

## USE OF A BARRIER TO EXCLUDE BLUNT-NOSED LEOPARD LIZARDS FROM A CONSTRUCTION ZONE

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1993 TRANSACTIONS OF THE WESTERN SECTION OF THE WILDLIFE SOCIETY 29: 16-19

**Abstract:** We used an impenetrable barrier to prevent endangered blunt-nosed leopard lizards (*Gambelia sila*) from entering a pipeline trench where the lizards were at risk of injury from construction activities. Prior to installation of the barrier, we removed an average of 3.3 blunt-nosed leopard lizards per day from the trench, and we observed other individuals daily along the pipeline right-of-way. After the barrier was completed, no blunt-nosed leopard lizards were found in the construction area. Two types of materials were used to construct the barrier: 61 cm high aluminum flashing and 91 cm high woven plastic (erosion cloth) held in place by metal or wooden stakes, respectively. The barrier was installed along both sides and ends of the pipeline right-of-way, which was approximately 2 km long and 15 m wide. Aluminum flashing was less expensive and less likely to collapse than erosion cloth. When erect, both types of barrier were equally effective in excluding blunt-nosed leopard lizards. We recommend that trenches be covered quickly in areas with active blunt-nosed leopard lizards, but when that is not possible, we recommend that trenches and associated construction areas be surrounded by barriers.

The blunt-nosed leopard lizard (*Gambelia sila*) is listed as an endangered species by the state of California and the U.S. Fish and Wildlife Service. Actions that cause the loss of individuals of an endangered species are prohibited, and such actions must be stopped or modified so as not to jeopardize the continued existence of the species. In June 1992, a pipeline trench was dug in the Kern Front Oil Field, north of Bakersfield, California. Although densities were not determined, portions of the Kern Front Oil Field seemed to support relatively large numbers of blunt-nosed leopard lizards. Problems arose when blunt-nosed leopard lizards were found in the open trench, and several individuals died. Blunt-nosed leopard lizards that entered the right-of-way and trench were subject to mortality from vehicles and equipment, from predators because of the lack of escape cover, from sloughing of trench walls, and from the collapse of burrows.

Project proponents did not plan to backfill the trench immediately, which meant that lizards, and other animals, would likely continue to be trapped in the trench. To prevent continued entrapment of blunt-nosed leopard lizards, a solid barrier was installed around the project area. Here we report on the effectiveness of two types of barriers in preventing blunt-nosed leopard lizards from entering a construction zone.

### STUDY AREA AND METHODS

The construction of an underground pipeline occurred between June and August 1992 in the Kern Front Oil Field (T28S, R27E and R28E) in Kern County, California.

Construction of the pipeline required digging a trench approximately 2 m wide and 1.5 m deep and grading a right-of-way 13.5 m wide. The total length of the pipeline was 12.3 km long, of which approximately 2 km traversed habitat supporting a high density of blunt-nosed leopard lizards.

The open pipeline trench was monitored daily for entrapped animals. All animals in the trench were captured and removed. Blunt-nosed leopard lizards found in the trench during the first several days of monitoring were taken out and kept in captivity until the trench was backfilled. However, due to deaths of several blunt-nosed leopard lizards in the trench and on the right-of-way, and the concern that some blunt-nosed leopard lizards might have been preyed upon while entrapped in the trench, it was determined that a more effective method of avoiding project-related loss was needed.

Construction of a barrier around the entire right-of-way in the area with blunt-nosed leopard lizards began 1 July and finished 4 July 1992. Two materials were used; aluminum flashing 61 cm high and erosion cloth (woven plastic) 91 cm high. Aluminum flashing was held vertically erect with metal stakes and soil was mounded at the base. The erosion cloth was angled slightly outward from the right-of-way, supported by wooden stakes, and the base of the cloth was held in place with soil. Daily searches for blunt-nosed leopard lizards in the trench and right-of-way continued after the barrier was erected.

Table 1. Mean number of blunt-nosed leopard lizards (BNLL) per day found in the trench and right-of-way of an oil pipeline in the Kern Front Oil Field before and after the construction of a barrier around the construction zone.

	Number Days After Trenching Began	Mean BNLL/Day
Before Barrier (22-30 June)	0-8	3.3
During Barrier Construction (1-4 July)	9-11	2.3
After Barrier (after 4 July)	>11	0

## RESULTS

In the first eight days of monitoring, we found an average of 3.3 blunt-nosed leopard lizards in the trench and right-of-way (Table 1). Of the 27 blunt-nosed leopard lizards found in this time period, 22 were captured alive in the trench, two were seen in the right-of-way, and three were found dead in the trench. One lizard was found partially buried in soil that fell from the side of the trench. During the four days in which the barrier was under construction, we found an average of 2.3 blunt-nosed leopard lizards per day (Table 1), five of which were found alive in the trench and one was seen in the right-of-way. We also found the tail of a blunt-nosed leopard lizard in the trench. After the barrier was

Table 2. Species found in the trench of a pipeline on the Kern Front Oil Field 22 June-4 July 1992.

