

University of Massachusetts Cooperative Extension System

CO-EXISTING WITH  
**BLACK BEARS**  
IN MASSACHUSETTS

GUIDELINES FOR THE  
PREVENTION AND MANAGEMENT  
OF BEAR DAMAGE

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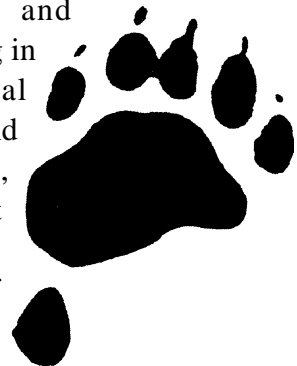
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# INTRODUCTION

**B**lack bears (*Ursus americanus*) are the only bear species found in the eastern United States. They are large, wide-ranging, relatively long-lived, intelligent, and generally elusive animals. They have one of the lowest reproductive rates of any North American mammal. Because of their large size, domineering presence, and adaptability in range and food habits, bears frequently have been regarded by humans as nuisances or competitors and their numbers have been reduced by vigorous control measures and changes to their habitat. More recently, black bears have been treated as big game animals, and valued for the recreational hunting opportunity provided during limited open seasons. Reactions of humans to bears often are colored by our cultural background and exposure to distorted presentations in the media, resulting in attitudes ranging from irrational fear to emotional protectionism. Such responses complicate the biological and ecological aspects of black bear management programs, which must address bear biology and ecology, habitat conservation, and human-bear interactions. These aspects must be integrated into a balanced program of consumptive and non-consumptive measures designed to manage bear populations at levels compatible with the available habitat and human interests.

If we are to understand why bear damage occurs and how it can be minimized or prevented, then a basic understanding of black bear biology and ecology is required (i.e., how bears live, behave, and fit into the environment). For this reason, the following brief summary of black bear life history and behavior has been included.



# BLACK BEAR

## BIOLOGY AND ECOLOGY

### *Description*

**B**lack bears are large-bodied animals that have a small, narrow head, powerful limbs, and small ears. Bears in the Northeast are entirely black with a brown muzzle and, occasionally, a small white chest patch (Figure 1). Adult females weigh 100-180 pounds whereas adult males are larger, at 150-300 pounds. The existing state record (dressed weight) for a male black bear in Massachusetts is 467 pounds (or greater than 550 pounds live weight). Black bears have 5 toes, each with a well-developed claw, on both front and hind feet, and teeth adapted for feeding on both plant and animal matter.

### *Range*

Black bears inhabit much of Alaska, Canada, and the western and north central United States. In the East, they occur along the Appalachian Mountains from Maine to Florida. In Massachusetts, bears are found in suitable habitat everywhere west of the Connecticut River and, in lesser densities, east of the Connecticut River from Franklin County through central Worcester County.

### *Habitat and Food Preferences*

Typical black bear habitat is characterized by remote terrain, thick understory vegetation, and an abundance of seasonal fruits, berries, and nut crops. Wetlands are of prime importance to bears in Massachusetts, especially in spring and early summer when these areas provide food (grasses, sedges, tubers, and various fruits and berries) and cover, and serve as travel corridors. Ants and other insects commonly are consumed in summer. Nut crops, especially acorns, hickory nuts, and beechnuts, are preferred fall foods.

Bears frequently adapt to human presence, but in developed areas, human intolerance of bears may lead to a reduction of the bear population. Near urban and agricultural areas, depredations by bears



*Figure 1: Bear in cornfield*

are most likely to occur in spring when natural foods are scarce, or in late summer and fall, especially during years of poor berry and nut yields.

### *Reproduction*

Female black bears become sexually mature at 3-5 years of age, and generally breed every other year thereafter. Mating takes place in late June and July, but embryonic development does not begin until November or December. Two to four cubs, each weighing about one-half pound, are born in late January or early February while the female is denning. Young remain with the female for about 16 months, and will den with her again during the second winter but disperse from the family group the following spring. Mortality is highest among young dispersing individuals, particularly males, due to inexperience, movement into unfamiliar territory in pursuit of food and home ranges, and competition. Because of the relatively low reproductive potential of bears, any change in breeding age, litter size, and frequency of breeding resulting from food shortages or stress may seriously affect the stability of bear populations.

