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Response of Coyotes and Gray Wolves to Simulated Howling in North-central Washington

Abstract

Simulated howling provided information on the location of coyotes (*Canis latrans*) and gray wolves (*Canis lupus*) in north-central Washington. Coyotes responded to simulated howling at a rate of 9.9% and wolves at a rate of 0.1% from April through October. The low response rate for wolves can most likely be attributed to low density in our study area. Response rates of coyotes were highest in September and October, and during dawn and dusk. Both wolf responses occurred during early August and at dusk. The sex of the person simulating the howl did not affect the response rate. There was not a significant difference in the response rates of coyotes between backcountry and road surveys. Monitoring the RR/S of these species may be useful in estimating the response of coyotes to a recolonizing wolf population. This method would be a useful component in programs monitoring the populations of wolves and coyotes.

Introduction

Simulated howling surveys have been used to locate wolves and coyotes, to estimate changes in the numbers of packs and pack size (Joslin 1967, Pimlott and Joslin 1968, Theberge and Strickland 1978), and to provide indices of canid abundance (Carbyn 1982, Fuller and Sampson 1986). Harrington and Mech (1982) presented a methodology for a saturation census and a sampling census using simulated howling surveys. Fuller and Sampson (1986) applied the sampling census over a relatively small area where information on wolf numbers and/or locations were available from radio telemetry studies. Tucker et al. (1990) discussed the application of howling surveys as one of several survey methods that can be used to locate canids. Very few studies have applied this methodology to determine coyote locations and response rates (Carbyn 1982, Laundre 1981, Pesendorfer et al. 1986), and it has never been applied to such a large study area.

The purpose of our study was to use simulated howling to indicate the presence and general location of gray wolves and coyotes within our study area, generally following the sampling census method (Harrington and Mech 1982). The limitations of howling surveys have been discussed in several publications (Fuller and Sampson 1986, Harrington and Mech 1982, Tucker et al. 1990) and we considered these in the design of our project. The howling surveys discussed in this paper were used in conjunction with the other methods discussed by Tucker et al. (1990).

The specific objectives of this study were to locate wolves and coyotes, evaluate the effects of the time of day, time of the year, the sex of the person conducting the simulated howls, and backcountry vs road surveys on their response rates. We also provide recommendations on the application of this method to a large study area.

Study Area

The study area included all of the Okanogan National Forest west of the Okanogan and Columbia rivers and that portion of the Wenatchee National Forest north of Interstate 90 (Figure 1), all within north-central Washington state. The study area is bounded on the north by the US/Canadian border, on the west by the crest of the North Cascades mountains, on the south by the Interstate 90 highway corridor, and on the east by the Columbia and Okanogan rivers. The study area is about 890,340 hectares in size.

The study area is comprised of 22% designated wilderness areas that are accessed solely by trails. The remaining portion of the study area is multiple use national forest lands. An extensive network of roads provide access into this portion of the study area.

