

AN ABSTRACT OF THE THESIS OF

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Title: Home ranges of coyotes (*Canis latrans*) in the Flint Hills of Kansas and predation on pronghorn fawns.

Abstract Approved: *J. H. Brown*

The purposes of this study were to determine the movements of coyotes (*Canis latrans*) in the Flint Hills, Chase Co., Kansas, and to determine if the coyotes affected the pronghorn (*Antilocapra americana*) herd found in this region. A total of nine coyotes (five males, four females) were captured using padded leg-hold traps and radio collars were attached. Their movements were monitored from February 1991 to September 1991. Home ranges varied from 6 km² to 257 km², with males ($X = 107 \text{ km}^2$) having larger home ranges than females ($X = 62 \text{ km}^2$), however the difference on home ranges between sexes was not statistically different. Females tended to be found in riparian habitat more than males. No changes in movement or home ranges of coyotes were detected visually in response to pronghorn fawning. An analysis of scats that were collected during the spring and summer indicated that coyotes did not eat pronghorn, either as a prey or as carrion. These results indicated that the pronghorn were not a major food source of coyotes in the Flint Hills, however they may still have an effect on pronghorn fawns during their critical period.

HOME RANGES OF COYOTES (CANIS LATRANS) IN THE FLINT HILLS
OF KANSAS AND PREDATION ON PRONGHORN FAWNS

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INTRODUCTION

The Flint Hills of Kansas is a tallgrass prairie that consists of grasses such as little bluestem (Andropogon scoparius), big bluestem (Andropogon gerardi), Indian grass (Sorghastrum nutans), switch grass (Panicum virgatum), and various forbs (Horak, 1985). This area is typically burned in early spring to promote growth of new grass and is used extensively for cattle grazing from April to September. In addition to cattle, a variety of birds and mammals exist in this area including various song birds and hawks, jackrabbits (Lepus californicus), eastern cottontails (Sylvilagus floridanus), white-tailed deer (Odocoileus virginianus), pronghorn (Antilocapra americana), and coyotes (Canis latrans).

Coyotes (Canis latrans) can be found in a variety of habitats and their distribution extends over most of the United States (Gier, 1968). Their success at survival can be attributed to being opportunistic in their diet (Gier, 1968; Ogle, 1971). In the winter, the coyotes' diet contains the carrion of large game animals (Ozoga and Harger, 1966; Gier, 1968; Ogle, 1971; Andelt, 1985; Huegel et al., 1985; Roy and Dorrance, 1985; Gese et al., 1988b). During spring, coyotes often attack the fawns of white-tailed deer, mule deer, and pronghorn (Cook et al., 1971; Ogle, 1971; White, 1973; Beason, 1974; Hamlin, 1979; Truett, 1979; Wenger, 1981; Smith et al., 1986). The rest of the year, their diet contains rabbits, rodents, birds, fruits,

and vegetables (Murie, 1940; Gier, 1968; Andelt, 1985; Gese et al., 1988b). Pronghorn were reintroduced to the Flint Hills in 1978 and 1979 by the Kansas Department of Wildlife and Parks (KDWP, 1987) to try and reestablish a reproductive herd in the Flint Hills. A herd of 37 pronghorn was released in 1978, followed by another herd of 98 in 1979. In 1991, 49 more were added to the herd. The fawning season for pronghorn generally occurs from mid May to early June (Autenreith and Fichter, 1975). It is during the first 30 days after fawning that the fawns are most vulnerable, and coyote predation can be high at this time (Gier, 1968; Smith et al., 1986; Gese et al., 1988b). Thus, coyotes may represent a significant source of mortality for the pronghorn fawns of this reintroduced population and may serve to limit the size and viability of the herd. However, the tallgrass prairie may help to reduce predation by providing cover in which fawns can hide. Therefore, information obtained on pronghorn-coyote interactions in other habitats may not be strictly applicable to the Flint Hills area.

Home ranges of coyotes have been studied across the United States (Gipson and Sealander, 1972). An important factor in determining home range is habitat type (Gese et al., 1988a). In Minnesota, home ranges averaged 42 km² for males and 10 km² for females in shrubland-woodland areas (Chesness and Bremicker, 1974). Gipson and Sealander (1972)

found home ranges in Arkansas to vary from 21 km² to 42 km² for males and 8 km² to 10 km² for females in woodland areas. Home ranges as large as 204 km² were reported by Roy and Dorrance (1985) in Central Alberta, where coyotes used agricultural and forested areas. In Colorado, coyotes preferred pinyon-juniper woodland and shrub-grasslands, and had an average home range of 11 km². However, they had the largest home ranges (17 km²) in the prairie areas (Gese et al., 1988a).