### *Home Range, Activities, and Movements*

A black bear's home range is not an exclusive territory that is defended against other bears, but rather is an area familiar to the bear and in which it spends most or all of its time during the course of the year.

Considerable overlap may occur in ranges among bears of different sexes and ages, but bears usually avoid direct contact with each other. The average home range of an adult, male bear in Massachusetts is about 120 square miles whereas that of a female is only 11 square miles. After the family unit (a female and her young) breaks up, yearlings generally remain within the mother's home range until they become sub-adults, at which time they form their own home range. Sub-adult females usually just expand their yearling range, but sub-adult males often move substantial distances (12-60 miles) and establish a range well outside their rearing area. These dispersing young males sometimes wander into suburban areas, causing concern among residents unfamiliar with bear habits and behavior.

Bears may be active throughout daylight hours, but particularly at dawn and dusk. Bears in Massachusetts rarely are active at night, except during the breeding season or where contact with humans is frequent. Movements by bears usually are limited in spring, but, by summer, breeding males may travel widely. In fall, bears become less active and their travels are limited to areas near productive food sources. Onset of denning occurs from early November to early December and is related to the fall food supply; denning occurs early when foods are scarce or later if foods are abundant. Bears will den in brush piles, logging slash, hollow trees, under rock outcrops, or simply at the base of a tree. The date of emergence from the winter den is variable, but most

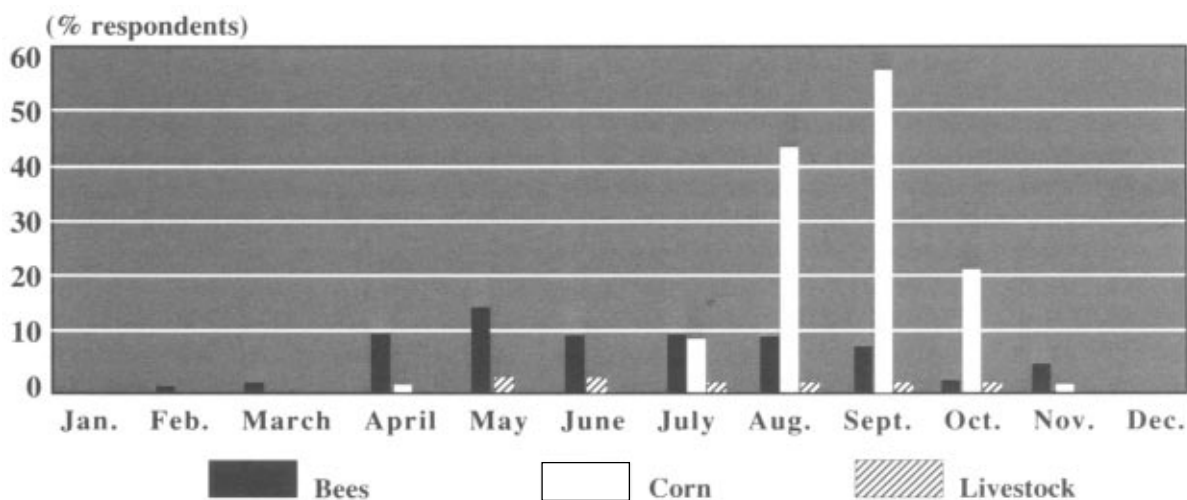
bears in Massachusetts will leave the den in early to mid-April. The timing of emergence is dictated more by the availability of food than the weather conditions. Adult males usually emerge first; females with newborn cubs frequently emerge last.

### *Legal Status*

Black bears are regulated as a game species in Massachusetts and may be hunted by permit only during a limited open season. Trapping of bears is illegal in the Commonwealth. Current hunting season dates are listed in the pamphlet "Abstracts of the Massachusetts Fish and Wildlife Laws", available from city and town clerks. The complete text of the regulations may be found in the Code of Massachusetts Regulations, 321 CMR 3.02(1).

Persons suffering damage by a bear are urged to contact the nearest District Office of the Massachusetts Division of Fisheries and Wildlife (MDFW) prior to taking any control action. When such contact is made immediately following damage, or beforehand in situations where damage is anticipated, Division personnel will provide recommendations on appropriate preventive measures or control strategies that can lessen the problem. Under certain circumstances, landowners, tenants, members of their immediate families, or persons permanently employed by them may kill a bear that is damaging their property. When authorized, lethal measures may only be employed in accordance with provisions of Chapter 131, Section 37, Massachusetts General Laws.

