Not-So-Candid Cameras

HOW TO PREVENT CAMERA TRAPS FROM SKEWING ANIMAL BEHAVIOR

By Michael L. Gibeau, Ph.D., and Cam McTavish

In Canadian forests, the trees have eyes. While doing carnivore research in Canadian Mountain National Parks, we find it increasingly common to encounter remote cameras mounted on trees. Growing numbers of wildlife professionals, hunters, and hobbyists are deploying these motion-activated cameras to monitor a variety of wildlife species, believing that this is a non-invasive way to capture natural behavior. Cameras certainly do capture behavior. But is it natural? Not always.

Typically a remote camera "wakes up" when a motion sensor detects the infrared light emanating from an object that's warmer than the environment, such as a moving animal. The sensor sends a trigger impulse to the camera, which snaps a picture. Some cameras can be programmed to take 10 images as quickly as possible upon receiving one motion trigger. Such motion-detector cameras have helped monitor wildlife for decades (Kucera and Barrett 1993, Mace *et al.* 1994, Culter and Swann 1999), but in recent years, technological advancements have improved camera function and image quality. Some newer camera models, for example, now have quieter triggers, invisible flashes, larger memory capacity, and more-accurate motion sensors that reduce false triggers. Some are also programmable to adjust focus, contrast, and brightness. With such improvements, cameras have become invaluable tools for wildlife researchers, who need inexpensive and efficient ways to collect data.

Researchers have studied numerous species with remote-camera technology including fox (Glen and Dickman 2003), black bear (Bridges *et al.* 2004), white-tailed deer (Koerth and Kroll 2000), and wood mice (Diaz *et al.* 2005). In one broad study of vertebrate scavengers in South Carolina, remote cameras monitored 17 different vertebrate species (DeVault *et al.* 2004). By providing data on population numbers and trends, presence and absence, breeding success, congregation "hot spots," and the like, such studies can provide the basis for sound, science-based wildlife management and conservation decisions.

Our own experience using remote cameras spans 17 years in eight Canadian national parks, with more than 25,000 camera days to monitor about 34 different species. In our most recent project, which began last year, we're using remote-camera technology on trail systems in Canada's Banff, Kootenay, and Yoho national parks to detect large carnivores such as the gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos*), black bear (*Ursus americanus*), cougar (*Puma concolor*), lynx (*Lynx canadensis*), and wolverine (*Gulo gulo*). Data about the seasonal movement, distribution, composition, and abundance of these species help quantify change across a bioregion, and also help fulfill Canadian National Park's mandate to track indicators of ecosystem health over the long term.

Camera-Trap Pitfalls

In doing our carnivore study, however, one issue has been evident and troubling. We've observed that some forms of remote-camera deployment prompt a startle response in gray wolves, negatively altering their behavior. Specifically, wolves will stop abruptly if they see a camera flash at night. Individuals will flee, and packs will rapidly disperse, resulting in displacement to the site and significant travel-route changes. This fear-and-avoidance behavior is most pronounced when wolves see a camera flash "head on" as opposed to coming from the side.

Approximately 40 percent of head-on nocturnal wolf images captured by our remote cameras show a distinct startle response as a result of the camera flash. Typically the flash rapidly displaces the first wolf in a pack. Trailing pack members quickly follow, so the camera misses them completely. This happens inside the relatively undisturbed boundaries of national parks, where wolves experience little human manipulation. We therefore suspect that the startle response would be even more pronounced in areas where management is more intense and wolves are more wary.

We have documented this deleterious response only in wolves (no other species) that have been photographed head on via flash photography at night.

Courtesy of Michael L. Gibeau

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The findings raise several concerns about remote-camera imaging of wolves. First, it's possible that the flash may cause a temporary loss of night vision in wolves, as well as spatial and temporal displacement of the animals to the camera site. In addition, cameras set at predation or carrion sites may disrupt feeding behavior. If camera data show atypical wolf behavior, that could lead to erroneous research interpretations. Finally, and perhaps most significant, there is potential for increased pup mortality if the careless use of cameras at den sites causes females to abandon or attempt to move litters.

Our findings also raise the question of whether there are other species that are being disrupted by the enthusiastic use of this new technology. We are aware of professional photographers, for example, who use night flash remote cameras on rare or sensitive species such as the snow leopard (*Panthera uncia*) without fully comprehending the effect on that animal. In fact, to our knowledge, no one has studied the potential harmful effects of remote cameras on wildlife.

Trial-and-Error Solutions

In our research, startle and dispersal behavior among wolves occurred with cameras from at least four different manufacturers, which suggests that it's not so much the camera that's causing problems, but the way it's mounted, used, or maintained. We therefore offer the following steps, learned through experience and experimentation, that can help minimize the negative impacts of remote cameras and increase the probability of ethically capturing natural behaviors, therefore benefiting species conservation.

Minimize the flash. When triggered at night, most remote cameras flash either a white light or a visible red infrared light. Though both cause startle and flight reactions in wolves, the animals appear more shocked by flashes that produce white visible light, which we never use. In our research, we use infrared light, which is preferable if you must photograph at night. Some cameras can be programmed to function only during daylight hours, which we recommend. If your gear cannot be programmed to work only in daytime, however, then it's best to eliminate the flash by simply covering it with duct tape.