The Flint Hills of Kansas consist of tallgrass prairie, which differs from habitats found in Minnesota, Arkansas, and Colorado. The tallgrass prairie consists of large rolling hills with many lowland creeks, rivers, and ponds. The riparian areas found here occur along the creeks and rivers. The habitats in Minnesota, Arkansas, and Colorado consist of woodland areas, with Colorado also reporting shrub-grassland areas. Therefore, home ranges may be considerably different from those found in other states because of the openness of the Flint Hills, lowland areas, and spacious riparian habitats (Gese et al., 1988a). The objectives of this study were 1) to determine the home ranges of coyotes in the Flint Hills and 2) to determine if coyotes caused a significant mortality in pronghorn fawns.

METHODS AND MATERIALS

The Flint Hills area is about 224,000 hectares and is comprised of 95% tallgrass prairie that is heavily grazed from April to September (Horak, 1985). The average temperature is 3°C in January and 26°C in July, with an average rainfall of 84 cm (Helyar, 1989 - 1990). The study areas consists of about 625 km². Stock ponds and creeks are abundant. The release site for the pronghorn is located in Chase County in the center of the Flint Hills in eastcentral Kansas. There are main gravel roads throughout the study area, and dirt trails in the pastures, which were drivable except during wet weather. The Kansas Turnpike runs through the center of the study site.

Nine adult coyotes were collected with padded steel leg-hold traps in seven nights of trapping. The coyotes were tranquilized with 1/2 cc of ketamine and fitted with a radio collar, which had a range of approximately 0.31 km. Fecal samples were collected at the trap site and analyzed for internal parasites. Blood samples were also collected for future genetic analysis.

An attempt was made to locate and track each coyote every other day from February 1991 to April 1991 to provide movement data prior to the pronghorn fawning season (Smith et al., 1981; Harris et al., 1990; Reynolds and Laundre, 1990). During the first three weeks of fawning season, coyotes were located and tracked daily. Tracking then continued three days a week through September 1991. Two

flights over the study area were made during the study to locate missing coyotes.

The coyotes were tracked in short sample periods to minimize the error in the daily distance travelled (Reynolds and Laundre, 1990). Intervals of less than 12 hours were used during pronghorn fawning season as recommended by Harris et al. (1990) and Reynolds and Laundre (1990). Home range was determined by the minimum convex polygon and the bivariate ellipse methods (Harris et al., 1990; Reynolds and Laundre, 1990) so that this study may be compared to other studies. The computer package, MCPAAL, was used to calculate home ranges. UTM (Universal Transverse Mercator) coordinates and visuals were plotted on topography maps. Triangulation was used during nighttime hours, with individual bearing points taken at less than 5 minutes apart to ascertain a location.

A total of 52 scats was collected from May to July on the main roadways of the study area, however not all scats were taken from areas that were occupied by pronghorn. The scats were placed individually in 8 cm x 13 cm linen bags, washed, and dried. Hair types were separated and placed on microscope slides. Permount was used and a cover slip added. Slides were scanned for pronghorn hair using description and photographs given by Blew (1988).

Hairs from a young pronghorn were mounted on glass slides in the same manner as hair from fecal samples and used as reference material.

RESULTS

Eight of the nine coyotes were successfully tracked (four females, four males). One coyote had a radio collar that malfunctioned before data were collected. The home ranges of the four females ranged from 6 km² to 100 km² and averaged 62 km² (Table 1). The home ranges of the four males ranged from 46 km² to 258 km² and averaged 107 km² (Table 1). The male and female home ranges were not statistically significant ($t = 0.809$, d.f. = 6, $P > 0.05$; $U = 6$, $P > 0.05$). The female coyotes were located 80% of the time in riparian areas along creeks, whereas males were only located 40% of the time along creeks (Figure 1). There was no significant difference between time spent in riparian areas between males and females ($Z = -0.161$, d.f. = 6, $P > 0.05$). Visual observation indicated that movements were primarily in lowland drainage areas, however upon coming to a hill, coyotes moved to the top, appeared to scout the area, and continued over the hill to the next lowland area.

The Kansas Turnpike runs through the study area but was not a major obstacle to movement. Coyote #994 (refers to the radio frequency of the coyote) was found to frequently cross underneath the turnpike, using a large drainage tunnel, during the early morning hours. Coyote #720 was also tracked on both sides of the turnpike within a 15 minute time period. Coyotes were also seen travelling about 50 m from the turnpike along the fence with no regard to the

moving traffic.