*Figure 2: Seasonal Occurrence of Depredations by Bears in Massachusetts, 1990*



# STATUS OF BLACK BEAR DAMAGE

In Massachusetts, black bear depredation is not a state-wide problem, rather it is local, seasonal, and can be quite severe for individual growers. Within the bear's known range, the incidence of damage has increased 23% since 1985. During 1990, 15% of the agricultural producers in the Commonwealth experienced some damage from bears. When depredations occur, they usually coincide with maturity of the corn crop, pollination season for bees/honey, or the livestock birthing season (Figure 2). Damage attributed to a bear can be verified by actually seeing a bear cause damage or by other on-site evidence of a bear's presence (tracks, feces). Although damage incurred by agricultural producers has ranged from less than \$100 to more than \$3000/year, the number of depredation incidences averaged less than 5/year. A recent survey of agricultural producers revealed that they maintain a positive attitude toward black bears in the environment and are willing to tolerate bears provided that they personally do not incur damage to their commodities. In fact, most producers also recommended that the bear population in Massachusetts should either stay at its current level or continue to slowly increase.

## BLACK BEAR DAMAGE MANAGEMENT RECOMMENDATIONS

As the bear population continues to expand (current population estimates project a 50% increase in bear numbers over the next 5-7 years), the likelihood of depredation by bears also is anticipated to increase. Thus, there will be a clear need for damage management and prevention, particularly for producers located within the existing range of bears in Massachusetts.

Black bears are highly intelligent animals with a keen learning capacity. They will adapt to changes in habitat or food sources, and tolerate contact with humans as they search for food, particularly foods associated with humans in suburban areas. In addition, bears are capable of remembering from year to year

the location of reliable sources of food. Thus, it is important to take precautions to prevent depredations from occurring and to not entice bears with food. Although bears are secretive and shy by nature, they are wild and unpredictable animals, and may become aggressive in response to abuse or undue provocation.

The measures by which bear damage may be alleviated vary with the nature and severity of the problem, and may include proactive preventive actions and/or control measures applied after damage has occurred. For producers located within or adjacent to known bear range, precautions should be taken to avoid potential confrontations and loss before damage actually occurs. The most effective and long-lasting success will be gained through damage prevention rather than "after-the-fact" responses to a bear that already has gained access to foods or adapted to its availability. Bears learn rapidly and if their activities are "rewarded" by food, many barriers or harassment techniques will be substantially less effective than if these animals had been excluded initially. As is true in most problem wildlife situations, no technique will provide absolute security from depredations. However, certain measures that are initiated in a timely manner, properly constructed and well maintained, and applied with an understanding of bear habits and behavior can greatly reduce the extent and severity of bear damage.

To reduce the potential for damage by black bears, don't encourage their presence or attract them to your property. Growers should be sure to 1) exercise good husbandry and maintain sanitary conditions, 2) remove all sources of alternative foods (e.g., garbage or refuse, unprotected compost piles, pet foods, bird feeders, animal carcasses), and 3) move domestic livestock into protected areas or away from areas with heavy cover. By all means, don't feed bears at or near home—this only attracts bears and habituates them to humans.

These generic or common sense precautions may not be sufficient to address damage problems on certain commodities. However, there are other, more targeted deterrent methods that can be used. In the following sections, we offer producers of bees/honey, corn, and livestock a more detailed review of the symptoms of bear damage, its identification, what to do if damage occurs, and where to go for assistance.

# PROTECTION OF APIARIES, BEES AND HONEY

## *How to Identify Black Bear Damage*

- visual observation of a bear causing damage;
- evidence of bear tracks, feces, hair, or other sign;
- supers (hives) knocked over, scattered and torn apart (Figure 3);
- numerous frames damaged or broken (look for claw marks);
- honeycombs and/or larvae destroyed or consumed.

Skunks, and sometimes raccoons, also may destroy bee hives. However, their sign is much smaller and the extent of their damage is less destructive than that of bears.