Choose the right angle. Cameras mounted parallel with an animal trail may get a great head shot (or rump shot), but this head-on orientation is also most likely to spook an animal, particularly when using a flash. In addition, motion sensors trigger poorly when a subject is moving directly towards or away from a camera. To avoid startling animals with a head-on flash, mount the camera at a 90-degree angle to the animal's direction of travel. This captures an image of the entire side body and helps ensure that the animal will not become camera shy and avoid the study area. It's also wise to mount the camera higher than the eye-level of the subject, as this helps reduce nighttime eye-shine as well as startle effects. When possible, face the camera away from the sun, and tilt it slightly down as opposed to straight ahead. This downward orientation will reduce the amount of sky in the picture and help keep rain out in bad weather.

Keep your distance. Set a camera at the greatest image-capture distance possible, especially when shooting at night. To achieve a field of view wide enough to capture a wolf moving at a typical fast walk, for example, cameras need approximately 10 to 15 meters of distance from the subject. Once you've set your camera, use it to photograph someone standing on the trail and holding a vertical measuring stick or rope marked at 10- to 20-centimeter intervals. Animals photographed later can then be measured for height by comparison to this baseline image.

Select low-impact sites. Ideally you'll set your camera along a routine travel pathway. Mounting cameras at sensitive areas like den sites, rub trees, mineral licks, or feeding grounds will likely be detrimental to the subjects. Animals

Courtesy of Parks Canada

Startle response. The flash of a tree-mounted infrared camera at night startles a pack of gray wolves (*Canis lupus*) in Banff National Park (above left), causing them to flee in all directions (above right). This type of altered behavior can skew the results of a study, affecting conservation decisions.

displaced from mineral licks or carrion sites, for example, may fail to acquire critical nutrients or fat reserves. Never set cameras near routes where animals have no other travel alternatives. Using these "pinch points" may seriously alter traditional movement patterns, with possibly harmful effects. Finally, some carnivores, especially wolves, quickly learn to avoid scary, unfamiliar objects like camera boxes. If you find that the quantity of data your camera is receiving is diminishing over time—a few weeks to a few months, depending on the target species—move the camera to a new location.

Maintain a low profile. When setting or checking a camera, minimize your presence. Don't eat, urinate, litter, or linger at the site. You can also minimize the camera's profile by camouflaging it with twigs or foliage, thus reducing avoidance behaviors and diminishing the chance of theft. As a final precaution, snip away any small branches dangling near the camera that could blow in the wind and deliver false triggers.

Maximize recording time. You can maximize the time that a camera captures images and thus minimize site visits by using high-quality rechargeable NiMH batteries. They can be recharged up to 500 times, and because they last longer than alkaline batteries they require fewer replacements. You can further reduce site visits by using a large-capacity memory storage card. Two-gigabyte cards are usually adequate, though more memory may be required in high-traffic areas, especially if using a flash.

Protect your investment. Always use a cable and lock to safeguard your camera. Some cameras have digital anti-theft software, which provides excellent "cheap insurance." Keep desiccants inside the camera box at all times to absorb moisture, and regularly check the O-rings that seal camera compartments. (We check our cameras at three-week intervals.) Inspect the seals before closing the lid of the camera box, as one loose spruce needle on the O-ring may ruin the seal in the next rain.

Go "covert." Newer camera models that have what is called a "covert" flash—producing almost no visible light even at night—are now available. We have been conducting field trials of several of these covert flash cameras. In our experience, only the Reconyx PC-90 is fully covert, showing no visible light when the camera flashes, virtually eliminating the startle response. In fact, wolves will stand next to this camera at night and ignore it completely, an observation we've now documented among numerous packs in several national parks. Although covert cameras tend to cost anywhere from 30 percent to 100 percent more than standard cameras (the Reconyx sells for about $830, or $950 Canadian), they yield much higher quality images because the subjects are not startled and fleeing. Ethically, we feel that covert cameras are the best choice for serious professionals, researchers, or others who respect animals and need high-quality data.

Courtesy of Parks Canada

Candid moment. Oblivious to the lens, a gray wolf in Banff National Park strolls undisturbed past a Reconyx PC-90 camera, mounted for a side view. Because the camera has a "covert flash" that produces no visible light, it causes no startle response.

Just because you have successfully imaged one animal using a given method does not mean that the same method can be used without harm on all species. If you note displacement with a particular technique, learn from your mistake and be sure to share your problem with other researchers as well as camera manufacturers, who would be happy to hear of both your successes *and* your failures.

Though we consider the methods above as ethical guidelines for wildlife imaging, we recognize that wildlife professionals who follow these steps will get fewer nocturnal images. However, the data collected will be of higher value because animals will display more natural behaviors. Camera monitoring for research purposes is critically important to wildlife conservation and should continue, but prudent site selection, camera choice, orientation, and flash reduction will do much to reduce the startle response and displacement that we've noted in studying wolves. We hope that all users of remote-imaging technology will strive to avoid potentially negative impacts on the species they're trying to protect. ■

To see photographs of various "right" and "wrong" camera mounts, as well as more wildlife images, go to *www.wildlife.org*.