OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION
WASHINGTON, D.C. 20460

March 21, 2024

Jacob S. Moore
U.S. Registration Leader
ADAMA Makhteshim Ltd.
c/o Makhteshim Agan of North America, Inc. (d/b/a ADAMA)
8601 Six Forks Road, Suite 300
Raleigh, NC 27615

Subject: Label Amendment – Implementing Chlorpyrifos Biological Opinion (BiOp) Mitigation and General Updates
Product Name: Vulcan
EPA Registration Number: 66222-233
Case Number: 474502; Application Date: September 8, 2022
Decision Number: 591653; Application Date: September 8, 2022

Dear Jacob Moore:

The Agency, in accordance with the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended, has completed reviewing all of the information submitted with your application to support the Registration Review of the above referenced product in connection with the Chlorpyrifos 2022 Biological Opinion and has concluded that your submission is acceptable. This approval does not affect any conditions that were previously imposed on this registration. You continue to be subject to existing conditions on your registration and any deadlines connected with them.

A stamped copy of your labeling is enclosed for your records. This labeling supersedes all previously accepted labeling. The next label printing of this product must use this labeling unless subsequent changes have been approved. In accordance with 40 CFR § 152.130(c), you may distribute or sell this product under the previously approved labeling for 12 months from the date of this letter. After 12 months, you may only distribute or sell this product if it bears this new revised labeling or subsequently approved labeling. “To distribute or sell” is defined under FIFRA section 2(gg) and its implementing regulation at 40 CFR § 152.3.

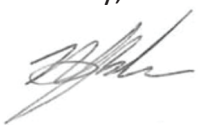
Should you wish to add/retain a reference to the company’s website on your label, then please be aware that the website becomes labeling under FIFRA and is subject to review by the Agency. If the website is false or misleading, the product would be misbranded and unlawful to

sell or distribute under FIFRA section 12(a)(1)(E). 40 CFR 156.10(a)(5) lists examples of statements EPA may consider false or misleading. In addition, regardless of whether a website is referenced on your product's label, claims made on the website may not substantially differ from those claims approved through the registration process. Therefore, should the Agency find or if it is brought to our attention that a website contains false or misleading statements or claims substantially differing from the EPA approved registration, the website will be referred to the EPA's Office of Enforcement and Compliance.

Your release for shipment of the product constitutes acceptance of these conditions. If these conditions are not complied with, the registration will be subject to cancellation in accordance with FIFRA section 6.

If you have any questions, please contact Briana Hanlon at (202) 566-2716 or at hanlon.briana@epa.gov.

Sincerely,



Michael Walsh
Product Manager 11
Invertebrate & Vertebrate Branch 2
Registration Division
Office of Pesticide Programs

Attachment

{Note to Reviewer: Brackets [ ] denote optional text that may or may not be on the final printed label. Parentheses ( ) denote text that will appear on the label in parentheses. Braces { } denote notes to the reviewer that will never appear on the final printed label.}

RESTRICTED USE PESTICIDE

FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.

CHLORPYRIFOS	GROUP	1B	INSECTICIDE

VULCAN®

For control of listed insects infesting certain non-food crop areas.

ACTIVE INGREDIENT	**% BY WT.**
Chlorpyrifos: 0,0-diethyl-0-(3,5,6-trichloro-2-pyridinyl) phosphorothioate	39.50%
OTHER INGREDIENTS*:	60.50%
TOTAL	100.0%

Contains 3.76 pounds of Chlorpyrifos per gallon.
* Contains petroleum distillates.

VOXIEN™ FORMULATIONS

KEEP OUT OF REACH OF CHILDREN

CAUTION / PRECAUCIÓN

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you **DO NOT** understand this label, find someone to explain it to you in detail.)

Manufactured for:
Makhteshim Agan of North America, Inc. (d/b/a ADAMA)
8601 Six Forks Road, Suite 300
Raleigh, NC 27615
How can we help? 1-866-406- 6262

Vulcan is an emulsifiable concentrate (EC) insecticide formulated as part of the Voxien family of products

EPA Reg. No. 66222-233 **EPA Est. No.** [redacted]

NET CONTENTS:

[For additional First Aid, Precautionary Statements, and Directions for Use, see inside of this booklet.]

FIRST AID **Organophosphate**	
IF SWALLOWED:	• Call a poison control center or doctor immediately for treatment advice. • **DO NOT** give any liquid to a person. • **DO NOT** induce vomiting unless told to do so by a poison control center or doctor. • **DO NOT** give anything by mouth to an unconscious person.
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 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.
Note to Physician: This product contains an organophosphate that inhibits cholinesterase. Treat symptomatically. If exposed, plasma and red blood cell cholinesterase tests may indicate significance of exposure (baseline data are useful). Atropine, only by injection, is the preferable antidote. Oximes, such as 2-PAM/protopam, may be therapeutic if used early; however, use only in conjunction with atropine. In case of severe acute poisoning, use antidote immediately after establishing an open airway and respiration. Contains petroleum distillate. Vomiting may induce aspiration pneumonia.	
Have the product container or label with you when calling a poison control center or doctor or going for treatment. For emergency medical treatment information, call 24 hours a day at 1-877-250-9291.	

In case of spills, fire, leaks or accidents call 1-800-535-5053.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION

Harmful if swallowed. Causes moderate eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Mixers and loaders using a mechanical transfer loading system and applicators using aerial application equipment must wear:

- Long-sleeved shirt and long pants
- Shoes and socks
- Protective eyewear

In addition to the above, mixers and loaders using a mechanical transfer loading system must wear:

- Chemical-resistant gloves made of barrier laminate or viton $\geq$ 14 mils.
- Chemical-resistant apron
- A minimum of a NIOSH approved particulate respirator, with any R or P filter with NIOSH approval number prefix TC-84A. ; or a NIOSH-approved powered air purifying respirator with an HE filter with NIOSH approval number prefix TC-21C.

See ***Engineering Control Statement*** for additional requirements.

All other mixers, loaders, applicators and handlers must wear:

- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves made of barrier laminate or viton $\geq$ 14 mils.
- Chemical-resistant apron when mixing or loading or exposed to the concentrate
- Chemical-resistant footwear plus socks
- Chemical-resistant headgear for overhead exposure
- A minimum of a NIOSH approved particulate respirator, with any R or P filter with NIOSH approval number prefix TC-84A. ; or a NIOSH-approved powered air purifying respirator with an HE filter with NIOSH approval number prefix TC-21C.

User Safety Requirements

• Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. **DO NOT** reuse them.

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

ENGINEERING CONTROL STATEMENT

Mixers and loaders supporting aerial applications must use a mechanical transfer system that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4)) for dermal protection, and must:

- Wear the personal protective equipment required above for mixers/loaders
- Wear protective eyewear

Pilots must use an enclosed cockpit in a manner that meets the requirements listed in the WPS for agricultural pesticides [40 CFR 170.240(d)(6)]. Use of human flaggers is prohibited. Mechanical flagging equipment must be used.

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the WPS for agricultural pesticides [40 CFR I70.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.
- Remove clothing/PPE 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

This pesticide is toxic to fish, aquatic invertebrates, small mammals, and birds. **DO NOT** apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. **DO NOT** contaminate water when disposing of equipment washwater or rinsate.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. **DO NOT** apply this product or allow it to drift to blooming crops or weeds if bees are foraging the treatment area. Protective information may be obtained from your cooperative agricultural extension service.