Fecal samples that were analyzed contained hookworms, roundworms, and tapeworms (Dr. Floyd Dorsey, West Plaza Animal Clinic, Emporia, Kansas, pers. comm., 1991) in all but one sample (coyote #1425). The 52 scats were analyzed with no presence of pronghorn hair found. The majority of samples contained the hair of eastern cottontail rabbits, jackrabbits, small rodents, and opossum. Grasshoppers were also found to be numerous in the samples.

TABLE 1--Home ranges of coyotes in the Flint Hills of Kansas as determined by telemetry studies from February 1991 to September 1991.

Coyote #	Date Tracked	# of Locations	Convex Polygon (km ²)	Bivariate Ellipse (km ²)
Females				
225	17 Apr- 9 Sep	21	100	261
310	17 Apr-22 Sep	25	42	96
720	17 Apr- 4 Sep	15	100	310
1425	19 Mar- 9 May	14	6	24
Males				
10	19 Mar- 9 May	7	46	503
36	25 Mar- 9 Sep	8	258	2258
788	24 Mar-25 Aug	22	55	119
994	19 Mar-24 Sep	34	69	103

Fig. 1--Home ranges of female coyotes in the Flint Hills of Kansas from February 1991 to September 1991.

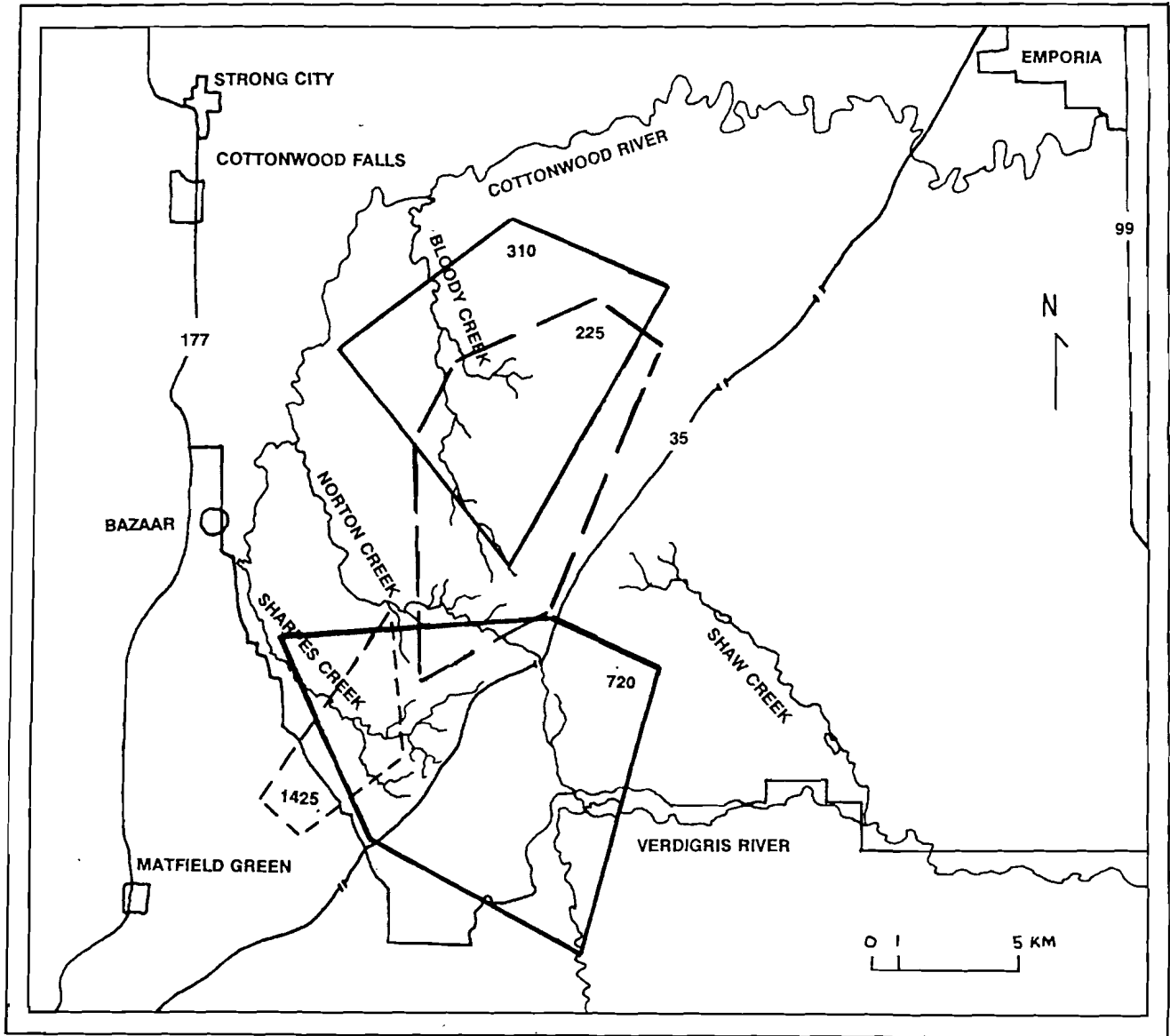
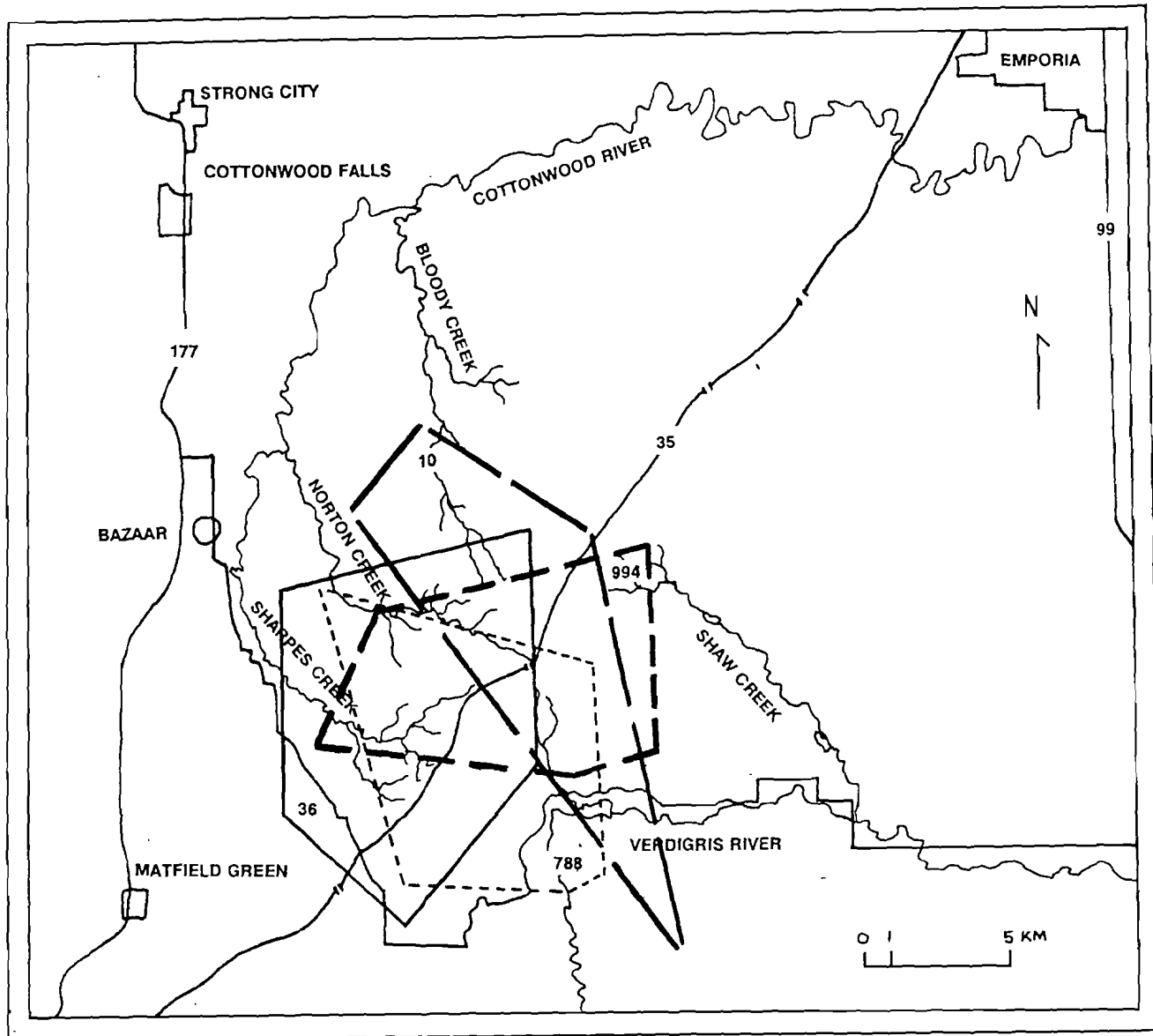


Fig. 2--Home ranges of male coyotes in the Flint Hills of Kansas from February 1991 to September 1991.



