



**WILDLIFE  
DAMAGE  
MANAGEMENT  
PROGRAM**

# **Nuisance Wildlife Repellent Handbook**

**Minnesota Department of Natural Resources  
Wildlife Damage Management Program  
1601 Minnesota Drive  
Brainerd, MN 56401  
(218) 833-8630/8633      fax (218) 833-8632**

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# COMMERCIAL DEER REPELLENTS

The listing of company and product names is for the reader's convenience and is not considered comprehensive. The State of Minnesota neither recommends nor endorses specific products or companies.

Commercial deer repellents are products containing chemicals that are thought to protect crops from foraging deer through several avenues: fear, pain, taste, or conditioned avoidance. Historically, it was thought that repellents inducing fear produce odors that are typical of predator activity. These repellents contain products that produce sulfurous odors, such as putrefied egg solids, blood meal, meat proteins, garlic and predator urine. Repellents that induce pain or discomfort in the mouth or intestines cause deer to develop a conditioned avoidance, or a taste aversion, to the product being used. These repellents include products containing hot peppers, such as capsaicin, or ammonia. Taste repellents often make use of bitter chemicals to induce a bad taste, such as Thiram, an extremely bitter tasting fungicide. Recent studies, however, indicate that the repellency of many of these products may be due to food neophobia (the suspicion & subsequent avoidance of new foods) Kimball & Nolte 2006. The results of this study can be downloaded through the following link: [http://www.aphis.usda.gov/wildlife\\_damage/nwrc/publications/06pubs/kimball062.pdf](http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/06pubs/kimball062.pdf). The study indicates that even taste repellents can lose their repellency if deer discover that there are no post ingestion consequences in eating food sources treated with them. Therefore, when alternative natural food sources are scarce, deer may attempt to try these "new foods" and subsequently learn that they are safe and nutritious.

Application of repellents will depend on the type of repellent being used and the avenue through which it repels deer. For example, repellents producing pain, foul taste, and conditioned avoidance will be applied directly to the plants being ingested, and are considered contact repellents. Repellents producing fear are considered area repellents, and can either be applied directly on the plants to be protected, or as an invisible chemical (odor) barrier around the crops to be protected. Studies indicate, however, that repellents applied directly to plants are the most effective in repelling deer (Kimball & Nolte 2006).

Repellents may be the method of choice for many non-commercial users and for people with light to moderate problems. Typically these people have small numbers of trees, shrubs or crops to protect and are going to apply controls over a small area. As repellents are labor intensive, due to the need to reapply after periods of precipitation, landowners with larger areas of crops to protect should consider a more permanent solution to deer damage, such as woven-wire deer fencing.

## FACTS ABOUT DEER REPELLENTS

1. Repellents are not fences
2. Repellents are most practical for non-commercial users.
3. Repellents are most practical for people experiencing low to moderate damage
4. Typical situations for repellent use include the following:
  - a. Landowner desires to protect a **small** number of trees, shrubs or crops.
  - b. Landowner desires to protect a **small** area

- c. Homeowners desiring to protect gardens, ornamental shrubs and flowerbeds.
  - d. Useful as a temporary, emergency control for larger commercial growers while implementing a permanent solution, such as a woven-wire deer fence.
5. Repellents should be applied prior to the period of anticipated damage. Deer are creatures of habit, so once a feeding pattern is established, damage becomes more difficult to control.
  6. Apply frequently to maintain coverage. Reapplication is usually necessary after periods of rainfall, and during peak growth seasons. The addition of a sticker to the mixture, such as Vapor Guard®, or Weathershield®, will reduce the need to reapply after every rain.
  7. Switch repellent type periodically to prevent deer from becoming accustomed to the use of only one. Remember that neophobia may be the mechanism through which repellents work. If deer learn that a repellent treated food source does not cause physical distress (ie. gastro-intestinal upset), they will not develop a taste aversion to food sources treated with that particular repellent.
  8. Be aware that hungry deer may accept the consequences of consuming repellent treated foods, especially when other natural food sources are scarce or unavailable.
  9. Crops protected by repellents require constant monitoring, as effectiveness may be reduced by a multitude of factors including precipitation, availability of alternative food sources, and adaptation of the depredating species, among others.

Refer to **Table 1** on **page 4** for a listing of commercial deer repellent products and the manufacturer/source information\*. Contact information for sources is located in **Appendix I (page 19)** of this manual. Most repellents listed in **Table 1** were top performers in a study undertaken by the USDA Animal Plant Health Inspection Service’s National Wildlife Research Center. The study compared 20 commercially available repellents, the results of which were published in the Forest Service’s Forest Tech Tips in July of 2001. This publication can be downloaded by following the link below:

[http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1568&context=icwdm\\_usdanwrc](http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1568&context=icwdm_usdanwrc).

The top performer in the group of repellents tested in the study was the powder form of Deer Away Big Game Repellent. Further information concerning repellent comparisons can be obtained by reviewing a subsequent study undertaken by the Wildlife Research Center. This study which compares active ingredients and delivery systems in commercial deer repellents can be downloaded through the following link:

[http://www.aphis.usda.gov/wildlife\\_damage/nwrc/publications/01pubs/01-82.pdf](http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/01pubs/01-82.pdf).

Also, a study of the “Effect of Repellex Deer Repellent on Browsing of Container-grown Ornamental Shrubs” was undertaken by the College of Forest Resources & Horticulture Dept. of the University of Georgia, Athens. The results of this study may be viewed by clicking on the following link: <http://74.125.95.132/search?q=cache:VgZE-YYgArOJ:www.canr.org/99003.pdf+Effects+of+Repellex+deer+repellent&hl=en&ct=clnk&cd=1&gl=us>.

An additional study, published in 1998 by USDA's Animal Plant Health Inspection Service, concerning comparisons of repellents for protection of conifer seedlings, can be viewed by following the link below. [http://www.aphis.usda.gov/wildlife\\_dam](http://www.aphis.usda.gov/wildlife_dam) (Nolte) (Linz et al.) (Julian)age/nwrc/publications/98pubs/98-73.pdf. Repellents compared in this study include Big Game Repellent (powder), Deer Stopper, Plantskydd and ECX95BY (denatonium benzoate which is the active ingredient in Tree Guard). The EPA registration of all products containing denatonium benzoate, however, has been cancelled, effective December 1, 2009.

**Seadust Wildlife Controllant** is an additional repellent not listed in **Table 1**, but showing promise in its ability to repel deer, elk, and rabbits in the protection of forest and agricultural crops. This repellent consists of corn oils, shellfish residues and fish oils, and is therefore exempt from EPA registration under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). There may be allergy concerns in its use, however, due to the presence of seafood products in its formulation. The reader is encouraged to investigate this product through the following link to determine the personal usefulness of this repellent: <http://www.treesearch.fs.fed.us/pubs/30895>. Further studies concerning this repellent can be accessed through the following link: <http://www.cffa-oswa.org/DCampell3.html>. Seadust can be purchased through Seadust.biz (<http://www.seadust.biz/index.html>).

Please note that some repellents listed in **Table 1** are also listed as being effective in repelling other wildlife species, such as rabbits. For additional repellents that are effective in repelling rabbits, please refer to **Table 9** on **page 17** of this handbook.