DIRECTIONS FOR USE
RESTRICTED USE PESTICIDE

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

Read entire label before using this product. This label must be in the possession of the user at the time of pesticide application.

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.

Endangered Species Protection Requirements:
It is a Federal offense to use any pesticide in a manner that results in an unauthorized “take” (e.g., kill or otherwise harm) of an endangered species and certain threatened species under the Endangered Species Act section 9. When using this product, you must follow the measures contained in the Endangered Species Protection Bulletin for the area in which you are applying the product. You must obtain a Bulletin no earlier than six months before using this product. To obtain Bulletins, consult http://www.epa.gov/espp/, call 1-844-447-3813, or email ESPP@epa.gov. You must use the Bulletin valid for the month in which you will apply the product.

Water Protection Statements:

- **DO NOT** apply within 25 feet of aquatic habitats (such as, but not limited to, lakes, reservoirs, rivers, permanent streams, wetlands or natural ponds, estuaries, and commercial fish farm ponds).
- **DO NOT** apply directly to, or allow the product to enter sewers or storm drains, or to any area like a drain or gutter where drainage to sewers, storm drains, water bodies, or aquatic habitat can occur.
- **DO NOT** apply directly to impervious horizontal surfaces such as sidewalks, driveways, and patios except as a spot or crack-and-crevice treatment.
- **DO NOT** apply to vertical surfaces directly above pervious or impervious surfaces that drain into ditches, storm drains, gutters, or surface waters.
- **DO NOT** apply or irrigate to the point of runoff.

Reporting Ecological Incidents: To report ecological incidents, including mortality, injury, or harm to plants and animals, call 1-866-406- 6262

AGRICULTURAL USE REQUIREMENTS

Use this product 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 intervals. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

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 over short sleeved shirt and short pants
- Chemical-resistant gloves made of barrier laminate or viton $\geq$ 14 mils.
- Chemical resistant footwear plus socks
- Chemical Resistant headgear for over head exposures.

Certified crop advisors or persons entering under their direct supervision under certain circumstances may be exempt from the early reentry requirement pursuant to 40 CFR Part 170.

Notify workers of the application by warning them orally and by posting warning signs at entrances to treated areas.

NON AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides [40CFR Part 170]. The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses. Keep children, pets and other unprotected persons out of treated area until sprays have dried.

PRODUCT INFORMATION

Part of the Voxien family of products. Vulcan insecticide forms an emulsion when diluted with water and is suitable for use in all conventional spray equipment. Consult your State Agricultural Experiment Station or State Extension Service for proper timing of applications.

When an adjuvant is to be used with this product, ADAMA suggests the use of a Chemical Producers and Distributors Association certified adjuvant.

DO NOT formulate this product into other end use products without written permission of ADAMA.

USE RESTRICTIONS

Attention: DO NOT cut or weld container.

Use as a wide area/general outdoor treatment for ants and other miscellaneous pests (excludes wide-area mosquito adulticide use) is prohibited.

RESISTANCE MANAGEMENT

For resistance management, Vulcan contains a Group 1B insecticide. Any insect population may contain individuals naturally resistant to Vulcan and other Group 1B insecticides. The resistant individuals may dominate the insect population if this group of insecticides are used repeatedly in the same fields. Appropriate resistance-management strategies should be followed.

To delay insecticide resistance, take the following steps:
• Rotate the use of Vulcan or other Group 1B insecticides within a growing season, or among growing seasons, with different groups that control the same pests.
• Use tank mixtures with insecticides from a different group that are equally effective on the target pest when such use is permitted. **DO NOT** rely on the same mixture repeatedly for the same pest population. Consider any known cross-resistance issues for the targeted pests between the individual components of a mixture.

In addition, consider the following recommendations provided by the Insecticide Resistance Action Committee (IRAC):

- Individual insecticides selected for use in mixtures should be highly effective and be applied at the rates at which they are individually registered for use against the target species.
- Mixtures with components having the same IRAC mode of action classification are not recommended for insect resistance management.
- When using mixtures, consider any known cross-resistance issues between the individual components for the targeted pest(s).
- Mixtures become less effective if resistance is already developing to one or both active ingredients, but they may still provide pest management benefits.
- The insect resistance management benefits of an insecticide mixture are greatest if the two components have similar periods of residual insecticidal activity. Mixtures of insecticides with unequal periods of residual insecticide activity may offer an insect resistance management benefit only for the period where both insecticides are active.

• Adopt an integrated pest management program for insecticide use that includes scouting, uses historical information related to pesticide use, crop rotation, record keeping, and which considers cultural, biological and other chemical control practices.
• Monitor after application for unexpected target pest survival. If the level of survival suggests the presence of resistance, consult with your local university specialist or certified pest control advisor.
• Contact your local extension specialist or certified crop advisors for any additional pesticide resistance-management and/or IPM recommendations for the specific site and pest problems in your area.
• For further information or to report suspected resistance contact ADAMA at (866) 406-6262.

SPRAY DRIFT MANAGEMENT

DO NOT allow spray to drift from the application site to contact people, structures people occupy at any time, or the associated property, parks and recreation areas, nontarget crops, aquatic and wetland areas, woodlands, pastures, rangelands, or animals.

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment and weather-related factors determine the potential for spray drift. The applicator is responsible for considering all of these factors when making decisions regarding application of this product.

Obeseve the following precautions when spraying Vulcan adjacent to permanent bodies of water such as rivers, natural ponds, lakes, streams,reservoirs, marshes, estuaries, and commercial fish ponds. The following treatment setbacks or bufferzones must be utilized for application around the above-listed aquatic areas with the following application equipment:

Application Method	Required Setback (Buffer Zone) ((feet)
Ground Boom	25
Chemigation	25
Orchard Airblast	50
Aerial (fixed wing or helicopter)	150

The applicator must use all measures necessary to control drift. Making applications when wind is blowing away from sensitive area is the most effective way to reduce the potential for drift.

The buffer distances specified in the buffer distance table are the distances in feet that must exist to separate sensitive sites from the targeted application site. Buffers are measured from the edge of the sensitive site to the edge of the application site.

Sensitive sites are areas frequented by non-occupational bystanders (especially children). These include residential lawns, pedestrian sidewalks, outdoor recreational areas such as school grounds, athletic fields, parks and all property associated with buildings occupied by humans for residential or commercial purposes. Sensitive sites include homes, farmworker housing, or other residential buildings, schools, daycare centers, nursing homes, and hospitals.

Buffer Distance				
Application rate (lb ai/A)	Nozzle Droplet Type	Required Setback (Buffer Zones) (feet)		
		Aerial	Airblast	Ground
>0.5 - 1	Coarse or very coarse	10	10	10
>0.5 - 1	Medium	25	10	10
>1 - 2	Coarse or very coarse	50	10	10
>1 - 2	Medium	80	10	10
>2 - 3	Coarse or very coarse	80	10	10
>2 - 3	Medium	100	10	10
>3 - 4	Medium or coarse	NA[1]	25	10
>4	Medium or coarse	NA[1]	50	10
[1]NA is not allowed.				

Only pesticide handlers are permitted in the setback area during application of this product. **DO NOT** apply this product if anyone other than a mixer, loader, or applicator, is in the setback area. Exception: Vehicles and persons riding bicycles that are passing through the setback area on public or private roadways are permitted.

Follow these spray drift Best Management Practices to avoid off-target drift movement from applications.