*Figure 3: Supers (hives) damaged by bear*



## *Preventive Measures*

*If damage has not yet occurred:*

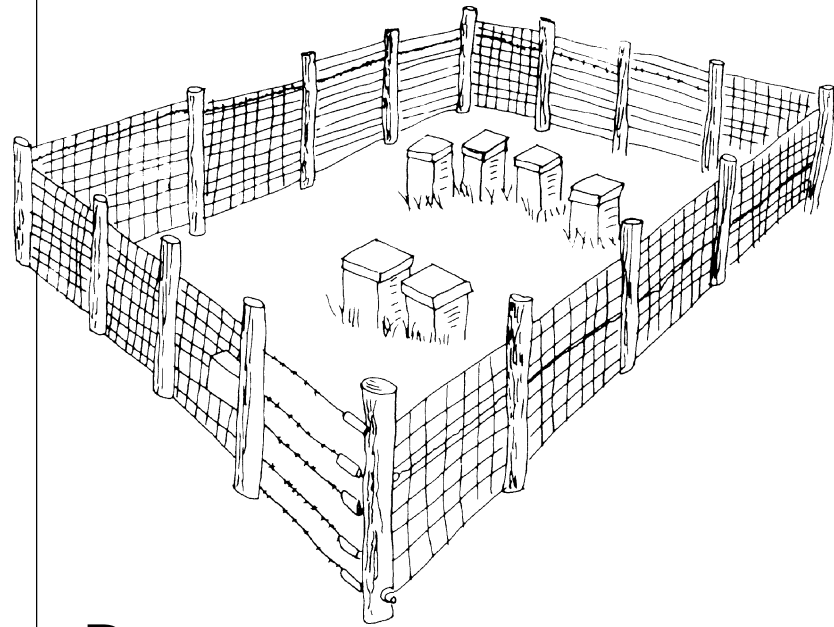
- keep mowed, cleared corridors around hive sites;
- avoid placing hives in abandoned areas or near wooded, overgrown areas;
- avoid feeding bears or providing supplemental food anywhere on your property as a means to distract or “decoy” them. This usually only attracts and habituates bears;
- erect temporary or permanent electric fencing—suggested electric fencing options include:
  - a) temporary, prefabricated electric net fencing (support posts are incorporated into fence) (Figure 4);
  - b) temporary polypropylene electric tape on fiberglass posts;
  - c) permanent, high-tensile, electrified wire on wooden posts (Figure 5).



***If damage has already occurred:***

- consult the nearest District Office of the Massachusetts Division of Fisheries and Wildlife (MDFW) for technical assistance (see *Sources of Assistance* on page 13 for location nearest to you);
- erect temporary or permanent electric fencing, baited heavily with peanut butter, bacon or bacon fat, sardines, or other suitable attractant;
- elevate hives on platforms protected by portable electric fencing.

Although generic plans for constructing permanent or semi-permanent electric fences are available from the MDFW, the specific design and list of materials will vary depending upon the needs of each particular situation and the number of hives to be protected.



## PROTECTION OF CORN CROPS

### *How to Identify Black Bear Damage*

- visual observation of the bear causing damage;
- evidence of bear tracks, feces, hair, or other sign (Figure 6);
- presence of somewhat circular patches within the field's interior where stalks have been pulled inward and flattened or broken (Figure 7);
- ears of corn that are completely eaten or cleaned of kernels, but not all ears on a stalk will be affected. More plants may be damaged than are actually consumed (Figure 8);
- damage occurring at the "milk-stage" of development.

Care must be taken to distinguish damage caused by bears from that of other potential predators. Raccoons frequently will pull down stalks, strip ears from a stalk, and chew kernels from an ear; the large circular patches of damaged corn in a field usually are lacking with raccoons and less total area will be affected when compared with bears. Other animals,



*Figure 4: Temporary, prefabricated net fencing*



*Figure 6: Bear footprint*

such as porcupines, deer, beaver, and even coyote, may cause damage to corn. Stalks may be chewed and felled (beaver, porcupine), ears and silk are often nipped (deer, coyote), or whole plants may be removed (beaver). It is important to check all field signs to correctly identify damage caused by these species versus bears.

### *Preventive Measures*

#### *If damage has not yet occurred:*

- keep mowed, open corridors around and between fields;
- alternate other row crops with corn to provide less cover and food;
- avoid feeding bears or providing supplemental food anywhere on your property as a means to distract or “decoy” them. This usually only attracts and habituates bears.