Refer to **Table 2** on **page 6** for deer repellent pricing & coverage information.

Application information for Hinder repellent is provided in **Table 3** on **page 7**. Application information for Deer Away repellent is provided in **Table 4** on **page 8**.

**BE SURE TO FOLLOW THE MANUFACTURER'S LABEL DIRECTIONS FOR COMPLETE APPLICATION INSTRUCTIONS FOR EACH OF THE COMMERCIAL REPELLENTS LISTED IN THIS HANDBOOK.**

**Table 1. Deer Repellent Products**

PRODUCT	ACTIVE INGREDIENT(S)	MANUFACTURER	SOURCES	COMMENTS
<b>Deer Away (Big Game Repellent) Powder Form</b> (also repels rabbits)	Putrescent Whole Egg Solids	INTAGRA, INC. (800)468-2472	<ul style="list-style-type: none"> <li>• Forestry Suppliers, Inc.</li> <li>• Local Nursery</li> <li>• Local Home &amp; Garden Center</li> </ul>	Non-toxic, biodegradable. Was the top performer of the repellents tested by USDA. Best for use on trees and nursery stock, but <b>not on fruit or vegetable plants when bearing.</b>
<b>Deer Away (BGR) Liquid Form</b> (also repels rabbits)	Same as powder (above)	Same as powder (above)	<ul style="list-style-type: none"> <li>• Same as powder (above)</li> </ul>	Not as effective or long lasting as the powder form. Use on trees & nursery stock, but <b>not fruits or vegetables when bearing.</b>
<b>DeerBusters Hanging Sachets</b>	Meat meal and red pepper	Trident Enterprises International, Inc. (301)694-6072	<ul style="list-style-type: none"> <li>• DeerBusters</li> </ul>	Safe to use around all plants No actual contact with the plant, so can be used to protect edibles.
<b>Bye Deer Sachets</b>	Sodium salts of mixed fatty acids (soap)	Security Products Co., Phoenix, AZ (602)285-1660	<ul style="list-style-type: none"> <li>• Bye Deer, LLC</li> <li>• Local Nursery</li> <li>• Local Home &amp; Garden Center</li> </ul>	Recommended for use on ornamentals
<b>Deer Stopper</b>	Thiram, capsaicin, egg solids	Landscape Plus, Chester, NJ	<ul style="list-style-type: none"> <li>• Ace Hardware Store</li> <li>• Local Home &amp; Garden Center</li> </ul>	Use on fruit trees before flowering, ornamentals and Christmas trees
<b>Plantskydd</b> (also repels rabbits & elk)	Dried bloodmeal	Tree World Plant Care Products, Inc. (800) 252-6051	<ul style="list-style-type: none"> <li>• Forestry Suppliers, Inc.</li> <li>• Tree World Plant Care Products</li> <li>• Local Home &amp; Garden Center</li> <li>• Itasca Greenhouse, Inc.</li> </ul>	Use on fruits and vegetables before flowering, trees and ornamentals. Effective in repelling deer, rabbits & elk.
<b>DeerBusters Coyote Urine</b>	Coyote urine (100%)	Trident Enterprises International (301)694-6072	<ul style="list-style-type: none"> <li>• DeerBusters</li> </ul>	Apply to scent tags and hang throughout area to be protected. Safe to use near edibles, as there is no contact with individual plants.
<b>Not Tonight Deer</b>	Dehydrated whole egg solids, Montok pepper	Not Tonight Deer Mendocino, CA (415)255-9498	<ul style="list-style-type: none"> <li>• Not Tonight Deer</li> </ul>	Fruits and vegetables before flowering, trees and ornamentals.
<b>Dr. T's Deer &amp; Rabbit Repellent</b>	Putrescent whole eggs, capsaicin, garlic & mint	Dr. T's Nature Products, Inc. Pelham, GA	<ul style="list-style-type: none"> <li>• Biocontrol Network</li> <li>• Professional Pest Control Products</li> </ul>	Fruits and vegetables before flowering, trees and ornamentals.
<b>Liquid Fence</b>	Egg & garlic formulation	The Liquid Fence Company 1-800-923-3623	<ul style="list-style-type: none"> <li>• Forestry Suppliers, Inc.</li> <li>• The Liquid Fence Company</li> <li>• Local Home &amp; Garden Centers</li> </ul>	Use on ornamentals only. <b>Do not use on edible crops.</b>
<b>Hinder</b> (also repels rabbits)	Ammonium soaps of higher fatty acids	Pace International Kirkland, WA (509)848-3300	<ul style="list-style-type: none"> <li>• Snow Pond Farm Supply</li> <li>• Local Home &amp; Garden Centers</li> </ul>	Safe to use on fruits and vegetables
<b>Tree Guard</b>	Bitrex™(denatonium benzoate*)	Becker Underwood, Inc., Ames, IA (515)-232-5907	<ul style="list-style-type: none"> <li>• Treessentials Company</li> <li>• Gempler's</li> <li>• Itasca Greenhouse, Inc.</li> </ul>	Active ingredient denatonium benzoate is a bittering agent. Protects tree seedlings, shrubs, ornamentals, hedges and flowers. <b>Not for use on fruit trees, or any edible crop.</b> Can be used as a spray or dip. Do not dilute with water.

**Table 1. Deer Repellent Products**

PRODUCT	ACTIVE INGREDIENT(S)	MANUFACTURER	SOURCES	COMMENTS
				Protects up to 100 days. Does not wash off with precipitation.
<b>Repellex Original Deer &amp; Rabbit Repellent</b>	Dried blood, pepper & garlic oils.	Repellex USA, Inc, Niles, MI 49120 (877)737-3539 <a href="http://www.repellex.com">www.repellex.com</a>	<ul style="list-style-type: none"> <li>• Repellex USA, Inc.</li> </ul>	Odor & taste repellent. <b>Not for use on edibles.</b> Protects up to 90 days.
<b>Repellex Fruit &amp; Vegetable Organic Deer &amp; Rabbit Repellent</b>	Dried eggs, pepper, garlic, & other essential oils	Repellex USA, Inc, Niles, MI 49120 (877)737-3539 <a href="http://www.repellex.com">www.repellex.com</a>	<ul style="list-style-type: none"> <li>• Repellex USA, Inc.</li> </ul>	Safe to use on edibles. Protects 60-90 days.
<b>Deer Off</b> <b>(also repels rabbits &amp; squirrels)</b>	Putrescent egg solids, garlic & capsaicin	Woodstream Corp.	<ul style="list-style-type: none"> <li>• Havahart</li> <li>• Gempler's</li> </ul>	Safe for use on edibles up to two weeks before harvest.
<b>Promois Milk</b> <b>(home remedy)</b>	Hydrolyzed casein (HC)	Rita Corporation P.O. Box 457, Crystal Lake IL 60039-0457 815-337-2500	<ul style="list-style-type: none"> <li>• Dairy or farm supply stores</li> <li>• American Casein Co. Burlington, NJ</li> <li>• Commercial concentrated baby formula powders containing hydrolyzed casein</li> </ul>	Mix according to label directions to obtain a concentration of 8-12%. May negatively affect the palatability of edible crops, so is <b>not recommended for use on crops intended for human consumption.</b> Good for use in reforestation projects and other situations where protection of tree and shrub seedlings is desired. Studies indicate it may be nearly as effective as Big Game Repellent in repelling deer. (Kimball & Nolte 2006). Apply as a powder to trees wetted with a sticker solution, or as a liquid spray mix consisting of the appropriate concentration of HC, water and a sticker, such as Vapor Guard or Tactic. A homemade sticker can also be formulated by mixing Elmer's Glue All with water to obtain a concentration of 0.26%. Concentrated baby formula powders containing HC are also effective in repelling deer when alternative sources of browse are available. These formulas, however, are not as effective as the pure technical grade of HC. <a href="http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/05pubs/kimball053.pdf">http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/05pubs/kimball053.pdf</a>

\* EPA registration for products containing this active ingredient is cancelled effective December 1, 2009 (<http://regulations.vlex.com/vid/denatonium-benzoate-active-ingredient-38610149>).