Aerial Application

- The boom width must not exceed 75% of the wingspan or 90% of the rotor blade.
- Nozzles must always point backward, parallel with the air stream, and never be pointed downward more than 45 degrees.
- Nozzles must produce a medium or coarser droplet size (255 to 340 microns volume median diameter) per

ASABE Standard 572.1 under application conditions. Airspeed, pressure, and nozzle angle can all effect droplet size. See manufacturer's catalog or USDA/NAAA Applicator's Guide for spray size quality ratings.

- **DO NOT** make applications at a height greater than 10 feet above the top of the target 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.

- Use upwind swath displacement and apply only when wind speed is 3 to 10 mph as measured by an

anemometer. **DO NOT** apply product when wind speed exceeds 10 mph.

- If application includes a no-spray zone, **DO NOT** release spray at a height greater than 10 feet above the ground or crop canopy.

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

The applicator should be familiar with and take into account the information covered inthe Aerial Drift Reduction Advisory.

Aerial Drift Reduction Advisory

This section is advisory in nature and does not supercede the mandatory label requirements.

Information on Droplet Size: The most effective way to reduce drift potentialis 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 adverse effects from 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.

Boom Length

For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application Height

Applications should be made at the lowest height consistent with efficacy and flight safety. **DO NOT** make applications at a height greater than 10 feet above the top of the target 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 downwind. Therefore, on the up 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. **DO NOT** apply below 1.5 mph due to variable wind direction and high inversion potential. **Note**: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity

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

Temperature Inversions

DO NOT make applications 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: Apply the pesticide only when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Ground Boom Application

The following mandatory spray drift best management practices are required to reduce the likelihood of off-target drift movement from ground applications.

- Choose only nozzles and pressures that produce a medium or coarse droplet size (255 to 400 microns volume median diameter) per ASABE Standard 572.1. See manufacturer's catalog or USDA/NAAA Applicator's Guide for spray size quality ratings.
- Apply with nozzle height no more than 4 feet above the ground or crop canopy.
- **DO NOT** apply product when wind speed exceeds 10 mph as measured by an anemometer.

Orchard Airblast Application

The following mandatory spray drift best management practices are required to reduce the likelihood of off-target drift movement from airblast applications.

- Direct nozzles so spray is not projected above the canopies.
- Apply only when wind speed is 3 to 10 mph at the application site as measured by an anemometer outside of the orchard/vineyard on the upwind side.
- Outward pointing nozzles must be shut off when turning corners at row ends.

The applicator should take into account the following best management practices to reduce off-site spray drift.

This section is advisory and does not supercede mandatory label requirements.

. • Number of nozzles, nozzle orientation and spray volume, air speed and wind direction are key factors in adjusting airblast spray delivery to match the height and density of the crop canopy. Adjust airblast equipment to provide uniform coverage while minimizing the amount of spray movement over the top or completely through the crop canopy.

• High air volumes deliver spray more efficiently than air at high speed. Reducing forward travel speed decreases the air speed necessary to deliver the spray to the top of the crop canopy.

• Use air guides along with the number and orientation of spray nozzles to achieve the desired spray coverage and directional control.

Take the following steps to minimize drift and the amount of non-target spray:

1. Orient nozzles and adjust air speed/volume/direction to force the spray through the crop canopy but not allow drift past the canopy.
2. Shut off spray delivery when passing gaps in crop canopy within rows.
3. Spray the outside rows of orchards from outside in, directing the spray into the orchard and shutting off nozzles on the side of the sprayer away from the orchard.
4. When treating smaller trees, vines or bushes, shut off top nozzles to minimize over the top spray movement.

SPRAY MIX DIRECTIONS

It is the pesticide user's responsibility to ensure that all products are registered for the intended use. Read and follow the applicable restrictions and limitations and directions for use on all product labels involved in tank mixing. Users must follow the most restrictive directions for use and precautionary statements of each product in the tank mixture.

To prepare the spray, add a portion of the required amount of water to the spray tank and with agitation, add the Vulcan. Complete filling the tank with the balance of water needed. Maintain sufficient agitation during both mixing and application to ensure uniformity of the spray mixture.

Vulcan can also be used in tank mixtures with certain herbicides and/or with non-pressure fertilizer solutions as specified under specific crop use directions. Prepare tank mixtures in the same manner as specified above for use of Vulcan alone. When tank mixtures of Vulcan and herbicides are involved, add wettable powders first, flowables second and emulsifiable concentrates last. Where a fertilizer solution is involved, use a fertilizer pesticide compatibility agent such as Unite or Compex. Maintain constant agitation during both mixing and application to ensure uniformity of the spray mixture. **DO NOT** allow spray mixtures to stand overnight.

Note: Test compatibility of the intended tank mixture before adding Vulcan to the spray or tank mix. Add proportionate amounts of each ingredient to a pint or quart jar, cap, shake, and let set 15 minutes. Formation of precipitates that **DO NOT** readily redisperse indicates an incompatible mixture that must not be used.

Note: It is recommended that before using any untried tank mix with fungicides, insecticides, buffers, foliar fertilizers, surfactants, adjuvants or additives, test the combination on a small portion of the crop to be treated to insure no adverse effects occur as a result of application.

SPRINKLER IRRIGATION

See the use sections for the individual crops for further application information. **DO NOT** apply this product to the above listed crops through any other type of irrigation system. **DO NOT** apply this product by chemigation to any other crop.

SPRINKLER USE DIRECTIONS

The following use directions are to be followed when Vulcan is applied through sprinkler irrigation systems. Thoroughly clean the injection system and tank of any fertilizer or chemical residues, and dispose of the residues according to state and federal laws. Flush the injector with soap and water. Determine the amount of insecticide needed to cover the desired acreage. Pump the required Vulcan into a steel tank, start mechanical or hydraulic agitation, and add in order the non-emulsifiable oil and/or water. Continually agitate the mixture containing Vulcan. Set the sprinkler system to deliver the desired inches of water per acre. Start the water pump and sprinkler, and let the system achieve the desired pressure and speed before starting the injector. Start the injector and calibrate the injector system according to number 14 in ***SPRINKLER USE PRECAUTIONS*** section. The mixture containing Vulcan must be injected continuously and uniformly into the irrigation water line as the sprinkler is moving. This procedure is necessary to deliver the desired rate per acre in a uniform manner. When the application is finished, allow the entire irrigation and injector system to be thoroughly flushed clean before stopping the system.

SPRINKLER USE PRECAUTIONS

The following use precautions will result in a safe and successful application of mixture containing Vulcan.

1. Apply this product only through sprinkler irrigation systems including center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, micro sprinkler, or hand move. **DO NOT** apply this product through any other type of irrigation system.
2. Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from non-uniform distribution of treated water.
3. If you have questions about calibration, contact state extension service specialist, equipment manufacturers, or other experts.
4. **DO NOT** connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system.
5. 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.
6. The system must contain a functional check valve, vacuum relief valve, and a low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from backflow. Refer to the American Society of Agricultural Engineer's Engineering Practice 409 for more information.
7. The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the flow of fluid back toward the injection pump.
8. 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.
9. The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
10. 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.
11. Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock. The metering pump must provide a greater pressure than that of the irrigation system at the point of injection. The pump must meet Section 675 for "Electrically Driven or Controlled Irrigation Machines" NEC 70 and must contain Viton or Teflon seals.
12. To insure uniform mixing of the insecticide into the water line, inject the mixture through a nozzle place in the fertilizer injection port or just ahead of an elbow or tee in the irrigation line so that the turbulence created at those points will assist in mixing. It is suggested that the injection point be higher than the insecticide tank to prevent siphoning.

