Safe Passage *for* Coyote Valley

A Wildlife Linkage for the Highway 101 Corridor

A User's Guide to Developing Protective Highway Crossings for Wildlife While Connecting California's Students with Science and Nature

By Julie Phillips, Ryan Phillips, Neela Srinivasan, Deborah Aso, Wendy Lao, & Pat Cornely
De Anza College, Environmental Studies Department

Safe Passage *for* Coyote Valley

A Wildlife Linkage for the Highway 101 Corridor

A User's Guide to Developing Protective Highway Crossings for Wildlife While Connecting California's Students with Science and Nature

By Julie Phillips, Ryan Phillips, Neela Srinivasan, Deborah Aso, Wendy Lao, & Pat Cornely
De Anza College, Environmental Studies Department

Kirsch Center for Environmental Studies, De Anza College
21250 Stevens Creek Boulevard
Cupertino, California 95014
www.deanza.edu/es/wildlifecorrproj
408.864.8316

Acknowledgements

We gratefully acknowledge the leadership and format of the safe passage guide provided by:
Bill Ruediger, Wildlife Consulting Resources and Monique DiGiorgio, Southern Rockies Ecosystem Project, *Safe Passage: A User's Guide to Developing Effective Highway Crossings for Carnivores and Other Wildlife*. This document provided a working format to communicate our findings in the Coyote Valley landscape and established protocols for reporting our findings.

This document will be used as the citation and format for partnering with other community colleges, K-12 schools, resource agencies, nonprofits and other academic institutions as the WCT Program training and monitoring efforts expand statewide as an integral component of the 21st Century education.

Primary Authors: Julie Phillips, Ryan Phillips, Neela Srinivasan, Deborah Aso, Wendy Lao, and Pat Cornely.

Contributors: Dave Deppen, Julie Ceballos, Jana Clark, Stuart Phillips, Alicia DeToro, Philip Higgins, Cyrus Hiatt, S. Nandagopalan, Breanna Martinico, Ryan Bourbour, Angus Teter, Chris DiLeonardo, David Tharp, Mark Sullivan, Samara Phillips, Kristin Jensen Sullivan, Valentine Hemmingway, Vicki Jennings, Tanya Diamond, Lisa Morton, Caitlin Williams, Tomislav Biondic, Mary Poffenroth, Diana Martinez, Dennis Gorsuch, Stephen Navarra, Josh McClusky, C. J. Gleaves, Gary Patton, Barry Martin, Jason Vasquez, Dr. Stephanie Sherman, and Dr. Brian Murphy.

Book Design / Production: Book design and layout by Janmarie Wright (janmariewright.com). WCT Program logo design by Isidro Raymundo. All photos ©2012: Kenny Schick, Ryan Phillips, Tanya Diamond, Jason Vasquez, and Neela Srinivasan.

Book printed and produced with Soy-based ink, on Forest Stewardship Council (FSC) Certified New Leaf Reincarnation papers by Patsons Press (patsons.com) of Sunnyvale, CA. Patsons Press is chain of custody certified by FSC (SCS-COC-001127). By buying products bearing the FSC label you are supporting the growth of responsible forest management worldwide.

De Anza College has saved the following resources* since 2006 by using New Leaf Paper, made with 100% recycled fiber and an average of 91% post-consumer waste, processed chlorine free, and manufactured with electricity that is offset with Green-e® certified renewable energy certificates.

Trees	Water	Energy	Solid Waste	Greenhouse Gases
135	54,533	93	6,381	12,400
fully grown	*gallons*	*million Btu*	*pounds*	*pounds*

**Calculations based on research by Environmental Defense Fund and other members of the Paper Task Force.*

Present and former WCT Program Interns and Mentors: Rick Malupo, Josh Goodwin, Zsuzsanna Nagyfejeo, Veronica Davis, Lori Parsons, Nicholas Peck, Nicole Chaney, Jessica Gonzales, Melissa DeKoven, Michelle Mai, Zarlasht Aziz, Rosita Fakhrevaezi, Alice Quan, Lakhena Howey, Matthew Daily, Jana Marquardt, Vilma Estacio, Lance Freihofer, Michelle Mai, Drew Mathers, Michelle Brewster, Bryan Do, Leila Fourouhi, Mark Anthony, Andrew McAndrews, Anneke Spanjaart, Daniel Valencia, Daniel Gray, Chris Choi, Renee Good, Sharon Hudak, Jason Vasquez, Danielle Christensen, Hugo Hernandez, Rosemary Alvarez, Patti Conens, Meagan Beaver, Dan Yocum, Tom Cervantes, Laura Coatney, Ray Lerwill, Kristy St. George, Therese Manansala, Javier Perez, Peter Woolhouse, Craige Edgerton, Lynn Thorensen, and Chris Lepe.

Acknowledgements: The authors and Wildlife Corridor Technician team wish to thank Becky and Jim Morgan, the Morgan Family Foundation, Carol Olson, Dr. Ben and Ruth Hammett, Dr. Reed Noss, Dr. Paul Beier, Ann Calnan, Brian Schmidt, Don Rocha, Ian Champeny, Mike Bacon, Ken Schreiber, Michele Beasley, Cynthia D'Agosta, Verna Jigour, Ernie Goiten, Dr. Jim Thorne, Troy Rahmig, Rebecca Sloan, Dave Johnston, Mark Elbroch, Dr. Michael Kutilek, Audrey Rust, Marc Landgraf, Bob Power, Ash Kalra, Dr. Steve Rottenborn, Galli Basson, Kirk Lenington, David Manzo, the owners of San Felipe Ranch-Santa Clara, Inc., and others for their support, information, guidance and recommendations provided during this project.

Partnerships: We wish to thank the following collaborators including governmental, non-governmental and non-profit partners for their support and assistance in this long-term project:

Santa Clara Valley Transit Authority (VTA)
The mission of the Santa Clara Valley Transportation Authority is to provide the public with a safe and efficient countrywide transportation system. The system increases access and mobility, reduces congestion, improves the environment, and supports economic development, thereby enhancing quality of life.

Santa Clara County Parks
The mission of the Santa Clara County Parks and Recreation Department is to provide, protect and preserve regional parklands for the enjoyment, education and inspiration of this and future generations.

Midpeninsula Regional Open Space District (MROSD)
The Midpeninsula Regional Open Space District's purpose is to purchase, permanently protect, and restore lands forming a regional open space greenbelt, preserve unspoiled wilderness, and provide opportunities for low-intensity recreation and environmental education. The District works to form a continuous greenbelt of permanently preserved open space by linking its lands with other public parklands.

Santa Clara County Open Space Authority (OSA)
The primary goal of the Open Space Authority is the preservation of undeveloped land in its natural state. Achieving this goal requires a systematic approach both to acquiring lands and managing them in a sound ecological manner.

California Department of Transportation (CalTrans)
The mission of CalTrans is to improve mobility across California. Its strategic goals include safety, mobility, delivery, stewardship and service.

Committee for Green Foothills
The mission of Committee for Green Foothills is to protect the open space, farmlands, and natural resources of San Mateo and Santa Clara counties through advocacy, education, and grassroots action.

City of San José
The City of San José is committed to an open and honest government and strives to consistently meet the community's expectations by providing excellent service, in a positive and timely manner, and in the full view of the public.

Greenbelt Alliance
The mission of Greenbelt Alliance is to make the nine counties of San Francisco Bay Area a better place to live by protecting the region's greenbelt and improving the livability of its cities and towns. The organization works through public policy development, advocacy and education, in partnership with diverse coalitions.

Santa Clara Valley Water District
The mission of the district is a healthy, safe and enhanced quality of living in Santa Clara County through watershed stewardship and comprehensive management of water resources in a practical, cost-effective and environmentally sensitive manner for current and future generations.

California State Parks
The mission of the California State Parks is to provide for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation.

California Department of Fish and Game (CDFG)
The mission of the Department of Fish and Game is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

U.S. Fish & Wildlife Service
The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitat for the continuing benefit of the American people.

De Anza College:
De Anza College fulfills its mission by engaging students in creative work that demonstrates the knowledge, skills and attitudes contained within the college's Institutional Core Competencies: communication and expression; information literacy; physical/mental wellness and personal responsibility; global, cultural social and environmental awareness and critical thinking.

Morgan Family Foundation:
The Morgan Family Foundation is a private, family foundation that was established in 1993. The Foundation focuses its giving on youth, education, the environment, and stewardship. We look for organizations to maximize their potential and the individuals they serve. We encourage and support collaboration among our grantees to maximize resources in sustaining programs and achieving outcomes.

Dr. Ben and Ruth Hammett
Continuing supporters of the De Anza College Environmental Stewardship Program.

Key Terms

Choke Point: A narrow route providing passage through or to another region where congestion may occur.

Connectivity: the measure of the ability of organisms to move among separate patches of suitable habitat (Hilty et al. 2006).

