March 11, 2019

***Sent via email and FedEx***

Ventura County Board of Supervisors
Attn: Shelley Sussman & Meighan Batinica
800 S. Victoria Avenue
Ventura, California, 93009
Shelley.Sussman@ventura.org
Meighan.Batinica@ventura.org
Wildlife.Corridors@ventura.org

**Re: Proposed Habitat Connectivity and Wildlife Corridor Ordinance and Planning Commission Recommendations**

Dear Ventura County Board of Supervisors:

These comments are submitted on behalf of the Center for Biological Diversity (the "Center") regarding the proposed Habitat Connectivity and Wildlife Corridor Ordinance ("Ordinance") and the Planning Commission Recommendations. The Center appreciates the work of the Board of Supervisors, Planning Commission, and Planning Division Staff in developing the Ordinance. The Ordinance as originally proposed would be a major step forward in maintaining and enhancing wildlife connectivity within Ventura County and the region; however, some of the proposed revisions and recommendations based on discussions from the January 31, 2019 Planning Commission meeting substantially weaken the Ordinance.

The Center strongly supports the objectives of the Ordinance and the County's efforts to preserve functional connectivity by establishing designated habitat connectivity and wildlife corridors (HCWC) and critical wildlife passage areas (CPWA). Limiting development and associated noise and lighting in these important corridor areas, enhancing wildlife crossing infrastructure where barriers already exist (*i.e.*, roads), and incorporating corridor redundancy will help to preserve habitat connectivity and foster the County's expansive biodiversity through current and future climate regimes. However, the Center is concerned about exemptions that would allow for excessive lighting, wildlife impermeable fencing, and surface mining and oil and gas exploration activities in these areas. Furthermore, recommendations from the Planning Commission do not take into account the best available science and instead aim to reduce the designated corridor areas to appease unknown agricultural concerns. The Center urges the Board to strengthen the Ordinance by applying the best available science to identify critical areas for wildlife movement and habitat connectivity, minimizing exemptions that undermine the Ordinance's goals, and requiring larger development buffers from surface water features (*i.e.*,

intermittent and perennial streams and wetlands) to effectively preserve functional connectivity for wildlife and vegetation throughout the County.

The Center is a non-profit, public interest environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center has over 1.4 million members and online activists throughout California and the United States. The Center and its members have worked for many years to protect imperiled plants and wildlife, open space, air and water quality, and overall quality of life for people in Ventura County.

## I. Habitat Connectivity Is Essential for Wildlife Movement and Biodiversity Conservation.

Habitat connectivity is vital for wildlife movement and biodiversity conservation. Limiting movement and dispersal with barriers (*e.g.*, development, roads, or fenced-off croplands) can affect animals' behavior, movement patterns, reproductive success, and physiological state, which can lead to significant impacts on individual wildlife, populations, communities, and landscapes (Trombulak and Frissell 2000; Tewksbury et al. 2002Cushman 2006; van der Ree et al. 2011; Haddad et al. 2015; Ceia-Hasse et al. 2018). Individuals can die off, populations can become isolated, sensitive species can become locally extinct, and important ecological processes like plant pollination and nutrient cycling can be lost. In addition, connectivity between high quality habitat areas in heterogeneous landscapes is important to allow for range shifts and species migrations as climate changes (Heller and Zavaleta 2009, Cushman et al. 2013). Lack of wildlife connectivity results in decreased biodiversity and degraded ecosystems. Thus, preserving and maintaining natural and created corridors is critical for species and habitat conservation in fragmented landscapes (Gilbert-Norton et al., 2010).

Wildlife connectivity and migration corridors are important at the local, regional, and continental scale. Local connectivity that links aquatic and terrestrial habitats would allow various sensitive species to persist, including state- and federally-protected California red-legged frogs (*Rana draytonii*), arroyo toads (*Anaxyrus californicus*), and other species. At a regional scale, medium- and large-sized mammals that occur in Ventura County, such as mountain lions (*Puma concolor*), bobcats (*Lynx rufus*), gray foxes (*Urocyon cinereoargenteus*), ring-tailed cats (*Bassariscus astutus*), and mule deer (*Odocoileus hemionus*), require large patches of heterogeneous habitat to forage, seek shelter/refuge, and find mates. In addition, anadromous fish, such as steelhead trout (*Oncorhynchus mykiss*), are born in some of Ventura's waterways, spend several years in the Pacific Ocean, and return to Ventura to spawn. Ventura is an important hub for local and global biodiversity; wildlife movement and habitat connectivity must be maintained throughout the Ventura County.