13. The steel tank holding the insecticide mixture should be large enough to allow the system to complete a revolution with one filling. It should be free of rust, fertilizer sediment, and foreign material, and equipped with an in-line strainer situated between the tank and the injector pump.
14. In order to calibrate the irrigation system and injector to apply the mixture containing Vulcan, determine the following:

    1) Calculate the number of acres irrigated by the system; 2) Set the irrigation rate and determine the number of minutes for the system to cover the intended treatment area; 3) Calculate the total gallons of insecticide mixture needed to cover the desired acreage. Divide the total gallons of insecticide mixture needed by the number of minutes to cover the treatment area. This value equals the gallons per minute output that the injector must deliver. Convert the gallons per minute to milliliters or ounces per minute. Calibrate the injector pump with the system in operation at the desired irrigation rate. It is suggested that the injector pump be calibrated at least twice before operation, and monitor the system.
15. **DO NOT** apply when wind speed favors drift beyond the area intended for treatment. End guns must be turned off during the application if they irrigate nontarget areas.
16. **DO NOT** allow irrigation water to collect or runoff and pose a hazard to livestock, wells, or adjoining crops.
17. Allow foliage to dry before reentering the field.
18. **DO NOT** apply through sprinkler systems that deliver a low coefficient of uniformity such as certain water drive units.

CHRISTMAS TREE PLANTATIONS

(Not for use in Mississippi) Worker Restricted Entry Interval: DO NOT enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

Use Vulcan at the rate indicated to control the following insects on the tree varieties listed.

TREE VARIETY	PEST	RATE PER ACRE	USE DIRECTIONS
Balsam fir, Concolor fir, Douglas fir, Eastern white pine, Fraser fir, Grand fir, Noble fir, Scotch pine, White spruce	Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), Aphids, Adelgids (Cooley, Eastern spruce gall), Douglas fir needle midge, European pine shoot moth, European pine sawfly, Grasshopper, Gypsy moth, Mites (European red spider, Two spotted spider)[except in WA & OR], Pales weevil (adult), Pine needle midge, Pine spittlebug, Plant bugs, Spittlebugs, Spruce budworm, Spruce needleminer, Scale (Pine needle, Pine tortoise, Spruce bud, Black pine, Striped pine)	1 quart	**DO NOT** treat plants under extreme heat and drought stress. Apply as a foliar spray using ground equipment. Thorough coverage of foliage is essential. Use a minimum 10 gpa of finished spray. Use higher volume of finished spray, 20 gpa or more, when foliage is dense and/or pest density is high and/or under high temperature and wind conditions. For effective control of adult spider mites if large numbers of eggs are present, apply a second spray 7 to 10 days after initial treatment to control newly hatched nymphs. Not for control of mites in Washington and Oregon. For scale control, apply when scale crawlers are active. To avoid injury, **DO NOT** apply under conditions of extreme heat or drought stress. Environmental factors and varietal differences significantly influence potential phytotoxic expression. Before treating other conifer species, make application and observe for 7 to 10 days for symptoms of phytotoxicity. The user is responsible for determining if it is safe to treat other conifer species under commercial growing conditions.
	Pales weevil	2.7 quarts/100 gal	Apply as a cut stump drench.

Use Restrictions:

- **DO NOT** allow livestock to graze in treated areas.
- **DO NOT** make more than 3 applications of Vulcan or other product containing chlorpyrifos per season. **DO NOT** make a second application of Vulcan within 7 days of the first application.
- **DO NOT** apply by aerial application.
- **DO NOT** Apply more than 3.0 lbs a.i. chlorpyrifos per acre per year as a foliar spray
- **DO NOT** apply more than 2.5 lb a.i chlorpyrifos per acre per year as a stump treatment.

Please refer to RESISTANCE MANAGEMENT section

TURF GRASS GROWN FOR COMMERCIAL SOD

(Not for use in Mississippi) Worker Restricted Entry Interval: DO NOT enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours unless PPE required for early entry is worn.

For best results, turf should be moist at time of treatment.

PEST	RATE PER		USE DIRECTIONS
	1000 sq ft	Acre	
Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), armyworms (such as: beet, fall, yellowstriped), centipedes, chiggers, chinch bugs, crickets, cutworms, deer ticks, earwigs, European crane fly larvae, fiery skipper, fleas, gnats, grasshoppers, greenbug aphids, green June beetle grubs, leafhoppers, Lucerne moth, millipedes, mites (such as: clover, Bermudagrass stunt, winter grain), mosquitoes, pillbugs, springtails, sod webworms (lawn moths), sowbugs, ticks	0.75 fl oz	1 qt	For sod webworms, watering or mowing of the treated area should be delayed for 12 to 24 hours after treatment.
Billbug adults (such as: bluegrass, Denver, hunting)	0.75 – 1.5 fl oz	1 - 2 qt	For billbugs, spray early in the season just prior to or coinciding with first appearance of adults as specified by your local Agricultural Extension Service Specialist.
Annual bluegrass weevil (Hyperodes), black turfgrass ataenius adults, mole crickets	1.5 fl oz	2 qt	To control annual bluegrass weevil, spray suspected problem areas in mid-April and again in mid May, or as specified by your local Agricultural Extension Service Specialist. For black turfgrass ataenius adults, spray early in the season as specified by your local Agricultural Extension Service Specialist. A repeat application may be needed 1 to 2 weeks later. To control mole crickets in turfgrass, apply Vulcan through high-pressure injection or other suitable subsurface placement application equipment. Depending on the application equipment used, follow the manufacturer's specification for calibration and the volume of spray per acre needed to provide control or as specified by your local Agricultural Extension Service Specialist. For best results, apply when young nymphs are active.
White grubs (such as: black turfgrass ataenius, European chafer, Japanese beetle larvae, and northern and southern masked chafers)	1.5 - 3 fl oz	2 - 4 qt	For white grubs, spray when grubs are young and actively feeding near the soil surface, usually during late July and August or as specified by your local Agricultural Extension Service Specialist. For best results, soil should be moist prior to treatment. For best results, immediately after spraying, irrigate the treated area with 0.5 to 1 inch or water to wash the insecticide into the thatch and underlying soil.

Use Restrictions:
• **DO NOT** make more than 2 applications of Vulcan or other product containing chlorpyrifos per year. **DO NOT** apply more than 7.5 lbs a.i.per acre per year when used as a spot treatment. **DO NOT** apply more than 4 quarts (2lbs a.i).per acre per year when spread.
• Maximum single application rate is 3.7 lb a.i. per acre when used as a spot treatment .
Please refer to Resistance Management section.

NONRESIDENTIAL TURF AND OTHER NONRESIDENTIAL OUTDOOR USES

Vulcan is an emulsifiable concentrate for control of pests located around industrial buildings (turf and ornamental), road medians (turf and ornamentals), and golf course turf only. Pests controlled by Vulcan are listed in the following tables. Vulcan is compatible with fungicides, insecticides, and miticides commonly specified except for alkaline materials such as Bordeaux mixtures and lime. Always conduct a small jar compatibility test using proper proportions of chemicals and water to check for physical compatibility prior to tank mixing.

Restrictions: Use on residential turf is prohibited. Keep out of fish pools and other bodies of water. **DO NOT** treat vegetable gardens. **DO NOT** allow livestock to graze in treated areas. **DO NOT** feed treated grass cuttings (hay) or seed screenings to livestock or use hay for livestock bedding. **DO NOT** use Vulcan in poultry houses.