#### *If damage has occurred:*

- consult the nearest District Office of the MDFW for technical assistance (see *Sources of Assistance* for location nearest to you);
- use bear hounds to chase bears away during prime corn maturity;
- use single strand, baited, polytape electric fencing around fields or at least on the most exposed side(s) of a field as crop matures, especially just prior to and at “milk-stage” of development.



*Figure 7: Aerial view of cornfield damaged by bear*



Figure 8: Ears of corn chewed by bear

## PROTECTION OF LIVESTOCK OR OTHER DOMESTIC ANIMALS

### *How to Identify Black Bear Damage*

- visual observation of a bear in the act of harassing or attacking domestic stock;
- evidence of bear tracks, feces, hair, or other sign;
- animals surviving a mauling (often young or weak) will show tooth marks on neck at the base of the skull or long claw marks (with 1/2 inch separation) on the shoulders;
- animals that have succumbed to bear attack often will have a broken neck or back as a result of blows from the bear's paws;
- bears will drag or carry a carcass away from the kill site, cache it, and return regularly to feed on it;
- bears often will strip back or reverse the skin of larger prey, particularly along the back (Figure 9);
- the udder of lactating female prey is highly preferred by bears and often will be eaten first;
- inexperienced bears might expose the viscera, but meat usually is preferred and consumed.

Care must be taken to distinguish bear damage from that of other carnivores, especially coyotes and domestic dogs. Coyotes usually kill their prey with bites to the neck, but, unlike bears, they feed on internal organs and hindquarters first rather than on the back or shoulders; long, 1/2 inch claw marks on the body generally are lacking; and coyotes/dogs usually do not strip back the prey's skin.



Figure 9: Sheep preyed upon by black bear

### *Preventive Measures*

#### *If damage has not yet occurred:*

- avoid pasturing animals in abandoned areas, areas with heavy cover, or areas adjacent to probable corridors used by bears;
- do not leave carcasses of dead animals exposed and available in fields, pastures, or areas near the farm. Bury or incinerate them completely;
- avoid feeding bears or providing supplemental food anywhere on your property as a means to distract or "decoy" them. This usually only attracts and habituates bears;
- where possible, pen animals near or in the barn at night, particularly expectant females or females with young. Avoid birthing animals in the field, or if pasture birthing is necessary, clear affected areas of all sign of birthing (afterbirth material is a very good attractant for bears, coyotes, and other predators).

*If damage has already occurred:*

- consult the nearest District Office of the MDFW for technical assistance (see *Sources of Assistance* for nearest location);
- use trained bear hounds or guarding dogs to ward off or deter bears;
- consider modifying or replacing existing fencing with high voltage (> 6,000 volts) low impedance electric fencing around animal enclosures.