Species	No. Found
Blunt-nosed Leopard Lizard ( <i>Gambelia sila</i> )	27
Western Whiptail ( <i>Cnemidophorus tigris</i> )	33
Side-blotched Lizard ( <i>Uta stansburiana</i> )	11
San Joaquin Coachwhip ( <i>Masticophis flagellum ruddocki</i> )	8
Gopher Snake ( <i>Pituophis melanoleucus</i> )	15
Deer Mouse ( <i>Peromyscus maniculatus</i> )	3
San Joaquin Pocket Mouse ( <i>Perognathus inornatus inornatus</i> )	50
Striped Skunk ( <i>Mephitis mephitis</i> )	4

complete, we did not find any blunt-nosed leopard lizards in the construction zone (Table 1).

We also found four other species of reptiles and three species of mammals in the open trench (Table 2). Several San Joaquin coachwhips (*Masticophis flagellum ruddocki*) from the trench were about 150 cm in length, large enough to capture and eat blunt-nosed leopard lizards. All species found in the trench, except for side-blotched lizards (*Uta stansburiana*), did not seem able to climb out and had to be removed.

Differences exist in the material we used as a barrier (Table 3). Aluminum flashing was more sturdy and cheaper than erosion cloth. In the four weeks that the barrier was in place, we did not have any collapses or breaks in the aluminum barrier. In contrast, the erosion cloth frequently collapsed or pulled up from the soil at the base, which diminished its effectiveness. After the barrier was constructed, one blunt-nosed leopard lizard was found inside the right-of-way near a break in the erosion cloth. Costs (Table 3) will vary greatly for both materials. Material was purchased during a holiday weekend and may not reflect the lowest cost possible. Also costs do not include labor, which was greater for the erosion cloth.

## DISCUSSION

Oil and gas development seems to adversely affect abundances of blunt-nosed leopard lizards, particularly areas of dense development (Chesemore 1980). Although the Kern Front Oil Field is an area of moderate development, there are portions of the field that support relatively dense populations of blunt-nosed leopard lizards. Based on captures in the trench, this site also supports a moderately dense population of San Joaquin coachwhips, a species of special concern to the State of California.

It is apparent that open trenches and roads associated with a pipeline within the range of the blunt-nosed leopard lizard are hazards, particularly in areas of high lizard density. We found the remains of four blunt-nosed leopard lizards either in the trench or in the right-of-way of a new pipeline north of Bakersfield. It is also possible that blunt-nosed leopard lizards were preyed upon while trapped in the trench. We found a tail of a blunt-nosed leopard lizard in the trench, which may have been broken off while the lizard was struggling with a predator. Coachwhips are known to eat lizards (Cunningham 1959, Dixon 1967, Stebbins 1985), and we found several large coachwhips in the trench. Several other species found in the trench potentially prey on blunt-nosed leopard lizards, including gopher snakes (*Pituophis melanoleucus*) and skunks (*Mephitis* spp.).

Table 3. Comparison of materials used as barriers around the trench and right-of-way of an oil pipeline in the Kern Front Oil Field.

	Aluminum Flashing	Erosion Cloth
Height	61 cm	91 cm
Cost	\$42.50/15 m + stakes + labor	\$75.00/15 m incl. stakes; labor additional
Orientation	Vertical; Base lined with soil	Angled outward; Basal 30 cm anchored with soil
Frequency of Collapse	Infrequent	Frequent
Effectiveness	High	Moderate

Oil and gas development within the range of blunt-nosed leopard lizards will continue, but the impact of development on this endangered species must be minimized. We believe that the best way to minimize impacts to blunt-nosed leopard lizards during the construction of oil and gas pipelines is either to limit oil and gas pipeline construction to periods of inactivity of blunt-nosed leopard lizards (November-February, March is variable for activity) or, if construction occurs during the active season of the lizard (April-October), to completely fence the right-of-way before construction begins of those sections of pipelines that traverses habitat of blunt-nosed leopard lizards. Limiting construction to periods when lizards are inactive would assure that no lizards would wander into the construction zone or fall into the trench. However, lizards that are inactive underground within the construction zone would be subject to harm from trench digging and blading of the right-of-way.

If barriers are erected during times when blunt-nosed leopard lizards are active, we suggest that the fenced area be walked by trained biologists for at least two weeks prior to construction in order to capture all blunt-nosed leopard lizards. Actual length of time capturing lizards before the start of construction should be based on the numbers of lizards captured. All blunt-nosed leopard lizards captured should be held in captivity until construction is complete. Construction time should be scheduled so that lizards are not held in captivity longer than four weeks. A long stretch of construction could be subdivided into phases to keep times of captivity for the lizards to a minimum. An aluminum barrier is preferred because of its effectiveness and reduced expense

compared to erosion cloth. We caution, however, that barriers of this construction are not designed to be in place longer than two months. We expect that considerable maintenance would be required to keep a barrier together longer than 6-8 weeks.

Alternatively, if the expense of a barrier is deemed too great, trenches should be dug and the pipe installed within two days. Even then, monitoring of the trench will be necessary and blunt-nosed leopard lizards will still be subject to being killed in the right-of-way by construction equipment. Biologists should walk the proposed right-of-way for two weeks before construction begins, and capture and hold blunt-nosed leopard lizards. However, if barriers are not constructed, a few lizards likely will still wander on to the right-of-way and be subject to construction-related mortality.

#### ACKNOWLEDGEMENTS

We thank the personnel of The Planning Center for assistance with this work. Funding for this project was provided by the Kern Front Joint Venture Pipeline. Blunt-nosed leopard lizards were held in captivity under federal permit #Willdf-9. Bill Lehman, Dan Pearson, and Ron Rempel reviewed an earlier draft of this manuscript.

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