## II. Climate Change Is Likely to Significantly Alter Wildlife Behavior and Movement.

A strong, international scientific consensus has established that human-caused climate change is causing widespread harms to human society and natural systems, and climate change threats are becoming increasingly dangerous. In a 2018 *Special Report on Global Warming of*

*1.5°C* from the Intergovernmental Panel on Climate Change (IPCC), the leading international scientific body for the assessment of climate change describes the devastating harms that would occur at 2°C warming, highlighting the necessity of limiting warming to 1.5°C to avoid catastrophic impacts to people and life on Earth (IPCC 2018). In addition to warming, many other aspects of global climate are changing. Thousands of studies conducted by researchers around the world have documented changes in surface, atmospheric, and oceanic temperatures; melting glaciers; diminishing snow cover; shrinking sea ice; rising sea levels; ocean acidification; and increasing atmospheric water vapor (USGCRP, 2017).

Climate change is increasing stress on species and ecosystems, causing changes in distribution, phenology, physiology, vital rates, genetics, ecosystem structure and processes, and increasing species extinction risk (Warren et al., 2011). A 2016 analysis found that climate-related local extinctions are already widespread and have occurred in hundreds of species, including almost half of the 976 species surveyed (Wiens 2016). A separate study estimated that nearly half of terrestrial non-flying threatened mammals and nearly one-quarter of threatened birds may have already been negatively impacted by climate change in at least part of their distribution (Pacifici et al. 2017). A 2016 meta-analysis reported that climate change is already impacting 82 percent of key ecological processes that form the foundation of healthy ecosystems and on which humans depend for basic needs (Scheffers et al. 2016). Genes are changing, species' physiology and physical features such as body size are changing, species are moving to try to keep pace with suitable climate space, species are shifting their timing of breeding and migration, and entire ecosystems are under stress (Cahill et al., 2012; Chen et al., 2011; Maclean & Wilson, 2011; Parmesan, 2006; Parmesan & Yohe, 2003; Root et al., 2003; Warren et al., 2011). As such, it is imperative that current and future land use planning consider the impacts of climate change on wildlife movement. In order to further this goal, any development within the overlay zones should be reviewed to ensure functional connectivity in light of potential climate change impacts.

## III. Corridor Redundancy Helps Retain Functional Connectivity and Resilience.

Corridor redundancy (*i.e*. the availability of alternative pathways for movement) is important in regional connectivity plans because it allows for improved functional connectivity and resilience. Compared to a single pathway, multiple connections between habitat patches increase the probability of movement across landscapes by a wider variety of species, and they provide more habitat for low-mobility species while still allowing for their dispersal (Mcrae et al., 2012; Olson & Burnett, 2008; Pinto & Keitt, 2008). In addition, corridor redundancy provides resilience to uncertainty, impacts of climate change, and extreme events, like flooding or wildfires, by providing alternate escape routes or refugia for animals seeking safety (Cushman et al., 2013; Mcrae et al., 2008; Mcrae et al., 2012; Olson & Burnett, 2008; Pinto & Keitt, 2008). Thus, the Center supports efforts that account for corridor redundancy and functional connectivity to facilitate wildlife movement throughout the County.

## IV. Human Development and Associated Noise and Lighting Can Interfere with the Behavior of Local Wildlife Such as Mountain Lions.

Human development and associated noise can degrade adjacent wildlife habitat and behavior. (*See, e.g.,* Slabbekoorn 2008.) For instance, field observations and controlled laboratory experiments have shown that traffic noise can significantly degrade habitat value for migrating songbirds. (Ware et al. 2015.) This finding followed lab results indicating that subjects exposed to 55 and 61 dBA simulated traffic noise exhibited decreased feeding behavior and duration, as well as increased vigilance behavior. (*Id*.) Such behavioral shifts increase the risk of starvation, thus decreasing survival rates. A recent study also highlighted the detrimental impacts of siting development near areas protected for wildlife. The study noted that "Anthropogenic noise 3 and 10 dB above natural sound levels . . . has documented effects on wildlife species richness, abundance, reproductive success, behavior, and physiology." (Buxton, et al.) The study further noted that "there is evidence of impacts across a wide range of species [] regardless of hearing sensitivity, including direct effects on invertebrates that lack ears and indirect effects on plants and entire ecological communities (e.g., reduced seedling recruitment due to altered behavior of seed distributors)." (*Ibid*.) Moreover, human transportation networks and development resulted in high noise exceedances in protected areas. (*Ibid*.)

There also is strong evidence documenting the effects of human activity specifically on mountain lions. One study found that mountain lions are so fearful of humans and noise generated by humans that they will abandon the carcass of a deer and forgo the feeding opportunity just to avoid humans. (Smith 2017.)[1] The study concluded that even "non-consumptive forms of human disturbance may alter the ecological role of large carnivores by affecting the link between these top predators and their prey." (Smith 2017.) In addition, the study found that mountain lions respond fearfully upon hearing human vocalizations. Another study demonstrates that mountain lions exposed to other evidence of human presence (lighting, vehicles, dogs) will impact mountain lion behavior. (Wilmers 2013.) Other studies documented diet shifts in mountain lions near human development, and recommended minimizing any development in mountain lion habitat. (Smith 2016; *see also* Smith 2015.)

