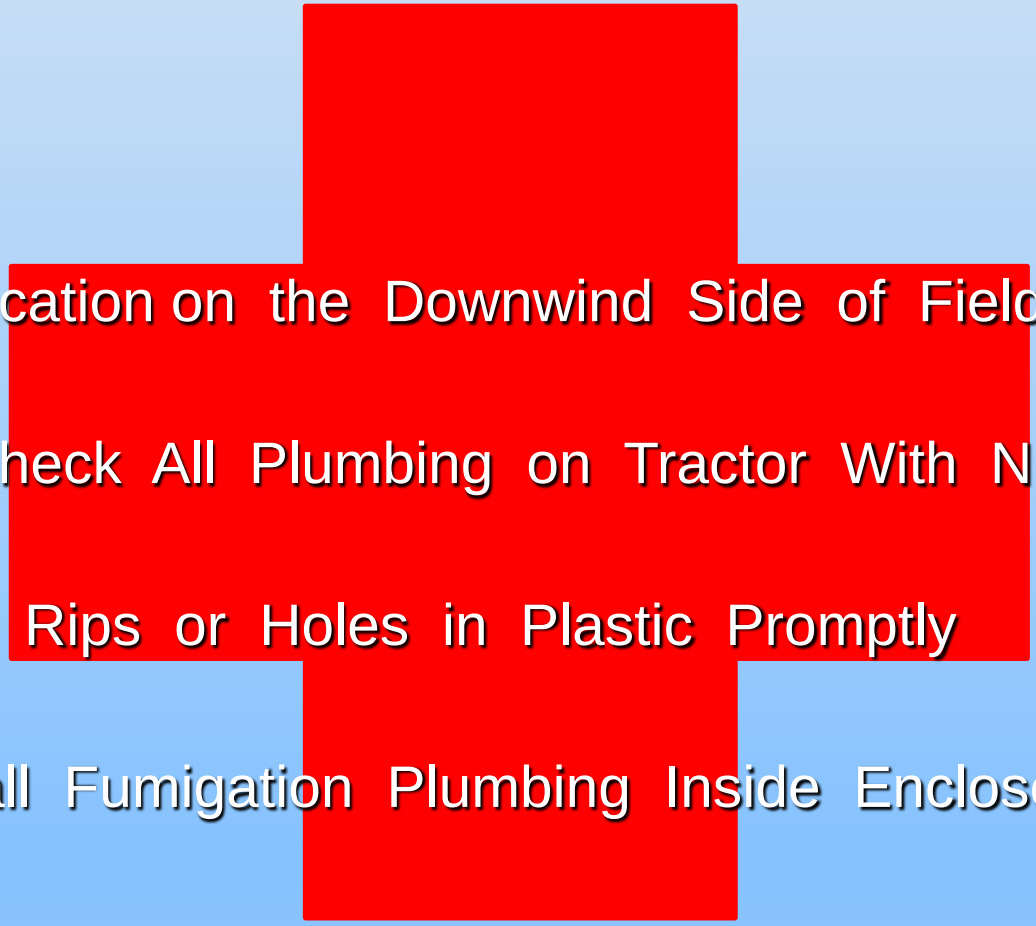
- Lachrymator
- 5.7 times heavier than air
- Colorless
- Respiratory Irritant
- TLV-0.1 ppm
- Liquid

METHYL BROMIDE TOXICITY

RESPIRATORY TRACT

- Symptoms: Dizziness, Headache, Nausea, and Vomiting
- Lung Edema
- Cardiac Irregularities
- Possible Death
- Symptoms Can Be Delayed

SAFETY MEASURES TO AVOID RESPIRATORY INJURY



- Begin Application on the Downwind Side of Field
- Pressure Check All Plumbing on Tractor With Nitrogen
- Repair Any Rips or Holes in Plastic Promptly
- Never Install Fumigation Plumbing Inside Enclosed Tractor Cab
- Replace Worn Chisels

PRACTICAL TREATMENT

- IF INHALED
  - Fresh Air - Stay Warm - Artificial Respiration
- IF ON SKIN
  - Remove Clothing - Wash With Soap and Water
- IF IN EYES
  - Flush At Least 15 Minutes With Water

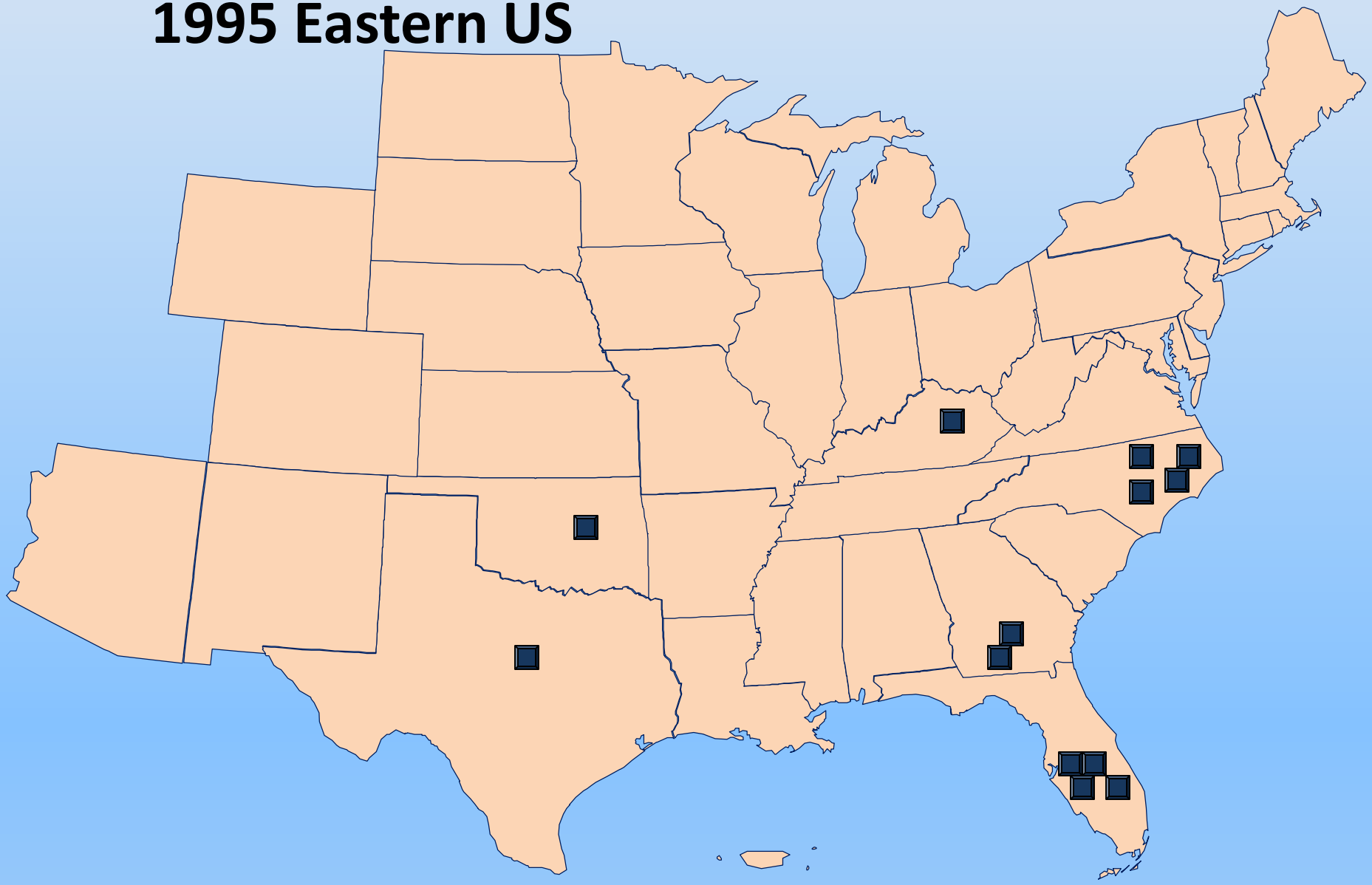
Go to a doctor or emergency treatment facility as soon as possible!

