**Wildlife Vehicle Collisions (WVC) Sub-group:** ***The Sierra National Forest Highway 41 Culvert Project***

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Wildlife - vehicle collisions have been identified as the second leading cause of death for fishers in the SNAMP study area when including five non-collared fishers found dead on Highway 41 in Yosemite National Park (YNP) during the period of the study (September 2007 to present). Of the nine road-kill fishers found on Highway 41, eight were found between February and June immediately prior to and including the denning season, and four of the road-kill deaths were lactating females. This subcommittee of the Southern Sierra Nevada Fisher Working Group was formed in 2011 with the goal of finding ways to reduce fisher road-kill mortalities in this part of fisher range in the Sierra Nevada. In summer 2012, we initiated an effort to identify specific areas where fishers regularly transition across Highway 41, focusing on drainages with water and pre-existing culverts that might provide safe passage beneath the road.

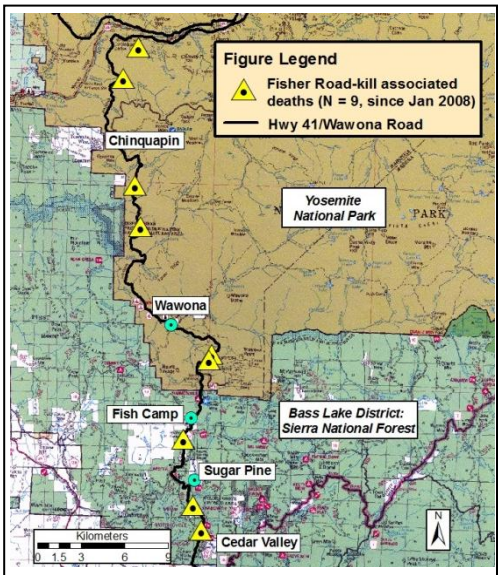


**Figure 1.** Locations of road-kill fishers along Highway 41/Wawona Road in the SNAMP Fisher Study area since February 2008.

***Background***: Highway 41 is the single major roadway that traverses the SNAMP study area, but it serves as the southern entrance to YNP and is used by many thousands of cars and buses annually. Highway 41 enters the study area near the community of Cedar Valley and enters YNP just north of Fish Camp where it continues as the Wawona Road into Yosemite Valley (Figure 1). Along its course from Cedar Valley to Yosemite Valley, Highway 41 bisects prime fisher habitat (Sierra Nevada mixed conifer forest, elevation 4000 feet to 6000 feet; Davis et al., Ecol Applications 2007, 17:2195-2213) known to be used by multiple individual collared study animals for foraging, denning, and dispersal.

**Table 1.** Number of sites where medium to large-sized mammals were detected during camera monitoring (n=11, 681 camera-nights), and the number of different culverts used by these species to pass under the road.

| Species | No. sites Detected | No. culverts used as crossing structures |
|---|---|---|
| Fisher | 5 | 4 |
| Ringtail | 5 | 2 |
| Gray fox | 6 | 2 |
| Black bear | 5 | 1 |
| Deer | 5 | 0 |
| Coyote | 2 | 0 |
| Raccoon | 7 | 5 |

***Methods***: During spring 2012 we completed a basic inventory of all existing culverts on Highway 41 between Cedar Valley and the entrance to Yosemite National Park. We identified 87 small corrugated "pipe culverts" with diameters of 1m or less that had some potential for use by fishers or other wildlife, but many of them were partially or completely blocked at one end or had significant erosion at the downslope exit that might discourage wildlife passage. During summer and fall 2012 we initiated camera monitoring of multiple pipe culverts that were (1) associated with drainages, (2) in areas where home range data indicated regular cross-road movement, and (3) in areas with high quality denning habitat. Cameras were preferentially placed in drainages with culverts that had perennial water related to the known dependence of fishers on water-cooled drainages during summer and fall. We deployed multiple cameras at promising sites, with one or more cameras


**Figure 2.** A coyote (left) investigates and then repels away from a culvert on Highway 41, and a gray fox (right) using the same culvert to cross under the road.

in the surrounding drainage and others aimed directly at culverts. Although our focal animal of interest was the fisher, other wildlife regularly die on Highway 41, and we were therefore keen to identify the full suite of wildlife using the existing culverts and/or drainages associated with culverts.

***Results:*** Our camera surveys unambiguously identified that fishers and other wildlife are actively utilizing several of the existing culverts on Highway 41 as crossing structures (Table 1, Figures 2-4). We determined that fishers used culverts to cross under Highway 41 at two separate locations (Happy Camp and Westfall), and they also used two larger culverts to pass beneath a forest road (road 5s17) immediately adjacent to Highway 41. Multiple other species of wildlife were identified as using culverts including black bear (*Ursus americanus),* raccoon (*Procyon lotor*), gray fox (*Urocyon cinereoargenteus*), and ringtail (*Bassariscus astutus*) (Table 1).

We calculated a fisher passage rate for each of the actively used culverts during the survey, which indicated a high level of use (Table 2). We are not aware of other reports from western North America of fishers using culverts to cross highways. Our preliminary data indicate that fishers are comfortable using culverts of various sizes, and that construction of a larger wildlife crossing structure on Highway 41 may enable passage by a broad suite of wildlife not limited to fishers. We do not know how use of existing culverts varies by season, or whether snowmelt runoff during spring temporarily precludes use of culverts, thereby contributing to the observed pattern of fisher road-kills focused in spring, and early summer.


**Figure 3**. Camera images detecting a radio collared fisher (top) and a black bear (bottom) using the same large culvert to cross under forest road 5s17.

**Table 2**. Summary review of data for four culverts actively used by fishers during fall 2012. Data include the minimum number of fishers present, the number of times the culvert was used as a crossing structure, and an overall passage rate (crossings/100 camera nights).

| Site | Min. number of Fishers | Crossing Events | Passage rate |
|---|---|---|---|
| Happy Camp | 3 | 27 | 32 |
| Westfall | 2 | 10 | 20 |
| 5s17 - A | 2 | 2 | 5 |
| 5s17 - B | 2 | 5 | 9 |

***Discussion and Future Activities***: In October 2012 we developed and submitted a pre-proposal to the National Fish and Wildlife Foundation (NFWF) for funding to continue this research effort. Funds were requested to conduct a detailed assessment of all existing culverts using the Passage Assessment System (PAS) designed for the Washington State Department of Transportation. PAS information would be used to identify which structures to modify or enhance for wildlife passage. Other funds were sought to continue camera monitoring of culverts during the winter/spring period, and to extend monitoring to other culverts not yet assessed for use by fishers. Although our pre-proposal to NFWF was not selected for a full proposal, our efforts have generated interest by Caltrans. We are currently working directly with Caltrans to develop task orders to execute the PAS and to continue camera monitoring of culverts during winter and spring through an on-call consultant. We envision that our collaboration with Caltrans will lead to the construction of designated wildlife crossing structures when Highway 41 is next due for a significant upgrade.


**Figure 4.** Camera images of a radio collared fisher (top) and a ringtail (bottom) using the same culvert to cross under Highway 41.