Additional studies similarly documented that mountain lions avoid "urban, agricultural areas, and roads and prefer[] riparian areas and more rugged terrain." (Zeller 2017; *see also* Vickers 2015.) One study found that over half (55 percent) of radio collared mountain lions in urban areas did not survive, and the majority were killed by humans either by vehicle strikes or using depredation permits. (Vickers 2015.) Given that human activities can interfere with natural behavior and movement of local wildlife, the Center supports the County's efforts to limit development and associated noise and lighting in corridor areas.

[1] *See also* Sean Greene, "How a fear of humans affects the lives of California's mountain lions," *Los Angeles Times* (June 27, 2017), available at http://beta.latimes.com/science/sciencenow/la-sci-sn-pumas-human-noise-20170627-story.html.

## V. Creating and Enhancing Wildlife Crossings for Existing Roads Is Critical to Maintaining Healthy Ecosystems.

The Center supports the objective of the Ordinance to enhance wildlife connectivity on existing roads through the use of increased setbacks. Enhanced connectivity helps sustain functional ecosystems and ensure public safety. Although natural, existing corridors in fragmented landscapes have been shown to have more wildlife movement compared to created corridors (Gilbert-Norton et al., 2010), crossing structures combined with setbacks at the entrances and exits are useful as retroactive restoration in areas where existing roads have high incidence of wildlife vehicle conflict or where species movement has been severely impacted. When appropriately implemented, wildlife crossing infrastructure has been shown to improve wildlife permeability and reduce wildlife vehicle collisions (Bissonette & Rosa, 2012; Dodd Jr. et al., 2004; Dodd et al., 2012; Kintsch et al., 2018; Sawaya et al., 2014; Sawyer et al., 2012). Thus, by maintaining and restoring habitat connectivity that facilitates movement required for current and future species ranges and behaviors, the County would improve driver safety while promoting local biodiversity.

Outside of California many other states and jurisdictions have been proactively addressing wildlife connectivity issues. For example, Arizona, Colorado, and Wyoming have seen 80-96% reductions in wildlife vehicle collisions while gradually increasing the level of wildlife permeability over time (it appears that some species take more time than others to adapt to crossings) on sections of highways where they have implemented wildlife crossing infrastructure, such as underpasses, culverts, overpasses, wildlife fencing, and escape ramps (Dodd et al., 2012; Kintsch et al., 2017; Kintsch et al., 2018; Sawyer et al., 2012). Utah just completed the state's largest wildlife overpass at Parleys Canyon for moose, elk, and deer. Washington State is about to complete its largest wildlife overpass on I-90, which is anticipated to provide habitat connectivity for a wide variety of species between the North and South Cascade Mountains. The overpass cost $6.2 million as part of a larger $900 million expansion project that will include multiple wildlife crossings along a 15-mile stretch of highway. Savings from less hospital bills, damage costs, and road closures from fewer wildlife vehicle collisions will make up those costs in a few years (Valdes 2018). State transportation departments are actively pursuing these types of projects because of the benefits for wildlife connectivity, public safety, and the economy. The Center supports Ventura County's efforts to actively invest in preserving habitat connectivity where there are no roads or development while also enhancing or restoring connectivity where roads or other transportation infrastructure already exist.

## VI. The Ordinance Should Require Stronger Development Buffers for Streams and Wetlands.

Based on recommendations from the Planning Commission, the Ordinance's surface water feature setbacks were reduced from 200 feet to 100 feet. The revision was based on concerns regarding potential impediments on agricultural operations. However, in a letter to the Board of Supervisors, Planning Division staff stated that it was not clear "what specific agricultural operations were of concern" given that there are already various exemptions for commercial agricultural activity (March 12, 2019 Planning Division Letter at 11). This change does not support one of the main objectives of the Ordinance to "[p]reserve the functional

connectivity and habitat quality of surface water features" (Section 8104-7.7(b)). Streams are important corridors for wildlife movement and habitat connectivity; the Ordinance should consider the best available science and require a minimum 200-foot setback from all perennial and intermittent streams, with special attention given to streams that are located within designated critical habitat or support or have the potential to support special-status, sensitive, or rare species.

Streams and wetlands throughout the County support numerous special-status flora and fauna, including steelhead trout (*Oncorhyncus mykiss*), least Bell's vireo (*Vireo bellii pusillus*), and California red-legged frogs (*Rana draytonii*). Many species that rely on these aquatic habitats also rely on the adjacent upland habitats (*e.g.*, riparian areas along streams, and grassland habitat adjacent to wetlands). In fact, 60% of amphibian species, 16% of reptiles, 34% of birds and 12% of mammals in the Pacific Coast ecoregion (which includes Ventura County) depend on riparian-stream systems for survival (Kelsey and West 1998). Many other species, including mountain lions and bobcats, often use riparian areas and natural ridgelines as migration corridors or foraging habitat (Dickson et al, 2005; Hilty & Merenlender, 2004; Jennings & Lewison, 2013; Jennings & Zeller, 2017). Additionally, fish rely on healthy upland areas to influence suitable spawning habitat (Lohse et al. 2008), and encroachment on these habitats and over-aggressive removal of riparian areas have been identified as major drivers of declines in freshwater and anadromous fish (*e.g.*, Stillwater Sciences 2002; Lohse et al. 2008; Moyle et al. 2011).