APPLICATOR COMPLIANCE CHALLENGES

Custom Solid Tarp Fumigators 1990 – 1995 Eastern US

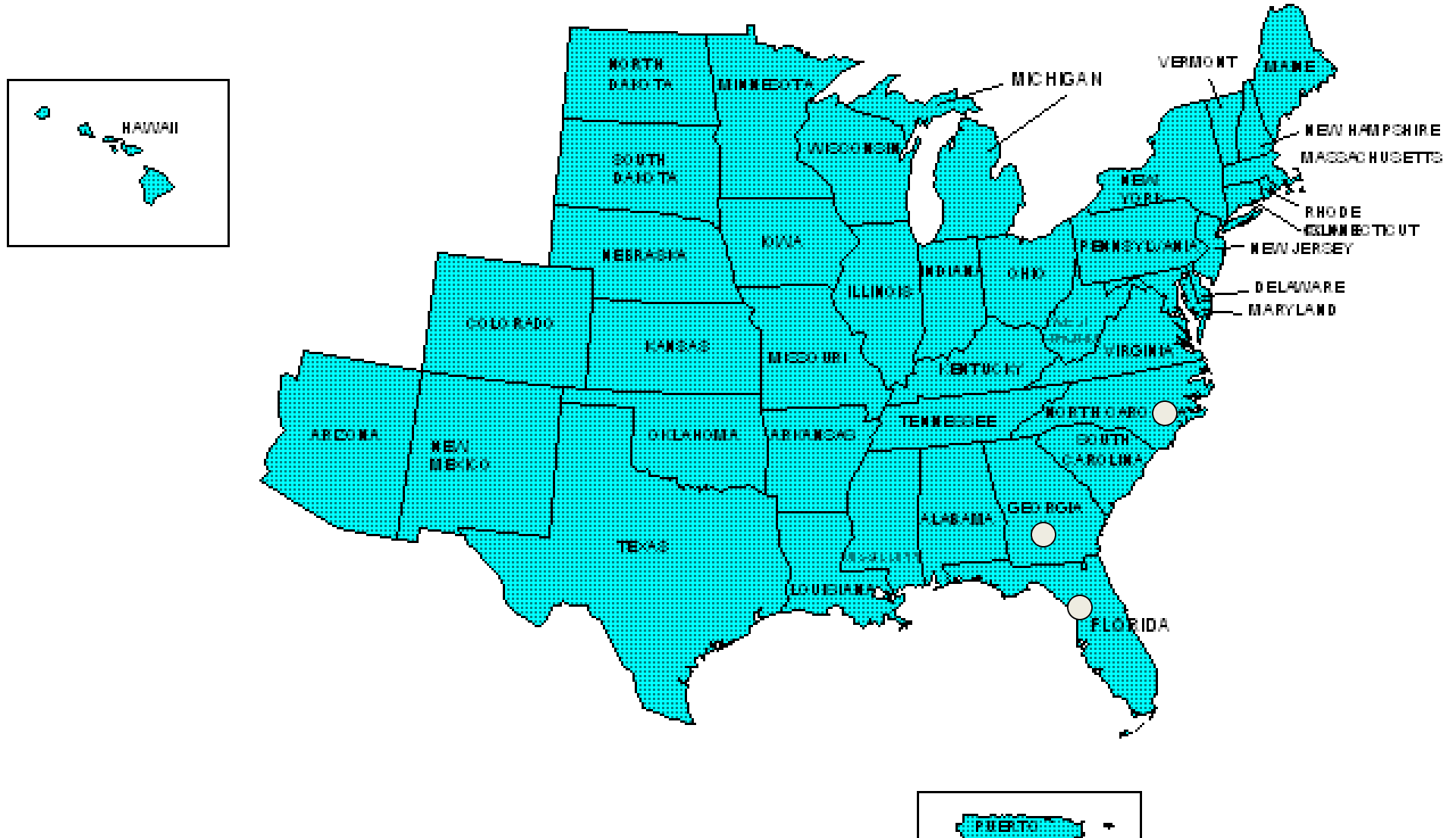
- Hendrix and Dail
- HMS Fumigation
- Sunbelt Services
- Fumatek
- Blair Fumigation
- Frances and Frances
- Burnside Fumigation Services
- Integrated Pest Management
- Caleco

Custom Solid Tarp Fumigators 1990 – 1995 Eastern US



Custom Solid Tarp Fumigators
2015 Eastern US

TriEst Ag Group Area 2015



COMMERCIAL APPLICATOR CHALLENGES

- Keep the cost of fumigation at a level the grower can afford.
- Post fumigation monitoring
- Loss of rates and loss of range of labels in certain states.
- Servicing the needs of the growers and government entities, i.e. effectively controlling pests and pathogens.
- State licensing requirements for our fumigators.
- DOT Hazmat Driver regulations.

Fumigation Cost

- QPS MB cost continue to increase
  - Reduced volumes of CUE
- Fumigation management plan
- Monitoring and sampling
- Use of TIF tarps and hot glue equipment
- Cancelled or delayed jobs if we get there and the GAP's are not perfect
- Additional state licensed fumigators
- Contract tarp removal will be more problematic and costly.

