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World-wide there are millions of people living in proximity to bears without conflict. However, where Human-Bear Conflict (HBC) does exist, management authorities and the public should consider responses that will not only reduce present conflicts but also reduce the chance of future problems. Effective, long-term approaches to HBC require methods and tools that integrate the needs and behaviors of both humans and bears, and address the root causes of HBC. These approaches may involve direct interventions (designed to reduce the severity or frequency of conflicts), indirect interventions (aimed at increasing people's tolerance for conflicts) or a combination of the two approaches (Table 1). For the definition of a HBC, please refer to the Principles of Human-Bear Conflict Reduction.

Human-focused methods for resolving HBC:

- **Education and Awareness** – Changing human behaviour is often necessary to reduce HBC because the vast majority of HBC are the result of undesirable human behaviour in bear country (e.g., leaving food attractants outside). Changing human behaviour usually requires community action, identifying obstacles to change, and encouraging new approaches. Involving stakeholders in the process is essential, as are educational and awareness efforts to improve understanding of bear ecology and causes of HBC. Information given to the public should be informed by social science. However, education and awareness is only one of the essential steps required to reduce HBC.



Community meeting to discuss bear awareness in Gujarat, India.

Photo: N. Dharaiya



Involving community members in the process of gathering information about local human-bear conflicts.

Photo: M. Proctor

- **Directly assisting people with conflict reduction efforts** - Implementing programs that provide expertise (e.g. electric fencing specialist) and/or providing financial assistance (e.g. cost share attractant management programs) may be essential to gain the acceptance and willingness of rural people living with large carnivores and conflicts that spread out the conservation burden to society in general. Providing direct and targeted reduction efforts can solve an immediate problem, overcome resistance of many people, develop tolerance, reduce retaliation, and fix the problem for the future.
- **Avoiding Negative Encounters** – Encounters with bears that lead to human injuries or fatalities can often be avoided by an increased understanding of bear behaviour and ecology as well as following principles of living, working, and recreating in bear habitat.
- **Management of Attractants** – The simplest solution to avoid many HBC may be to remove attractants from the vicinity of the conflict area (e.g., unsecured garbage, livestock carcasses, human foods, bird feeders or pet food,). When it is not possible or desirable to remove an attractant, securing the attractant so that bears cannot access them usually works well.

- **Landscape Planning** – Planning for wildlife travel routes and corridors may be used to direct animals around or away from human developments. This requires site-specific knowledge of seasonal bear habitat and the identification and management of these habitats. Landscape planning also includes planning for new developments, particularly in human-wildlife interface areas.
- **Regulations and Enforcement** – conflict resolution should largely focus on obtaining voluntary compliance; however, the ability to enforce regulations may be necessary to ensure the compliance-level required to reduce HBC (e.g., ordinances, bylaws, legislation, park regulations).



Providing information about the presence of bears in an area with instructions about how to obtain additional information to prevent HBC.

Photo: J. Hechtel



Black bear emerging from a damaged car that contained human food.

Photo: T. Evans, NPS

- **Compensation** – Property or livestock losses caused by bears can be directly compensated through cash payments or other assistance. Governments and/or NGOs that share the financial burden with people affected by HBC is usually appreciated and effective. When the burdens of HBC rests entirely on governments, people are often less motivated to reduce conflicts. Conversely, when the burden rests entirely on affected individuals, their negative attitudes toward bears may hinder conservation. Direct compensation sometimes treats the symptom, not the true cause of HBC, and should be combined with other mitigation efforts. Adding value to wild bears may raise tolerance for conflicts and indirectly promote bear conservation. Rewarding landowners who protect bear habitat or resolve conflicts non-lethally (e.g., through direct payments or by certifying and thereby promoting their products) are two ways to directly promote bear conservation.
- **Communication Networks** – Local communities can set up a “neighbour network” to alert each other and wildlife managers about bear presence. In areas where people have access they may use social media platforms, e-mail, and telephone. The objective is a low-cost tool that connects residents and relevant authorities so precautions can be taken to protect human safety and property and target attractant management to increase bear safety.

Bear-focused methods for resolving HBC:

- **Physical Barriers** — Physical barriers, such as electric fences, elevated platforms, bear-resistant garbage containers, steel bins and secured buildings are effective at keeping bears from attractants (such as beehives, agricultural crops, livestock, garbage, etc.).