**Table 2. Deer repellent pricing & coverage**

<b>PRODUCT</b>	<b>2008 PRICING (approx.)</b>	<b>COVERAGE</b>
<b>Deer Away (Big Game Repellent) Powder Form</b>	➤ \$20.90/lb	One pound of powder treats 400 seedlings in the field, or 800 bundled/bagged seedlings
<b>Deer Away (Big Game Repellent) Liquid Form</b>	➤ \$20.90/gallon kit	One gallon of liquid (mixed) treats 400 seedlings in the field, or 800 bundled/bagged seedlings
<b>DeerBusters Hanging Sachets</b>	➤ \$24.95/pail (24/pail)	Hang one every few feet throughout area to be protected
<b>Bye Deer Sachets</b>	➤ \$17.49/6 pouches	Hang throughout area to be protected
<b>Deer Stopper</b>	➤ \$33.12/qt. concentrate ➤ \$129.99/gal concentrate ➤ \$324.00/5 gal concentrate	16 oz of concentrate mixes with water to make 1.25 gal. of spray that will treat 4,500 sq.ft.
<b>Plantskydd (Soluble powder)</b>	➤ \$24.95/lb ➤ \$39.95/2.2 lb ➤ \$349.95/22 lb	Each pound of powder concentrate, when mixed with water, treats 200-300 plants (sprayed), or 300-400 plants (dipped)
<b>DeerBusters Coyote Urine Sachets</b>	➤ \$29.95/qt. ➤ \$99.95/gal	Apply to scent tags and hang tags from individual plants
<b>Not Tonight Deer</b>	➤ \$12.99/6oz bag ➤ \$69.99/5# bag	6oz bag makes 5 gallons of liquid to treat 5,000 sq.ft.
<b>Dr. T's Deer &amp; Rabbit Repellent</b>	➤ \$22.50/pint	One pint makes one gallon of spray to cover 2,000 sq.ft.
<b>Liquid Fence</b>	➤ \$39.99/40 oz conc. ➤ \$124.99/gal conc.	1 gallon concentrate covers 32,000 sq. ft.
<b>Hinder Deer &amp; Rabbit repellent</b>	➤ \$18.99/qt. conc. ➤ \$37.99/gal. conc.	1qt. concentrate makes 5 gallons of spray
<b>Tree Guard</b>	➤ \$49.00/gal. premix ➤ \$104.00/2.5 gal. premix	1 gallon covers approximately 1,000 tree seedlings
<b>Repellex Original Deer &amp; Rabbit Repellent</b>	➤ \$14.99/32 oz premix ➤ \$29.99/1 gal premix ➤ 34.99/32 oz concentrate ➤ 119.99/1 gal concentrate	32 oz premix will cover 30-40 plants 16"-18" tall 1 gal premix will cover 120-160 plants 1 qt. concentrate will cover 240-320 plants 1 gal concentrate will cover 960-1280 plants
<b>Repellex Fruit &amp; Vegetable Organic Deer &amp; Rabbit Repellent</b>	➤ \$14.99/32 oz premix ➤ \$29.99/1 gal premix ➤ \$34.99/32 oz concentrate ➤ \$119.99/1 gal concentrate	32 oz premix will cover 30-40 plants 16-18" tall 1 gal premix will cover 120-160 plants 1 qt. concentrate will cover 240-320 plants 1 gal concentrate will cover 960-1280 plants
<b>Deer Off</b>	➤ \$146.04/gal concentrate ➤ \$315.30/2.5 gal concentrate	1 gallon concentrate makes 8 gallons of mixture, to cover approx. 16,000 sq. ft.
<b>Promois Milk (hydrolyzed casein) – home remedy</b>	➤ ~\$8.00/4.0 liters (2006 pricing)	Four liters will treat ~500 30cm. seedlings.

**Table 3. Hinder Application Information**

<b>TIMING</b>	<b>ROW/FIELD CROPS</b>	<b>FLOWERS</b>	<b>VEG./ GARDENS</b>	<b>ORNAMENTALS</b>	<b>FRUIT TREES</b>	<b>NURSERY STOCK</b>	<b>CHRISTMAS TREES</b>
<b><u>GROWING SEASON</u></b>							
<b>PRE-PLANT</b>	N/A	[ Spray sets/flats before planting 1:10 ]				[ Dip seedlings before planting at 1:10 ]	
<b>1<sup>ST</sup> SPRAY</b>	[ Seedling Emergence 1:20 ]	[ Flower Bud Sets-1:20 ]	[ 1 <sup>st</sup> Set of leaves-1:20 ]			[ Spray at greentip or at candling for conifers - 1:20 ]	
<b>SPRAY SCHEDULE</b>	[ Silking Stage and maturity 1:20 ]	[ 7-10 days or when new growth since last spray exceeds 6" 1:20 ]	[ 1:20 ]	[ 1:20 ]	[ 1:20 ]	[ 1:20 ]	[ 1:20 ]
<b><u>DORMANT SEASON</u></b>							
<b>1<sup>ST</sup> SPRAY</b>	N/A	N/A	N/A			[ Spray at bud set (Late Oct) then apply monthly as conditions permit 1:10 ]	
<b><u>ANTLER RUBBING</u></b>	N/A	N/A	N/A			[ Apply to drip on trunk 1 <sup>st</sup> application = ~ Labor Day 2 <sup>nd</sup> application = ~ Late September  1:1 for trees > 1" DBH 1:5 for small trees and shrubs ]	

**Table 4. Deer-Away Application Information**

<b>TIMING</b>	<b>ROW/FIELD CROPS</b>	<b>FLOWERS</b>	<b>VEG./ GARDENS</b>	<b>ORNAMENTALS</b>	<b>FRUIT TREES</b>	<b>NURSERY STOCK</b>	<b>CHRISTMAS TREES</b>
<b><u>DORMANT SEASON</u></b>							
<b>1<sup>st</sup> Spray</b>	N/A	N/A	N/A	Apply at greentip and before flowering. Apply at bud set and after harvest to bearing trees. Spray may burn young, non-bearing trees in growing season.  1:3 concentration (follow label directions)			
<b>SPRAY SCHEDULE</b>	N/A	N/A	N/A	Apply monthly as conditions permit or as needed.			
<b>ANTLER RUBBING</b>	N/A	N/A	N/A	Apply as drip on trunk. 1 <sup>st</sup> Application = ~ Labor Day 2 <sup>nd</sup> Application = ~ Late September 1:3 Concentration (follow label directions)			

## COMMERCIAL GOOSE REPELLENTS

Canada geese are grazers, preferring short-grass areas adjacent to water sources in which to forage, such as lawns, golf courses, cemeteries and athletic fields. Large numbers of geese foraging in these urban/suburban settings can be a nuisance due to the amount of fecal matter they leave behind (approximately ½#/goose/day), and the amount of damage they can inflict on turf grass areas through over-grazing. Geese can also decimate crops, such as alfalfa, winter wheat, oats, buckwheat, soybeans and even corn, when the cobs are within 38" of the ground. Damage to crops occurs via foraging and trampling. In regions where open water and a reliable food source are available year-round, geese have formed resident populations which no longer migrate. These populations continue to increase in size as their offspring also become resident geese.