ORNAMENTALS AROUND INDUSTRIAL BUILDINGS AND ROAD MEDIANS

Vulcan can be used to treat evergreens, vines, flowers, shrubs, shade and flowering trees, non-bearing fruit, nut and citrus trees found around industrial buildings and road medians infested with pests listed in the following table. Dilute Vulcan with water according to the directions given in the table and apply using suitable hand- or power-operated spray equipment. Ensure complete and uniform coverage. Uniform coverage is critical for effective insect and mite control. Apply a coarse spray to thoroughly wet both upper and lower leaf surfaces and infested limb and trunk areas. Attempt to penetrate dense foliage but avoid over-spraying to the point of excessive runoff. Treat when pests appear and repeat at 7 to 10 day intervals, if needed. For application timing and other specific use information, consult your State Agricultural Experiment Station or Extension Service Specialist.

Note: Environmental factors have significant effects on phytotoxic expression. Vulcan has been tested on numerous ornamental plants without causing serious phytotoxicity at listed use rates. Some varieties of azaleas, camellias, poinsettias, rose bushes, or variegated ivy have shown varying degrees of phytotoxicity following treatment with Vulcan. Before treating large numbers of plants (especially those previously listed), treat a small block of plants and observe for 7 to 10 days to determine phytotoxic potential.

Note: The user assumes responsibility for determining if Vulcan is safe to treated plants under commercial growing conditions.

Please refer to RESISTANCE MANAGEMENT section

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE		USE DIRECTIONS
	Per Acre	100 Gallons	
Adelgids: (Cooley, Eastern spruce galls, Pine bark), Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), Aphids: (Apple, Chrysanthemum, Cottonwood, Elm leaf, Peach, Rose, Spirea, Woolly), Armyworms: (Fall, Yellowstriped), Bagworms[1], Boxelder bugs, Cankerworms, Catalpa sphinx, Chiggers (for control of chiggers in golf courses, road medians, and industrial sites only), mealy bugs, Elm spanworms, Fall webworms[2], Grasshoppers, Green fruitworms, Hornworms, Jackpine budworms, Juniper webworms, Katydids, Lace bugs, Leafhoppers, Leafrollers[3], Maple leafcutters[4], Mites[5]: (Clover, Red spider, Southern red, Spruce spider, Twospotted spider), Oleander caterpillars, Orange tortrix, Periodical cicada, Plant bugs, Poplar tentmaker, Psyllids, Puss caterpillars, Rose chafers, Sawflies, exposed: (Pin oak, Pine, Redheaded), Sowbugs, Spittlebugs, Spring elm caterpillars, Springtails, Spruce	1 pt – 1 qt	8-16 fl oz	[1] Treat when bagworm larvae are small and actively feeding. [2] Direct spray into web and immediately adjacent foliage for control of fall webworms. [3] For effective control of leafrollers, spray before leaves are tightly rolled. [4] Apply spray to maple leafcutter larvae as cases are being formed for effective control. **DO NOT** treat sugar maple trees intended for maple syrup production. [5] For effective control of spider mites when large numbers of eggs are present, apply a 2nd spray 3-5 days in the South or 7-10 days in the North after initial treatment to control newly hatched nymphs.

budworms:(Eastern, Western), Tent caterpillars: (Eastern, Western, Forest), Thornbug, Walnut caterpillars, Whiteflies, Yellownecked caterpillars, brown marmorated stink bug			
Armyworms: (Beet), Beetles: (Fuller rose, Native elm bark[1]), Browntail moth, Cutworms, Leafhoppers, Mahogany webworms, Mealbugs, Mimosa webworms, Moths: (Browntail, Cypress tip, Douglas fir tussock, European pine shoot, Gypsy[2], Holly bud, Nantucket pine tip, Pandora, Pitch pine tip, Subtropical pine tip, Tussock, Oakworms: (California, Orangestriped, Redhumped), Redhumped caterpillars, Thrips: (Exposed), Weevils: (Blackvine[3], Pine production, Yellow poplar)	1 qt	1 pt	[1] Make applications in the spring or early summer to reduce twig and branch feeding by bark beetles. [2] To kill migrating and invading gypsy moth larvae, treat trunks and foliage. [3] Blackvine weevils are night feeders. Late afternoon spraying will maximize control.
Foliar feeding beetles: (Blister leaf, Cottonwood leaf[1], Elm leaf, Flea, Fuller rose, Japanese, June, Willow leaf)	1 qt	1 pt	[1] Use Vulcan in water to control cottonwood leaf beetle larvae and adults infesting cottonwoods. Make the treatment when field counts indicate damaging beetle populations are developing or present.
Borers[1], Clearwing moths: (Ash, Dogwood, Lesser peachtree, Lilac, Oak, Rhododendron), Metallic wood: (Bronze birch, Flathead appletree, Twolined chestnut), Longhomed beetles: (Locust, Red oak), Cranberry girdler larvae[2], Leafminers, Needleminers: (Jeffrey pine, Lodgepole pine, Spruce), Scale insects[3]: (Cottonycushion, Cottony maple, Euonymus, Fletcher, Florida wax, Golden oak, Hemispherical, Lecanium, Magnolia, Oak kermes, Oak lacanium, Oystershell, Pine needle, San Jose, Tea, White birch, White peach)	1 qt	1 qt	[1] For borers, apply Vulcan to the trunks and lower limbs of trees and shrubs when the adults begin to emerge. Consult your State Agricultural Experiment Station or Extension Service Specialist for proper time to treat. Apply uniformly a coarse low-pressure spray. Pheromone traps can aid in detection of adult clearwing moths. [2] Apply 1 qt of Vulcan for cranberry girdler larvae. Direct spray at the base of tree using 50 gallons of water per acre. Irrigate immediately after applications for soil penetration of 1-2 inches. Treat after egg laying during the summer. [3] Time applications for control of scale insects when crawlers or first two stages of settled nymphs are present.
Borers: (Cottonwood, Peachtree[1])	1 qt	3 qts **	[1] For peachtree borers, apply Vulcan in water to flowering trees and shrubs of the genus *Prunus* as a trunk spray before newly-hatched larvae enter the trees. Apply as a coarse, low-pressure spray. Thoroughly wet all bark areas from ground level to scaffold limbs. ** When using the 3 qt per 100 gallon dilution, **DO NOT** exceed 1 qt of Vulcan per acre.
Beetles[1]:(Includes wood infesting, Ambrosia, Anobiidae, Black turpentine, Cottonwood leaf, Elm leaf, European elm bark, Flea, Fuller rose, Japanese, June, Native elm bark[2], Southern pine, Willow leaf)	1 qt	2 gals***	[1] For preventative treatment, apply the spray to the main trunk of trees in the early spring or when threat of attack exists from nearby infested trees. For remedial treatment, apply the spray to the main trunk of infested trees when damage occurs but before adult beetles begin to emerge. [2] To prevent native elm bark beetles from overwintering in uninfested trees, apply Vulcan in water to the bottom 9 ft of the trunk. Wet the trunk thoroughly but **DO NOT** spray to runoff. Take care to apply the spray right to the base of the root flare. Application can be made with either a backpack mistblower or a hydraulic pressure sprayer from spring through early fall. *** When using the 2-gallon per 100-gallon dilution, **DO NOT** exceed 1 qt of Vulcan per acre.