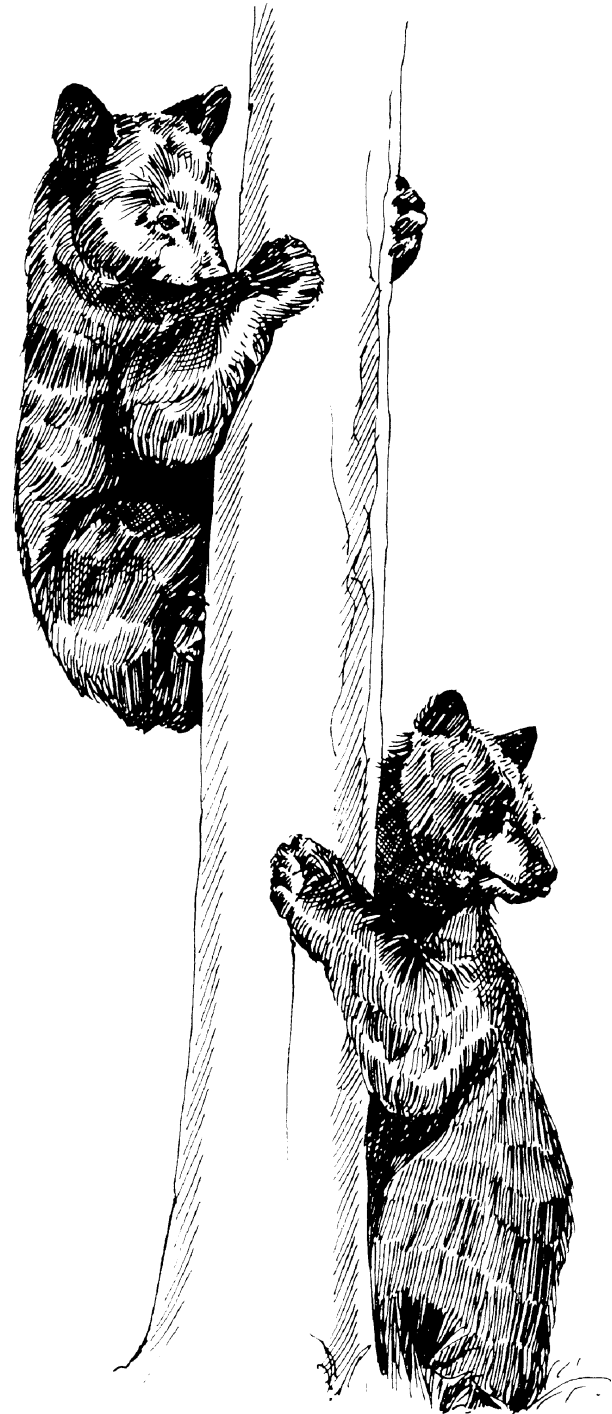
## LETHAL ACTION

If all attempts to deter bear depredation with preventive measures or non-lethal measures have failed, removal of the offending animal(s) may be warranted. Producers are encouraged to keep their lands open and available to hunters and, during the regulated season, to assist local hunters in identifying depredating bears. Regardless of time of year, the owner of the property, a member of their immediate family, or a person permanently employed by them may control or destroy a bear, **but only while the animal is in the act of causing damage**. Landowners are required to report any such taking and to surrender the bear's carcass to the MDFW within 24 hours.

## CONCLUSION

Sustaining a viable population of black bears is important because bears are an indicator species of what is occurring in our environment and they are an integral part of a functioning ecosystem. Management strives to achieve a balance between the cultural and biological carrying capacities of the black bear population, but this also requires an effort from the public. Black bears are very adaptable in their pursuit of food, which has led to conflicts between humans and bears. Therefore, with investment in long-term black bear deterrent techniques and producers' willingness to tolerate and learn about bears, the public and bears can co-exist and reap mutual benefits from a

well-balanced and functioning ecosystem. By understanding the biology and behavior of the black bear, and by following the recommendations listed above, the black bear can be managed appropriately and will remain a native species in Massachusetts as a part of our natural heritage.



# SOURCES OF ASSISTANCE

## **Massachusetts Division of Fisheries and Wildlife**

Field Headquarters  
1 Rabbit Hill Road  
Westboro, MA 01581  
(508) 792-7270

[Mass.Wildlife@state.ma.us](mailto:Mass.Wildlife@state.ma.us)

## **Mass. Fisheries & Wildlife District Offices**

Central Wildlife District  
211 Temple Street  
West Boylston, MA 01583  
(508) 835-3607

Conn. Valley Wildlife District  
341 East Street  
Belchertown, MA 01007  
(413) 323-7632

Northeast Wildlife District  
68 Harris Street  
Acton, MA 01720  
(978) 263-4347

Southeast Wildlife District  
195 Bournedale Road  
Buzzards Bay, MA 02532  
(508) 759-3406

Western Wildlife District  
400 Hubbard Avenue  
Pittsfield, MA 01201  
(413) 447-9789

## **Massachusetts Department of Food & Agriculture**

Apiculture & Apiary Inspectors  
251 Causeway St., Suite 500  
Boston, MA 02114  
(617) 626-1802/03/04

## **University of Massachusetts**

Dept. Natural Resources Conservation  
Holdsworth Natural Resources Center  
Amherst, MA 01003  
(413) 545-2665

## **United States Department of Agriculture**

APHIS— Wildlife Services  
463 West Street  
Amherst, MA 01002  
(413) 253-2403

## **Massachusetts Farm Bureau Federation**

466 Chestnut Street  
Ashland, MA 01721  
(508) 881-4766

# SOURCES OF ELECTRIC AND NON-ELECTRIC FENCING MATERIALS

*Authorized Field Representatives or Distributors of Commercial Products  
(listed in alphabetical order)\**