Repellents can be effective in controlling the number of geese frequenting an area, but can be costly, due to the large quantities needed to be effective, and the need to reapply after periods of precipitation. Frequent reapplication in turf-grass areas is also necessary to ensure adequate coverage during the growing season, especially after mowing. Therefore, other methods of damage prevention are preferable over the use of repellents, whenever feasible. Damage control methods, such as hazing, can be used in conjunction with repellents for greater success. Additional methods include temporary, emergency measures such as the placement of electric or barrier fencing between the foraging area and water source. More permanent solutions include the planting of wetland buffers, and population management as a result of hunting pressure. Strategic placement of crop fields can also be a factor in reducing damage by Canada geese. Crops that are susceptible to grazing should not be placed adjacent to ponds and lakes in areas where Canada geese pose a problem. Rather, these areas may be more suitable to the establishment of hayfields and pasture areas, which are more resilient to the effects of trampling and grazing, and could act as a lure to prevent geese from traveling to the more susceptible crop fields.

Refer to **Table 5** for a listing of commercial goose repellent products and the manufacturer/source information. **Table 6** lists pricing and coverage information for each repellent outlined in **Table 5**. Contact information for sources is included in **Appendix I** of this handbook.

Three of the four repellent products listed in **Table 5** contain methyl anthranilate as the active ingredient. Methyl anthranilate is a human and livestock food flavoring that is derived from concord grapes. It is safe to use and environmentally friendly, but in studies undertaken by USDA's National Wildlife Research Center, the repellent has had very limited success in controlling the grazing of geese on turf grasses. The chemical was effective when first applied, but its effectiveness dramatically decreased four days after application, rendering the repellent impractical due to cost and labor constraints. The reader is invited to pursue additional information concerning this study by clicking on the following link : [http://www.aphis.usda.gov/wildlife\\_damage/nwrc/publications/96pubs/96-14.pdf](http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/96pubs/96-14.pdf). More information concerning avian repellents is provided in the following USDA National Wildlife Research Center publication [http://www.aphis.usda.gov/wildlife\\_damage/nwrc/publications/02pubs/aver027.pdf](http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/02pubs/aver027.pdf).

**PLEASE NOTE: REFER TO THE MANUFACTURER'S LABEL FOR APPLICATION INSTRUCTIONS FOR EACH OF THE COMMERCIAL REPELLENTS LISTED IN TABLE 5.**

**Table 5. Goose Repellent Products**

<b>PRODUCT</b>	<b>ACTIVE INGREDIENT(S)</b>	<b>MANUFACTURER</b>	<b>SOURCES</b>	<b>COMMENTS</b>
<b>Flight Control Plus</b>	Anthraquinone	Arkion Life Sciences, LLC 3521 Silverside Rd. Wilmington, DE (302)695-5502 <a href="http://www.arkionls.com/">http://www.arkionls.com/</a>	Sepro Corp.  John Deere Landscapes  Midwest Aqua Care	A taste aversion agent that is safe to use on turf-grasses and ornamental trees & bushes. Also approved for use on building surfaces and roof structures. Not for use on food crops. Is visible to geese in ultraviolet light. (Ballinger et al.) (B.A. Kimball, D.L. Nolte) (Kimball et al.) (Kimball et al.) (Ferraro) (Trent et al.) (Campbell et al.) (L. Clark, J. Shivik) (A.G. Hile, M.G. Tordoff) Mow area to be treated prior to application. Repellent will persist through precipitation and irrigating. If geese are still present after the treated area is mowed, reapplication will be necessary.
<b>Rejex-it Migrate for Turf</b>	Methyl Anthranilate (14.5%)(a natural component of concord grapes)	Ceannard, Inc. P.O. Box 2404 Gastonia, NC 28054 (866)532-5737 <a href="http://ceannardinc.com/">http://ceannardinc.com/</a>	Martinson-Nicholls, Inc.  Reed Joseph International  Bird B Gone, Inc.	A taste aversion agent that is safe to use on food crops. Produces gastro-intestinal upset, thus creating a taste aversion to the product. For protection of turf-grasses mow area to be treated before application. Retreatment is necessary to maintain control as grass grows. Other brand names include Crop Guardian.
<b>Rejex-it Fog Force (TP-40)</b>	Methyl anthranilate(40%)	Ceannard, Inc. P.O. Box 2404 Gastonia, NC 28054 (866)532-5737 <a href="http://ceannardinc.com/">http://ceannardinc.com/</a>	Martinson-Nicholls, Inc.  Reed Joseph International  Bird B Gone, Inc.	As a fogging agent, this repellent produces irritation of the eyes and mucous membranes of birds that are exposed to the aerosol droplets. Used to repel nuisance birds such as starlings, blackbirds, cowbirds, gulls, Canada geese, mallards and other birds. Fog generator must be able to produce a dry fog for best results. Repeat application 4-6 times to repel established flocks.
<b>Liquid Fence Goose Repellent</b>	Methyl anthranilate (20%)	Liquid Fence Co., Inc. PO Box 300 Broadheadsville, PA 18322 (570) 722-8165 <a href="http://www.liquidfence.com/">http://www.liquidfence.com/</a>	The Liquid Fence Company	Taste aversion agent used to protect turf grasses. Produces gastro-intestinal upset, thus creating a taste aversion to the product. Can be used year-round to deter feeding geese. Must be reapplied after mowing, rain or irrigation.
<b>Flockbuster</b>	Cinnamon oil, citric acid, clove oil, peppermint oil, rosemary oil, sodium chloride, thyme oil, white pepper,	Skeet-R-Gone 5515 University Ave. Grand Forks, ND 58203 (701)373-0670 (General Info) (866)599-7410 (Technical Assistance) <a href="http://www.skeetrgone.com">www.skeetrgone.com</a>	Flockbuster 159 8 <sup>th</sup> Avenue NorthWest West Fargo, ND 58078 (877)662-7697 <a href="http://www.flockbuster.com">www.flockbuster.com</a>	Is a combination of 3 scent and 4 taste aversions to repel a wide variety of birds including blackbirds, Canada geese, gulls, pigeons, and other nuisance birds. Safe to use on all food crops. Is EPA and FIFRA exempt as it is 100% ecologically and biologically safe. Aerial application is recommended. Wait for 10 days before harvest to allow product effects to diminish. Can also be used on turf areas, such as golf courses, lawns, and at airports. Aerial application is recommended to protect agricultural crops.