Education: "Education in the true sense is an enablement to serve—both the living human community in its natural household or neighborhood and the precious cultural possessions that the living community inherits or should inherit. To educate is, literally, to bring up, to bring young people to a responsible maturity, to help them to be good caretakers of what they have been given, to help them to be charitable toward fellow creatures. And if this education is to be used well, it is obvious that it must be used somewhere, it must be used where one lives, where one intends to continue to live; it must be brought home" (Berry 1987)

High landscape connectivity: occurs when the matrix areas of the landscape comprise relatively benign habitat types without barriers, thus allowing organisms to move freely.

Landscape connectivity: the degree to which the landscape facilitates animal movement and other ecological flows (Hilty et al. 2006).

"Ruth and I wish to express our deep gratitude to you, Julie Phillips, Pat Cornely, the staff and especially the enthusiastic and creative students who have turned your dreams into a unique project which we know will set the example and standard for other similar endeavors which it is sure to inspire. You all have recognized the perfect opportunity to link across a major highway, two remaining wildlife areas that fortunately lie directly across from each other. We are grateful to the County Government and Open Space District for providing an opportunity for the students to learn hands-on environmental field research."
Dr. Ben Hammett

Mission of Wildlife Corridor Technician Program

To use sound science to preserve and establish habitat connections for wildlife between the Santa Cruz Mountains and Diablo Range through our stewardship efforts to study, teach and promote sustainable development and action along the 37th Parallel.

Coyote Ridge Coyote peering into the landscape

PREFACE: Building Connections for People and Wildlife

This document is based on the first full-scale study conducted in Coyote Valley with an emphasis on connectivity and the effects of Highway 101 and other roads on wildlife movement (Phillips et al. 2008). It is a guide for developing protected highway crossings for wildlife while connecting California's students with science and nature.

If Coyote Valley is developed, the linkage between the Diablo Range and Santa Cruz Mountains will be lost. Species in the Santa Cruz Mountains with large home ranges, such as the mountain lion, will be genetically isolated and local extinction may occur (P. Beier and R. Noss pers. comm.).

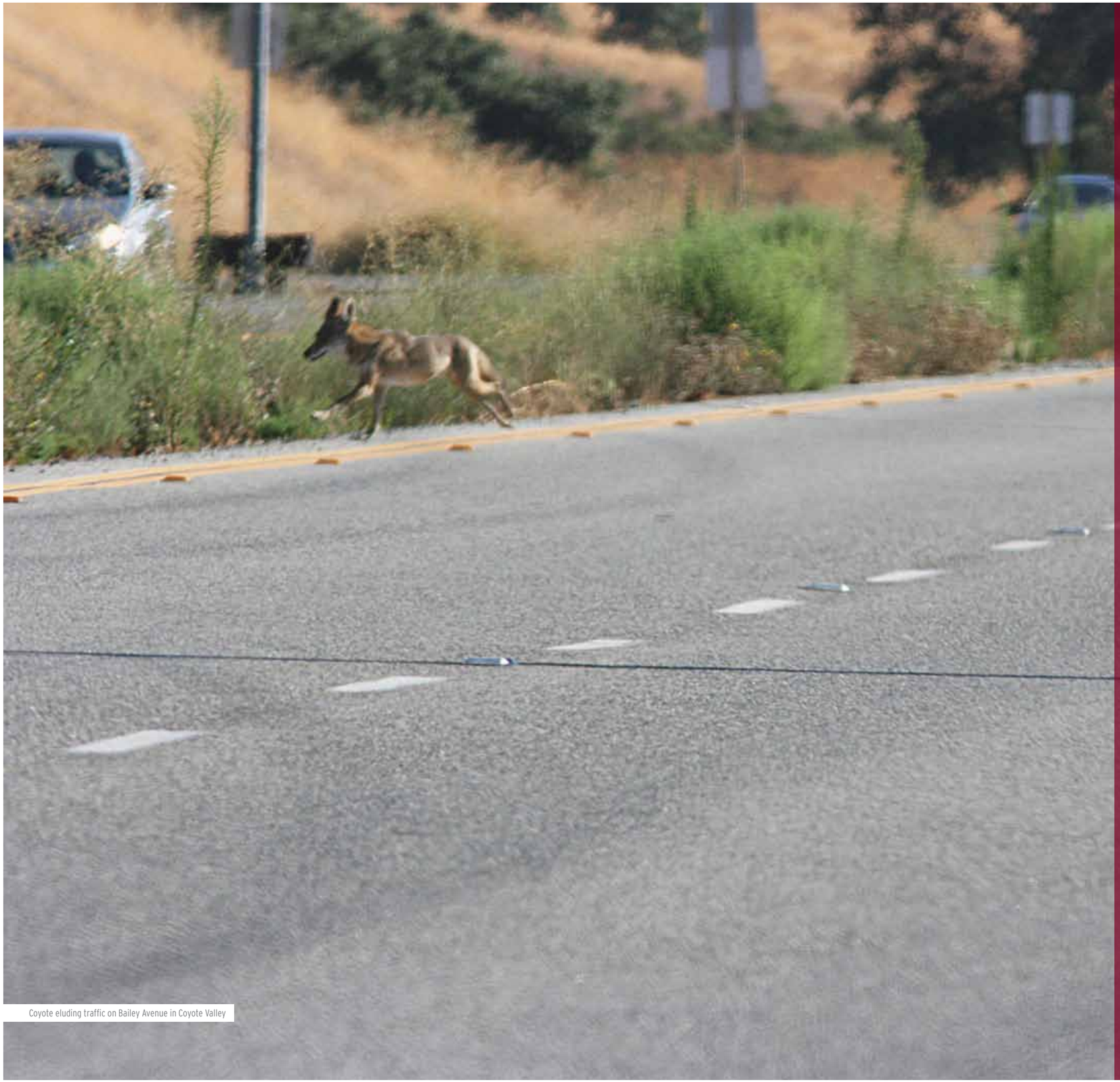
Coyote Valley is approximately 7,000 acres (28 km^2) and is one of the largest remaining contiguous tracts of undeveloped valley floor in Santa Clara Valley, which connects the Santa Cruz Mountains with the Diablo Range. It has local, regional, state, and national significance as a critical connectivity link within the California Floristic Province. It provides safe passage for wildlife between the Mount Hamilton Region of the Diablo Range, Santa Teresa Hills, and the Sierra Azul region of the Santa Cruz Mountains. Scenic America declared Coyote Valley as a "Last Chance Landscape" in 2001, one of the most endangered landscapes in the United States. It was the only landscape selected in California.

Our research demonstrates that Highway 101 through Coyote Valley is permeable to wildlife movement, via two overpasses, three underpasses and twenty-seven culverts.

The Coyote Valley Landscape, an integral component of the California Floristic Province, has been determined to be a biodiversity hotspot with over 200 species of birds, including 21 species of raptors, and over 20 species of mammals (R. Phillips et al. 2008).

The recommended minimum width of a viable corridor for multiple species is 2 km wide (Penrod et al. 2006). The current width of the Coyote Valley floor is 1.95 km. Losing any habitat within the Coyote Valley floor will decrease the effectiveness of this linkage for multiple species (Phillips et al. 2008).

Free-roaming Tule Elk provide an incredible opportunity to enjoy and view nature right in our community, as well as teach our children about the value of protecting and restoring our natural heritage. Thousands of school children each year will visit Coyote Valley to learn about this natural community. The economic opportunities afforded by a sustainable vision and regional conservation planning in the long-term will surpass other uses of this area. Ecotourism, including wildlife viewing and bird watching, has surpassed most other recreational activities in this country (Sekercioglu 2002).



Coyote eluding traffic on Bailey Avenue in Coyote Valley

Table of Contents

1.0 Introduction

This report is written for the resource agencies, transportation agencies, civilian scientists, the public, students, educators, scientists, landowners, engineers, and others concerned about the wildlife/urban interface and the many challenges it brings. Fragmentation and destruction of habitat are major threats to wildlife populations globally.

Two of the main contributors to habitat fragmentation are urbanization and the construction of roads. As a result, corridor ecology and landscape connectivity are leading topics in conservation biology today. As humans infringe into wildlife habitat, there will ultimately be more human-wildlife interactions, which may result in a loss of biodiversity, genetic variability and viability of populations leading to extinction of species.

A leading cause of the lack of awareness of wildlife and nature, especially among young people, is a disconnect between youth and nature, referred by author Richard Louv as Nature Deficit Disorder in his book, *Last Child in the Woods* (Louv 2005). Another disturbing trend in academic institutions is the loss of natural history programs and classes, with molecular studies replacing wildlife studies programs (Noss and Cooperrider 1994).

To address these issues, the Environmental Studies Department at De Anza College launched the Wildlife Corridor Technician (WCT) Program along with a 50 year study of the wildlife connectivity in the Central Coast Region of California in 2006. Its initial curriculum included the exploration of landscape connectivity along the 37th Parallel, specifically the connectivity between the Santa Cruz Mountains and the Diablo Range in Santa Clara County, California. In 2007, the WCT field studies team of faculty, students and other partners began to conduct biological surveys in the Coyote Valley Landscape. They had two goals in mind: first to assess the diversity of habitat and the diversity of residential and migratory mammals and birds; second to assess the valley's viability as a multi-species wildlife linkage between the Diablo Range and Santa Cruz Mountains.

