PRACTICAL WINERY & VINEYARD

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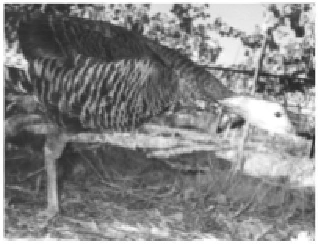
VINEYARD LANDSCAPE



Wildlife activity along creek corridors

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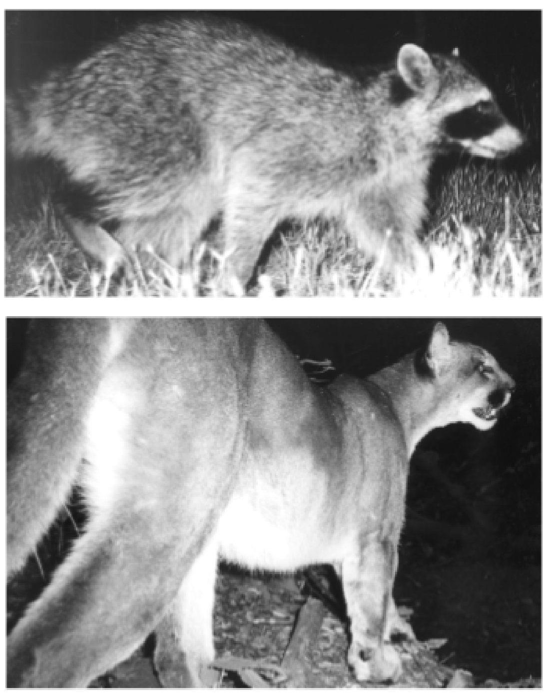
Learning how to manage agro-ecosystems to conserve natural resources and wildlife is an ongoing challenge for agriculture the world over. Agro-ecology focuses on the farm, where farming practices, land management, and restoration can enhance production and improve ecosystem health. In California vineyards, for example, a great deal of progress has been made in promoting biodiversity by increasing the use of cover crops and hedgerows.[1,4]

Improving land stewardship so that farming can remain a way of life for future generations is a laudable goal. However, the concept of sustainable agriculture goes beyond the boundaries of the vineyard to include entire ecosystems, the myriad of species these systems support, and the goods and services they provide.



Infrared cameras captured nighttime inhabitants of wildlife corridors in Sonoma County, CA.

In California, many agricultural valley floors are dominated by vineyards and, over the past 10 years, vineyards have been expanded into higher elevations and natural habitat. Many voices have been raised concerning the impacts of this monoculture on wildlife and the consequences of increasing habitat loss.

A central question is whether or not intensively managed agricultural landscapes exclude native flora and fauna due to a lack of habitat diversity. However, little is known about how wildlife use existing agro-ecosystems, and in particular, what species are sustained across California's vineyards.

Maintaining small populations requires that animals be able to move among remnant habitat patches to find adequate resources.[2] In an effort to conserve wildlife populations in fragmenting landscapes, managers and conservation biologists have proposed the use of habitat corridors — strips of intact habitat between two or more otherwise disjunct habitats.[5]

Although theoretical assumptions abound, few studies provide empirical evidence that wildlife use corridors. Of existing corridor studies, few examine spatial scales large enough to be relevant to landscape management, and few studies focus on mammals that exist at low population densities — such as carnivores — which most need corridors to survive.

Most wildlife corridors, both remnant (sometimes called *de facto* or "by default") and designed, are riparian corridors that are essential to protect river systems. Without knowing whether wildlife preferentially use riparian corridors in highly modified landscapes, it is difficult to develop appropriate guidelines for farmers on maintaining riparian corridors for wildlife movement.

Several recent land-use issues in northern California have made a riparian wildlife corridor study appropriate and timely. The decline of anadromous fisheries, invasion of exotic plant species into riparian zones, and hillside vineyard expansion have prompted concern about riparian corridors. Additionally, there is increasing recognition that riparian corridor vegetation is important for terrestrial wildlife.

These issues have led resource and land management agencies, environmental organizations, grapegrower associations, and other groups to take increasing interest in establishing appropriate guidelines for buffers around creeks and riparian corridor management in northern California.

Our study

Our primary goals in this study were to quantify the presence (and absence) of wildlife in riparian corridors adjacent to vineyards to assess which mammalian predators used them. Additionally, we wished to examine whether the width of the corridor affected wildlife composition in the riparian zone. If so, it would be an important factor in future planning, since corridor width varies greatly between vineyards, and is sometimes regulated or under consideration for government regulation.

Two non-baited remote-triggered cameras were placed at 21 riparian corridors in Sonoma Valley and Alexander Valley (Sonoma County, CA) where vineyards abut riparian zones. The riparian corridors originate in relatively natural hillside oak woodland of the Mayacamas Mountains and drain into either the Russian River or Sonoma Creek. Creeks on the opposite banks of the Russian River and Sonoma Creek also originated in hillside oak woodlands, theoretically creating riparian corridors that connected oak woodlands on either side of Sonoma Valley and Alexander Valley.

We sampled three types of riparian corridors:
1) denuded corridors had very little natural vegetation along the creek;
2) narrow corridors had a strip of vegetation ranging from 10 to 30 meters on each side of the creek;
3) wide corridors had more than 30 meters of natural vegetation on each side of the creek.