DISCUSSION

The range of the radio collars used in this study was approximately 0.31 km. This range was not large enough to pick up coyotes easily. In the Flint Hills, there has been hunting pressure by ranchers attempting to control predation by coyotes on their cattle (Fox, Kansas Department of Wildlife and Parks, pers. comm. 1991). This has made it difficult to get close to coyotes in this area. When coyotes were tracked from the vehicle, most of the time the coyotes were already aware of my presence, and so were on the move, possibly disrupting their normal movement patterns. It was only when on foot that I was able to get close enough, without disrupting movement, to get an accurate location.

The coyotes used lowland areas for travelling and tops of hills for look-out points. They may be attempting to minimize exposure to humans, while also searching the lowland areas for small rodent populations. Most of the movements were recorded at dusk and again at dawn, which was also recorded by Ozoga and Harger (1966) and Andelt (1985). However, the crepuscular nature may be a function of the tracking periods since data that were collected during the middle of the night were minimal.

The pronghorn herds in the area did not seem to change the movements of the coyotes. The herds were also constantly on the move, therefore not providing the coyotes with a consistent area in which to find pronghorn (Simpson,

Division of Biological Sciences, Emporia State University, Emporia, Kansas, pers. comm., 1991). No coyotes were tracked in the direct vicinity of the pronghorn and scat analysis showed no presence of pronghorn hair. Therefore, pronghorn were not a major food source for the coyotes of the Flint Hills. However, because the pronghorn density is low in this area, a loss of only a few pronghorn fawns may represent a significant mortality rate.

The home ranges were larger than expected, as compared to studies done by Chesness and Bremicker (1974), Gipson and Sealander (1972), and Roy and Dorrance (1985). The open area of the Flint Hills is probably responsible for the large home ranges. The distance between riparian areas is great, and coyotes may be moving from one area to another. The water supply which consists of stock ponds and creeks is plentiful, therefore allowing coyotes to travel great distances. The utilization by the coyotes of the recently increased jackrabbit populations in the open upland areas, and the existing small rodent populations in the lowland areas may also be responsible for the large home ranges of the coyotes.

The females on the average had smaller home ranges than males, probably due to pup rearing. However, this was not statistically significant. Only one female (#720) was seen with a pup. They averaged 62 km² compared to 10 km² in Minnesota (Chesness and Bremicker, 1974) and 8 km² to 10 km²

in Arkansas (Gipson and Sealander, 1972). The males averaged 107 km² compared to 42 km² in Minnesota (Chesness and Bremicker, 1974) and 20 km² to 41 km² in Arkansas (Gipson and Sealander, 1972). Roy and Dorrance (1985) reported home ranges as high as 204 km². One coyote (male #36) in the Flint Hills had a home range of 258 km². The home ranges were found to widely overlap in space, although no two coyotes were ever seen in the same area at the same time.

The turnpike, which cuts through the middle of the study area, did not seem to be an obstacle to movement. Several coyotes were found to cross under the turnpike using drainages to another area. There was one coyote (#1460), who in an attempt to cross over the turnpike, was killed.

The minimum convex polygon method was used for analysis of home ranges (Table 1). Although, it encompasses all of the fixes it is still a valuable method of determining area use. One of the disadvantages of the minimum convex polygon is that the range size can be influenced by peripheral fixes (Harris et al., 1990). However, the home ranges in the Flint Hills were so large that peripheral fixes were probably a large part of the home ranges. Trap site locations are usually not included in home ranges because coyotes are usually trapped in unfamiliar territory (Fox, Kansas Department of Wildlife and Parks, pers. comm. 1991) However, only three of the eight coyotes were trapped

outside of their home range as determined by the telemetry data.

The bivariate ellipse method was used to compare to the minimum convex polygon method. The results were not comparable to the home range sizes of the minimum convex polygon which is probably due to the lack of data points for some of the coyotes (Table 1).

SUMMARY

This study reports the home ranges of coyotes in the Flint Hills of Kansas and predation on pronghorn fawns. Eight coyotes were tracked from February 1991 to September 1991 and home ranges were recorded from 6 km² to 278 km². These home ranges are larger than those reported from studies in other states. The Flint Hills is a tallgrass prairie with vast open pastures which may account for these large home ranges. Due to a plentiful water supply, distances between riparian areas, and an increase in jackrabbit populations, small rodent populations in lowland areas, coyotes seem to be taking advantage of the large open area of the Flint Hills. Pronghorn have been recently reintroduced to the Flint Hills of Kansas. Coyotes are known to attack large game animals and are opportunistic in their diet, however, scat analysis showed no presence of pronghorn hair, and therefore, pronghorn were not a major food source for coyotes in the Flint Hills during this study. However, coyotes may still have an effect on pronghorn fawn mortality during their critical fawning period.

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6-10-92
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