A literature review found that recommended buffers for wildlife often far exceeded 100 meters (~325 feet), well beyond the largest buffers implemented in practice (Robins 2002). For example, Kilgo et al. (1998) recommend more than 1,600 feet of riparian buffer to sustain bird diversity. In addition, amphibians, which are considered environmental health indicators, have been found to migrate over 1,000 feet between aquatic and terrestrial habitats through multiple life stages (Semlitsch and Bodie 2003; Trenham and Shaffer 2005; Cushman 2006; Fellers and Kleeman 2007). Specifically, the California red-legged frog, a threatened species that occurs and has designated critical habitat within Ventura County, was found to migrate about 600 feet between breeding ponds and non-breeding upland habitat and streams, with some individuals roaming over 4,500 feet from the water (Fellers and Kleeman 2007). Other sensitive species known to occur in Ventura County, such as western pond turtles (*Actinemys marmorata*, a candidate species under the Endangered Species Act) and California newts (*Taricha torosa*), have been found to migrate over 1,300 feet and 10,000 feet respectively from breeding ponds and streams (Trenham 1998; Semlitsch and Bodie 2003). Accommodating the more long-range dispersers is vital for continued survival of species populations and/or recolonization following a local extinction (Semlitsch and Bodie 2003; Cushman 2006). In addition, more extensive buffers provide resilience in the face of climate change-driven alterations to these habitats, which will cause shifts in species ranges and distributions (Cushman et al., 2013; Heller & Zavaleta, 2009; Warren et al., 2011). This emphasizes the need for sizeable riparian and upland buffers around streams and wetlands in Ventura County, as well as connectivity corridors between heterogeneous habitats. The Ordinance should not be weakened to 100-foot stream setbacks.

In addition, maintaining a minimum 200-foot development buffer from streams would facilitate essential ecosystem services that humans rely on. Larger buffer zones than those

proposed in the weakened Ordinance along streams would provide more stream bank stabilization, water quality protection, groundwater recharge, and flood control both locally and throughout the watershed (Nieswand et al. 1990; Norris 1993; Whipple Jr. 1993; Sabater et al. 2000; Lovell and Sullivan 2006). They would also protect communities from impacts due to climate change by buffering them from storms, minimizing impacts of floods, and providing water storage during drought (Environmental Law Institute 2008). Thus, the County should require a minimum 200-foot buffer around streams.

## VII. Some of the Proposed Exemptions to the Critical Wildlife Passage Areas Overlay Zone Undermine the Objectives of the Ordinance.

The Center wholeheartedly supports the objectives of the Ordinance, which are outlined in the staff report to include (1) regulating the siting of structures, uses and activities within individual lots so as to avoid key habitat areas used by wildlife; (2) consolidating development to provide open areas as a means to facilitate wildlife passage within and between individual lots; and (3) providing access to, and movement between, surrounding protected habitat areas on a regional geographic scale.

In furtherance of those objectives, the Center again recommends that certain exemptions be removed from the Ordinance. In particular, section 8109-4.9 establishes the Critical Wildlife Passage Areas Overlay Zone ("CWPA"), which provides requirements and procedures for development in this zone. (Exh. 14 at 21.) However, the next section provides that these requirements and procedures do not apply to some types of development, including "[a]ny development on a lot zoned Commercial (CO, C1, CPD)....aboveground pipelines or transmission lines...construction and maintenance of driveways and roads internal to a lot." (*Id*. at 21.) Commercial development, pipelines, and internal roads can all impede wildlife connectivity and disturb animal behavior. As such, it is unclear why these uses are exempt from the CWPA requirements and procedures. Instead, these exemptions undermine the objectives of the Ordinance.

In addition, it appears that some uses are partially exempt from the CWPA requirements and procedures, including golf courses, wildlife impermeable fencing used to enclose commercially grown agricultural crops or products (Section 8109-4.929(c)), and drilling for geologic testing. Golf courses can fragment and degrade wildlife habitat while causing groundwater and surface water pollution arising from pesticides and fertilizers. And as stated in Section 8104-7.7, wildlife impermeable fencing "can create barriers to food and water, shelter, and breeding access to unrelated members of the same species needed to maintain genetic diversity." Exempting wildlife impermeable fencing that encloses vast areas of land undermines the goals of the Ordinance to "preserve functional connectivity for wildlife and vegetation" and"[m]inimize wildlife impermeable fencing" (*Id*). These types of development/land use should not be exempt from the CWPA requirements and procedures.