Bobcats use numerous crossing structures to safely pass through Highway 101 in Coyote Valley

The WCT Program findings: The Coyote Valley Landscape is the primary and vital link between the Santa Cruz Mountains and the Diablo Range, where over 200 species of birds, including 21 species of raptors and over 20 species of mammals are found. It has local, regional, state and national significance as a critical connectivity link within the California Floristic Province, providing safe passage for wildlife between the Mount Hamilton Region of the Diablo Range, Santa Teresa Hills and the Sierra Azul region of the Santa Cruz Mountains.

This research has shown that Coyote Valley is a key linkage in the Central Coast Region and has identified key choke-points and potential crossing locations for wildlife safe passage.

The WCT research has been highly facilitated by our partners, Santa Clara County Parks Department, Valley Transit Authority, California Department of Transportation, Santa Clara Open Space Authority, Mid-peninsula Regional Open Space District, California Department of Fish and Game, and private landowners (Los Trancos LLC).

These findings are being shared with decision-makers and stakeholders including state and federal legislators, local government leaders, nonprofits, land trusts, resource agencies, other academic institutions, and the community.

In addition, these studies have provided invaluable data to the decision-making process of the City of San José when assessing the Coyote Valley Specific Plan (CVSP) and other efforts. Prior to this effort, no significant data had been collected and analyzed on the long-term impacts of developing Coyote Valley on the wildlife in this region.

The WCT monitoring program has also informed the draft Santa Clara Valley Habitat Conservation Plan (SCVHCP) in 2009 and again in April 2011. Our findings also contribute to the private efforts initiated by the Bay Area Critical Linkages (BACL) project to map key linkages in the Central Coast Region.

In Coyote Valley, Bay Area residents have an opportunity to protect this critical area for future generations. We can forge a "partnership for the future" by honoring wildlife's needs, the historic use of the lands, and the cultural heritage of the valley. Educational opportunities and a natural history museum will be created for thousands of students and ecotourists.

SECONDARY LINKAGE

PRIMARY LINKAGE

COYOTE VALLEY, CALIFORNIA

“The landscapes of the Santa Clara Valley were fairly drenched with sunshine, all the air was quivering with the songs of the meadowlarks, and the hills were so covered with flowers that they seemed to be painted. Slow, indeed, was my progress through these glorious gardens…Cattle and cultivation were making few scars as yet, and I wandered enchanted in long, wavering curves.”

John Muir, April 1868

The Coyote Valley landscape with a spring flower bloom

The Coyote Creek riparian habitat is critical to the survival of many species

2.0
Now or Never: Appreciating Coyote Valley

What would John Muir think about permanently preserving Coyote Valley for future generations as a national monument? Will this valley become largely indistinguishable from the rest of the Bay Area's urban sprawl, or will it be permanently preserved for its ecological, cultural and historical significance? This area is the largest undeveloped valley floor habitat and open space remaining in the Santa Clara County and includes sacred lands of the Amah Mutsun and Muwekma Ohlone peoples.

The Coyote Valley Landscape is an integral component of the California Floristic Province. It has been determined to be a biodiversity hotspot with over 200 species of birds, including 21 species of raptors, and over 20 species of mammals.

Coyote Valley was declared "Last Chance Landscape" by Scenic America in 2001 as one of the most endangered landscapes in the United States. It was the only landscape selected from California. Scenic America described the significance of the landscape as:

"Barely seven miles long and two miles wide, Coyote Valley is a rare scenic break in an otherwise urbanized area. Thousands of commuters and visitors value the area as an irreplaceable and close-in opportunity for scenic vistas, environmental education, recreation, and reflection. The rolling hills, blossoming orchards, and grand oaks provide respite to visitors, residents, and myriad species of wildlife. The Valley is among the region's last bastions of active family farms, wild coyote, and the spirit of California's missionary founders. Less than 11 miles south of San José, along Highway 101, Coyote Valley provides an important visual buffer between the intense suburban development of San José and agricultural communities south of the city." *Scenic America's 2001 Last Chance Landscape*

According to renowned scientist E.O. Wilson (1992), "given the means and sufficient leisure, a large portion of the populace backpacks, hunts, fishes, bird watches and gardens. In the United States and Canada more people visit zoos and aquariums than attend all professional athletic events combined. They crowd the national parks to view natural landscapes, looking from the tops of prominences out across rugged terrain for a glimpse of tumbling water and animals living free."

Coyote Valley is critical to the youth and community of San José — serving as a gateway to reconnect our children with nature.

"Coyote Valley honors the fact that we are unique compared to other cities such as New York, Los Angeles and Chicago. We have an incredible natural diversity right outside our doors. Just go a few miles outside the city and you see it open up to this rare space. Right at city boundaries, wildlife and landscapes spread for miles. It must make people proud that they kept Coyote Valley as open space." *Pat Cornely, Executive Director, Kirsch Center for Environmental Studies*

Coyote Valley is one of the largest remaining contiguous tracts of undeveloped valley floor, providing vital landscape linkage between the Santa Cruz Mountains and the Diablo Range. If Coyote Valley is developed, the linkage will be lost and species in the Santa Cruz Mountains with large home ranges may become locally extinct due to genetic isolation.

Boots on the ground research

3.0 Who We Are

The WCT Program is run by the Environmental Studies Department at De Anza College of the Foothill De Anza Community College District, one of the 72 autonomous districts, which encompasses 112 colleges in every region of California. The California Community College (CCC) System is the largest institution of higher learning in the world and enrolls more than 2.9 million students. The WCT Program's long-term goal is to incorporate wildlife studies as an integral component of community college curriculum in leadership, community and civic engagement.

California Community College System

The mission of the California Community Colleges Board of Governors and the state Chancellor's Office is to empower the community colleges through leadership, advocacy and support. The vision of the Board and Chancellor is to build a better future for California by providing exceptional leadership, advocacy and support on behalf of California's Community Colleges. These efforts will foster access, success and lifelong learning for all students while simultaneously advancing the state's interests in a skilled workforce and an educated citizenry.

Instructor, Dave Deppen, leading a culvert charette with students in Coyote Valley

De Anza College

De Anza College created the Environmental Studies Department in 1993 with the hiring of its first full-time faculty member. The team of ES faculty and staff worked over the next 18 years to create general education Environmental Studies (ES) and Environmental Science (ESCI) courses as well as institutionalize career technical programs in Wildlife Corridor Technician/Stewardship, Biodiversity Specialist, Pollution Prevention, Energy Management and Climate Policy.

Wildlife Corridor Technician Program

The Wildlife Corridor Technician certificates are part of the Environmental Stewardship Program within the Environmental Studies Department. The program was initiated to develop the sound science needed to effectively identify and study the critical wildlife corridors in the Central Coast Region with the purpose of protecting wildlife and educating students about wildlife connectivity. The community college curriculum for the WCT Program was approved by the CCC State Chancellor's Office in January 2009. This program was entered into the Inventory of Approved Programs under T.O.P. code 0115.00, with Career Technical Education (CTE) status thereby institutionalizing the WCT/Stewardship Certificates and Degree as part of California's CTE training programs.

The research work commenced in February 2007 with a focus in Coyote Valley. It is the goal of this long-term study to eventually encompass most of the Central Coast region including the following key connectivity points:

- Coyote Valley (providing connectivity between the Diablo Range and Santa Cruz Mountains)
- Diablo Range (providing connectivity between the northern Diablo to southern tip of Diablo. This may eventually expand south to the Temblor Mountains bisected by Highway 46 into the Carrizo Plains National Monument)
- Santa Cruz Mountains (providing connectivity between southern Santa Cruz Mountains surrounding Monterey Bay north to San Mateo region including region bisected by Highway 17)
- Pajaro River Valley (providing connectivity between the south Santa Cruz Mountains and Diablo Range)
- Salinas River Valley (providing connectivity between the Sierra de Salinas and the Gabilan Mountains)
- San Benito River Valley (providing connectivity between the Diablo Range and Gabilan Mountains)
- Pacheco Pass (providing connectivity between the northern and southern Diablo Range bisected by Highway 152 into the San Luis Reservoir drainage)
- Temblor Range (providing connectivity between southern Diablo Range into Temblor Range and the Carrizo Plains and south to Highway 166)

Building Relationships: Good Decisions Start with Good Relationships

- Environmental Scientists and Engineers
- Agency Partners
- Other Interested Partners
- Training & the critical role of Community Colleges

This ongoing study has allowed the WCT Program to assess our methodology and student training techniques, conduct extensive field studies, analyze the data collected and develop the next phase of long-term studies necessary to continue to identify these critical connectivity points throughout the Central Coast region.