**Table 6. Goose repellent pricing and coverage**

PRODUCT	2008 PRICING (APPROX.)	COVERAGE
<b>Flight Control Plus</b>	<ul style="list-style-type: none"> <li>➤ \$230.00/gal concentrate</li> <li>➤ \$825.00/cs (4 gal conc./case)</li> </ul>	<p>½ - 1 gallon of concentrate mixed with 55 gallons of water will treat 1 acre of turf. If used as a structural repellent to repel a variety of bird species, apply full strength, or slightly diluted with water, with a paintbrush or roller on the surfaces to be protected.</p>
<b>Rejex-it Migrate for Turf</b>	<ul style="list-style-type: none"> <li>➤ \$90.00/gal concentrate</li> <li>➤ \$320.00/cs (4 gal conc./case)</li> </ul>	<p>2.5 gallons of concentrate mixed with 50 gallons of water will treat 1 acre of turf.</p>
<b>Rejex-it Fog Force</b>	<ul style="list-style-type: none"> <li>➤ 154.00/gal</li> <li>➤ \$600.00/case (4 gal)</li> </ul>	<p>For outdoor use, apply undiluted at a rate of 6-8 oz/acre with either a thermal or mechanical fogger.</p>
<b>Liquid Fence Goose Repellent</b>	<ul style="list-style-type: none"> <li>➤ \$39.99/1 qt. concentrate</li> <li>➤ 119.99/gallon concentrate</li> </ul>	<p>1 qt. concentrate makes 2 gallons mixture.            1 gallon concentrate makes 8 gallons mixture.            1 quart of mixture will cover up to 4,000 sq. ft. of turf.</p>
<b>Flockbuster</b>	<ul style="list-style-type: none"> <li>➤ \$150.00/gallon concentrate</li> </ul>	<p>Mix one part concentrate to 75 parts water. To protect turf grasses, spray areas where geese are known to congregate. To protect agricultural crops, such as corn seedlings, aerial application is recommended at a rate of 5 gallons/acre of diluted product initially, reducing to 2.5 gallons/acre of diluted product for residual maintenance. Allow 10 days prior to harvest.</p>

## **REPELLENTS FOR ADDITIONAL AVIAN SPECIES**

Small grain and fruit crops are susceptible to damage from a multitude of avian species. To name just a few, blackbirds, grackles, European starlings, crows, brown-headed cowbirds, and cedar waxwings take full advantage of these easily accessible, high-energy foods. A wide variety of avian repellents have been tried and tested, with mixed success. Products containing methyl anthranilate have been tested with limited success in the protection of crops, such as rice, sunflowers, blueberries, cherries & grapes. The effects of this repellent are reduced when alternative sources of food are scarce or unavailable. When applied as an aerosol with a fogging machine, however, its effectiveness increases dramatically. This may be due to a higher concentration of active ingredient (40% as opposed to approx. 15-27%), as well as to the method of delivery. To access the USDA National Wildlife Research Center (NWRC) study concerning the testing and use of methyl anthranilate as an avian repellent for rice and sunflower crops, follow the link below:

[http://www.aphis.usda.gov/wildlife\\_damage/nwrc/publications/05pubs/werner052.pdf](http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/05pubs/werner052.pdf)

Information concerning NWRC's testing of methyl anthranilate in the protection of small fruits can be obtained through the following link:

[http://www.aphis.usda.gov/wildlife\\_damage/nwrc/publications/02pubs/aver026.pdf](http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/02pubs/aver026.pdf).

Information concerning NWRC's study of methyl anthranilate aerosol can be obtained through the following link.

[http://www.aphis.usda.gov/wildlife\\_damage/nwrc/publications/02pubs/enge022.pdf](http://www.aphis.usda.gov/wildlife_damage/nwrc/publications/02pubs/enge022.pdf).

(Engemen et al.)

Products containing anthraquinone have been more successful in repelling birds in studies, but are only approved for use on turf grasses in the control of geese (Flight Control®). This leaves growers with very few choices in chemical repellents, with the exception of methyl anthranilate. Research indicates that some substances, such as caffeine, show promise in their ability to repel avian species, but repellents containing these substances have not yet been formulated and/or approved by the EPA (Linz et al. 2007).

A listing of commercial avian repellents is contained in **Table 7**, with pricing and coverage information listed in **Table 8**. The reader is cautioned, however, that use of these repellents can become expensive, quite labor intensive, and their effectiveness is questionable. It may be more cost efficient and effective to use other means of protection, such as hazing (harassment) techniques, and/or exclusion techniques, such as bird netting, over small fruit crops.

**PLEASE NOTE: REFER TO THE MANUFACTURER'S LABEL FOR APPLICATION INSTRUCTIONS FOR EACH OF THE COMMERCIAL REPELLENTS LISTED IN TABLE 7.**

**Table 7. Avian Repellent Products**

<b>PRODUCT</b>	<b>ACTIVE INGREDIENT</b>	<b>MANUFACTURER</b>	<b>SOURCES</b>	<b>COMMENTS</b>
<b>Rejex-It Migrate for Agriculture (formerly Crop Guardian)</b>	Methyl Anthranilate (14.5%)	Ceannard, Inc. P.O. Box 2404 Gastonia, NC 28054 (866)532-5737	Martinson-Nicholls, Inc. Reed Joseph International Pest Control Solutions Bird Barrier America, Inc. Bird B Gone, Inc. Nixalite Bird Control Wildlife Control Supplies	For use on blueberries, cherries and grapes. Can be applied up to the day of harvest. If bird pressure continues, reapply within 7 days.
<b>Rejex-It Fog Force</b>	Methyl Anthranilate (40%)	Ceannard, Inc. P.O. Box 2404 Gastonia, NC 28054 (866)532-5737	Martinson-Nicholls, Inc. Reed Joseph International Pest Control Solutions Bird Barrier America, Inc. Bird B Gone, Inc. Nixalite Bird Control Wildlife Control Supplies	Used to dispel birds from large, open areas. Can be used indoors, or outdoors. Can be used to protect orchards, vineyards, and turf grass areas. Also used to dispel roosts from rooftops, etc. Apply with a thermal or mechanical fog generator.
<b>Bird Shield</b>	Methyl Anthranilate (26.4%)		Bird-X Bird Shield Repellent Corp.	Can be used to repel birds from feeding on berries, table grapes, blueberries, corn, apple and stone fruits, cereal grains, sunflowers. Also dispels birds from turf areas, ornamental plantings, non-fish bearing bodies of water, such as fountains, and structures.
<b>Flockbuster</b>	Cinnamon oil, citric acid, clove oil, peppermint oil, rosemary oil, sodium chloride, thyme oil, white pepper,	Skeet-R-Gone 5515 University Ave. Grand Forks, ND 58203 (701)373-0670 (General Info) (866)599-7410 (Technical Assistance) <a href="http://www.skeetrgone.com">www.skeetrgone.com</a>	Flockbuster 159 8 <sup>th</sup> Avenue NorthWest West Fargo, ND 58078 (877)662-7697 <a href="http://www.flockbuster.com">www.flockbuster.com</a>	Is a combination of 3 scent and 4 taste aversions to repel a wide variety of birds including blackbirds, Canada geese, gulls, pigeons, and other nuisance birds. Safe to use on all food crops. Is EPA and FIFRA exempt as it is 100% ecologically and biologically safe. Aerial application is recommended. Wait for 10 days before harvest to allow product effects to diminish. Can also be used on turf areas, such as golf courses, lawns, and at airports. Aerial application is recommended to protect agricultural crops.