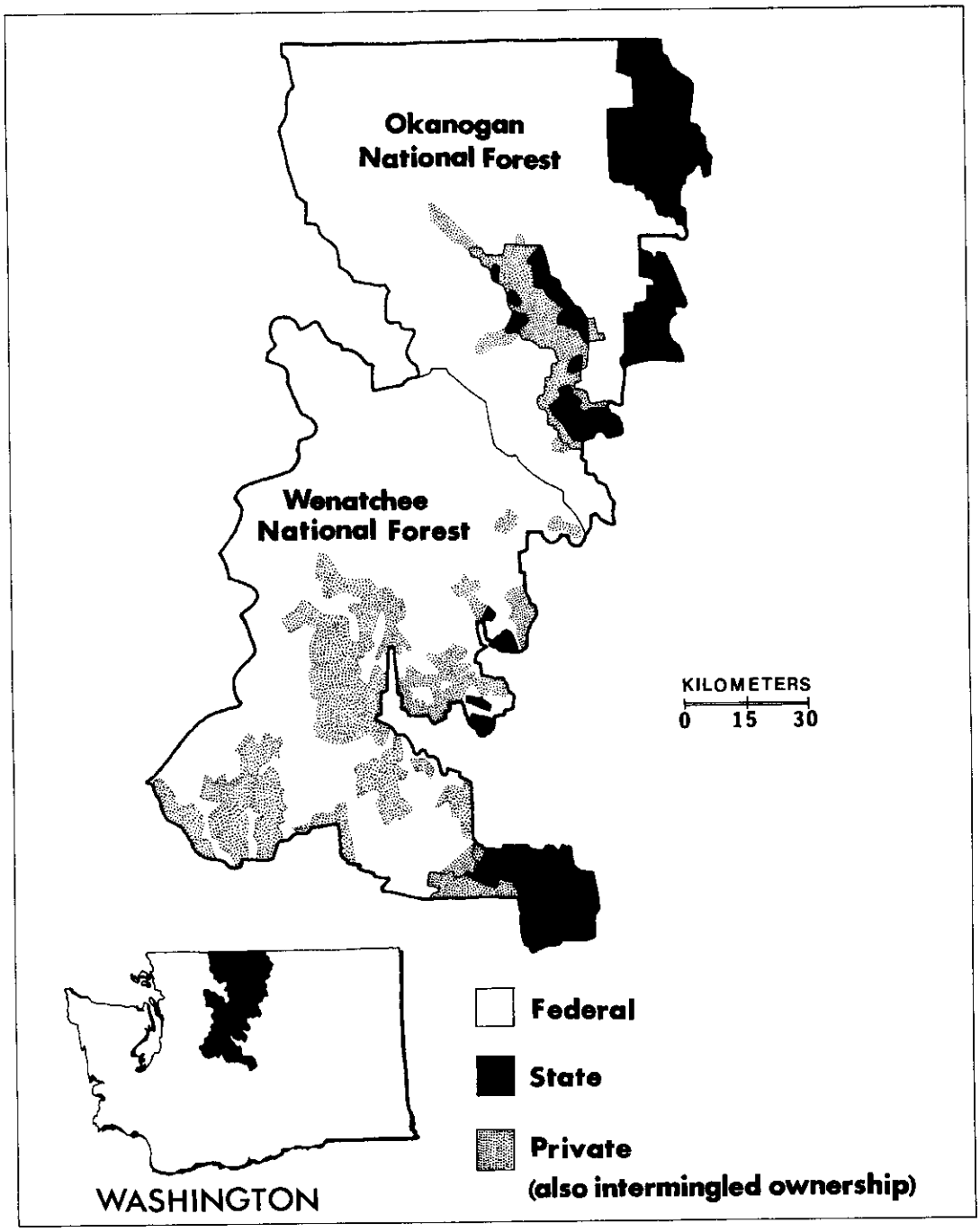

Figure 1. Map of the study area.

The elevations range from about 2300 meters along the Cascade crest to 500 meters along the eastern boundary of the study area. Precipitation levels vary from 300 cm/year in some areas along the Cascade crest to 25 cm/year in the dry east side of the study area.

Methods

We used the methodology presented by Harrington and Mech (1982) to locate gray wolves and coyotes within our study area. In general, this method involved locating howling stations approximately 1.6 km apart. We spatially stratified our study area by historical wolf presence (within past five years as determined by the Washington Department of Fish and Wildlife Large Carnivore Investigations team), ungulate winter/spring range, or recent reliable sightings that were evaluated by an interagency team.

Stations and routes were designed to limit water noise from creeks and rivers and account for varied topography. Each station was designed to cover approximately 2.6 km^2, following Fuller and Sampson (1986). At each station one person conducted a howling trial that consisted of three to five howls alternating "flat" and "breaking" howls over a period of 20 to 35 seconds. This was repeated two times with a two minute interval in between each howling trial to complete one howling session. Harrington and Mech (1982) recommended three trials, the first being of lower volume, but showed higher response rates for the last two trials. We used two trials to reduce the time at each station and covered more of our study area. We always used live human imitations of howls, as research has shown this to work as well or better than playbacks of recorded wolf howling (Theberge and Falls 1967).