One of the critical benefits has been the on-the-job training provided to students in a community college program. Students are learning environmental science in the most appropriate place — outdoors — while conducting top-level research and contributing to their community through a sound science approach. In addition, this critical corridor work requires leadership and team-building skills, which better prepares our students to serve their community. This approach to long-term monitoring of roads, highways and freeways provides an invaluable resource to the agencies entrusted with "the largest human artifact on earth, this vast,

Northern Pacific Treefrog, *Pseudacris regilla*

nearly 5 million mile (8 million km) network used by a quarter billion vehicles that permeates virtually every corner of North America" (Forman 2003). Many have witnessed the death of wildlife on roadways. These roadways have not provided safe passage for millions of animals every year along U.S. roads, highways and freeways.

To minimize impacts on the natural environment, wildlife movement and connectivity, the WCT Program provides an invaluable role as a component of the public good.

In the United States, the public may not understand that wildlife resources are public resources both on public and private lands, protected under the Public Trust Doctrine (Wright and Boorse 2010). Public education is protected and is the right of every citizen. Schools and wildlife must be held in trust for the present and future generations.

The Public Trust Doctrine acknowledges the right of the public to advocate and participate in the protection, preservation and restoration of species and the landscape. We must engage the public and students in these processes as they learn to become good stewards of the land.

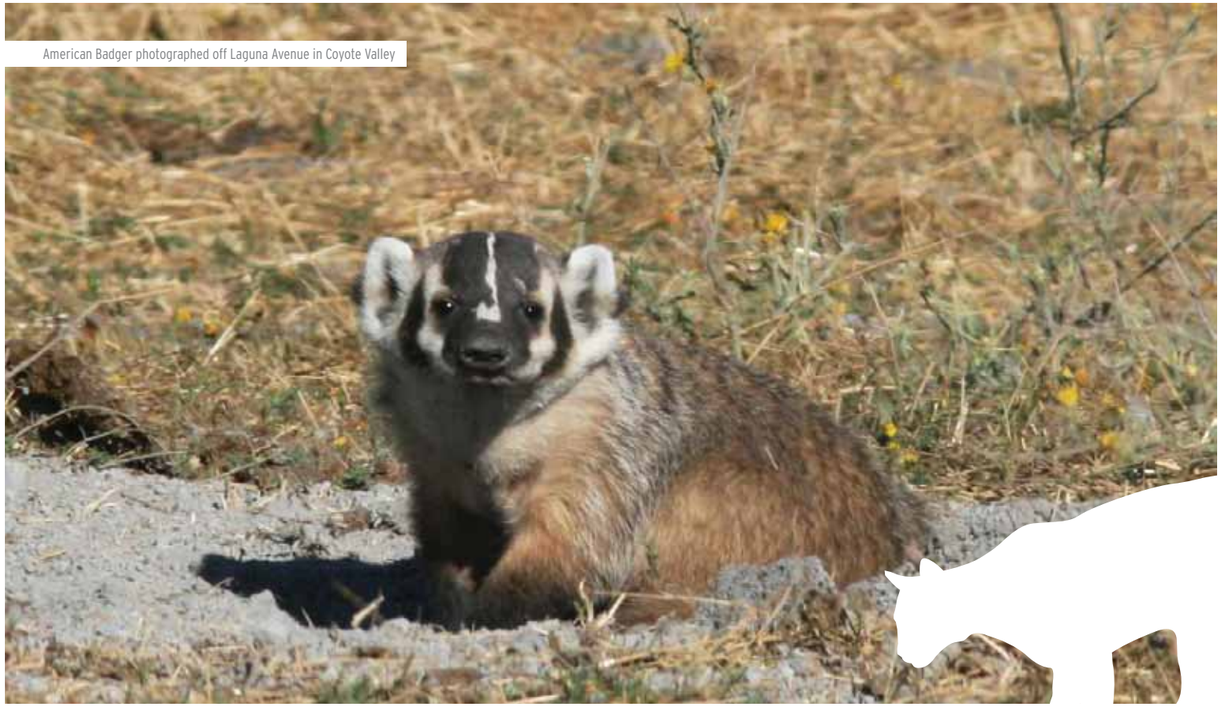
The WCT Program worked with former California Assembly Member Ira Ruskin and his staff on the importance of wildlife corridors. California Assembly Bill 2785 was authored by Assembly Member Ruskin and was signed into law on February 2008. This bill amends California Department of Fish and Game (CDFG) code to direct the identification of wildlife corridors throughout California. While the passage of the Endangered Species Act in 1973 gives the legal rights of species to exist, AB 2785 was the first legislation in California giving legal recognition of the right of species to move across the landscape over time.

The WCT Program's long-term study provides the sound science and the methodology needed to assist the state in these efforts and provides a vital link and partnership between the California Community College System and the California Department of Fish and Game (the wildlife agency with the fiduciary responsibility to steward and protect California's wildlife). Both the community colleges and CDFG have the legal responsibility under the Public Trust Doctrine to foster and protect education and wildlife as part of the public good — the core mission of the WCT Program at De Anza College.

The efforts of the WCT Program are to provide invaluable long-term and permanent data and information about the status of connectivity across the Central Coast region into perpetuity. These data generated will be stored in a permanent public archive at the Kirsch Center for Environmental Studies so that present and future generations will have access to the status of wildlife connectivity in this region forever. Thus the public will become active participants in the long-term stewardship of their state and wildlife. This next generation will monitor its survival or decline.

Students designing a safe passage for wildlife through Coyote Valley

Stealth Cam 11/22/2010 06:23:55 052F
Stealth Cam 10/17/2010 03:58:32 058F
Stealth Cam 09/02/2010 23:07:00 072F
Stealth Cam 10/27/2010 21:44:01 059F
HCO ScoutGuard 5.29.2011 22:40:27
HCO ScoutGuard 5.29.2011 22:41:05
HCO ScoutGuard 5.29.2011 22:41:06
HCO ScoutGuard 5.29.2011 22:41:52
HCO ScoutGuard 6.07.2011 15:12:53
HCO ScoutGuard 6.07.2011 15:12:54
HCO ScoutGuard 6.07.2011 15:12:56
HCO ScoutGuard 6.06.2011 23:49:50
HCO ScoutGuard 6.06.2011 23:49:52
HCO ScoutGuard 6.06.2011 23:49:54
HCO ScoutGuard 2.01.2011 21:09:55
HCO ScoutGuard 2.04.2011 20:19:08
HCO ScoutGuard 8.12.2011 2:35:55
HCO ScoutGuard 7.22.2011 21:37:39
HCO ScoutGuard 7.23.2011 22:30:17
HCO ScoutGuard 7.29.2011 23:34:47