Presence and absence data were recorded by site for each species of mammal predator. Mammal predators were detected using cameras with infrared devices that sensed wildlife and triggered the shutter from dusk to dawn. Two cameras at each of the 21 creek sites for 30 functional days resulted in 435 photos of mammalian predators across all sites (Figure I).

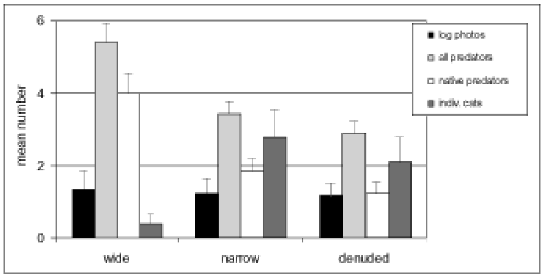


Figure I: *Mean and standard error of number of: all predators, native predators, and individual cats detected as well as number of photos taken of all mammal predators (log transformed) in wide (n=5), narrow (n=7), and denuded (n=9) corridor treatments using remotely-triggered cameras.*

Native species detected included striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), and mountain lion (*Felis concolor*). Non-native mammalian predators detected included opossum (*Didelphis virginiana*), domestic cat (*Felis catus*), and domestic dog (*Canis familiaris*). Another 240 photos were taken of non-focal species including jackrabbit (*Lepus californicus*), black-tailed deer (*Odocoileus hemionus*), and several rodent and bird species.

There were a nearly equal number of photographs taken of all mammal predators at each riparian corridor site type — denuded, narrow, and wide. Despite the similar number of photos across riparian sites, the number of mammal predator species found across corridor categories differed, and the composition also varied across categories. Significantly more species of mammal predators were detected in wide riparian corridor sites than narrow or denuded sites.

In addition to the difference in numbers of species by site type, the species composition was different. Domestic cats were detected primarily at narrow and denuded riparian corridor sites. Unique coat coloration and markings distinguished one to five individual cats in each of the denuded and narrow site types and only one individual cat at the different wide riparian corridor sites.

Bobcats and coyotes were found primarily in wide corridors, and striped skunks and gray fox also were detected proportionally more there than in other categories. Raccoons and opossums were found widespread across all creek categories and sites, such that there was no significant different in use among wide, narrow, and denuded corridors by these species. Only one mountain lion was detected at a well-vegetated narrow riparian corridor site.

These results indicate that both the number and composition of mammalian predators change based on different widths of natural vegetation along creeks. A greater diversity of all mammalian predators and more native mammal predators were found in wide riparian corridors, compared to narrow or denuded corridors.

Large native predators were detected primarily in wide riparian corridors, and smaller native and non-native mammalian predators, especially the domestic cat, were more active in narrow and denuded riparian corridors. Despite the large sampling effort, only one mountain lion was detected and no black bears were ever detected, indicating that these highly altered landscapes may not be serving these larger carnivores.

The number of photographs taken of mammal predators can be related to a general measure of activity level. Photo results suggest that general mammal predator activity levels among denuded, narrow, and wide riparian corridors were similar. However, there were fewer species at the narrow and denuded sites than the wide riparian corridor sites.

The loss of predator diversity did not lead to lower activity levels in narrow corridors. Instead, smaller native and particularly non-native mammalian predators became more active. This relationship is suggestive of "meso-predator release," where the loss of larger predators leads to an outbreak of smaller and often non-native predators. This is a concern, because other studies have shown that high numbers and activity levels of these smaller predators, such as domestic cats, can lead to heavy predation upon other native fauna in the system, such as birds and rodents. This cascading effect can lead to further species declines.

Some mammalian predators may cross vineyards rather than travel along degraded riparian corridors. However, we conducted a separate study that indicated overall levels of vineyard use by these mammal predators was very low compared to riparian corridor use, a result which indicates the preferential use and importance of these riparian zones for wildlife.

Average detection rate of predators per functional camera in riparian corridors was 0.345 per night, compared to 0.031 per night for cameras in vineyards. Mammalian predators were 11 times more likely to be detected in creek corridors than in vineyards. This is probably a reflection of their avoidance of vineyards and the importance of riparian zones. Also, many native species were not detected at all much beyond the habitat vineyard edge, indicating that large expanses of vineyards may be a barrier for them.

As vineyard and housing developments expand across the oak woodland landscape, core habitat areas will be smaller and increasingly isolated from one another.3 The probability of mammalian predator occurrence across expanding vineyard areas will decrease.

Some species, including grizzly bears (*Ursus arctos*) and wolves (*Canis lupus*) are known to be extinct in California already. There were no detections of spotted skunks (*Spilogale gracilis*) and only one mountain lion. Both species have historically been known to range throughout the study area, but are also known to be sensitive to human activity and habitat loss and fragmentation.

Spotted skunks are thought to already be extinct in Sonoma County, but mountain lions continue to persist in the mountains. Studies in southern California have documented extinction of mountain lions from increasingly fragmented habitats 6, and careful planning will likely be needed if this animal is to survive in Sonoma County in the future.

Maintenance of wide corridors may be important where they are regularly used by the remaining spectrum of mammalian predators and other species, if these species are to remain in the region in the long-term.

Further research is needed, however, to better understand how individual wildlife in riparian corridors contribute to overall long-term species survival. Meanwhile, these findings provide another good reason for grapegrowers and all land owners to set back from creeks and for the public to provide incentive to landowners to retain more riparian habitat, leaving these valuable corridors unfenced for free passage by wildlife that remain on vineyard landscapes.

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