Fumigation Management Plan

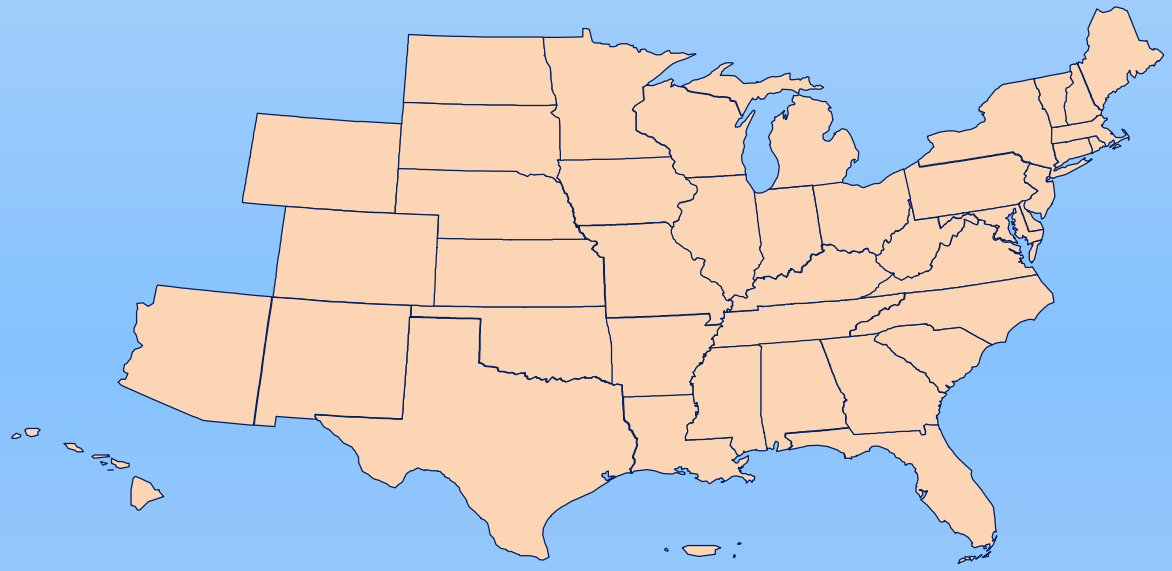
- Several hours a day over several days to complete
- Office is in Tifton, GA and job may be in Texas, Wisconsin, Tennessee, etc.
- GPS coordinates for fields (many w/o physical address)
- Number and location of blocks (multiple FMP's)
- Evacuation routes and diagrams from customer
- First Responder Info (no one knows this even fire depts – everyone says call 911)
- Lot, batch number, and part number for the tarp.
- NOAA weather confusing to a layman, air-stagnation advisories and inversions

Fumigation Management Plan Logistics

- Handler Information created after fumigators get to job
- Weather conditions printed out after fumigators get to job.
- Many times fields or blocks will change due to soil conditions
- Additional info included: Work Orders, BOL, MSDS, Labels must all go to customers

Post fumigation monitoring

- 2 ppe equipped handlers from nursery
- 5 day tarp inspection
- 48 hour emissions monitoring



ABILITY TO CONTROL SOME PATHOGENS

- Flexibility of rates needed for control.
- Buffer zones can limit the ability to treat an entire contaminated area.
- Cancelling labels due to new fees imposed by states – reduces our ability to tailor the mixture to the pathogen.
- Respirator requirements limit our ability to use any Methyl Bromide mixtures containing less than 20% Chloropicrin.


98
2

Work/Rest Guidelines for PPE

- The following are recommended Work / Rest cycles for all employees required to wear PPE (clothing and respirator) during fumigant applications:

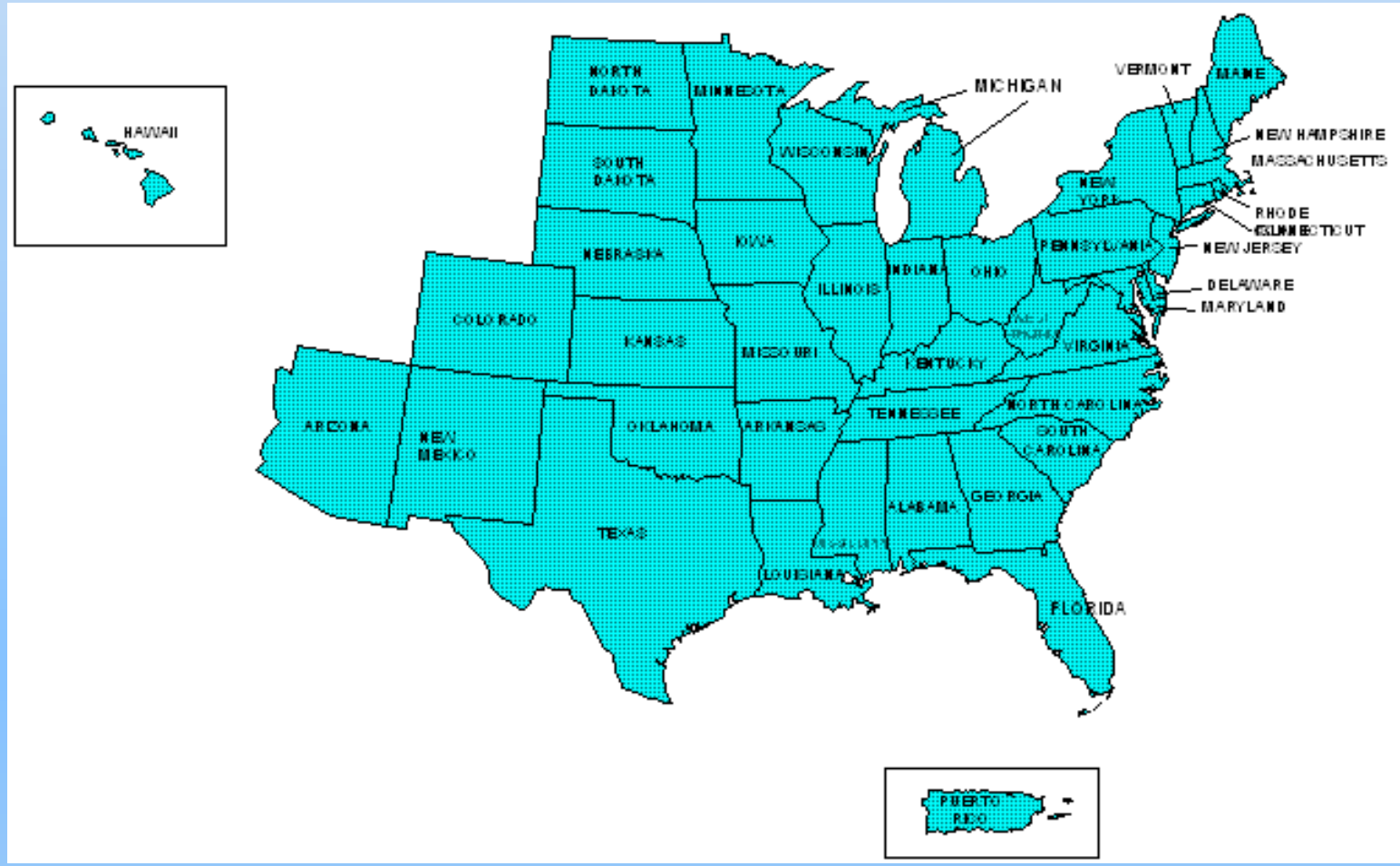
- COOL TEMPERATURES
  - 50 – 70°F (10 – 21°C) [Wet Bulb/Globe Temperature (WBGT)]
  - Work 30 – 45 minutes
  - Followed by 10 –15 minutes rest

- WARM TEMPERATURES
  - 70 – 85°F (21 – 29°C) (WBGT)
  - Work 20 – 30 minutes
  - Followed by 40 – 60 minutes rest

- HOT TEMPERATURES
  - 85 – 100°F (29 – 38°C) (WBGT)
  - Work 15 – 20 minutes
  - Followed by indefinite rest

- In the southeast, during summer fumigation season, ambient temper
  fumigator's ability to efficiently conduct operations

State Licensing Requirements



State Licensing Requirements

DOT Hazmat Driver Challenges

- Mandatory drug and alcohol testing
- Monthly random drug and alcohol testing
- Hours of service
- Competition from commercial hazmat haulers

GROWER COMPLIANCE CHALLENGES

Label Challenges Affect Growers

- Potential loss of Methyl Bromide
  - Alternatives are not forgiving and much more complicated to apply
  - Alternatives tend to loose control after 3 years
  - Soil and environmental conditions much more critical for efficacy.