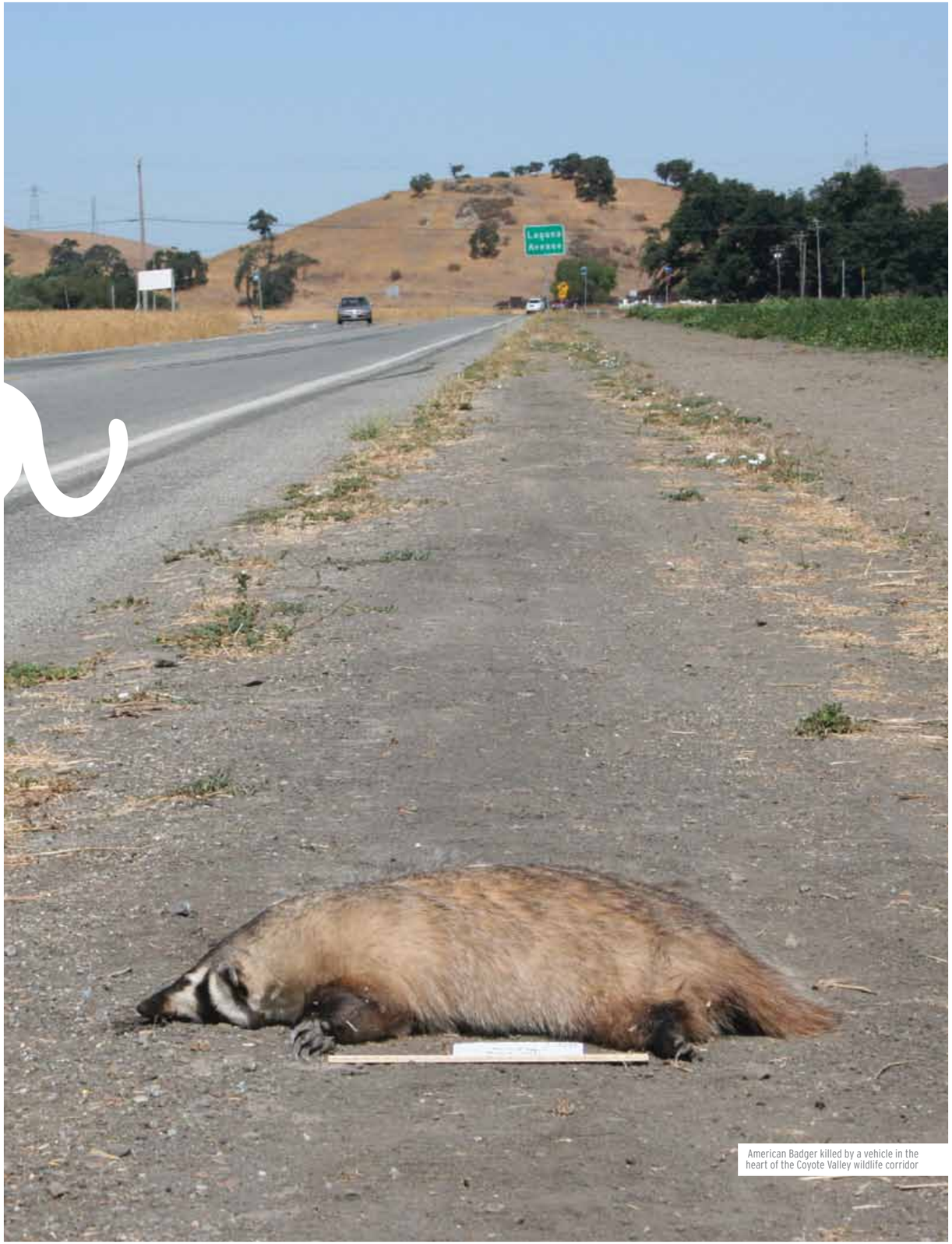


American Badger photographed off Laguna Avenue in Coyote Valley

4.0 Why We Are Concerned

Wildlife Home, Highway and Byway

From the paradise described by John Muir, Coyote Valley is today at the brink of being consumed by urban-sprawl. The City of San José has seen urban sprawl in the last few decades as never before even as it has tried to curtail it in recent times. Coyote Valley has been designated as an "Urban Reserve", land that the city reserves the right to develop, should future conditions require it — conditions that focus on short-term economic growth. Regardless of whether the City of San José's "smart growth vision" of "development" for the Coyote Valley Urban Reserve consists of environmentally sound innovations or unrealistically rosy projections, the viability of the current ecosystems in the valley is in jeopardy. Wildlife species and the critical habitat will disappear as yet another area of natural habitat is lost to relentless human development.



American Badger killed by a vehicle in the heart of the Coyote Valley wildlife corridor

Highway 101 runs through Coyote Valley, but is not a barrier to safe wildlife movement

The long-term economic benefits of the ecological services provided by Coyote Valley to the surrounding region are beyond what any development can afford in the short term. The Coyote Valley ecosystem's contribution to greenhouse gas (GHG) reduction mandated by California State law AB 32 is significant.

With over 6,000 acres of healthy, environmentally intact open space in the heavily populated and developed San Francisco Bay Area, the Coyote Valley landscape supports genuine wilderness: animals such as Tule Elk *(Cervus elaphus nannodes)*, American Badger *(Taxidea taxus)*, Mule Deer *(Odocoileus hemionus)* and Mountain Lion *(Puma concolor)* roam its hills, ravines and flatlands.

Coyote Valley is critical habitat to over 20 species of mammals and over 200 species of birds. Thirty listed species are found in the valley, including several that are endangered. Some of these species are endemic to the serpentine soils found in parts of the Coyote Valley landscape. Specially adapted rare plant species thrive in these nutritionally poor soils. Mount Hamilton Thistle *(Cirsium fontinale var. campylon)* is found in serpentine soil seeps and drainages on both sides of Highway 101 and is dispersing through the culverts in some locations. These plants, including the dwarf plaintain (Plantago erecta), and the endangered Bay Checkerspot Butterfly *(Euphydryas editha bayensis)* that depends upon them are threatened not only by habitat loss but also by nitrogen deposition produced by millions of cars. Nitrogen enriches the soil and permits invasion of the serpentine grasslands by invasive non-native species (Weiss 1999).

Coyote Valley is a floodplain. It contains the largest freshwater wetland in Santa Clara County, Laguna Seca. This also serves as an aquifer recharge. The seasonal wetlands found on the valley floor provide critical habitat to many species of wildlife year round and are important to migratory birds. While amphibian diversity is declining world-wide, Coyote Valley's vernal pools offer a safe haven to many amphibian species such as the California Tiger Salamander *(Ambystoma californiense)* and the California Red-legged Frog *(Rana draytonii)*.

Coyote Valley also provides one of the last remaining wildlife habitat linkages between the Santa Cruz Mountains to the west and the Diablo Range to the east. The WCT Program's research demonstrates that Highway 101 through Coyote Valley is permeable to wildlife movements with two overpasses, three underpasses and 27 culverts (Phillips et al. 2008). Further, it has been established that the minimum width of a viable corridor, that supports movement of multiple species, is two kilometers (Penrod et al. 2006). The current width of the corridor within the Coyote Valley floor is 1.95 kilometers (Phillips et al. 2008). Any further habitat loss will mean a loss of its efficacy as a wildlife linkage.

The importance of wildlife corridors or "connectivity" is based on sound science. Successful examples such as in Banff, Canada are already in existence. Animals require connectivity between areas of suitable habitat to take advantage of seasonal changes in food and weather and to travel long distances to find mates. Without a sufficiently large gene pool, species will be vulnerable to inbreeding. Without a corridor to the Diablo Range, the population of mountain lions in the Santa Cruz Mountains will be isolated and could likely die out. The Bay Checkerspot Butterfly also requires as many habitat patches as possible to protect against annual differences in weather, which can cause entire populations to die out in the smaller patches. Tule Elk are found along the edges of Highway 101 and require habitat connectivity.

Pacific Gopher Snake, *Pituophis catenifer catenifer*

Last Chance Landscape: Coyote Valley

In 2001, Scenic America selected Coyote Valley as a Last Chance Landscape. Coyote Valley was the only landscape nominated from California. According to Scenic America:

The Last Chance Landscapes of America the Beautiful awarded that year were:

1. The State of Oregon
2. Washington, District of Columbia
3. The Marsh Islands of Coastal Georgia
4. Red Rocks Scenic Road (AZ 179), Sedona, Arizona
5. Narragansett Bay, Rhode Island
6. **Coyote Valley, San José, California**
7. St. Croix Valley Scenic Corridor, Minnesota and Wisconsin
8. Harpeth River Valley, Williamson County, Tennessee
9. Lynville Mountain Landscape, Roanoke, Virginia
10. Woodberry Watershed Forest, Baltimore, Maryland

Scenic America wrote these words: "We envision a future in which we....

1. Retain the distinctive character of our communities and countryside by rebuilding older cities, towns and suburbs as beautiful places in which to live and work; and conserve agricultural land and open space;

2. Foster new development that respects the special character of places as defined by their distinctive geographic features, cultures, climate, and natural systems;

3. Encourage a balance of regulatory and market approaches to protect scenic resources including rewarding land stewardship by property owners, local governments and corporations; and providing disincentives for practices that destroy scenic values;

4. Design a national transportation system that respects aesthetic values as well as economic and energy efficiency, social equity, and environmental quality;

5. Prevent mass marketing and outdoor advertising from intruding on the landscape or community appearance;

6. Teach young people to value the visual environment and to create and respect places of beauty; and

7. Actively engage business, industry, civic and professional organizations in the movement for a more scenic America."

"Last Chance Landscapes of America the Beautiful 2001 is about saving the places we love for ourselves and for future generations. The citizens who submitted nominations know that protecting our scenic heritage is their responsibility. Scenic America is proud to work with these landscape stewards as they fight to make America the Beautiful once again a reality."
Scenic America's 2001 Last Chance Landscape

Flowering Black Mustard field in the heart of Coyote Valley

A Corridor of Life

Intact wilderness such as that found in Coyote Valley offers much-needed balance to our hectic modern world. Already in existence in the valley is a network of state and county recreational areas and privately held land trusts that are available to the public and provide incredible opportunities for hiking, biking and bird watching. But they must be connected!

The Valley floor is surrounded by a significant amount of permanently protected public lands. The more recent additions of the Blair and San Felipe Ranches under conservation easement augment the publicly protected lands. The Bay Ridge Trail and the Juan Bautista De Anza National Historic Trail (NHT) are already found in Coyote Valley! These trails must be expanded to other critical areas to the east and the west including Rancho Canada del Oro and Sierra Azul Open Space Preserves.

This great natural wealth, enhanced by a wildlife corridor, can make Coyote Valley a major ecotourism destination, diversifying Santa Clara County's economic base and preserving something of lasting and priceless value. Coyote Valley can play a central role in educating current and future generations about our cultural, historical and ecological heritage. It is an outdoor classroom for the people of California.

Sustainability—Getting It Right

Of the possible connectivity points being considered, Coyote Valley is the shortest distance between the two mountain range ecosystems, making it the optimal linkage.

If Coyote Valley were to be developed, thousands of acres of prime agricultural land and open space would be lost.

Once converted to streets, shops, and residences, the natural value of this land is gone. The agricultural history of Santa Clara County will be less visible.

The wildlife passage between the Diablo Range and the Santa Cruz Mountains will be lost.

Agriculture is still a very valuable industry in the Santa Clara Valley. If we lose it, we will lose a valuable piece of our economy, our community, and our heritage.