Howling sessions were not conducted when there was precipitation or wind >10 km/hour. The information recorded during each howling trial included time, sex of howler, response on first or second vocalization, suspected species of canid, and weather conditions. Surveys were conducted April through October from 1991 to 1993. Survey efforts were most intensive during the months of July, August, and September, as recommended by Harrington and Mech (1982).

When survey routes occurred along roads we followed the recommendations of Harrington and Mech (1982) and Tucker et al. (1990) by conducting surveys on three consecutive nights. However, when survey routes occurred in the backcountry we did not follow the three consecutive night routine. Instead we adopted a method developed in consultation with P. Paquet and R. Ream that maximized the area covered by only surveying for one night. Backcountry routes followed trails or ridges and stations were spatially located at distances similar to road surveys.

Field crews carried tape recorders equipped with parabolic microphones (Bionic Booster, Silver Creek Industries, Manitowol, WI. 54220) to record any responses. All responses were recorded on tape for later verification of canid species by an interagency team of biologists. Species were differentiated by the aural characteristics of their howls. Fundamentally, wolf howls differ from coyote howls in pitch, intensity, and duration (Theberge and Falls 1967).

We evaluated the responses of canids using the parameter of Response Rate per Session (RR/S) and Response Rate per Trial (RR/T) (Harrington and Mech 1978a). The RR/S was the percent of howling sessions during which replies were received and the RR/T was the percent of the howling trials that were answered during a howling session (Harrington and Mech 1978a). The RR/S was calculated at two hour time intervals from 1800 to 0800 in order to estimate diurnal fluctuations. By using these parameters the response rate was standardized allowing monthly comparisons of RR/S even though survey efforts varied depending upon weather conditions and available personnel.

Results and Discussion

Presence and General Location

The presence of coyotes determined from the howling surveys was confirmed at 213 locations and occurred throughout the study area. Coyotes were located in a variety of habitats, including areas that received relatively high levels of human use. Wolves were located in two areas using simulated howling. Both of these locations occurred in designated wilderness areas where human activities were relatively low. A more detailed discussion of habitat use and the effects of human activities is beyond the scope of this project.

Overall Response Rate

A total of 2137 howling sessions were conducted resulting in 215 responses by canids and an overall RR/S of 10%. Of the total number of canid responses, two were determined to be wolf and 213 were coyotes. The RR/S of wolves was very low (0.1%) and is likely due to low numbers of wolves in the study area. The RR/S of coyotes was 9.9%.

Of the coyote responses, 27% were made by lone animals, 73% by packs of two or more animals. Further differentiation of group numbers is extremely difficult (Harrington and Mech 1982). One of the wolf responses was made by a lone animal and the other by a pack of more than two animals.

Canid responses were analyzed to determine the proportion that occurred on the first or second trial. The response on the first howling trial was 65%, and 35% on the second trial. Both wolf responses occurred during the first howling trial, one response was from a wolf pack and one by a lone animal. Harrington and Mech (1982) reported a response rate of 68% by wolves on the first trial. Our results indicated that the response rate of coyotes is similar.

Time of Day

The RR/S for two hour time intervals from 1800 to 0800 PST are shown in Figure 2. During two time periods, 1800 and 2000 PST and between 0400 and 0600 PST, the RR/S for coyotes was 16% and 11%, respectively, above the overall RR/S. The lowest RR/S occurred between 0201 and 0400 PST (6%) and between 0601 and 0800 PST (0%). The wolf responses occurred during the 2201 to 2400 PST period. These results are similar to those reported in other studies where peaks in howling frequency by gray wolves occurred during the evening and morning hours (Harrington and Mech 1978b).