Label Challenges for Growers

- Cost of ppe and monitoring compliance
- Tilth requirements will be difficult to meet in certain soils in mountain production area
- Moisture requirements may be difficult to meet if fumigation window is short (spring) and supplemental irrigation not available

Personal Protective Equipment

Type, Cost, Maintenance, and Training Considerations

Air Purifying Respirators (APRs)

Full-Face Respirator

- **Advantages**
  - **Eye protection**
  - **Higher APF (50X)**
  - **Repairable**
- **Disadvantages**
  - **Cost – can be in excess of $150.00/unit**
  - **Psychological effects (breathing restriction)**
  - **No IDLH or Oxygen-deficient atmospheres**
  - **Continued use requires cartridge change-out schedule and increased cartridge cost (~$10.00 set)**
  - **Must change cartridges after every shift or when breakthrough occurs**

Self-Contained Breathing Apparatus (SCBA)

Advantages

- Highest level of respiratory protection (APF = 10,000X)
- Cleared for use in IDLH and Oxygen-deficient atmospheres

Disadvantages

- Cost – depending on brand, type, and any discounts for repeat purchases, can be as low as $1,600.00; usually ~$2,000.00
- Units require high-degree of maintenance and inspections; recharging breathing air tanks can be problematic in remote areas
- Cumbersome, and require more storage space: a premium in the field
- More intensive and frequent training required for user to become proficient in its use

Medical Evaluation

- Prior to wearing any tight-fitting respirator, each employee must be evaluated by a physician or other licensed health care professional to determine that no physiological restrictions exist to wearing a respirator.
- This evaluation needs not be repeated unless:
  - The employee reports signs or symptoms related to ability to use a respirator;
  - A PLHCP, supervisor, or the program administrator informs the employer that an employee needs to be re-evaluated;
  - Observations made during fit testing indicate a need for reevaluation; or
  - A change occurs in workplace conditions that may result in an increase in the physiological burden place on the employee.

Respirator Fit Test

- Before an employee may be required to use a tight-fitting respirator, the employee must be fit tested with the same make, model, style, and size of respirator that will be used.
- The employee must pass an appropriate qualitative or quantitative fit test at least annually, which follows an OSHA-accepted protocol (Appendix A to 29 CFR 1910.134)

Air Monitoring Requirements & Equipment

Aspirator-style Pumps w/ Colorimetric Tubes

- **Advantages**
  - **Pump is portable and reliable**
  - **Relatively inexpensive $415.00 Retail**
- **Disadvantages**
  - **Colorimetric tubes are expensive ($85-$160 /box of 10)**
  - **Time consuming (>10 min/reading)**
  - **Tubes susceptible to damage from high temperatures (must be kept at room temperature)**
  - **Shelf life contingent on storage temperature**
  - **Tubes are not readily available**

What is critical for the safe handling of fumigants?

- MB and Pic
  - Eye protection
  - Water on the tractor and in a pickup
  - At least 1 available respirator kept in the tractor and another in a pickup
  - Cell phone
  - At least 1 spare fumigant filter
  - Good common sense applicator training
  - Good set-up on the applicator with fresh poly tubing
  - Check valve and pressure relief valve on the regulator
  - Way to pressurize and leak check the system before introducing fumigant to the system.

Minimum Worker Protection

Regulatory Update

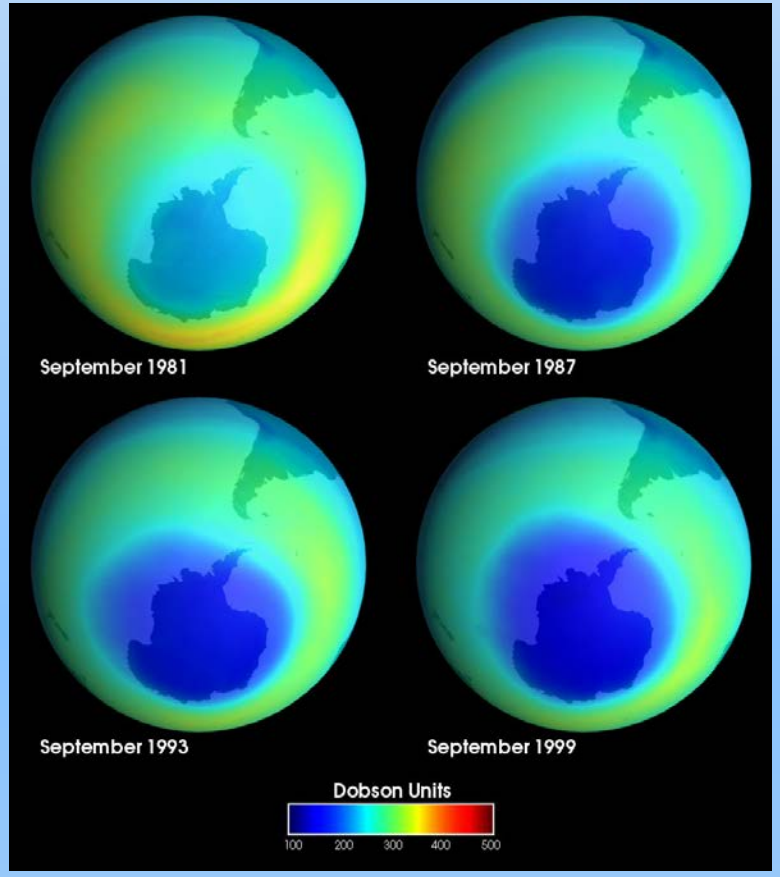
HOW BAD IS METHYL BROMIDE?