Use Restrictions:
• **DO NOT** make more than 2 applications of Vulcan or other product containing chlorpyrifos per year. **DO NOT** apply more than 4 quarts (2 lbs a.i).per acre per year.
• Maximum single application rate is 1 lb a.i. per acre.

*Superscrips refer to specific directions

FOR COMMERCIAL ORNAMENTALS IN NURSERIES AND GREENHOUSES FOR USDA QUARANTINE USE ONLY AND FOR DIRECT MOUND AND/OR DRENCH APPLICATION ONLY

Vulcan can be used for USDA quarantine use only to treat containerized, potted, or balled and burlapped nursery stock to control the insects in the soil attached to the roots of these plants. Completely submerge the container with drain holes or root ball stabilized by burlap in a tank containing diluted Vulcan. **DO NOT** remove burlap wrap or plastic containers with drain holes prior to submerging. Keep the container or root ball submerged until complete soil saturation has occurred, normally about 30 seconds.

Note: During all operations (submerging, drenching, injecting), wear a chemical-resistant apron in addition to other PPE listed for applicators and other handlers. Make applications in a well-ventilated area.

Note: Environmental factors have significant effects on phytotoxic expression. Vulcan has been tested on numerous ornamental plants without causing serious phytotoxicity at listed use rates. However, because of the numerous varieties grown, treat a small group of plants at the listed rate under the anticipated growing conditions and observe for at least 7 days to determine phytotoxic potential before treating a larger number of plants.

Note: The professional user assumes responsibility for determining if Vulcan is safe to treated plants under commercial growing conditions.

Please refer to RESISTANCE MANAGEMENT section

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE		USE DIRECTIONS
	1 Gallon	100 Gallons	
Fire Ants[1]	1/25 fl oz	4 fl oz	[1] As an alternative to submerging potted plants, dilute 4 fl. oz. of Vulcan in 100 gallons of water. Apply this dilution to the point of runoff twice daily for 3 consecutive days. **DO NOT** remove burlap wrap or container from plants prior to treatment.
White Grubs[2] Weevils[3] (such as Blackvine)	⅔ fl oz	2 qts**	[2] An alternative treatment to submerging containerized plants is to drench the container with the diluted insecticide solution applying approximately 10 to 12 fl oz of diluted insecticide solution per gallon of container size (4-5 fl oz/100 cubic inches of container). Pre-moisten the container media by irrigation or rainfall before drenching. **DO NOT** remove container from plants prior to treatment. [3] An alternate treatment to submerging balled and burlapped plants is to inject Vulcan into the root ball. Equally distribute 1 to 3 quarts of the dilute Vulcan solution per cubic foot of soil volume through an injection rod inserted into the soil ball surrounding the plant roots. Uniform distribution of the insecticide throughout the soil of the root ball is critical for effective control. Insert the injection rod in at least 4 equally spaced locations around the stem of the plant at a 30-45 degree angle from the plant between the stem and the upper, outer perimeter of the ball. This technique has been shown to be most effective with small root balls (up to 1.5 ft in diameter). Larger root balls may require more injection points to ensure thorough soil distribution of the insecticide. Couple the injection rod to a flow meter to monitor the correct volume applied per root ball using an injection pressure of at least 30 psi. The application must be made such that splash-back and runoff are minimized. ****DO NOT** exceed more than 1 quart (0.94 lbs a.i.) of Vulcan per acre.
Coffee root mealybug[2]	1/6 fl oz	1 pt	
Use Restrictions: • **DO NOT** apply more than 1 quarts (0.94 lbs a.i).per acre per year.			

*Superscripts refer to specific directions.

ORNAMENTALS IN INDUSTRIAL PLANT SITES AND ROAD MEDIANS (DORMANT SPRAY OF TREE PESTS)

Vulcan can be used as a dormant or delayed dormant spray at the rates indicated to control the listed insects. Vulcan can be used without oil; however, use oil to control additional pests such as the European red mite.

For high volume (dilute) sprays (200 to 600 gallons of spray mixture per acre), tank mix the specified dosage with 1 to 2 gallons of a petroleum spray oil specified for dormant use in 100 gallons of water. Spray the entire tree to runoff using suitable ground spray equipment.

For low volume (concentrate) sprays (less than 200 gallons of spray mixture per acre), use the same amount of Vulcan as for a dilute spray and apply in a manner that will ensure thorough coverage of the trees. Use oil as specified by your State Agricultural Experiment Station or Extension Service Specialist.

PEST	AMOUNT OF VULCAN IN WATER TO MAKE			USE DIRECTIONS
	1 Gallon	3 Gallons	100 Gallons	
Aphids: (Mealy plum, Rosy Apple, Woolly apple), Borers: (Peach twig), Cutworms: (Climbing), Leafrollers: (Pandemis), Pear psylla adults, Plant bugs, Scale: (San Jose)	1/12 – 1/6 fl oz	¼ - ½ fl oz	½ - 1 pt	Tank mix with 1-2 gallons of a petroleum spray oil specified for dormant use in 100 gallons of water.
Apple ermine moth	1/12 fl oz	¼ fl oz	½ pt	For control on *Malus* species make 2 applications at a 7 to 14 day interval in combination with a petroleum spray oil at the rate of 2 to 4% (v/v) in a spray to wet application to ensure thorough coverage of all stems and branches. When using tank mixtures, follow all label directions for the mixing partner (oil). Use appropriate application equipment and spray volumes to ensure complete coverage of the plant(s) or control will be compromised.

Use Restrictions:

- **DO NOT** apply until rain or irrigation have replenished soil moisture such that bark and twigs are not desiccated since cold dry conditions can cause Vulcan plus oil to infuse trees resulting in bud damage or drop.
- Make only one application during the dormant season except for the control of the apple ermine moth. **DO NOT** allow meat or dairy animals to graze in treated areas.
- **DO NOT** apply more than 2.8 quarts (3 lbs a.i).per acre per year.

Please refer to RESISTANCE MANAGEMENT section

TREE PESTS IN GREENHOUSES AND PLANTATIONS

Vulcan can be used to treat shade and flowering trees, and evergreens infested with pests listed in the following table. Dilute Vulcan with water according to the directions given in the table and apply using suitable hand-or power operated spray equipment in a manner to provide complete and uniform coverage. Apply a coarse spray to thoroughly wet both the upper and lower leaf surfaces and to infested limb and trunk areas. Attempt to penetrate dense foliage, but avoid overspraying to the point of excessive runoff. Treat when pests appear and repeat application at 7 to 10 day intervals, if needed. Consult your State Agricultural Experiment Station or Extension Service Specialist for application timing and other specific use information applicable to your area. Please refer to RESISTANCE MANAGEMENT section

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE			USE DIRECTIONS
	1 Gallon	3 Gallons	100 Gallons	
Adelgids: (Cooley, Eastern spruce gall, Pine bark), Aphids: (Apple, Chrysanthemum, Cottonwood, Elm leaf, Peach, Rose, Spirea, Woolly), Bagworms[1], Boxelder bugs, Cankerworms, Catalpa sphinx, Citrus mealybugs, Elm spanworms, Fall webworms[2], Greenstriped mapleworms, Jackpine budworms,	1/12 fl oz.	¼ fl oz	8 fl oz	[1] Treat when bagworm larvae are small and actively feeding. [2] For effective control of fall webworms, direct spray into web and immediately surrounding foliage. [3] For control of leafrollers, apply spray before leaves are tightly rolled. [4] Apply spray to maple leafcutter larvae as cases are being formed. **DO NOT** treat sugar

