



Gray Wolf Tracking Collars – Frequently Asked Questions

What is a wildlife tracking collar?

A tracking collar is a collar attached to a wild animal by biologists that provides information about the animal's movements and behavior.

Why does CDFW deploy tracking collars on wolves?

Tracking collars are very important for wolf conservation and management. Tracking wolf movement and behavior helps biologists document reproduction, habitat use, and mortality. Data from tracking collars allows biologists to determine pack territories, individual animal movements, locations of dens and other areas important for raising young, and the time and location when a collared animal dies. Data from tracking collars also helps identify potential areas of wolf-livestock conflict, including livestock predation events.

How do tracking collars work?

Tracking collars indicate the location of an animal at a specific time. Most of the tracking collars used by CDFW on gray wolves include both a Global Positioning System (GPS) component and a Very High Frequency (VHF) component. However, some collars may include only a VHF component.

The GPS component uses the GPS satellite network to calculate its location, just like the GPS system in a smart phone. However, due to battery life limitations, the collar does not calculate locations continuously. Instead, it calculates its location at scheduled times (such as once every four hours). The collar then stores that location in its memory. At regular intervals, typically once per day, it connects with the Iridium satellite network and sends any newly stored GPS locations through the Internet to end users. Transmitting stored locations from the collar to the Iridium satellites uses more battery power than calculating and storing the locations.

The VHF component of a collar transmits a signal at a specific radio frequency (unique to each collar) that can be heard in the field using a special antenna and receiver that allows biologists to determine the direction to the collar. The receiver operator needs to be within a certain distance from the collar to pick up the signal (typically within a few miles), though that distance varies considerably due to factors such as terrain and weather. The receiver operator assesses the signal strength to estimate the direction and distance of the collar. By listening to the signal from several different locations, the operator can determine the collar's location via triangulation. If the collared animal is moving, the operator can often only develop a general estimate of its location.

**How long do collars function?**

Wildlife tracking collars are powered by batteries. However, unlike those in a smart phone, the batteries typically cannot be recharged or replaced once deployed. While some tracking collars include a solar component for recharging, such collars are not currently practical for gray wolves. Therefore, collar longevity is a function of battery size and the amount of power used to collect and transmit information. Collars use battery power to emit VHF signals, calculate and store GPS location, and transmit GPS locations to the satellite network. A collar that collects many locations and transmits them frequently will deplete its battery faster than a collar that collects fewer locations and transmits them less frequently. CDFW needs to balance the amount of data collected and transmitted by collars with their longevity; for wolves, CDFW typically programs GPS/VHF collars to calculate and store a GPS location every four hours, transmit newly stored GPS locations to end users once per day, and emit VHF signals 15 hours per day. With this programming schedule, collars are expected to last approximately 2.5 – 3 years.

Collars that include only the VHF component typically last longer than GPS/VHF collars, because VHF collars are not collecting, storing and transmitting location data. While VHF collars do not send precise locations to users through the Internet, they may be deployed on the breeding adults in some packs to increase the chances of always being able to track at least one individual within a pack.

How much do tracking collars weigh?

Collars are intended to help with wildlife management and research without adversely affecting the animal's behavior or survival. Biologists consider an animal's size and weight when selecting collars and generally aim to deploy collars that weigh less than 3% of the animal's weight. The wolf collars typically used by CDFW include a GPS and VHF component and weigh about 700 grams (1.5 lbs.).

What happens if an animal wearing a collar grows?

The life stage of an animal is carefully considered when an animal is considered for collaring. If it is an immature animal, biologists will sometimes fit the collar to be slightly looser than normal to accommodate projected growth. In some cases, biologists will line the inside of the collar with material that will degrade and/or compress over time as the animal grows. Animals deemed too small or young (or animals with significant injuries or health challenges) are not collared.

Does a wolf have to wear a collar for the rest of its life?

The collars CDFW uses on wolves include an electronic drop-off mechanism that releases the collar from the animal near the end of the collar's battery life.

**How many collared wolves are in California?**

The number of wolves in California with operational tracking collars changes regularly. While new collars are periodically placed on animals, other collars reach the end of their operational life or, like any electronic device, sometimes simply fail. Additionally, collared wolves can emigrate to other states or die. Currently, CDFW aims to maintain at least one operational collar within each pack.

Do the collars provide real-time, precise tracking of wolves?

GPS collars do not provide real-time tracking of wolves. GPS collars calculate several locations per day and periodically transmit those locations via satellite to end users. As such, they provide information on where wolves have recently been, but not where they are when the locations are being reviewed. CDFW collars are generally programmed to try to transmit the accumulated location data from the prior 24 hours to biologists early each morning. Biologists then know the general areas where the collared wolves were the preceding night (when they most typically hunt) and the general area in which they may spend much of the current day (when they most typically rest).

However, like other devices that communicate wirelessly with satellites, sometimes collars fail to establish good satellite connections and do not transmit on schedule. On a day when this happens, location data can arrive hours after the scheduled time or perhaps not at all. The collar will periodically attempt to connect to the satellite system until it successfully sends the previously acquired locations.

In contrast with GPS collar technology, a VHF signal from a collared animal does allow for real-time tracking in the field. However, the person tracking the collared wolf needs to be relatively close to it (typically within a few miles) to hear the VHF signal and often can only estimate the animal's general location. This becomes even more difficult if the animal is moving.

How does CDFW share wolf collar location information?

While specific GPS-collar locations are not broadly released to protect both wolves and private property owners, CDFW does provide approximate wolf locations to the public each day via its [online location map](#). This automated system utilizes the most recent GPS collar location data to map the approximate location of individual collared wolves. More information on the system is available [here](#).

Specific locations of suspected wolf-livestock conflict, as determined from GPS collar locations, are shared with the potentially affected livestock producers and with agencies that investigate suspected wolf depredation events. When it has a data sharing and confidentiality agreement in place with a county, CDFW shares wolf location data with authorized county staff. Those staff can then provide the general locations of wolves, or the specific locations of specific depredation events, to local livestock producers.



To facilitate scientific research, CDFW also shares wolf location data with university and other researchers through data sharing and confidentiality agreements.

What happens when a collared wolf leaves California? Or enters California from another state?

CDFW has cooperative relationships with wildlife management agencies from other states. When collared wolves cross state borders, the agencies share information about those animals' locations. For example, when collared wolves from California enter Oregon, CDFW shares their Oregon locations with Oregon Department of Fish and Wildlife. If a collared wolf enters California and its movements suggest it is likely to stay in the state for some time, CDFW will work with the collaring agency to add the collar to its automated online location map. However, this process may take several weeks.