- POMBO HEARINGS
  - 99.6% OF TOTAL MB IS NATURAL
  - 0.4% IS MAN MADE
  - OTHER ESTIMATES LESS THAN 1% MAN MADE
- OZONE DEPLETION POTENTIAL DOWN TO 0.4

From 2001 Presentation

Methyl Bromide

Montreal Protocol: International ban on substances that deplete the Ozone Layer

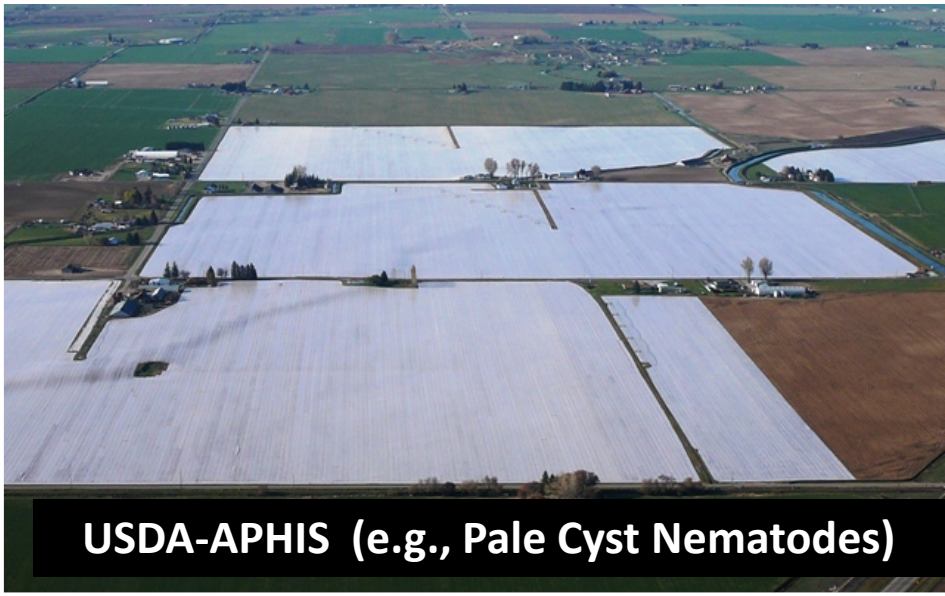


Elimination / Phase-Out of:

- Refrigerants, insulating foams, and solvents
  - Chlorofluorocarbons (CFCs)
  - Hydrofluorocarbons (HFCs)
- Halons (fire extinguishers) and others
- Methyl Bromide:
  - Quarantine/Pre-Shipment (QPS) is exempt
  - Crop, Post-Harvest, and Structural Use Phase-Out
    - Developed Countries: phase-out by 2005
      - Critical Use Exemptions post-2005
    - Developing Countries: phase-out by 2015
      - Developing Critical Use Exemptions

Quarantine/Pre-Shipment (QPS) treatments are exempt

Nursery Crops



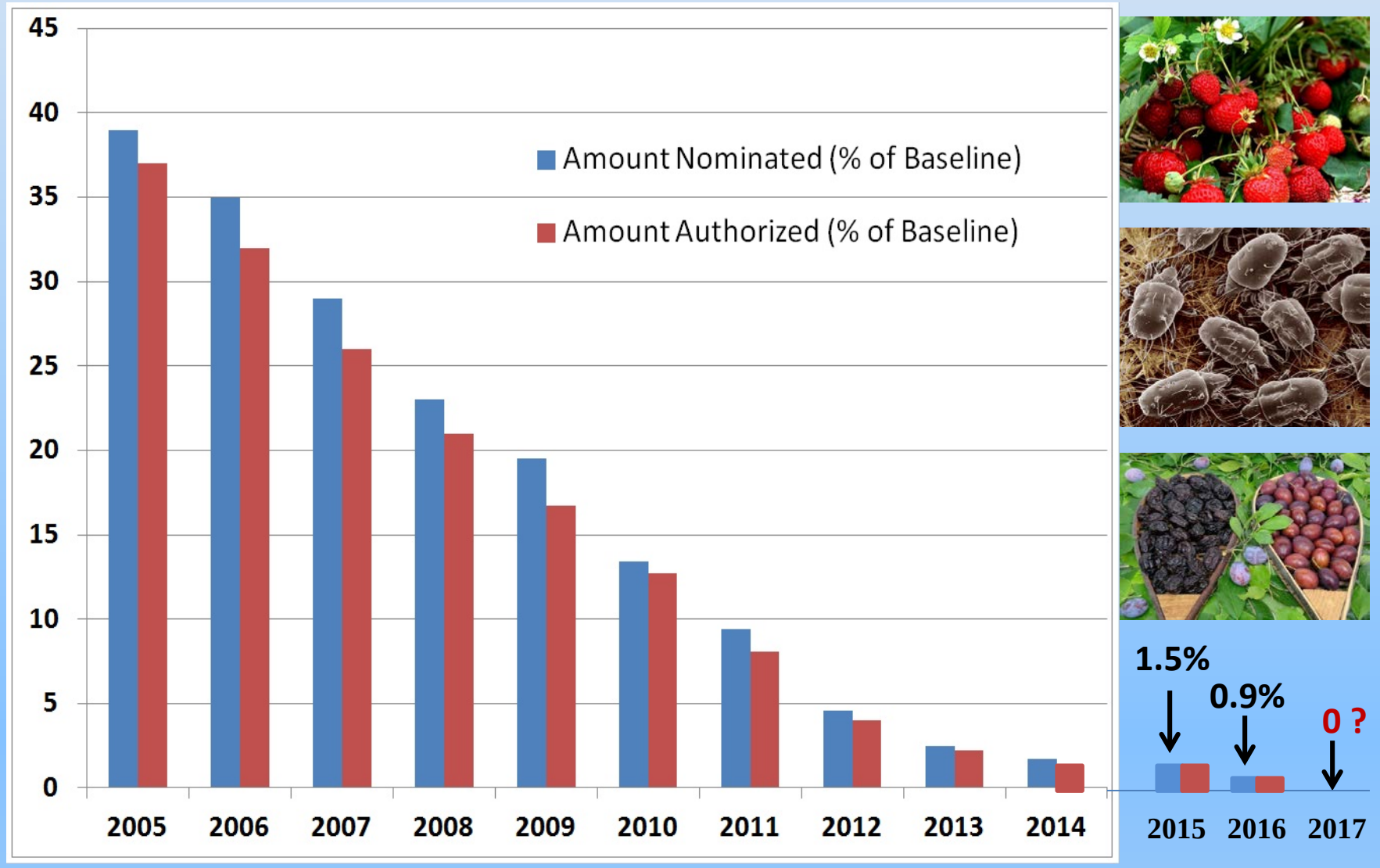
USDA-APHIS (e.g., Pale Cyst Nematodes)

Fruit Import (e.g., Chilean Grapes)

Oak Log Export

10^{+} Years of Critical Use Exemptions (CUE)

US Methyl Bromide Nominations and Approvals



Methyl Bromide

2016 Proposed CUE Rule (517,600 lbs approved)

- **California strawberries:** 510,458 lbs (98.6% total) **2016 is the final year?**
  - New Production: 305,543 lbs (60% of approval)
  - CUE Carryover: 190,354 lbs (35% of approval)
  - Draw from Stock: 17,430 lbs (5% of approval)
  - **As Tri-Con 50/50 @ 350 lbs/acre: ~2,900 acres (~7% of CA strawberry acres)**
- **Dry-cured hams** 7,143 lbs (1.4% of total)