**Table 8. Avian repellent pricing & coverage**

PRODUCT	2008 PRICING (APPROX.)	COVERAGE
<b>Rejex-It Migrate for Agriculture (formerly Crop Guardian)</b>	<ul style="list-style-type: none"> <li>➤ \$190.00/2.5 gallons</li> <li>➤ \$795.00/case (4 gal)</li> </ul>	2.5 - 5.0 gallons of product mixed with 25-50 gallons of water will treat 1 acre in ground application. If applied aerially, 3-6 gallons product mixed with 10-20 gallons water will treat 1 acre.
<b>Rejex-It Fog Force</b>	<ul style="list-style-type: none"> <li>➤ \$154.00/gallon</li> <li>➤ \$600.00/case (4 gal)</li> </ul>	<p><b>Outdoor applications:</b> 6-8 oz of undiluted product will treat approximately 1 acre.</p> <p><b>Indoor applications:</b> 1oz. Of undiluted product will treat 10,000 cu.ft.</p>
<b>Bird Shield</b>	<ul style="list-style-type: none"> <li>➤ \$104.00/gallon</li> </ul>	Varies with the crop being treated. Refer to product label for application information. Use .5 – 2.7 gallons of concentrate for each acre treated, depending on the vegetation density.
<b>Flockbuster</b>	<ul style="list-style-type: none"> <li>➤ \$150.00/gallon concentrate</li> </ul>	Mix one part concentrate to 75 parts water. To protect turf grasses, spray areas where geese are known to congregate. To protect agricultural crops, such as corn seedlings, aerial application is recommended at a rate of 5 gallons/acre of diluted product initially, reducing to 2.5 gallons/acre of diluted product for residual maintenance.

## COMMERCIAL SANDHILL CRANE REPELLENTS

In the early-mid 1800's, sandhill cranes (*Grus canadensis*) were a common, widely distributed species, south and west of Minnesota's heavily forested areas. However, following the expansion of European settlement, this once common species was nearly extirpated from the state, and was considered rare by 1900. By the mid-1900's it is estimated that only 10-25 pair nested in Minnesota. Their decline throughout their entire former range is thought to be due to a combination of factors, including habitat loss, as well as market and subsistence hunting. Today, under protected status, the species has become reestablished in portions of its former range. Habitat restoration (primarily wetland and prairie habitats), legal protection, and increased public awareness have played a large part in the re-establishment of this species.

Sandhill cranes are omnivores, feeding on a wide variety of invertebrates, small vertebrates, plant tubers and grains. Flightless chicks feed primarily on invertebrates, which provide the young birds with a much needed protein source necessary for development and growth. Their taste for insects and small vertebrates, such as mice, can prove to be valuable to agricultural producers as a biological control. In addition, cranes will glean harvested fields of waste grain, thereby reducing the occurrence of disease, insects and rodents. However, their taste for grains can be a detriment to growers who produce corn and small grains. Cranes are adept at probing for seeds in newly planted fields, and can decimate fields of sprouting corn by systematically pulling out the newly emerging sprouts to access the seed. This damage occurs within the first 14-17 days of new growth, while the gymnosperm is still present in the seed.

Emergency measures to control crane damage include a wide variety of hazing techniques, which over the long term, prove to be ineffective. Hazing techniques include pyrotechnic scare devices, mylar flagging, propane exploders, scarecrows, etc. Oftentimes, these hazing devices simply move the problem to the next field. In addition, cranes quickly become accustomed to the hazing, rendering it ineffective within a short period of time.

Most repellents have not proved to be successful in preventing damage to corn fields by cranes, with the exception of **Avipel** (formerly known as **Avitec**), a non-lethal crane repellent whose active ingredient is 9,10 anthraquinone. **Avipel** has been temporarily approved by the USEPA for use as a crane repellent in Minnesota, Wisconsin and Michigan for the years 2006 – 7/30/2009, and applications for long-term agricultural use are being investigated. **Avipel** can be detected by cranes at very low levels. Ingestion of seeds treated with **Avipel** is avoided, but fields planted to the treated seed are still utilized by cranes who continue to forage in them for waste grain and insects, thereby providing a valuable service as a biological control to the landowner. Subsequent relocation of the damage to adjacent fields is also therefore avoided.

**Avipel** can be used in two forms: liquid and powder. Seeds pre-treated with the liquid form can be purchased through seed distributors. Growers can also purchase the powder form of **Avipel**, which is added to the seed hopper at planting time at a rate of 3.5 oz (1 pouch) for every 42# of seed. **Please note that growers have reported that the liquid form of seed treatment is substantially more effective in repelling cranes than the powder form.**

Manufacturer, distributor, pricing and coverage information are as follows\*:

Manufacturer: Arkion Life Sciences, LLC  
3521 Silverside Rd.  
Wilmington, DE  
(302)695-5502  
<http://www.arkionls.com/>  
Avipel help line: 1-800-468-6324

Distributors: Local seed retailer  
Local seed distributor

Pricing & Coverage: Approx. \$5.00/acre

**\*PLEASE NOTE: REFER TO THE MANUFACTURER’S LABEL FOR APPLICATION INSTRUCTIONS.**

### **Commercial Repellents for Additional Wildlife Species**

**Table 9** lists repellents that are commercially available for controlling damage caused by rabbits, mice, voles, moles, gophers, skunks, groundhogs, chipmunks, and squirrels. These repellents work on the same principle as deer repellents, protecting crops from a variety of wildlife species through the avenues of fear, pain, taste, or conditioned avoidance. While research has found it to be mostly ineffective, a snake repellent (Snake Away) is also listed in **Table 9**. For more information concerning this repellent, please refer to the comments column in **Table 10**. Testing of various home remedies commonly believed to repel snakes was undertaken by North Carolina State University in 1985. The results of this testing can be accessed by following the link below.

<http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1041&context=ewdcc2>. Testing of aerosolized essential oils as snake repellents was undertaken by USDA’s National Wildlife Research Center. Results of this promising study can be reviewed by following the links below.  
[http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1466&context=icwdm\\_usdanwrc](http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1466&context=icwdm_usdanwrc).  
[http://www.aphis.usda.gov/wildlife\\_damage/nwrc/registration/content/Snake%20Repellents%20Tech%20Note.pdf](http://www.aphis.usda.gov/wildlife_damage/nwrc/registration/content/Snake%20Repellents%20Tech%20Note.pdf)

Refer to **Table 10** for pricing and coverage information for all repellents listed in **Table 9**. Contact information for sources is included in **Appendix I** of this handbook. Please note that some repellents listed as deer repellents in **Table 1** are also used as repellents for rabbits, and may not be re-listed in the following table. Therefore, please check both tables when searching for repellents that may be effective in preventing damage caused by rabbits.

Optimum results for all wildlife repellents are achieved when application begins before feeding habits are established. Results are likely to vary with local conditions.