Juniper webworms, Katydids, Lace bugs, Leafhoppers, Leafrollers[3], Maple leafcutters[4], Mites: (Clover, Red spider, Southern red), Oak skeletonizers, Poplar Tentmakers, Puss caterpillars, Sawflies, exposed: (Pin oak, Pine), Spring elm caterpillars, Spruce budworms, Tent caterpillars: (Eastern, Forest, Western), Walnut caterpillars, Western spruce budworms, Yellownecked caterpillars				maple trees intended for maple syrup production.
Beetles: (Fuller rose, Native elm bark[1]), Leafhoppers, Mahogony webworms, Mealybugs, Mimosa webworms, Moths: (Browntail, Cypress tip, Douglar fir tussock, European pine shoot, Gypsy[2], Holly bud, Nantucket pine tip, Pandora, Pitch pine tip, Subtropical pine tip, Tussock), Oakworms: (California, Orangestriped, Redhumped), Redhumped caterpillars, Thrips-exposed, Weevils: (Blackvine[3], Pine reproduction, Yellow poplar)	1/6 fl oz	½ fl.oz.	1 pt	[1] To reduce foliar feeding on twigs and branches by beetles, apply in the spring or early summer. [2] To kill migrating and invading gypsy moth larvae, treat trunk and foliage. [3] Blackvine weevils are night feeders. Late afternoon spraying will maximize control.
Beetles: (Cottonwood leaf[1], Elm leaf, Flea, Willow leaf)	1/6-1/3 fl oz	½ - 1 fl oz	1 pt – 1 qt	[1] For cottonwood leaf beetles, use Vulcan in water to control larvae and adults infesting cottonwoods. Apply when field counts indicate damaging beetle populations are developing or are present. For seedlings, use 8-20 gallons of spray volume per acre.
Borers[1], Clearwing moths: (Ash, Dogwood, Lesser peachtree, Lilac, Oak, Rhododendron), Metallic wood: (Bronze birch, Flatheaded appletree, Twolined chestnut,), Longhorned beetles: (Locust, Red oak), Cranberry girdler larvae[2], Leafminers, Needleminers: (Jeffery pine, Lodgepole pine, Spruce), Scale insects[3]: (Cottonycushion, Cottony maple, Euonymus, Fletcher, Florida wax, Golden oak, Hemispherical, Lecanium, Magnolia, Oak kermes, Oystershell, Pine needle, San Jose, Tea, White birch)	1/3 fl oz	1 fl oz	1 qt	[1] For borers, apply Vulcan to the trunks and lower limbs of trees and shrubs when the adults begin to emerge. Consult your State Agricultural Experiment Station or Extension Service Specialist for proper time to treat in your area. Apply uniformly as a coarse low-pressure spray. Pheromone traps can aid in detection of adult clearwing moths. [2] Apply 1 quart (0.94 lbs a.i.) of Vulcan per acre to cranberry girdler larvae infesting Douglas fir seedlings. Direct spray at the lower crown and stems using 50 gals of water per acre. Irrigate immediately after application for soil penetration of 1-2 inches. Treat after egg laying during the summer. [3] Time applications for control of scale insects when crawlers or first two stages of settled nymphs are present.
Northern pine weevil, Pales weevil	1 fl oz	3 fl oz	3 qts**	Apply as a cut stump spray or drench in winter or early spring. ** **DO NOT** exceed 1 quart (0.94 lbs a.i.) of Vulcan per acre.
Borers: (Cottonwood, Peachtree)[1]	1 fl oz	3 fl oz	3 qts**	[1] For peachtree borers, apply Vulcan in water to flowering trees and shrubs of the genus *Prunus* as a trunk spray before newly hatched larvae enter the trees. Apply as a coarse low-pressure spray. Thoroughly wet all bark areas from ground level to scaffold limbs. ** **DO NOT** exceed more than 1 quart (0.94 lbs a.i.) of Vulcan per acre.
Beetles[1]: (Cottonwood leaf, Elm leaf, Flea, Fuller rose, Native elm bark[2], Willow leaf)	1 ⅓ fl oz	4 fl oz	1 gal **	[1] For preventative treatment, apply spray to the main trunk of trees in the early spring or when threat of attack exists from nearby infested trees. For remedial treatment, apply

				the spray to the main trunk of infested trees or logs when damage occurs but before adult beetles begin to emerge. [2] To prevent native elm bark beetles from overwintering in uninfested trees, apply a dilution of 1 gallon per 100 gals of water (1 ⅓ fl oz per gallon) as a spray to the bottom 9 ft. of the trunk. Wet the trunk thoroughly but **DO NOT** spray to runoff. Take care to apply the spray to the base of the root flare. Applications can be made from spring to early fall. To reduce twig and branch feeding on trees deemed to be of high value, apply as spray to the tree crown using a dilution of 1 gallon per 100 gals of water (1 ⅓ fl oz per gallon). Make applications in the spring or early summer using a sprayer that will give thorough coverage to the tree crown. ** **DO NOT** exceed more than 1 quart (0.94 lbs a.i.) of Vulcan per acre.
Weevils: (such as Northern pine, Pitch eating, Twig)	5 ⅓ fl oz	16 fl oz	---	Treat pine seedlings immediately after transplanting. Treat each seedling with enough spray to thoroughly wet the foliage and stem to the point of runoff.
Use Restrictions: • **DO NOT** apply more than 1 quart (0.94 lbs a.i).per acre per year.				

*Superscripts refer to specific directions.

NON-RESIDENTIAL TURF ON GOLF COURSES, AROUND INDUSTRIAL PLANTS AND ON ROAD MEDIANS

Apply Vulcan to control the pests listed in the following table at the listed dosages and in accordance with the directions given below or as specified by your local Agricultural Extension Service specialist. Dilute Vulcan in water and apply as a coarse, low-pressure spray using suitable application equipment. Except as noted, thoroughly water immediately after treatment to wash the insecticide into the turf. The area to be treated should be moist at the time of treatment. Spray when pests first appear. Please refer to RESISTANCE MANAGEMENT section.

PEST*	AMOUNT OF VULCAN PER		USE DIRECTIONS
	1,000 Sq Ft	Acre	
Ticks[1]: (American dog, Cattle fever, Gulf coast, Lone star)(for control of ticks in golf courses, road medians, and industrial plant sites only)	¼ fl oz	1 ½ pts	[1] For control of ticks, treat soil and other areas likely to serve as harborage sites for ticks that have removed themselves from their host. Spray surfaces to be treated until wet but **DO NOT** create excessive runoff. Note: This application is intended as a premise spray only. **DO NOT** use as a direct spray on livestock or any sites that may come in contact with livestock.
Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), Armyworms: (Beet, Fall, Yellowstriped), Chiggers[1] (for control of chiggers in golf courses, road medians and industrial plant sites only), Chinch bugs, Clover mites, Cutworms, Crickets, Deer ticks[2] (for control of ticks in golf courses, road medians, and industrial sites only), Earwigs, Fiery skipper, Gnats, Grasshoppers, Greenbug aphids, June beetles, Leafhoppers, Lucerne moths, Millipedes, Mites: (Clover, Bermudagrass stunt, Formula grass, Winter grain), Pillbugs, Sod webworms[3]: (Lawn moths), Sowbugs, Ticks[1] (for control of ticks in golf courses, road medians and industrial plant sites only), brown marmorated stink bug	¾ fl oz	1 qt	[1] Apply Vulcan for area control of ticks and chiggers infesting golf course turf, turf in road medians, and industrial plant sites where these pests are present and create a nuisance or a possible public health problem. **DO NOT** allow public use of treated areas during application or until spray has dried. Apply Vulcan in water at the rate of ½ pint/acre (equivalent to 1/6 fl oz per 1,000 sq. ft) using a hydraulic sprayer, mist applicator, knap sack sprayer, or other suitable hand or power-operated spray equipment. Treat low underbrush, grassy areas, weeds, and ground surface and debris using enough spray volume to obtain thorough coverage, usually 40-100 gals/acre. [2] Apply Vulcan in water at the rate of 1 quart per acre or ¾ fl oz per 1,000 sq ft for control of deer ticks. Treat low underbrush, turf, grassy areas, weeds, and ground surface and debris, using enough spray volume to obtain thorough coverage. [3]For sod webworms, delay watering or mowing of the treated area for 24 hours after treatment.