## VIII. The Lighting Exemptions for Surface Mining and Oil and Gas Exploration Undermine the Objectives of the Ordinance.

Light pollution can confuse migratory birds and otherwise disturb and disrupt wildlife foraging and breeding. Light pollution can seriously threaten the continual survival of numerous species: "[t]he cumulative effects of behavioral changes induced by artificial night lighting on competition and predation have the potential to disrupt key ecosystem functions." (Rich and Longcore 2013). Species known to be impacted include mammals, birds (both migrating and non-migrating), reptiles, amphibians, invertebrates, fishes and plants. The impacts are wide ranging. Impacts include utilization of artificial lights, such as streetlights to forage underneath for food, which increases predation risk. (Rich and Longcore 2013). Bird species can also become "entrapped" within lighted areas, refusing to move for the night, and thus increasing their risk of predation. (*Id*.) Furthermore, light pollution need not be highly extensive to have a major impact on nearby plants and wildlife. For instance, one study found that desert rodents reduced foraging activity when exposed to the light of a single camp lantern. (Rich and Longcore 2013).

As such, any exemptions for outdoor lighting standards set forth in section 8109-4.8.2.1 should be narrowly drawn. (See Exh 14 at 8). While some of these exemptions described in section 8109-4.8.2.2 appear warranted, it is unclear why this section exempts "temporary or intermittent outdoor night lighting used for surface mining operations or oil and gas exploration and production." (*Id*.) Notably, the term "intermittent" is defined as a period of between "31 and 90 calendar days within any 12-month period." This exemption would allow surface mining or oil and gas exploration operations to use outdoor night lighting—often in remote or rural areas—for up to three months out of any given year. This exemption is likely to undermine the objective of the Ordinance to provide for movement between protected habitat areas on a regional geographic scale.

Further exemptions are provided in a post-Planning Commission revision in Section 8109-4.8.2.4(b)(11), which states that "lighting utilized for oil and gas exploration and production and surface mining operations may deviate the above-stated standards and requirements and shall be specified in a lighting plan approved by the County during the discretionary permitting process for the subject facility or operation." This weakens the Ordinance by allowing for increased light pollution that would further degrade wildlife corridors and deter animals from using them for movement and migration. Additional exemptions for lighting standards and requirements should not be afforded to surface mining and oil and gas exploration.

## IX. The Ordinance Should Use the Best Available Science to Identify Important Areas for Wildlife Movement and Habitat Connectivity.

The Planning Commission Recommendations include the removal of Lockwood Valley from the Habitat Connectivity and Wildlife Corridor ("HCWC") overlay zone. As detailed in the March 12, 2019 Planning Division Letter to the Board of Supervisors, the wildlife connectivity mapping is a result of a collaborative research effort spanning several years and involving "scientists, regulatory agencies, academics, land managers, private property owners, businesses,

and non-profits throughout California." This mapping is the best available science that delineates habitat linkages with "the best potential movement routes" to support animal and plant species that were collectively selected to "represent a diversity of habitat needs and movement patterns" (*Id*.). As such, important habitat linkages identified through this process, including Lockwood Valley, should remain in the HCWC overlay zone.

The Planning Commission Recommendations also include the removal of Tierra Rejada Valley from the Critical Wildlife Passage Areas ("CWPA") overlay zone. This is one of three areas that were identified as "critically important wildlife passage areas" because they have the "highest risk of functional connectivity loss" (*Id*.) Again, this area was designated as a priority corridor area based on the best available science and should not be dismissed. The idea is to encourage clustering of development to minimize impacts of human activities (*e.g*., habitat degradation and removal; increased frequency of wildfire ignitions; edge effects caused by irrigation, artificial night-lighting, introduction of invasive species). To facilitate the general purpose of the Ordinance stated in Section 8104-7.7 "to preserve functional connectivity for wildlife and vegetation throughout the overlay zone by minimizing direct and indirect barriers, minimizing loss of vegetation and habitat fragmentation and minimizing impacts to those areas that are narrow, impacted or otherwise tenuous with respect to wildlife movement," the Tierra Rejada Valley should remain designated in the CWPA overlay zone.

The Center is encouraged by and supports the Planning Commission's recommendation to include the entire lot of the Santa Susana Field Lab in the HCWC and CWPA overlay zones, as the Save Open Space, Santa Monica Mountains ("SOS") identified this area as important habitat for mountain lions and other wildlife. (See Exh. 23 at PDF 189.) In addition, the SOS requested that the Lake Sherwood/Hidden Valley area be considered for inclusion in the HCWC and CWPA overlay zones because multiple mountain lions have been known to use the undeveloped areas of Lake Sherwood (*Id*.). The Center joins SOS in requesting that this area be considered for inclusion in the overlay zone. Ventura County should implement the best available scientific information regarding wildlife movement and habitat connectivity in the Ordinance. Furthermore, the Center urges the County to monitor existing corridors and identify other priority wildlife movement and habitat connectivity areas in collaboration with local experts, agencies, and organizations.