**PLEASE NOTE: REFER TO THE MANUFACTURER’S LABEL FOR APPLICATION INSTRUCTIONS FOR EACH OF THE COMMERCIAL REPELLENTS LISTED IN TABLE 9.**

**Table 9. Commercial Wildlife Repellents**

Product Name	Target Species	Manufacturer	Active Ingredient	Type	Sources
<b>Dr. T's Snake-A-Way*</b>	Snakes	Woodstream Corp. Lititz, PA 17543 (800)800-1819	Naphthalene & sulphur	Granular, odor (area) repellent	<ul style="list-style-type: none"> <li>Gempler's</li> <li>Do-It-Yourself Pest Control</li> <li>Wildlife Control Supplies</li> <li>Local nursery &amp; garden centers</li> </ul>
<b>Bobbex-R Small Animal Repellent</b>	Rabbits, ground hogs, chipmunks, squirrels, voles	Bobbex, Inc.	Meat meal, fish oil, putrescent eggs, garlic, etc.	Liquid, odor/taste (area & contact) repellent	<ul style="list-style-type: none"> <li>Bobbex, Inc.</li> <li>Johnsons Way Plant Care</li> <li>Wildlife Control Supplies</li> <li>Local nursery &amp; garden centers</li> </ul>
<b>Shake-Away Small Animal Repellent</b>	Chipmunk, gopher, groundhog, porcupine, possum, rabbit, skunk, squirrel, woodchuck	Shake-Away	Fox urine	Granular odor (area) repellent that induces a fear response	<ul style="list-style-type: none"> <li>Gempler's</li> <li>Local Ace Hardware Stores</li> <li>Shake-Away</li> </ul>
<b>Shake-Away Rodent Repellent</b>	Mice, moles, rats, shrews, voles	Shake-Away	Fox & bobcat urine	Granular odor (area) repellent that induces a fear response	<ul style="list-style-type: none"> <li>Gempler's</li> <li>Local Ace Hardware Stores</li> <li>Critter-repellent.com</li> <li>Shake-Away</li> </ul>
<b>Garlic Barrier</b>	Deer, rabbits, mice, geese, insect pests	Garlic Research Labs	Garlic Oil	Liquid, odor/taste (area/contact) repellent	<ul style="list-style-type: none"> <li>Gempler's</li> <li>Garlic Research Labs, Inc.</li> </ul>
<b>Dr. T's Mole Out</b>	Moles, skunks, voles	Woodstream Corp. Lititz, PA 17543 (800)800-1819	Castor oil	Granular taste repellent (creates taste aversion through stomach upset)	<ul style="list-style-type: none"> <li>Gempler's</li> <li>Professional Pest Control Prod.</li> <li>Havahart</li> </ul>
<b>Liquid Fence Mole Repellent</b>	Moles, voles & gophers	Liquid Fence Company, Inc.	Castor oil	Liquid spray taste repellent (creates taste aversion through stomach upset)	<p>The Liquid Fence Company</p> <ul style="list-style-type: none"> <li>Local nursery &amp; home &amp; garden centers</li> </ul>
<b>Repellex Mole, Vole &amp; Gopher Repellent</b>	Moles, voles, & gophers	Repellex USA, Inc, Niles, MI 49120 (877)737-3539 <a href="http://www.repellex.com">www.repellex.com</a>	Castor oil, pepper & garlic oils	Granular or liquid taste repellent	<ul style="list-style-type: none"> <li>Repellex</li> </ul>
<b>Whole Control</b>	Moles, voles, pocket gophers, armadillos	Dr. T's Nature Products, Inc. Pelham, GA 31779 1-800-800-1819	Castor oil	Liquid taste repellent	<ul style="list-style-type: none"> <li>Nixalite of America Inc.</li> <li>Havahart</li> <li>Gempler's</li> </ul>

\* Refer to Table 10 for comments concerning the effectiveness of this product.

**Table 10. Commercial Wildlife Repellent Pricing & Coverage**

Product	2008 Pricing (approx.)	Coverage	Comments
<b>Dr. T's Snake-A-Way</b>	<ul style="list-style-type: none"> <li>➤ \$15.90/4#</li> <li>➤ \$99.95/28#</li> <li>➤ \$375.85/112#</li> </ul>	4# will treat 200 to 250 linear feet	Apply in bands around area of exclusion. Manufacturer claims that many, but not all species of snakes avoid contact with the granules. Will not consistently repel corn and other rat snakes, nor moccasin snakes, such as cotton-mouths and copperheads. <sup>1</sup>
<b>Bobbex-R Small Animal Repellent</b>	<ul style="list-style-type: none"> <li>➤ \$26.75/quart conc.</li> <li>➤ \$59.95/.5 gal. conc.</li> <li>➤ \$115.75/2.5 gal. conc.</li> </ul>	Quart conc. makes 2.5 gal. of mixture .5 gal. conc. makes 4.5 gal. of mixture 2.5 gal conc. makes 22.5 gal. of mixture	Do not apply to the edible portion of fruit & vegetable plants, as product contains a sticker which adheres to the leaves & stems of treated plants.
<b>Shake-Away Small Animal Repellent</b>	<ul style="list-style-type: none"> <li>➤ \$14.95/20 oz</li> <li>➤ \$28.95/3#</li> <li>➤ \$99.95/12#</li> </ul>	20oz bottle provides a line of protection 600' long 3# bottle protects 1500'	Provides a scent barrier around crops to be protected. Apply twice/week for the first 2 weeks, then once/month thereafter.
<b>Shake-Away Rodent Repellent</b>	<ul style="list-style-type: none"> <li>➤ \$14.95/20 oz</li> <li>➤ \$28.95/3#</li> <li>➤ \$99.95/12#</li> </ul>	20oz bottle will provide a line of protection 600' 3# bottle will provide a line of protection 1500'	Provides a scent barrier around the crops to be protected. Apply twice/week for the first 2 weeks, then once/month thereafter.
<b>Garlic Barrier</b>	<ul style="list-style-type: none"> <li>➤ \$9.95/quart conc.</li> <li>➤ \$84.95/gal. (twice conc.)</li> </ul>	Dilute quart bottle with water 10:1 Dilute gallon bottle with water 99:1	Reapply every 10-14 days. Safe for use with edible crops. Spray on turf grasses to repel geese.
<b>Dr. T's Mole Out</b>	<ul style="list-style-type: none"> <li>➤ 14.99/5#</li> <li>➤ 69.00/25#</li> </ul>	Apply at a rate of 1#/500 sq. ft.	Dr. T's Mole Out is the granular form of Whole Control. Treat each tunnel, followed by broadcasting of granules over entire area to be protected. Water area after each application. Apply in spring, summer and fall of each year. For use on turf grasses and garden areas. Safe for use with edible crops.
<b>Liquid Fence Mole Repellent</b>	<ul style="list-style-type: none"> <li>➤ 39.99/gal conc.</li> <li>➤ 84.99/2.5 gal conc.</li> </ul>	1 gal. concentrate covers 40,000 sq. ft.	Protects turf-grass areas. Apply in early spring, summer and fall of each year.
<b>Tree Guard</b>	<ul style="list-style-type: none"> <li>➤ 49.00/gal. premix</li> <li>➤ 104.00/2.5 gal. premix.</li> </ul>	1 gallon covers approx. 1,000 tree seedlings	Protects tree seedlings, shrubs, ornamentals, hedges and flowers. Not for use on edibles. Can be used as a spray or dip. Do not dilute with water. Protects up to 100 days. Does not wash off with precipitation.
<b>Repellex Mole, Vole &amp; Gopher Repellent</b>	<ul style="list-style-type: none"> <li>➤ \$17.99/32oz liquid premix</li> <li>➤ \$49.99/gal liquid conc.</li> <li>➤ \$15.99/7# dry granular</li> <li>➤ \$49.99/24# dry granular</li> </ul>	32 oz premix will cover 8,000 sq. ft. of lawn 1 gal of conc. will cover 32,000 sq. ft. of lawn Each pound of granular covers 1,000 sq. ft.	Not for use on edibles. Apply granular with a broadcast spreader. Protects up to 90 days.
<b>Whole Control</b>	<ul style="list-style-type: none"> <li>➤ \$14.50/32oz.</li> <li>➤ \$42.00/gal</li> </ul>	One quart will cover approximately 10,000 sq. ft.	Apply with garden hose attached to self-dispensing unit (quart size) or spray applicator. Apply in spring, summer & fall for year-round control. Protects up to 90 days. For use on turf grass and garden areas. Safe for use with edible crops.