Time of Year

We limited our survey season to April through October. This corresponds to one of the high response rate periods reported by Harrington and Mech (1982). The RR/S of coyotes increased spring through fall (Figure 3). RR/S of coyotes was highest during the months of September (11%) and October (12%), and lowest in the spring. Harrington and Mech (1978b) reported a seasonal increase in howling frequency for two wolf packs they monitored. Harrington and Mech (1982) showed

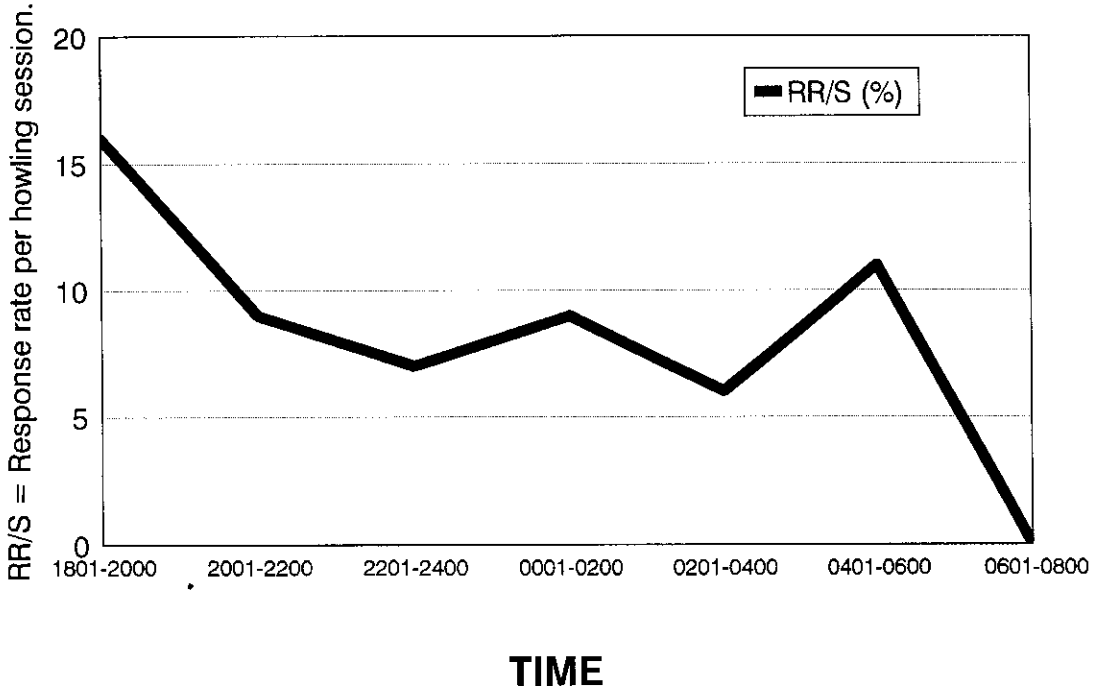

Figure 2. Diurnal response rates of coyotes.