2016 CUE Nominations were Denied (EPA: "alternatives exist")

- Michigan Growers (cucurbits, eggplant, pepper, tomato)
- Florida Growers (eggplant, pepper, strawberry, tomato)
- Florida Cut Flower Growers
- California Cut Flower Commission
- California Walnut Commission
- California Almond Hullers & Processors & California Grape and Tree Fruit League
- California Dried Plum Board
- California Strawberry Nursery Association
- California Association of Nurseries and Garden Centers
- Golf Course Superintendents Association of America

Methyl Bromide Labels: Cancelled – Valid - Pending

Crop	2015-2016 Status
Eggplant	Lost CUE / Reapplication Denied
Cucurbits	Lost CUE / Reapplication Denied
Forest Seedlings, Orchard Seedlings, Strawberry Nurseries	Lost CUE / Reapplication Denied Covered in QPS section
Ornamentals	Lost CUE / Reapplication Denied EPA may allow stock: pending
Orchard Replant	Lost CUE / Reapplication Denied EPA may allow stock: pending
Peppers	Lost CUE / Reapplication Denied
Strawberry Fruit (2015-2016)	CUE
Sweet Potato Slips	Lost CUE
Tomato (fresh market)	Lost CUE / Reapplication Denied

Table 2. Quarantine Uses

USDA-APHIS Quarantine Uses (e.g., Pale Cyst Nematode in Idaho, Golden Cyst Nematode in NY)

Other Quarantine Uses (not USDA-APHIS Quarantine uses), including:

Forest Seedlings: Conifer and hardwood seedling for reforestation, Christmas tree seedlings

Nursery Stock: Roses, strawberry transplants, sweet potato slips, caneberry and blueberry nursery stock, fruit and nut trees, garlic transplants, onion transplants, vineyard stock, seed potato, tobacco seed beds, food crop transplants, and other wild or cultivated trees, shrubs, vines and forbs.

Ornamental Plants: Caladiums, chrysanthemums, flower bulbs, flowering plants, ornamental grasses, rhizomes, shrubs, trees, and other perennials and annuals.

Turf or Sod: For interstate and intrastate shipments to areas that require fumigation with methyl bromide to meet quarantine or phytosanitary requirements

The maximum application rate for quarantine uses shall be 400 lbs of MB per acre.

Must identify the federal, state, or local authority requiring the quarantine application in the FMP

Maximum MB product rates for Quarantine Uses

	98/2	80/20	75/25	67/33	57/43	50/50	45/55	33/67
Eligible Quarantine Use	400	500	533	597	700	700	636	522

The Bottom Line

- 1 Nursery Employee trained to “Handler Status” for site monitoring outside the buffer zone
- 2 Nursery Employees trained to “Handler Status” for tarp repair
  - Must possess full face respirators, drager tubes and pump, tarp repair supplies, other ppe.
- Monitor Buffer Zone for any offgassing
- Record activities in Fumigant Management Plan
- Keep completed FMP on file for 2 years

THE ALTERNATIVES

- BASAMID
- MIDAS
- PALADIN 79/21
- TRIFECTA
- DOMINUS
- CHLOROPICRIN
- PIC-CHLOR 60

Iodomethane:

sales suspended in US due to economic viability issues

MIDAS provided broad-spectrum control

Cost, phytotoxicity and detractors effect on market viability

Paladin 79/21

- Sept 5, 2013: TAMPA (FOX 13) - It was the million-dollar question on everybody's mind in Tampa after their morning commute: What in the world was that smell?"It had the smell of a natural gas, or a propane gas-type release," said Tampa Fire Rescue Chief Tom Forward. The "gas-like" smell was such an issue that emergency personnel in Tampa were forced into action.
- Sept 12, 2014: **Strawberry fumigant odor eliminated this season**
- **Oct 11, 2014: Berry farms' neighbors fuming over use of chemical…**The Florida Department of Health is investigating 30 cases that involve people who think they are sick as a result of the fumigant.

- Commercial use in plasticulture
- Several Watch Trials in Forest Nurseries
  - All have reported good results
- See Perry or your TriEst Sales Rep!

- Several issues with Cylinders
- Trials at Jesup using separate cylinders and static mixer
- Paladian odor issue could affect the end use label of DMDS

DOMINUS

- AITC
- Few label issues
- Could have a place if buffer zones are an issue
- Low vapor pressure – very immobile in soil
- Expensive
- Trichoderma???
- Forestry Trials?

Methyl Bromide

Emergency Use Effort

- Legislative action to give grower access to MB for emergency uses
- Effort stalled due to illegal MB application in the Virgin Islands

New Fumigant Compound

Second year trials in VA

First year trials at Jesup, GA

Classic Caladiums

“Our standard/protocol fumigant is Methyl Bromide. This block bested all Methyl Bromide blocks. The growth of the caladiums was uniform and vigorous. Further, we experienced the least amount of disease and nematode problems of any block on the farm. Weed and rogue control was excellent. As you know caladiums are a 7-8+ month crop. We were very satisfied with the overall results with this new fumigant. In fact, if future trials turn out similar to this one, “formula 22” will become our fumigant of choice”

Bob Hartman

Classic Caladiums

Nematode Damage in Adjacent block 11/10/14
Fumigated 3/4/14 Planted 3/26/14

"Tj, out of the three areas that we have fumigated on hole #5 the new areas with the trial product that was used, has worked better than the methyl bromide that was used at the same time. We will continue to monitor the areas for contamination, but as of now they are very clean" **Kevin Shields, Director of Grounds.**

Fumigated 1/1/15 Planted 1/1/15 Photo Taken 6/19/15


Citra Research Center Trial
Fumigated May 7, Plastic Pulled May 12
Fallow for 42 Days

New Fumigant Summary

- Two years of trial work at the Branch Level including Forest Seedling trials
- Results have been consistent
- Excellent nutsedge and weed control
- Excellent Bermuda grass control
- Growers feel it could be an excellent MB alternative
- We have not seen any issues at the application level such as odor, handling, etc.
- This product could bring back our turf and golf fairway work, provided the cost is reasonable.

USEPA's Registration Review started September 2013.

- Opportunity for refinements to labels.
- EPA will review/incorporate data generated after the 2008/2009 REDz.
- Runs through ~2019
- MB, Pic, MITC, and will also include 1,3-D (RED completed in 1998)

Labels and other Regulatory Updates

Steve Godbehere

Pre-RED labels: ~10 pages

Phase I RED labels: ~25 pages

Phase II RED labels: >40 pages. Decided to add an index to help navigate labels.

Pic-Clor 60

Index

Soil Chemicals Corporation D/B/A Cardinal Professional Products

P. O. Box 782 • Hollister • CA 95024-0782 • (831) 630-2258

EPA Reg. No. 8536-8

EPA Est. 11220-CA-4; 11220-CA-8

Net Contents_____LBS

Buffer Zones:

not only affect production area, but larger distances incur greater regulatory obligations

Buffer Zone Tables:

All application rates are expressed as “broadcast equivalent”, or lbs Product per gross acre.