European crane fly	1 fl oz	1 qt	
Turfgrass weevil (*Hyperodes*)[1]	1 ½ fl oz	1 qt	[1] Make application to problem areas in mid-April and again in mid-May or as specified by your local Agricultural Extension Service specialist.
White grubs[1]: (Black turfgrass ataenius, European chafer, Japanese beetle larvae, Southern and Northernmasked chafer)	1 ½ - 3 fl oz	1 qt	[1] Spray when white grubs are young and actively feeding near the soil surface, usually during late July and August or as specified by your local Agricultural Extension Service specialist. Immediately after spraying, irrigate the treated area with ½ to 1 inch of water to wash the insecticide deep into the thatch or into the underlying soil.
Billbug adults, such as: (Bluegrass, Denver, Hunting)	¾ - 3 fl oz	1 qt	Spray early in the season when adult billbugs first appear.
Mole Crickets	1 ½ fl oz	1 qt	For mole crickets in golf course turf, turf in road medians, and industrial plant site turfgrass, apply through high-pressure injection or other suitable subsurface placement application equipment. Depending on the application equipment used, follow the manufacturer's specification for calibration and the volume of spray per acre needed to provide control or as specified by your local Agricultural Extension Service specialist. Apply when young nymphs are active.
Use Restrictions: • **DO NOT** apply more than 1.9 quarts (2 lbs a.i).per acre per year.			

*Superscripts refer to Specific Directions.

OUTSIDE SURFACES AND AROUND INDUSTRIAL PLANT SITES (SUCH AS AROUND WAREHOUSES)

Vulcan can be applied as a residual spray to and around outside surfaces of nonresidential buildings and structures. Permitted areas of use include fences, pre-construction foundations, refuse dumps, outside of walls, and other areas where pests congregate or have been seen. Repeat treatment as needed to maintain effectiveness. Unless prohibited by a product label, users, at their own discretion, can tank mix pesticides currently labeled for similar use patterns. Always perform a small jar compatibility test using proper proportions to check for physical compatibility prior to tank mixing. Please refer to RESISTANCE MANAGEMENT section.

Restrictions:

DO NOT allow adults, children, or pets to contact treated surfaces until sprays have dried. Keep out of fish pools and other bodies of water.
DO NOT feed treated grass cuttings (hay) or seed screenings to livestock, or use treated hay for livestock bedding.
DO NOT treat vegetable gardens.
DO NOT tank mix this product with products containing dichlorvos (DDVP).

PEST*	AMOUNT OF VULCAN IN WATER TO MAKE			USE DIRECTIONS
	1 Gallon	10 Gallons	50 Gallons	
	For Band Treatment[1]			
Ants (except fire ants, carpenter ants, harvester ants, and pharaoh ants), Beetles, Boxelder bugs (for other true bugs), Clover mites, Crickets, Earwigs, Elf leaf beetles (adults), Firebrats, Millipedes, Pillbugs, Silverfish, Sowbugs, Spiders (excluding black widow and brown recluse spiders), Springtails, Ticks (for control of ticks in golf courses, road medians and industrial plant sites only) brown marmorated stink bug	¼ tsp	¾ fl oz	4 fl oz	[1] To help prevent infestation of non-residential buildings, treat a band of soil 6-10 ft. wide around and adjacent to buildings including the building foundation to a height of 2-3 ft. where pests are active and may find entrance. Use 4 fl oz of Vulcan per 50 gals of water and apply as a coarse spray at the rate of about 10 gals of spray mixture per 1,000 sq. ft. to thoroughly and uniformly wet the band area.
	For Outside Surfaces			
	1 ⅓ fl oz	13 ⅓ fl oz	2 qts**	**[**]DO NOT** exceed 1 qt (0.94 lbs a.i.) of Vulcan per acre.

*Superscripts refer to Specific Directions.

STORAGE AND DISPOSAL

DO NOT contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE:

Store in a cool, dry place and in such a manner as to prevent cross contamination with other pesticides, fertilizers, food and feed. Store in original container and out of reach of children, preferably in a locked storage area.

DO NOT store above 100°F for extended periods of time. Storage below 20°F can result in formation of crystals. If product crystallizes, store at 50°F to 70°F and agitate to redissolve crystals. If container is damaged or spill occurs, use product immediately or dispose of product and damaged container as indicated below.

PESTICIDE DISPOSAL:

Open dumping is prohibited. Pesticide wastes are toxic. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the hazardous waste representative at the nearest EPA Regional Office for guidance.

CONTAINER HANDLING:

NONREFILLABLE CONTAINERS:

Rigid, Nonrefillable containers small enough to shake (i.e. with capacities equal to less than five gallons).

Nonrefillable container. **DO NOT** reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. 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 or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling or reconditioning if available, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities**.**

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or a mix tank or collect rinsate at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Once container is rinsed, offer for recycling if available, or puncture and dispose of in a sanitary landfill.

Rigid, Nonrefillable containers that are too large to shake (i.e. with capacities greater than 5 gallons or 50 lbs).

Nonrefillable container. **DO NOT** reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Offer for recycling or reconditioning if available, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities**.**

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or a mix tank or collect rinsate at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip. Once container is rinsed, offer for recycling if available, or puncture and dispose of in a sanitary landfill.

LIMITATION OF WARRANTY AND LIABILITY

Read the entire directions for use, conditions of warranties and limitations of liability before using this product. If terms are not acceptable, return the unopened product container at once.

By using this product, user or buyer accepts the following **CONDITIONS**, **DISCLAIMER OF WARRANTIES,** and **LIMITATIONS OF LIABILITY**.

CONDITIONS: The directions for use of this product are believed to be adequate and must be followed carefully. However, it is impossible to eliminate all risks associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use or application, all of which are beyond the control of ADAMA. To the extent

consistent with applicable law,all risks shall be assumed by the user or buyer.

DISCLAIMER OF WARRANTIES: To the extent consistent with applicable law, ADAMA makes no other warranties, express or implied, of merchantability or of fitness for a particular purpose or otherwise, that extend beyond the statements made on this label. No agent of ADAMA is authorized to make any warranties beyond those contained herein or to modify the warranties contained herein. To the extent consistent with applicable law, ADAMA disclaims any liability whatsoever for special, incidental or consequential damages resulting from the use or handling of this product.

LIMITATIONS OF LIABILITY: To the extent consistent with applicable law, the exclusive remedy of the user or buyer for any and all losses, injuries or damages resulting from the use or handling of this product, whether in contract, warranty, tort, negligence, strict liability or otherwise, shall not exceed the purchase price paid or at ADAMA's election, the replacement of product.

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