Student identifying a Black-tailed Deer skull

Student locating a data point on the map

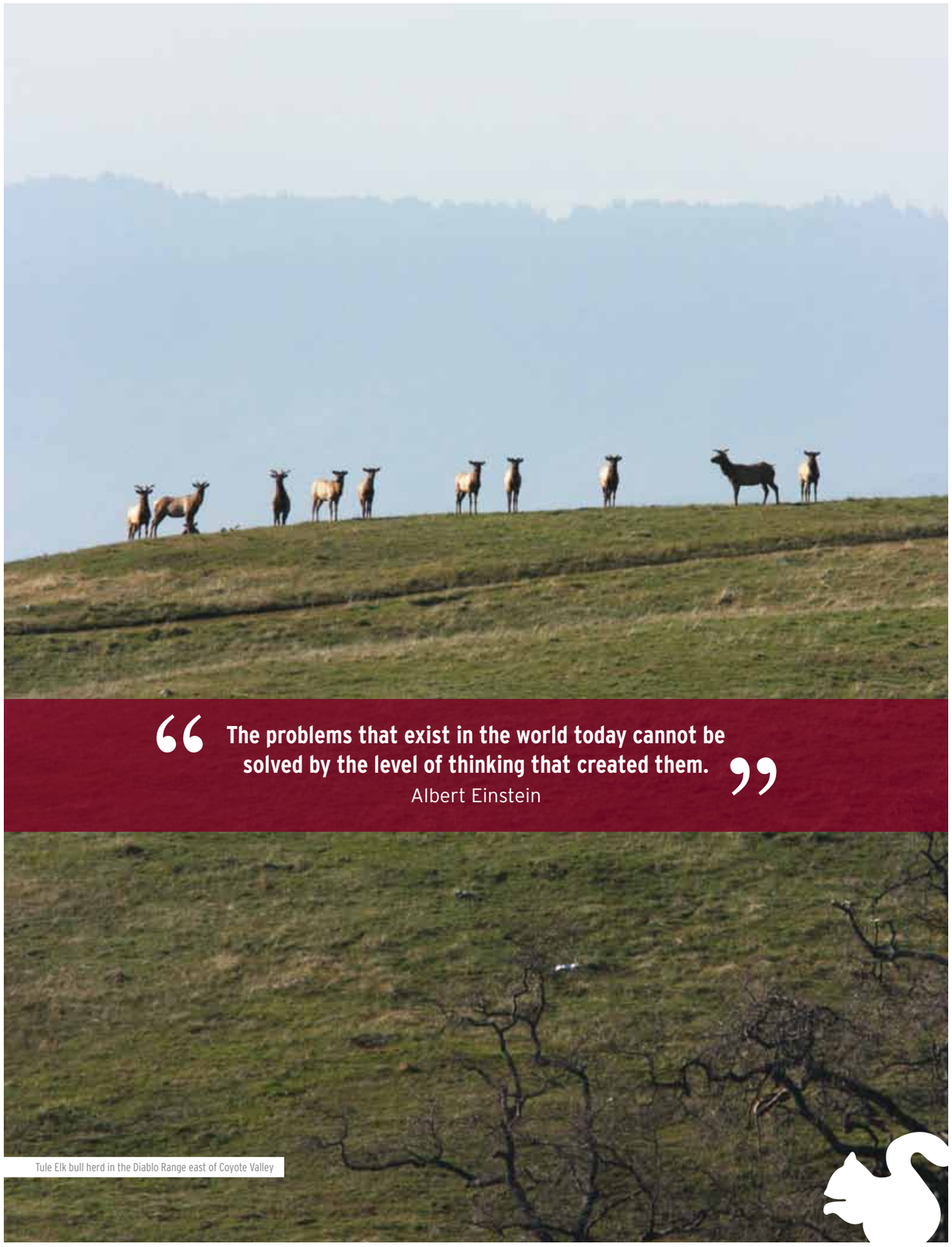
Lead Field Studies Instructor, Ryan Phillips, zooming in on a Golden Eagle on Laguna Avenue

Mountain Lion track in Coyote Valley

Field Studies Instructor, Neela Srinavasan, discussing corridor ecology

WCT Program Staff Pat Cornely and Deborah Aso pointing out the Coyote Valley research site to students

Black-tailed Deer skull



> **The problems that exist in the world today cannot be solved by the level of thinking that created them.**
> Albert Einstein

Tule Elk bull herd in the Diablo Range east of Coyote Valley

5.0 The Importance of the Coyote Valley Landscape

Global to Local Importance

California: A Biodiversity Hotspot

California Floristic Province is included in the 34 global biodiversity hotspots listed by Conservation International (Biodiversity Hotspots 2011). Despite this international recognition, very few wildlife land bridges, wildlife underpasses, or overpasses specifically designed and constructed for wildlife are found along California's roads and highways. When it comes to building wildlife crossing structures, California is far behind most states.

According to the *Atlas of the Biodiversity of California* (CDFG 2003), California is the definition of biodiversity because it has the highest total number of species and the highest number of endemic species — those that occur nowhere else — to be found in the United States. The variety of life in California can be explained by the sheer size of the state with more than 100 million acres in area and its unique geography and geological history. It has the highest and lowest points in the contiguous U.S. California's high mountain ranges and deserts kept native animals and plants relatively isolated from the rest of the continent. Warm summers and mild winters of California's rare Mediterranean climate also make the state different from other parts of the country.

There is scientific consensus that Coyote Valley is one of the last critical links for wildlife between the Diablo and Santa Cruz mountain ranges. The California Essential Habitat Connectivity Project (Caltrans 2010) designated Coyote Valley as an "Essential Connectivity Area" and a Critical Linkage Planning Area.

According to the California Wilderness Coalition, the Santa Cruz Mountains and Santa Teresa Hills of the California Central Coast Region are becoming increasingly isolated from the rest of the state due to development and natural geographical features. Development occurs on the south and east, the Pacific Ocean lies to the west, and the San Francisco Bay lies to the north. Coyote Valley is a key connectivity

point in the landscape and one of the last viable east-west wildlife connections remaining in California's Central Coast Region. According to their findings, the Diablo and Santa Cruz Mountains are proposed core areas, which require a high level of habitat protection. The significance of this region is that the "linkage runs east-west across Coyote Valley," Wildlands Conservation says (Thorne et al. 2002).

Tule Elk: Flagship Species

Tule Elk in Santa Clara County

Tule Elk, endemic to California, is the smallest subspecies of the North American Elk. Tule Elk were once abundant throughout most of Central California, but by the 1870s, it was thought that Tule Elk were extinct. A small group of less than 20 individuals were discovered and through careful management were gradually reintroduced statewide. As of 2007, the statewide population had increased to approximately 3,800 Tule Elk in 21 different herds (J. Hobbs pers. comm.). CDFG estimates that there are approximately 400 Tule Elk in Santa Clara County.

The Mt. Hamilton region of the Diablo Range and including Coyote Valley and west through the Santa Cruz Mountains is native Tule Elk range. Evermann (1916) referred to

A female Tule Elk killed by a motorcycle in the Diablo Range

"convincing evidence of elk range over the entire San Joaquin Valley and adjacent foothills and through the Livermore and Sunol Valleys across to Santa Clara Valley and even to Monterey." Santa Clara County was selected as a relocation site for Tule Elk. The initial reintroduction of Tule Elk into this area occurred between 1978 and 1981 within the Mount Hamilton Region of the Diablo Range. This resulted in the eventual establishment of herds in Isabel Valley, San Antonio Valley, Livermore area, San Felipe Ranch, Metcalf Canyon, Coyote Ridge, Anderson Reservoir, and surrounding areas. The total study area within the Mt. Hamilton region of the Diablo Range included an area of 1875 km^2 (Phillips 1985, 1988).

Tule Elk are an important "focal species" for Santa Clara County. Tule Elk were formerly included in the draft Santa Clara Valley Habitat Plan 2009 (County of Santa Clara 2009) although they are not listed as a focal species in the 2011 SCVHCP. Suitable elk habitat occurs within the Coyote Valley east through the Diablo Range and in the western Coyote Valley into the Santa Cruz Mountains. This includes the Almaden Valley.

Visual observations of Tule Elk between 2007 to present were recorded along Coyote Ridge and surrounding hills, east and south of Metcalf Canyon, along Anderson Reservoir and east into the San Felipe landscape and along the eastern edge of Highway 101 (J. Phillips pers. obs.). It is highly probable that elk have dispersed east-west through Coyote Valley over the last 30 years.

Tule Elk can and will move over very large areas especially if disturbed. Random cow and bull dispersal from traditional home range areas have been observed in several herds in California (Phillips 1985, 1988). Tule Elk have been observed utilizing riparian corridors and moving across roads and highways as they shift to different areas of their home range during calving and breeding seasons or disperse across developed areas (Phillips 1988).

The fencing and topography of areas along the Highway 101 corridor through the Coyote Valley are not barriers to the east-west movement of elk (J. Phillips pers. obs.). Tule Elk could utilize some under crossings along Highway 101 but enhancement of fencing along the freeway and overcrossing structures to facilitate elk movement across the Coyote Valley would facilitate safe passage for California's flagship species.