Bear damage to unprotected beehives in Poland.
Photo: Carpathian brown bear project



Beehives protected by an electric fence in Poland.
Photo: Carpathian brown bear project



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- **Short-term or Temporary Bear Deterrents** — Some bears can be kept away from attractants using tools such as flashing lights, loud noises, chemicals or untrained dogs. These types of deterrents usually fail after a short period of time if the attractants that are causing the HBC situation are not removed or properly secured.
- **Aversive Behavioral Conditioning** — Consistent conditioning of bears to avoid people and human food resources may result in their aversion to an area, type of food, or people. Such aversive conditioning typically involves repeated negative (threatening, uncomfortable, or painful) stimuli (e.g., cracker shells, rubber bullets, pursuit by trained dogs, emetic chemical that induces vomiting or diarrhea). These programs may be costly, time consuming, and should be combined with efforts to remove all attractants.
- **Bear Population Control** — Where non-lethal options are either not effective or impractical, controlled culling or regulated hunting may be used to reduce bear numbers without jeopardizing population viability. However, governments should consider potential ramifications of this approach in terms of: (1) risk of over-harvest, especially where little information exists about the bear population, and (2) responses of the public.
- **Habitat Management** — Some bears are attracted to human sources of food, particularly when natural foods are in short supply. Habitat management is creating a better natural environment for bears. Key to managing natural habitats is to ensure bears have minimal mortality risk while accessing high quality natural foods (e.g., salmon streams, soft (berry patches) and hard (nuts) masting foods), and that the natural habitats are secure and not degraded or diminished.
- **Supplementary Feeding** - is designed to enhance nutrition for bears with the idea that less hungry bears are less likely to seek human sources of food.
- **Diversionsary Feeding** - attempts to physically divert bears away from potential problem areas.
 - **Supplementary & Diversionsary feeding** – both require the enhancement of key feeding areas away from people (provision of fruit-producing trees and shrubs, edible vegetation, waste grain, and in some cases animal carcasses) may reduce the attractiveness of food sources near human habitations. However, supplementary and diversionsary feeding affects bear biology, ecology and behaviour, including for instance, diet, home range size, hibernation and/or movements. Further, bear reproductive biology is tied to body condition and the supplementally fed bears may increase the rate of population growth, potentially increasing population size beyond what the environment can support naturally, eventually leading to more conflicts.

- **Removal of Conflict Animals** — In some cases it may be necessary to remove bears that are persistent conflict animals away from the conflict area. There are 4 primary mitigation methods that involve the removal of bears: (1) translocation; (2) relocation; (3) captive facility placement; and, (4) euthanasia. The translocation of bears requires capturing the bear(s) and releasing it far from the conflict area and outside of the bears' known home range. Translocating bears is generally not recommended because it may have negative consequences on the receiving bear population or may simply shift the problem to the new area, which is particularly true in landscapes with heavy human development. Relocating bears involves releasing the bear in good habitat within the animal's known home range but away from the conflict area. Relocation is generally more successful than translocation; however, relocation simply buys time to remove or manage what is causing the bear to display unwanted/problem behaviour - it does not change the behaviour itself. Translocated and relocated bears often return to the conflict area and problems will resume if attractants have not been properly managed. Bears may also be captured and placed in suitable captive facilities or killed.



A black bear that lives in and around the city of Prince George in Canada is tranquilized in a residential front yard and outfitted with a Global Positioning System tracking device and ear tag.

Photo: L. Ciarniello



Evaluating the effectiveness of HBC resolution actions

To assess the effectiveness of mitigation actions, the level and extent of HBC must be quantified both before and after implementation using an objective monitoring program. Monitoring should be conducted yearly and incorporate five measures of performance: (1) were actions conducted as planned? (2) did the level of HBC diminish as a result? (3) was the welfare of humans improved? (4) was the bear population maintained at a sustainable level? and, (5) were stakeholders satisfied that HBC had declined to acceptable levels?

Table 1. Potential Interventions for reducing human-bear conflicts in human dominated landscapes.

Methods of Human-Bear Conflicts	Potential Interventions
Management of Attractants	<p>Physically eliminate attractants by removing them from human use areas that are accessible to bears; store attractants in bear-resistant containers; use electric fencing to prevent bears from accessing attractants; alter waste removal times in areas with bear activity.</p> <p>Physically prevent bears from entering buildings by installing bear resistant doors and windows, placing wrought iron coverings over access points or using “unwelcome” mats (electrified mats or mats perforated by sharp spikes) in front of access points.</p>
Management of Bear Habitat and Landscapes	<p>Conduct Bear Habitat Assessments (BHAs) prior to development in occupied bear habitat; discourage bears from entering areas of high human use by considering the layout of bear habitat; manage landscapes to allow bears to move among habitat patches; remove or reduce natural forage items and vegetation to limit available food and reduce security cover in areas with high human-bear encounter rates.</p> <p>Relocate camp grounds, picnic areas and portions of hiking trails away from areas with natural attractants (food, cover) that bears are known to use; implement short-term closures for campgrounds and trails in areas where conflicts occur because of the seasonal availability of natural food resources or temporary high risk situations (bear on a carcass).</p>



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Enforcement

Implement and enforce regulations that prohibit feeding bears or improper storage of food, garbage and other attractants. Threatened and endangered bear populations may require increased enforcement of regulations regarding the illegal killing of conflict bears.

Road Management

Remove vegetation that limits the line of sight adjacent to roadways; use non-palatable plants to reseed roadways; reduce speed limits in areas with limited visibility; construct overpasses in areas where bears are killed on roads and roads are fragmenting critical habitat patches.