## XI. Conclusion

Thank you for the opportunity to submit comments on the Ordinance and Planning Commission Recommendations. The Center strongly supports the objectives of the Ordinance and appreciates Ventura County's effort to use its local land use authority to develop an ordinance that promotes regional wildlife movement and habitat connectivity. Please do not hesitate to contact the Center with any questions at the number or email listed below.

Sincerely,

Tiffany Yap, D.Env/PhD
Scientist, Wildlife Corridor Advocate
Center for Biological Diversity
1212 Broadway, Suite 800
Oakland, California 94612
Telephone: (510) 847-5838
tyap@biologicaldiversity.org

J.P. Rose
Urban Wildlands Staff Attorney
Center for Biological Diversity
660 S. Figueroa Street, Suite 1000
Los Angeles, California 90017
Telephone: (213) 785-5406
jrose@biologicaldiversity.org

cc:
Rosa Gonzalez, Chief Deputy Clerk of the Board
Clerkoftheboard@ventura.org

Steve Bennet, District 1 Supervisor
Steve.Bennett@ventura.org

Linda Parks, District 2 Supervisor
Linda.Parks@ventura.org

Kelly Long, District 3 Supervisor
Kelly.Long@ventura.org

Bob Huber, District 4 Supervisor
supervisor.huber@ventura.org

John C. Zaragoza, District 5 Supervisor
John.Zaragoza@ventura.org

## References

(included on CD)


Bissonette JA, Rosa S (2012) An evaluation of a mitigation strategy for deer-vehicle collisions. Wildilfe Biol 18:414–423 . doi: 10.2981/11-122

Buxton, R. T., McKenna, M. F., Mennitt, D., Fristrup, K., Crooks, K., Angeloni, L., & Wittemyer, G. (2017). Noise pollution is pervasive in US protected areas. Science, 356(6337), 531-533.

Cahill AE, Aiello-Lammens ME, Fisher-Reid MC, Hua X, Karanewsky CJ, Ryu HY, Sbeglia GC, Spagnolo F, Waldron JB, Warsi O, Wiens JJ (2012) How does climate change cause extinction? Proc R Soc B Biol Sci 280:20121890 . doi: 10.1098/rspb.2012.1890

Ceia-Hasse A, Navarro LM, Borda-de-Água L, Pereira HM (2018) Population persistence in landscapes fragmented by roads: Disentangling isolation, mortality, and the effect of dispersal. Ecol Modell 375:45–53 . doi: 10.1016/j.ecolmodel.2018.01.021

Chen I-C, Hill JK, Ohlemüller R, Roy DB, Thomas CD (2011) Rapid range shifts of species associated with high levels of climate warming. Science (80- ) 333:1024–1026 . doi: 10.1126/science.1206432

Cushman SA (2006) Effects of habitat loss and fragmentation on amphibians: A review and prospectus. Biol Conserv 128:231–240 . doi: 10.1016/j.biocon.2005.09.031

Cushman SA, McRae B, Adriaensen F, Beier P, Shirley M, Zeller K (2013) Biological corridors and connectivity. In: Macdonald DW, Willis KJ (eds) Key Topics in Conservation Biology 2, First Edit. John Wiley & Sons, Ltd., pp 384–403

Dickson BG, Jennes JS, Beier P (2005) Influence of Vegetation, Topography, and Roads on Cougar Movement in Southern California. J Wildl Manage 69:264–276 . doi: 10.2193/0022-541X(2005)069<0264:IOVTAR>2.0.CO;2

Dodd Jr CK, Barichivich WJ, Smith LL (2004) Effectiveness of a barrier wall and culverts in reducing wildlife mortality on a heavily traveled highway in Florida. Biol Conserv 118:619–631 . doi: 10.1016/j.biocon.2003.10.011

Dodd NL, Gagnon JW, Boe S, Ogren K, Schweinsburg RE (2012) Wildlife-Vehicle Collision Mitigation for Safer Wildlife Movement Across Highways: State Route 260

Environmental Law Institute (2008) Planner's Guide to Wetland Buffers for Local Governments

Fellers GM and, Kleeman PM (2007) California Red-Legged Frog (Rana draytonii) Movement and Habitat Use : Implications for Conservation. J Herpetol 41:276–286 . doi: 10.1670/0022-1511(2007)41[276:CRFRDM]2.0.CO;2

Gilbert-Norton LB, Wilson R, Stevens JR, Beard KH (2010) A Meta-Analytic Review of Corridor Effectiveness. Conserv Biol 24:660–668 . doi: 10.1111/j.1523-1739.2010.01450.x