## **Advanced Farm Systems, Inc.**

(Tech Fence)  
RD 1, Box 364  
Bradford, ME 04410  
(207) 327-1237

## **Gallagher Power Fence, Inc.**

18940 Redland Road  
Box 708900  
San Antonio, TX 78270  
(800) 531-5908  
[www.gallagherusa.com](http://www.gallagherusa.com)

## **Jeffers**

P.O. Box 100  
Dothan, AL 36302  
(800) 533-3377  
[www.jefferslivestock.com](http://www.jefferslivestock.com)

## **K Fence Systems**

Rte. 1 Box 195  
Zumbro Falls, MN 55991  
(507) 753-2943  
[www.kfence.com](http://www.kfence.com)

## **Kencove Farm Fence, Inc.**

344 Kendall Lane  
Blairsville, PA 15717  
(800) 536-2683  
[www.kencove.com](http://www.kencove.com)

## **Kiwi Fence Systems, Inc.**

121 Kiwi Road  
Waynesburg, PA 15370  
(724) 627-8158  
[www.kiwifence.com](http://www.kiwifence.com)

## **Margo Supplies, Ltd.**

Box 5400  
High River, AB T1V 1M5  
Canada  
(403) 285-1932  
[www.wildlife-mgmt.com](http://www.wildlife-mgmt.com)

## **Max-Flex Fence Systems**

(West Virginia Fence Corporation)  
U.S. Rte. 219  
Lindside, WV 24951  
(800) 356-5458  
[www.maxflex.com](http://www.maxflex.com)

## **Premier Fence Systems**

2031 300th Street  
Washington, IA 52353  
(319) 653-6631  
[www.premier1supplies.com](http://www.premier1supplies.com)

## **Walnut Grove Farm**

Tipper Tie Fencing Products  
c/o Laura Gund  
48 Cartland Road  
Lee, NH 03824  
(603) 659-2044

## **Wellscroft Farm**

c/o David Kennard  
167 Sunset Hill-Chesham  
Harrisville, NH 03450  
(603) 827-3464  
[www.wellscroft.com](http://www.wellscroft.com)

## **The Wright Place**

5051 Fowler Road  
Reading, MI 49274  
(517) 283-2645

\* Inclusion on this list does not represent an endorsement by the authors or the sponsoring organizations. It is supplied for information purposes only.

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# REFERENCES

- Cardoza, J.E. 1976. *The history and status of the black bear in Massachusetts and adjacent New England states*. Mass. Div. Fish. Wildl. Res. Bull. 18. 113pp.
- \_\_\_\_\_. 1985. *Black bear damage and control in Massachusetts*. Mass. Div. Fish. Wildl. Publ. 14143-13-300-8-85-CR, Mass. Federal Aid in Wildl. Restor. Proj. W-35-R. 11pp.
- \_\_\_\_\_. 1990. *Commonwealth of Massachusetts Division of Fisheries and Wildlife standard protocol for the capture, handling, marking, transport, and field investigation of black bear (Ursus americanus)*. Unpubl., internal publ. 42pp.
- Green, J.S. and R.A. Woodruff. 1989. *Livestock-guarding dogs reduce depredation by bears*. Pages 49-53 in M. Bromley, ed. *Proceedings of a symposium on management strategies: bear-people conflicts*. Northwest Territ. Dep. Renew. Resour., Yellowknife, Northwest Territories, Canada.
- Jorgensen, C.J., R.H. Conley, R.J. Hamilton, and O.T. Sanders. 1978. *Management of black bear depredation problems*. Proc. East. Black Bear Workshop 4:297-319.
- Robinson, S.A. 1992. *Black bear depredation in the Northeast: problems, deterrents, and public education*. M.S. thesis, Univ. of Massachusetts, Amherst. 100pp.
- Roy, L.D. and M.J. Dorrance. 1976. *Methods of investigating predation of domestic livestock*. Alberta Agric. Plant Ind. Lab., Edmonton, Alberta. 54pp.
- Will, G.B. 1980. *Black bear-human conflicts and management considerations to minimize and correct these problems*. Proc. East. Black Bear Workshop 5:75-88.

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Figure 9: from *Physical Evidence of Carnivore Depredation*, produced by James A. Bowns, Utah State University, and Dale A. Wade, Texas A&M University, San Angelo, TX, with permission