Human Safety & Education

Promote an understanding of the relatively small risk to humans from bears in most areas. Focus education programs on how to reduce chances of bear encounters and how to best behave during a bear encounter or attack. Teach people to understand and recognize the types of bear encounters (defensive, non-defensive and predatory), how best to respond to bear encounters and attacks, and how their behaviour during an incident can minimize risk of a serious negative encounter.

Teach people to: stay alert and aware of signs of recent bear use (scats, tracks or feeding sign); avoid walking, jogging or bicycling alone in forested areas early morning and late evening hours when most bears are active; travel in groups whenever possible; keep children and domestic animals (i.e. dogs) close or preferably on a leash; make noise to provide adequate warning of your presence by clapping or talking loudly when traveling in dense vegetative cover, near running streams, in areas with limited visibility or walking into the wind; carry a deterrent such as bear spray; and never approach or feed bears.

When sleeping outdoors in bear country camp in open areas away from natural food sources and bear travel routes; separate sleeping areas from cooking areas if possible; practice careful hygiene; be proficient in first-aid and carry adequate medical supplies; in areas of high bear density consider using portable electric fencing at overnight campsites.



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Field Crops

Remove security cover adjacent to fields; plant alternate crops that are less desirable for bears; physically protect crops with electric or barrier fences. Use people, guard animals or hazing methods (e.g., motion or heat sensing devices that trigger alarms, strobe lights, deflectors) to deter bears from entering croplands.

Animal Husbandry Practices

Husbandry practices: Pen animals at night; place pens closer to human use areas and further from forested areas; use birthing sheds; move birthing and early rearing areas away from thick vegetation cover; alter breeding seasons; alternate pasturing systems or land-zoning strategies; change herd classes/composition; consider increasing herd supervision through the use of herders or range riders in high risk habitats.

Physical deterrents: Use electric fencing, shepherds or guard animals; place beehives on elevated platforms/buildings or behind electric fences; render all carcasses (if possible); if rendering plants are not available bury carcasses deep and cover with lime or similar to reduce smell; consider carcass redistribution program (see diversionary feeding).

Diversionsary Feeding

Heavily fertilize strips of vegetation adjacent to cropland to “lure” bears away from crops. Temporarily provide alternate food resources (intercept feeding using deadstock or road killed wildlife carcasses, grains, pelletized foods, or enhancement of native fruit bearing trees) in secure habitat away from conflict areas and other human activity.

Limiting Undesirable Behavior Aversive Conditioning

To maximize safety, aversive conditioning programs should be carried out by trained personnel.

Primary Repellants: use repellants designed to disrupt undesirable behavior by causing a fright or startle response (e.g., visual, noise, electronic guards such as strobe lights, sirens or chemical scents).



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Secondary Repellants: Use repellants that are paired with pain or fright to “condition” target animals against a specific undesirable behavior (e.g., aversive conditioning, hazing, taste aversion, human dominance, physical deterrents such as rubber slugs and rubber pellets, bean bags, cracker shells or water streams, or pursuit by trained dogs).

Compensation Programs

Pair compensation programs with legitimate efforts to reduce losses. Compensate producers for verified losses only if they have implemented accepted methods for reducing losses. Compensation programs may also be considered in areas where bears are re-colonizing former habitats and landowners/producers are not accustomed to bear presence. Compensation programs will require policy mechanism to address when and when not to compensate with the aim to encourage the use of preventative tools.

Relocation and Translocation

Non-lethal: Removing attractants is the most effective way to reduce HBC. However, relocation of bears to areas within their home range where there is good habitat and less potential for conflict with humans may *temporarily* resolve individual conflicts. Relocation requires the manager to know the approximate area of a bear’s home range. Translocation is the long distance removal of a bear outside of its home range. The success rate for translocation as a management option is low and many negative issues may result from translocation, such as competition with a bear that has not been in a conflict with humans in the receiving area or the bear may get involved in HBC at other sites as it returns. Relocated and translocated bears often return to the conflict site and if the source of the problem has not been properly managed, the bears (or another bear) will resume conflict behaviour, continuing the cycle.

Removal of Conflict Bears

Lethal: Bears involved in chronic conflicts, entering human occupied structures, acting aggressively towards humans, or responsible for “unprovoked” human fatalities should be euthanized in a humane manner. In some cases these bears may be brought into permanent captivity.



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Sport Hunting

It is unclear whether conflicts can be reduced by regulated bear hunting that is not intended to reduce population size. It is challenging for hunters to selectively remove individuals involved in conflicts. However, hunting seasons in areas with abundant bear populations may indirectly result in greater human tolerance for some conflicts and/or result in behavioral avoidance of humans by hunted bears. In some cases hunting might be useful to reduce a population, but more often hunting is most useful to prevent population expansion or growth. Sport hunting is a risky strategy when applied to small populations.

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