Haddad NM, Brudvig LA, Clobert J, Davies KF, Gonzalez A, Holt RD, Lovejoy TE, Sexton JO, Austin MP, Collins CD, Cook WM, Damschen EI, Ewers RM, Foster BL, Jenkins CN, King AJ, Laurance WF, Levey DJ, Margules CR, Melbourne BA, Nicholls AO, Orrock JL, Song D, Townshend JR (2015) Habitat fragmentation and its lasting impact on Earth's ecosystems. Sci Adv 1:1–9 . doi: 10.1126/sciadv.1500052

Heller NE, Zavaleta ES (2009) Biodiversity management in the face of climate change: A review of 22 years of recommendations. Biol Conserv 142:14–32 . doi: 10.1016/j.biocon.2008.10.006

Hilty JA, Merenlender AM (2004) Use of Riparian Corridors and Vineyards by Mammalian Predators in Northern California. Conserv Biol 18:126–135 . doi: 10.1111/j.1523-1739.2004.00225.x

Jennings M, Lewison R (2013) Planning for Connectivity Under Climate Change: Using Bobcat Movement To Assess Landscape Connectivity Across San Diego County's Open Space

Jennings M, Zeller K (2017) Comprehensive multi-species connectivity assessment and planning for the highway 67 region of San Diego County, California

Kilgo JC, Sargent RA, Chapman BR, Miller K V. (1998) Effect of stand width and adjacent habitat on breeding bird communities in bottomland hardwoods. J Wildl Manage 62:72–83 . doi: 10.2307/3802265

Kintsch J, Cramer P, Singer P (2017) CO State Highway 9 Wildlife Crossings Monitoring – Progress Report

Kintsch J, Cramer P, Singer P, Cowardin M, Phelan J (2018) State Highway 9 Wildlife Crossings Monitoring - Year 2 Progress Report

Lohse KA, Newburn DA, Opperman JJ, Merenlender AM (2008) Forecasting relative impacts of land use on anadromous fish habitat to guide conservation planning. Ecol Appl 18:467–482 . doi: 10.1890/07-0354.1

Lovell ST, Sullivan WC (2006) Environmental benefits of conservation buffers in the United States: Evidence, promise, and open questions. Agric Ecosyst Environ 112:249–260 . doi: 10.1016/j.agee.2005.08.002

Maclean IMD, Wilson RJ (2011) Recent ecological responses to climate change support predictions of high extinction risk. Proc Natl Acad Sci 108:12337–12342 . doi: 10.1073/pnas.1017352108

Mcrae BH, Dickson BG, Keitt TH, Shah VB (2008) Using circuit theory to model connectivity in ecology , evolution , and conservation. Ecology 89:2712–2724

Mcrae BH, Hall SA, Beier P, Theobald DM (2012) Where to restore ecological connectivity? Detecting barriers and quantifying restoration benefits. PLoS One 7:e52604 . doi: 10.1371/journal.pone.0052604

Moyle PB, Katz JVE, Quiñones RM (2011) Rapid decline of California's native inland fishes: A status assessment. Biol Conserv 144:2414–2423 . doi: 10.1016/j.biocon.2011.06.002

Nieswand GH, Hordon RM, Shelton TB, Chavooshian BB, Blarr S (1990) Buffer strips to protect water supply reservoirs: a model and recommendations. J Am Water Resour Assoc 26:959–966 . doi: 10.1111/j.1752-1688.1990.tb01430.x

Norris V (1993) Review Article: The use of buffer zones to protect water quality: A review. Water Resour Manag 7:257–272 . doi: 10.1007/BF00872284

Olson DH, Burnett KM (2013) Geometry of forest landscape connectivity: pathways for persistence

Pacifici M, Visconti P, Butchart SHM, Watson JEM, Cassola FM, Rondinini C (2017) Species' traits influenced their response to recent climate change. Nat Clim Chang 7:205–208 . doi: 10.1038/nclimate3223

Parmesan C (2006) Ecological and Evolutionary Responses to Recent Climate Change. Annu Rev Ecol Evol Syst 37:637–669 . doi: 10.1146/annurev.ecolsys.37.091305.110100

Parmesan C, Yohe G (2003) A globally coherent fingerprint of climate change ipacts across natural systems. Nature 421:37–42 . doi: 10.1038/nature01286

Pinto N, Keitt TH (2008) Beyond the least-cost path: Evaluating corridor redundancy using a graph- theoretic approach. Landsc Ecol 24:253–266 . doi: 10.1007/s10980-008-9303-y

Robins JD (2002) Stream Setback Technical Memo

Root TL, Price JT, Hall KR, Schneider SH, Resenzweig C, Pounds JA (2003) Fingerprints of global warming on wild animals and plants. Nature 421:57–60

Sabater F, Butturini A, Marti E, Munoz I, Romani A, Wray J, Sabater S (2000) Effects of riparian vegetation removal on nutrient retention in a Mediterranean stream. J North Am Benthol Soc 19:609–620 . doi: 10.2307/1468120

Sawaya MA, Kalinowski ST, Clevenger AP (2014) Genetic connectivity for two bear species at wildlife crossing structures in Banff National Park. Proc R Soc B 281:

Sawyer H, Lebeau C, Hart T (2012) Mitigating roadway impacts to migratory mule deer - a case study with underpasses and continuous fencing. Wildl Soc Bull 36:492–498 . doi: 10.1002/wsb.166

Scheffers BR, De Meester L, Bridge TCL, Hoffmann AA, Pandolfi JM, Corlett RT, Butchart SHM, Pearce-Kelly P, Kovacs KM, Dudgeon D, Pacifici M, Rondinini C, Foden WB, Martin TG, Mora C, Bickford D, Watson JEM (2016) The broad footprint of climate change from genes to biomes to people. Science (80- ) 354: . doi: 10.1126/science.aaf7671

Semlitsch RD, Bodie JR (2003) Biological criteria for buffer zones around wetlands and riparian

habitats for amphibians and reptiles. Conserv Biol 17:1219–1228 . doi: 10.1046/j.1523-1739.2003.02177.x

Slabbekoorn, H., & Ripmeester, E. A. P. (2008). Birdsong and anthropogenic noise: implications and applications for conservation. Molecular ecology, 17(1), 72-83.

Smith, J. A., Wang, Y., & Wilmers, C. C. (2015). Top carnivores increase their kill rates on prey as a response to human-induced fear. Proceedings of the Royal Society of London B: Biological Sciences, 282(1802), 20142711.

Smith, J. A., Wang, Y., & Wilmers, C. C. (2016). Spatial characteristics of residential development shift large carnivore prey habits. The Journal of Wildlife Management, 80(6), 1040-1048.

Smith, J. A., Suraci, J. P., Clinchy, M., Crawford, A., Roberts, D., Zanette, L. Y., & Wilmers, C. C. (2017). Fear of the human 'super predator'reduces feeding time in large carnivores. Proc. R. Soc. B, 284(1857), 20170433.

Stillwater Sciences (2002) Napa River Basin Limiting Factors Analysis

Tewksbury, J. J., Levey, D. J., Haddad, N. M., Sargent, S., Orrock, J. L., Weldon, A., ... & Townsend, P. (2002). Corridors affect plants, animals, and their interactions in fragmented landscapes. Proceedings of the national academy of sciences, 99(20), 12923-12926.

Trenham PC (1998) Demography, migration, and metapopulation structure of pond breeding salamanders. University of Californai Davis

Trenham PC, Shaffer HB (2005) Amphibian upland habitat use and its consequences for population viability. Ecol Appl 15:1158–1168

Trombulak SC, Frissell CA (2000) Review of ecological effects of roads on terrestrial and aquatic communities. Conserv Biol 14:18–30 . doi: 10.1046/j.1523-1739.2000.99084.x

U.S. Global Change Research Program (USGCRP) (2017) Climate Science Special Report Fourth National Climate Assessment. Washington, D.C.

van der Ree R, Jaeger JAG, van der Grift EA, Clevenger AP (2011) Effects of roads and traffic on wildlife populations and landscape function: Road ecology is moving toward larger scales. Ecol Soc 16:48 . doi: 10.5751/ES-03982-160148

Vickers, T. W., Sanchez, J. N., Johnson, C. K., Morrison, S. A., Botta, R., Smith, T., ... & Boyce, W. M. (2015). Survival and mortality of pumas (Puma concolor) in a fragmented, urbanizing landscape. PloS one, 10(7), e0131490.

Ware, H. E., McClure, C. J., Carlisle, J. D., & Barber, J. R. (2015). A phantom road experiment reveals traffic noise is an invisible source of habitat degradation. Proceedings of the National Academy of Sciences, 112(39), 12105-12109.

Warren R, Price J, Fischlin A, de la Nava Santos S, Midgley G (2011) Increasing impacts of climate change upon ecosystems with increasing global mean temperature rise. Clim Change 106:141–177 . doi: 10.1007/s10584-010-9923-5

Whipple Jr. W (1993) Buffer zones around water-supply reservoirs. J Water Resour Plan Manag 119:495–499

Wiens JJ (2016) Climate-related local extinctions are already widespread among plant and animal species. PLoS Biol 14:1–18 . doi: 10.1371/journal.pbio.2001104

Wilmers, C. C., Wang, Y., Nickel, B., Houghtaling, P., Shakeri, Y., Allen, M. L., ... & Williams, T. (2013). Scale dependent behavioral responses to human development by a large predator, the puma. PLoS One, 8(4), e60590.

Zeller, K. A., McGarigal, K., Cushman, S. A., Beier, P., Vickers, T. W., & Boyce, W. M. (2017). Sensitivity of resource selection and connectivity models to landscape definition. Landscape Ecology, 32(4), 835-855.

Zeller, K. A., Vickers, T. W., Ernest, H. B., & Boyce, W. M. (2017). Multi-level, multi-scale resource selection functions and resistance surfaces for conservation planning: Pumas as a case study. PloS One, 12(6), e0179570.