The continuing long-term dispersal, as envisioned by the Tule Elk Task Force and early reintroduction visionaries, of this large vertebrate species will include movement across Coyote Valley and surrounding areas. Random dispersal of individual or small groups of elk can be expected in this region. These animals will move across roads, highways and interstates and elk-vehicle collisions have occurred and will continue. Long-term regional conservation planning for this species is essential for the safety of elk, as well as people.

Native Tule Elk were returned to this region of Santa Clara County over 30 years ago and are an important part of the natural community of Coyote Valley and surrounding ranges. It would be irresponsible and a violation of the public trust to not plan for connectivity and movement of these large

A view of Mid and North Coyote Valley between the Santa Cruz Mountains (top) and Diablo Range (bottom).

animals, as well as other wildlife, which benefit both the natural and human communities where they roam.

Tule Elk provide an incredible opportunity to enjoy and view nature right in our community, as well as to teach our children about our values of protecting and restoring natural heritage. Thousands of school children each year will visit the Coyote Valley, particularly along Bailey Avenue and surrounding areas, to learn about this natural community and one of California's flagship species, the Tule Elk. Tourists will have an opportunity to view Tule Elk and other wildlife in this spectacular setting as well. The economic opportunities afforded by regional conservation planning will surpass other uses of this area.

Coyote Valley Landscape: Study Area

Coyote Valley is a mosaic of farmlands, orchards, wetlands, riparian corridors and residential housing located in Santa Clara County between Morgan Hill and southern San José. The total land area of Coyote Valley is approximately 7,000 acres (28km^2) and is the largest contiguous tract of undeveloped valley floor which connects the Santa Cruz Mountains with the Diablo Range. Coyote Valley's watershed is made up of two main creeks, Coyote and Fisher, a large wetland system called Laguna Seca in the north and mid valley and an intricate man-made pond system in the southeast portion of Coyote Creek County Park called the Ogier Ponds.

The total study area for both the mammal and bird surveys encompassed most of Coyote Valley, including Coyote Creek County Park and Tulare Hill Ecological Reserve. Research was also conducted on the Coyote Ridge Ecological Reserve, San Felipe Ranch (located east of the valley floor in the Diablo Range), San Antonio Valley and the Santa Cruz Mountains to the west of Coyote Valley (focus on the Highway 17 corridor in partnership with Midpeninsula Regional Open Space District and Santa Clara County Parks). Although that information is not included in this document and will be reported separately.

Current Status of Coyote Valley:

North Coyote Valley: Permits are currently pending for commercial development in the north section of Coyote Valley from Bailey Avenue north and west to Santa Teresa Boulevard. Gavilan College has purchased land along Bailey Avenue to the west side of the Coyote Valley and has plans to construct a college campus of approximately 10,000 students.

Mid Coyote Valley: The Envision San José General Plan 2040 recognizes Coyote Valley as an area facilitating wildlife movement. Yet, Mid Coyote Valley is still designated as an "Urban Reserve" by the City of San José, should the city choose to develop it.

South Coyote Valley: The southern portion of the valley has been designated the "greenbelt" zone. It consists of residential development and commercial factories, while the northern region consists of agricultural fields.

The WCT monitoring program does not consider the southern section feasible as part of the Coyote Valley wildlife corridor.

Road description: Highway 101, Monterey Highway, Santa Teresa Boulevard and other less utilized roads are located within Coyote Valley.

Central point: The unincorporated area of the town of Coyote is in the middle of Coyote Valley.

Human uses: The Coyote Valley landscape supports multiple land uses, including a landfill, a power station, a rail system, residential, commercial, industrial, and agricultural uses, recreational activities such as a model airplane park, a shooting range, a motorcycle park, bike and hiking trails, fishing, bird-watching and nature viewing.

Laguna Seca Wetland in winter with gulls, waterfowl and shorebirds

Coyote Creek Watershed

The largest watershed in the Santa Clara basin is the Coyote Creek watershed. It comprises 320 square miles of land that drains into Coyote Creek and its tributaries (Creek and Watershed Map of Central San José and Vicinity, Stephen C. Thompson, Janet M. Sowers, Oakland Museum of California). It contains the largest freshwater wetland in Santa Clara County, Laguna Seca. "In Coyote Valley, Laguna Seca offers a rare opportunity to restore natural wetland functions and a diverse wetland habitat mosaic. Laguna Seca restoration would link to existing buffers and have regional significance as a large, natural, valley floor wetland" (San Francisco Estuary Institute 2006). The seasonal wetlands found on the valley floor provide critical habitat to many species of wildlife year round and are important to migratory birds. When amphibian diversity is declining worldwide, Coyote Valley's vernal pools offer a safe haven to many species such as the California Tiger Salamander and the California Red-legged Frog.

Addressing the groundwater recharge loss in the region, the San Francisco Estuary Institute notes that, "The dramatic increase in constructed drainage tends to decrease groundwater recharge while increasing flood peaks downstream." Keeping development out of Coyote Valley offers huge potential for enhancing groundwater recharge by undertaking appropriate restoration measures. This is especially important given future climate uncertainties due to global warming.

The Coyote Creek Watershed encompasses Coyote Valley, two riparian corridors, Coyote and Fisher Creeks, the Laguna Seca wetland in the north valley and the Ogier Ponds, the manmade pond system in the southeast portion of Coyote Creek County Park (Phillips et al. 2008). It also includes the seasonal inland wetland found along Laguna Avenue and north to Bailey Avenue and provides critical habitat for birds, mammals and amphibians, including the Tiger Salamander and California Red-legged Frog.

> "The Coyote Creek Watershed is the largest in the Santa Clara Basin, and drains approximately 320 square miles of area from the Diablo Range on the east side of the Basin. The Creek originates in the mountains northeast of the City of Morgan Hill and flows northwest for approximately 42 miles before entering the Lower South San Francisco Bay. At the base of the Diablo Range, the Creek is impounded by two dams, which form Coyote and Anderson Reservoirs.
>
> Nine major tributaries lie within the area that drain to these two reservoirs: Canada de los Osos, Hunting Hollow, Dexter Canyon, and Larios Canyon Creeks drain to Coyote Reservoir; Otis Canyon, Packwood, San Felipe, Las Animas, and Shingle Valley Creeks drain to Anderson Reservoir... At least four major tributaries flow from the mountains across this alluvial plain to Coyote Creek."
>
> *Coyote Watershed. Web.*

Greater Scaup utilizing the Ogier Ponds in the Coyote Creek County Park

Laguna Seca Wetland flooding Laguna Avenue in Coyote Valley

Wild Boar scat located on a mammal transect by a keen-eyed student

Bobcat utilizing one of the many culverts under Highway 101

6.0 Our Research and Findings

WCT Tools for Connectivity Planning

To explore connectivity between the Santa Cruz Mountains and the Mount Hamilton region of the Diablo Range (also known as Northern Diablo Range), biological surveys assessing diversity of mammals, birds, and plants were conducted in the Coyote Valley. Specific objectives of this long-term monitoring program include:

- Establish east to west, west to east, north to south and south to north movement of vertebrate species between the Diablo Range and the Santa Cruz Mountains
- Develop species lists and assess community composition and habitat structure
- Establish baseline data on status, distribution and seasonality of all species recorded
- Determine the relative abundance of focal species
- Determine the permeability and connectivity chokepoints along the Highway 101 corridor between Metcalf Road and Cochrane Ave
- Develop habitat suitability and connectivity models
- Train the WCT Program's field teams to utilize the rapid assessment methodology for collecting baseline data of critical wildlife corridors in the Central Coast Region.
- Reconnect thousands of students and the public to the Coyote Valley Landscape and educate them about the incredible biodiversity of this region
- Continue to build partnerships to help protect critical wildlife corridors, connectivity chokepoints and critical habitat throughout the Coyote Creek Watershed, Diablo Range, Santa Cruz Mountains and other regions of California

The Bird Research Team conducts a point-count survey in Coyote Creek County Park

Previous to the launch of this long-term study in 2007, there was only limited research conducted on Coyote Valley's wildlife and species movement through the valley floor and connected landscape. Commencing February 2007, mammal surveys began along the Highway 101 corridor between Metcalf Road and south to Cochrane Avenue in Santa Clara County and will continue over the next fifty years. Avian research was initiated in January 2008 and continues today along the same corridor. A three month vegetation survey was conducted starting in April 2008. This long-term study will help inform long-term planning efforts as well as monitor the outcomes of public policies developed by the current leadership for the County of Santa Clara, City of San José, Santa Clara Valley Water District, City of Morgan Hill, other agencies and public entities.

The WCT team's data has shown that the Coyote Valley is a viable wildlife corridor with multiple species movement in both an east-to-west and south-to-north directions. Not only is it important for migration, as well as movement and dispersal, but it is very important habitat for resident species. Coyote Valley is one of the only locations in the Santa Clara County that incorporates all habitat types found in the region, including riparian, agriculture, oak woodland, oak savannah, Serpentine grasslands, seasonal wetlands, chaparral and residential. We have recorded over 20 species of mammal and over 200 species of bird, including 21 species of raptors within Coyote Valley.