1 . . Research undertaken by the University of Nebraska Cooperative Extension in 1995 indicates that the plains garter snake was not repelled by either of the active ingredients in this product (naphthalene & sulphur). This study can be accessed by following the link below. <http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1431&context=gpwdcwp>

**Arkion Life Sciences, LLC**

3521 Silverside Rd.  
Wilmington, DE  
(302)695-5502  
<http://www.arkionls.com/>  
Avipel help line: 1-800-468-6324

**Bird-B-Gone, Inc.**

23918 Skyline  
Mission Viejo, CA 92692  
(800)392-6915  
<http://www.birdbgone.com/>

**Bird Barrier, Inc.**

20925 Chico Street  
Carson, CA 90746  
(800)503-5444  
<http://www.birdbarrier.com/>

**Bird Shield Repellent Corporation**

P.O. Box 785  
Pullman, WA 99163  
(509)339-5740  
<http://www.birdshield.com/index.html>

**Bye Deer, LLC**

9000 Bronson Drive  
Potomac, MD 20854-4606  
(301)765-0481

**Biocontrol Network**

5116 Williamsburg Rd.  
Brentwood, TN 37027  
(800)441-2847  
<http://www.biconet.com/>

**Bobbex, Inc.**

52 Hattertown Rd.  
Newtown, CT 06470  
(800)792-4449  
<http://www.bobbex.com/>

**Critter Repellent.com**

P.O. Box 101  
Canisteo, NY 14823  
(866)802-8837  
<http://www.critter-repellent.com/>

**DeerBusters**

9735A Bethel Rd.  
Frederick, MD 21701-2017  
(888)422-3337  
<http://www.deerbusters.com/>

**Do-It-Yourself Pest Control**

305 Shawnee North Drive  
Suite 100  
Suwanee, GA 30024  
(800)476-3368  
<http://store.doyourownpestcontrol.com/>

**Flockbuster**

159 8<sup>th</sup> Avenue NorthWest  
West Fargo, ND 58078  
(877)662-7697  
[www.flockbuster.com](http://www.flockbuster.com)

**Forestry Suppliers, Inc.**

205 W. Rankin St.  
P.O. Box 8397  
Jackson, MS 39284-8397  
(800)647-5368  
[www.forestry-suppliers.com](http://www.forestry-suppliers.com)

**Garlic Research Labs**

624 Ruberta Ave.  
Glendale, CA 91201-2335  
800-424-7990  
<http://www.garlicbarrier.com/>

**Gempler's**

P.O. Box 44993  
Madison, WI 53744  
1-800-382-8473  
<http://www.gemplers.com/>

**Havahart**

Woodstream Corp.  
69 N. Locust Street  
Lititz, PA 17543  
(800)8001819  
<http://www.havahart.com/>

**Itasca Greenhouse, Inc.**  
26385 Blackwater Road  
P.O. Box 273  
Cohasset, MN 55721  
(800)538-8733  
<http://www.itascagreenhouse.com/>

**John Deere Landscapes**  
Refer to company website to locate branch nearest  
you (800)347-4272

**Johnsons Way Plant Care**  
W186 N6520 Marcy Road  
Menomonee Falls, WI 53051-4932  
(800)869-1310  
<http://www.johnsonsway.com/>

**Midwest Aqua Care, Inc.**  
10001 Great Plains Blvd.  
Chaska, MN 55318  
(877)430-0143  
[http://www.midwestaquacare.com/item/goose\\_repellent](http://www.midwestaquacare.com/item/goose_repellent)

**Martinson-Nicholls, Inc.**  
4910 E. 345<sup>th</sup> St.  
Willoughby, OH 44094  
(800)876-1312  
<http://www.floormat.com/rejexit.html>

**Not Tonight Deer**  
428 W. Spruce Lane  
Louisville, CO 80027  
(888)535-2030  
<http://www.nottonight.com/>

**Nixalite of America, Inc.**  
1025 16<sup>th</sup> Avenue  
East Moline, IL 61244  
(888)624-1189  
<http://www.nixalite.com>

**Pest Control Solutions**  
2938 Ridgeway  
Memphis, TN 38115  
(877)800-6884  
<http://www.pestcontrol-products.com>

**Professional Pest Control Products**  
6920 Pine Forest Road  
Pensacola, FL 32526  
(800)434-4555  
<http://www.pestproducts.com/>

**Reed Joseph International**  
800 Main Street  
Greenville, MS 38701  
(800)647-5554  
<http://www.reedjoseph.com/>

**Repellex USA, Inc.**  
P.O. Box 396  
Niles, MI 49120  
(877)737-3539  
[www.repellex.com](http://www.repellex.com)

**Shake-Away**  
2330 Whitney Ave.  
Hamden, CT 06518  
(800)517-9207  
<http://www.shake-away.com/>

**Sepro Corporation**  
11550 North Meridian Street, Suite 600  
Carmel, IN 46032  
(317)580-8281  
<http://www.sepro.com/default.php>

**Snow Pond Farm Supply**  
227 Centre Ave., Rt. 123  
P.O. Box 2021  
Abington, MA 02351  
(781)878-5581  
<http://www.snow-pond.com/>

**The Liquid Fence Company**  
P.O. Box 300  
Brodheads ville, PA 18322  
(800)923-3623  
<http://www.liquidfence.com/>

**Treessentials Company**  
60 E. Plato Blvd., Suite 130  
St. Paul, MN 55107-1827  
(800)248-8239  
<http://www.treessentials.com/>

**Tree World Plant Care Products, Inc.**  
1421 S. 11<sup>th</sup> St.  
St. Joseph, MO 64503  
(800)252-6051  
<http://www.treeworld.com/>

**Wildlife Control Supplies**  
P.O. Box 538  
East Granby, CT 06026  
(860)844-0101  
<http://www.wildlifecontrolsupplies.com>

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