Need to convert strip, bedded, and drip rates (if in treated acre) to broadcast equivalent. Treated acre ignores untreated space/furrows.

$$\text{Pounds of product/treated acre} \times \frac{\text{strip or bed bottom width (in.)}}{\text{center-to-center row spacing (in.)}} = \text{Broadcast equivalent rate}$$

Example: 300 lbs *Pic-Clor 60 EC* per treated acre to 30” wide beds on 60” centers

$$300 \times \frac{30}{60} = 150$$

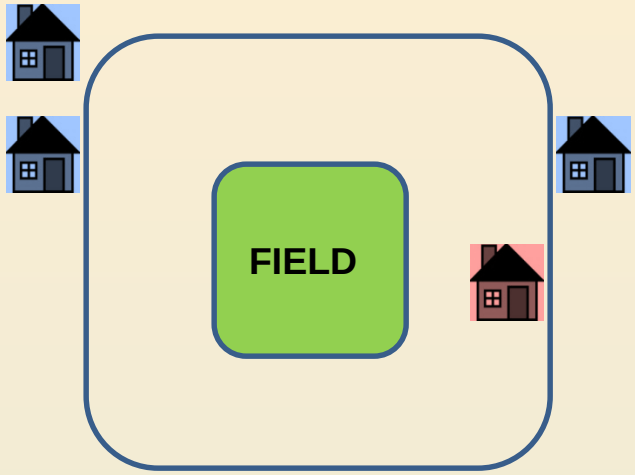
(lbs/acre in broadcast equivalent)

USEPA Buffer Zones: Distance and Period

No occupied structures in buffer zone during buffer zone period

BUFFER DISTANCE

- Range: 25 feet to 2,640 feet
- Buffer distance determined by 4 factors:
    - Product formulation
    - Application rate
    - Application method
    - Field size (acres)



BUFFER PERIOD

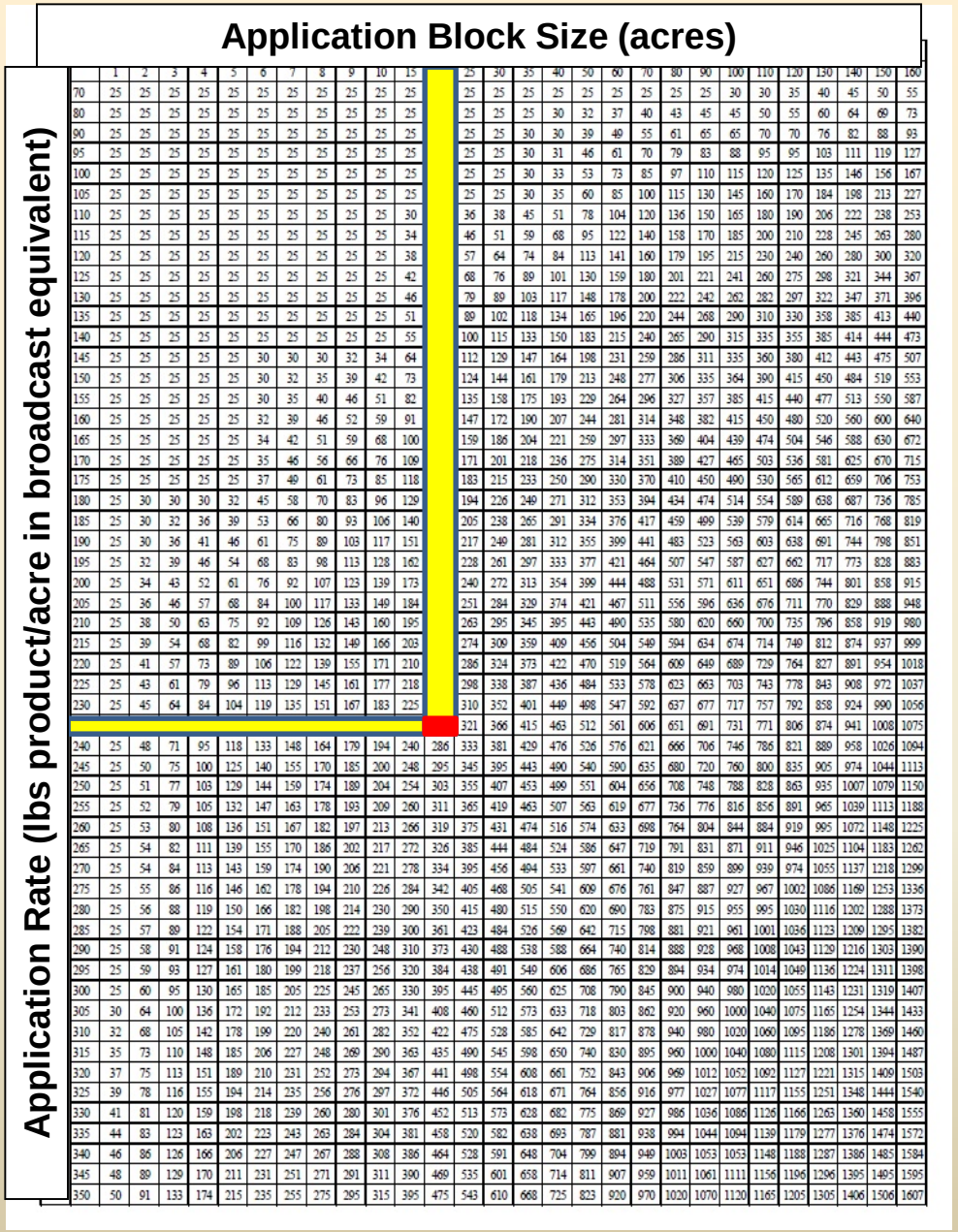
- Buffer zones will be in effect for 48 hours, but it starts at the beginning of the application

For example:

***Chloropicrin 100* label will have 9 buffer zone tables:**

1. Tarped strip
2. Bedded tarp
3. Untarped bed
4. Tarped broadcast
5. Untarped broadcast
6. Untarped deep (18”) broadcast
7. Tarped Drip
8. Untarped Buried Drip
9. Tarped Drip in Greenhouses

Select the application method, then use table to find buffer distance using application rate (row) x application block size (column)