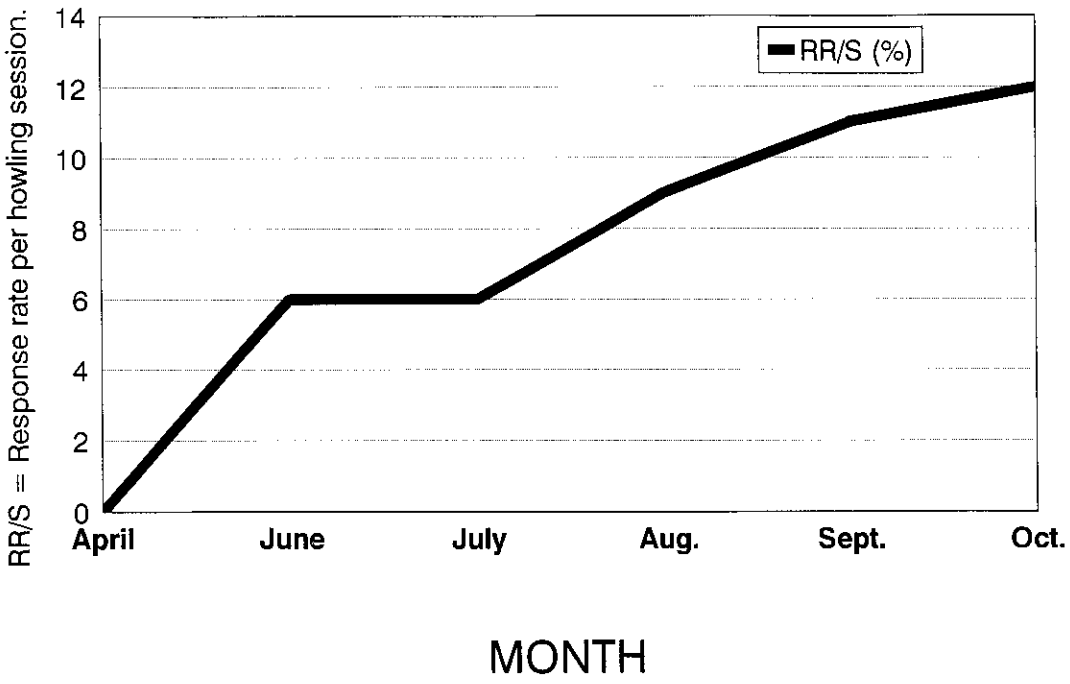

Figure 3. Monthly response rates of coyotes.

that wolf packs were more responsive to simulated howling during the summer and fall. Joslin (1967) reported a seasonal increase in responses by wolves to simulated howling and attributed the higher response rates to increased pup responsiveness. Our results and observations indicated that the seasonal increase in RR/S by coyotes may also be related to increased activity by pups. The two responses from gray wolves occurred during early August.

Sex of Howler

There was not a significant difference between the RR/S by coyotes relative to the sex of the howler. When females conducted the howling session, the RR/S was 9.8% ($p < 0.05$), and RR/S was 11.0% ($p < 0.05$) when conducted by males. One wolf response was elicited by a male howler and one by a female.

Backcountry vs Road Surveys

Most of the surveys were conducted from roads (85%) vs trails (15%) due to the ease of access. However, there was not a significant difference in the RR/S by coyotes between howling surveys conducted from roads (RR/S = 8.4%, $p < 0.05$) or from trails (RR/S = 10.3%, $p < 0.05$). Both of the responses by wolves occurred while conducting backcountry surveys.

Conclusions

Fuller and Sampson (1986) and Crete and Messier (1987) felt that howling surveys conducted over large areas were infeasible due to logistical and statistical restraints. We feel that, given funding and available personnel, application of this method over large areas can produce results that may be of use to resource managers and researchers. Our suggestions for conducting a survey of coyotes and wolves closely follow those of Harrington and Mech (1982). They made the following recommendations: (1) the best times of the day are dawn and dusk; (2) July, August, and September are the best months; and (3) trials should be repeated three times at two minute intervals (Harrington and Mech 1982).

Based upon the results of our study, howling surveys for coyotes and wolves can be effectively conducted from June through October. The highest response rates occurred in September and October. However, locations made during June and July provided information about den and

rendezvous sites. Surveys are best conducted during the dawn and dusk hours. Because a high proportion of the canid responses did not occur until the second howling trial, we suggest at least two trials/session. We also discovered that the sex of the person simulating the howls did not affect the RR/S of coyotes.

The RR/S of coyotes was not significantly different between road and backcountry howling survey strategies. This may be a function of the coyotes' tolerance of human activities but also suggests that our one-time survey strategy was an adequate method to elicit coyote responses. Our information was inconclusive relative to RR/S by wolves from roads vs backcountry routes. However, other studies have documented the negative effects that roads can have on wolves (Fuller 1990, Mech et al. 1988). Both of the responses by wolves in this study occurred while conducting backcountry surveys.

The use of simulated howling to elicit responses of coyotes and wolves in our large study area was successful in verifying the presence of many coyotes and gray wolves at two locations. The application of the methodology to such a large study area was very labor intensive. However, we feel that the RR/S reported here accurately reflects the relative abundance of the two species and can be used as an index to monitor trends. Monitoring the RR/S of these species may be useful in estimating the response of coyotes to a recolonizing wolf population, and as one technique that can be used to monitor the populations of gray wolves and coyotes.

Acknowledgements

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