	1	2	3	4	5	6	7	8	9	10	15	25	30	35	40	50	60	70	80	90	100	110	120	130	140	150	160
70	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	30	30	35	40	45	50	55
80	25	25	25	25	25	25	25	25	25	25	25	25	25	25	30	32	37	40	43	45	45	50	55	60	64	69	73
90	25	25	25	25	25	25	25	25	25	25	25	25	25	30	30	39	49	55	61	65	65	70	70	76	82	88	93
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200	25	34	43	52	61	76	92	107	123	139	173	240	272	313	354	399	444	488	531	571	611	651	686	744	801	858	915
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215	25	39	54	68	82	99	116	132	149	166	203	274	309	359	409	456	504	549	594	634	674	714	749	812	874	937	999
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250	25	51	77	103	129	144	159	174	189	204	254	303	355	407	453	499	551	604	656	708	748	788	828	863	935	1007	1079	1150
255	25	52	79	105	132	147	163	178	193	209	260	311	365	419	463	507	563	619	677	736	776	816	856	891	965	1039	1113	1188
260	25	53	80	108	136	151	167	182	197	213	266	319	375	431	474	516	574	633	698	764	804	844	884	919	995	1072	1148	1225
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305	30	64	100	136	172	192	212	233	253	273	341	408	460	512	573	633	718	803	862	920	960	1000	1040	1075	1165	1254	1344	1433
310	32	68	105	142	178	199	220	240	261	282	352	422	475	528	585	642	729	817	878	940	980	1020	1060	1095	1186	1278	1369	1460
315	35	73	110	148	185	206	227	248	269	290	363	435	490	545	598	650	740	830	895	960	1000	1040	1080	1115	1208	1301	1394	1487
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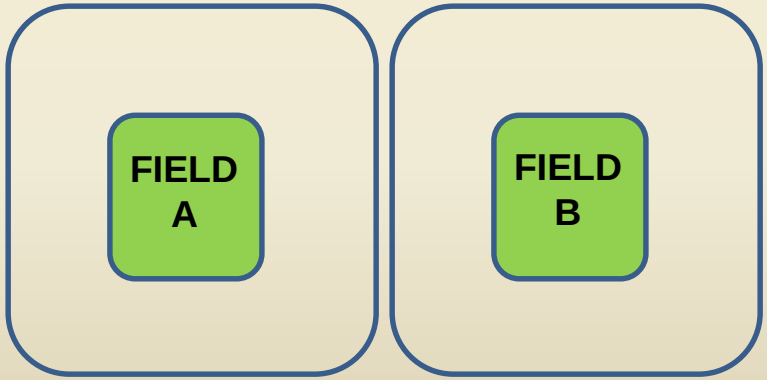
335	44	83	123	163	202	223	243	263	284	304	381	458	520	582	638	693	787	881	938	994	1044	1094	1139	1179	1277	1376	1474	1572
340	46	86	126	166	206	227	247	267	288	308	386	464	528	591	648	704	799	894	949	1003	1053	1053	1148	1188	1287	1386	1485	1584
345	48	89	129	170	211	231	251	271	291	311	390	469	535	601	658	714	811	907	959	1011	1061	1111	1156	1196	1296	1395	1495	1595
350	50	91	133	174	215	235	255	275	295	315	395	475	543	610	668	725	823	920	970	1020	1070	1120	1165	1205	1305	1406	1506	1607

USEPA Buffer Zones: Proximity

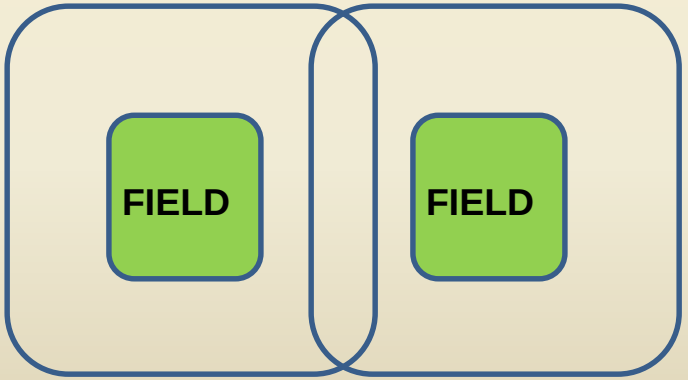
BUFFER ZONE PROXIMITY

USEPA: Two or more adjacent blocks can be fumigated at the same time if buffers do not overlap. If buffers will overlap, then applications must be staggered by at least 12 hours and may require buffer monitoring or neighbor notification. Smaller buffers will allow more simultaneous applications in relatively close proximity.

A and B buffers don't overlap:
can be done simultaneously



A and B buffers do overlap:
must wait 12 hours between applications



USEPA Buffer Zones: Posting signs

BUFFER ZONE POSTING

• Buffer Zone signs must be placed along or outside the perimeter of the buffer zone, at all usual points of entry and along likely routes of approach from areas where people not under the owner's control may approach the buffer zone. Larger buffers will require more signs.

USEPA Buffer Zones: Additional Requirements

BUFFER ZONES FOR "DIFFICULT-TO-EVACUATE SITES"

- pre-K to 12th grade, state-licensed daycare centers, nursing homes, assisted-living facilities, hospitals, in-patient clinics, and prisons:
  - If buffer zone is greater than 300 feet, cannot fumigate within ¼ mile (1,320 ft) unless site is not occupied during application and next 36 hours
  - If buffer is less than 300 feet, cannot fumigate within 1/8 mile (660 ft) unless site is not occupied during application and next 36 hours

BUFFER-RELATED CONDITIONS

- Unless buffer is 25 feet, we have to chose between:

- **Buffer Perimeter Monitoring:**
  - Assess buffer perimeter 8 times in 48-hr following application. OR

- **Neighbor Notification:**
  - If buffer is >25-100 ft, notification zone extends 50 ft from buffer edge
  - If buffer is >100-200 ft, notification zone extends 100 ft from buffer edge
  - If buffer is >200-300 ft, notification zone extends 200 ft from buffer edge
  - If buffer is >300 or buffers overlap, notification zone extends 300 ft from buffer edge

Handler Protection Requirements:

- **Handler Definitions:** anyone actively participating in the fumigation (tractor drivers, shovelers, tarp repair, tarp removal, sign poster, etc.)
- **Handler Training:** all handlers must have had receive handler training within 12 months of the application. Includes grower-provided workers.
- **Supervision of Handlers:** a certified applicator must be on-site and in the line of sight of the application from the start to the finish of the application.
- *Note: based on label text, our PCAs do not count as the certified applicator, which is why we have our drivers sign the FMPs. The certified applicator also has to sign the Post-Application Summary, posing a problem for us.*

Fumigation Management Plan (FMP)

- **Applicator Information**
- **Site information**
- **General Application Information**
- **Tarp Information**
- **Tarp Repair and Perforation/Removal Plan**
- **Soil Conditions**
- **Weather Conditions**
- **PPE**
- **Air Monitoring Plan**
- **GAP Compliance**
- **Emergency Response Plan**
- **Application Block Posting Procedures**
- **Communication Plan**
- **Authorized On-Site Personnel**
- **Record-Keeping Procedures**

- **Buffer zone information**
- **Buffer zone calculations**
- **Buffer zone posting sign locations**
- **Neighbor Notification or Buffer Zone Perimeter Air Monitoring**
- **Post-Application Summary**

Primary Issue (aside from burden):
Certified Applicator must sign FMP and PAS. Our drivers are typically not around to sign PAS.