The highest diversity, movement and abundance of both mammals and birds are found in the two biodiversity "hotspots", namely the coyote creek riparian corridor and the area to the west of Santa Teresa Boulevard between Bailey Avenue and Richmond Avenue. The Coyote Creek corridor is protected as a country park (see map on page 55). This area facilitates high **species richness** because of its low impact agricultural practices, low human disturbance, high prey abundance and multiple habitat types.

Coyote passing in front of a camera-trap

Adult Bald Eagle

Roosting Barn Owl

Flock of California Gulls

Juvenile Red-tailed Hawk on Laguna Avenue

Foraging Long-billed Curlews in mid Coyote Valley

Western Meadowlark, a grassland specialist

Osprey utilizing the Ogier Ponds

Juvenile Swainson's Hawk, first winter record for Santa Clara County

Birds of Coyote Valley

Bold = Rarity Rating: 4 (uncommon) – 6 (very rare)
Red = Special Status Species
BSSC = Bird Species Special Concern
SE = State Endangered
ST = State Threatened
CS = Covered Species by HCP
FP = Fed. Fully Protected
CO = Confirmed, **PR** = Probable, **PO** = Possible

Greater White-fronted Goose 4
Snow Goose 4
Ross's Goose 4
Cackling Goose
Canada Goose **CO**
Wood Duck **CO**
Gadwall **CO**
Mallard **CO**
American Wigeon
Blue-winged Teal 4
Cinnamon Teal **PR**
Northern Shoveler
Northern Pintail
Canvasback
Redhead
Ring-necked Duck
Greater Scaup
Lesser Scaup
Bufflehead
Common Goldeneye
Barrow's Goldeneye 4
Hooded Merganser
Common Merganser **CO**
Red-breasted Merganser
Ruddy Duck **PO**
California Quail **CO**
Ring-necked Pheasant **PO**
Wild Turkey **CO**
Common Loon 4
Pied-billed Grebe **CO**
Horned Grebe
Red-necked Grebe 5
Eared Grebe
Western Grebe
Clark's Grebe
Brandt's Cormorant 6
Double-crested Cormorant
American White Pelican BSSC
Brown Pelican SE/FE
American Bittern 4 PR
Great Blue Heron **CO**
Great Egret **PO**
Snowy Egret **PO**
Little Blue Heron 5
Green Heron **CO**
Black-crowned Night-Heron
White-faced Ibis
Turkey Vulture **CO**
Osprey **PO**
White-tailed Kite FP • **CO**
Bald Eagle 4 • SE
Northern Harrier BSSC • **PR**
Sharp-shinned Hawk
Cooper's Hawk **CO**
Red-shouldered Hawk **CO**

Swainson's Hawk 5 • ST
Red-tailed Hawk **CO**
Harlan's Red-tailed Hawk
Ferruginous Hawk 4
Golden Eagle CS/FP • **PO**
Crested Caracara 6
American Kestrel **CO**
Merlin
Peregrine Falcon SE
Prairie Falcon 4
Virginia Rail
Sora
Common Gallinule **CO**
American Coot **CO**
Black-bellied Plover
Semipalmated Plover
Killdeer **CO**
Black-necked Stilt **CO**
American Avocet
Spotted Sandpiper **PO**
Solitary Sandpiper 5
Greater Yellowlegs
Western Sandpiper
Least Sandpiper
Dunlin
Lon-billed Dowitcher
Wilson's Snipe
Bonaprte's Gull
Mew Gull
Ring-billed Gull
California Gull
Western Gull
Herring Gull
Thayer's Gull
Iceland Gull 6
Glaucous-winged Gull
GlaucousxHerring Gull
Glaucous Gull 4
Caspian Tern
Forster's Tern
Rock Pigeon **PO**
Band-tailed Pigeon
Eurasian Collared-Dove 4
Mourning Dove **PO**
Greater Roadrunner 4 PO
Barn Owl **CO**
Western Screech-Owl
Great-horned Owl **CO**
Burrowing Owl BSSC/CS • **PO**
Short-eared Owl 4 • BSSC
Vaux's Swift BSSC
White-throated Swift **PR**
Anna's Hummingbird **CO**
Costa's Hummingbird 5
Rufous Hummingbird 4

Allen's Hummingbird
Belted Kingfisher **CO**
Acorn Woodpecker **PO**
Red-breasted Sapsucker
Nuttall's Woodpecker **PR**
Downy Woodpecker
Hairy Woodpecker
Northern Flicker **PO**
Pileated Woodpecker 4
Olive-sided Flycatcher
Western Wood-Pewee
Willow Flycatcher 4
Hammond's Flycatcher 5
Pacific-slope Flycatcher **PR**
Black Phoebe **CO**
Say's Phoebe
Ash-throated Flycatcher **PR**
Cassin's Kingbird 5
Western Kingbird **CO**
Loggerhead Shrike BSSC • **CO**
Yellow-throated Vireo 6
Hutton's Vireo **PO**
Warbling Vireo **CO**
Steller's Jay **CO**
Western Scrub-Jay **CO**
Yellow-billed Magpie **CO**
American Crow **CO**
Common Raven **CO**
Horned Lark **PO**
Purple Martin 4
Tree Swallow **CO**
Violet-green Swallow **PO**
Northern Rough-winged Swallow **CO**
Barn Swallow **CO**
Cliff Swallow **CO**
Chestnut-backed Chickadee **CO**
Oak Titmouse **CO**
Bushtit **CO**
White-breasted Nuthatch **CO**
Brown Creeper
Rock Wren 4 CO
Bewick's Wren **CO**
House Wren **CO**
Pacific Wren
Marsh Wren **CO**
Ruby-crowned Kinglet
Blue-gray Gnatcatcher
Western Bluebird **CO**
Swainson's Thrush
Hermit Thrush
American Robin **PO**
Wrentit
Northern Mockingbird **CO**
California Thrasher **PR**
European Starling **CO**
American Pipit
Cedar Waxwing
Orange-crowned Warbler **PR**
Nashville Warbler 4
MacGillivray's Warbler 4
Common Yellowthroat **CO**
American Redstart 5
Yellow Warbler **PR**
Palm Warbler 5
Yellow-rumped Warbler
Townsend's Warbler
Wilson's Warbler **PR**
Yellow-breasted Chat 5 • BSSC • PO
Spotted Towhee **PR**
Rufous-crowned Sparrow **CO**
California Towhee **PR**
Brewer's Sparrow 5
Vesper Sparrow 5
Lark Sparrow **CO**
Savannah Sparrow
Grasshopper Sparrow 4 PO
Fox Sparrow
Song Sparrow **CO**
Lincoln's Sparrow
Swamp Sparrow 5
White-throated Sparrow 4
White-crowned Sparrow
Golden-crowned Sparrow
Dark-eyed Junco
Western Tanager
Black-headed Grosbeak **CO**
Blue Grosbeak 4
Lazuli Bunting **PO**
Indigo Bunting 5
Red-winged Blackbird **CO**
Tricolored Blackbird BSSC • **PR**
Western Meadowlark **CO**
Yellow-headed Blackbird 5
Brewer's Blackbird **PR**
Great-tailed Grackle 5 CO
Brown-headed Cowbird **PR**
Hooded Oriole **CO**
Bullock's Oriole **CO**
Purple Finch
House Finch **CO**
Lesser Goldfinch **CO**
Lawrence's Goldfinch
American Goldfinch **PR**
House Sparrow **PO**

Coyote Valley Avian Research

Methods

Coyote Valley was divided into 9 study site sub-sets: north Coyote Creek, south Coyote Creek, Ogier Ponds, north Santa Teresa, south Santa Teresa, residential, IBM, Fisher Creek, and San Bruno, with vary sizes for ease of logging data. Survey techniques included line-transects, variable radius point counts, Breeding Bird Atlas, spot mapping, and raptor nest mapping. Six 500 meter line-transects, monitored monthly, were established throughout Coyote Valley and were chosen as randomly as possible depending on accessibility to certain lands. All transects were set up in different habitat types for comparison of species composition of all bird species. All the data in this publication was collected from March 2008 through April 2012.

Sixteen variable radius point count stations were established to survey raptors in Coyote Valley. Point counts were set up evenly distributed and as randomly as possible throughout Coyote Valley with all habitats being monitored.

Breeding Bird Atlas data was compiled using the criteria used in the "Breeding Bird Atlas of Santa Clara County, California" (Bousman 2007). A Breeding Bird Atlas (BBA) survey categorizes each species breeding within a geographic region by using various behavioral observations. A single list of the breeding status of all bird species in Coyote Valley was compiled instead of a list for each study site sub-sets.

Along with point counts to survey for raptors, nest surveys were also conducted to determine nesting density, intra and inter-specific competition, habitat usage and nesting success. Prior to raptor nesting season, which begins in late February, most trees were surveyed for possible raptors nests while the deciduous trees were without leaves. All nests were georeferenced and then checked during the breeding season for activity. If an active nest was located, data would be collected, disturbance to the nest would be limited, and observations would be taken from at least a distance of 100 meters. The status of each nest was monitored two times per month to determine the lengths of different stages: incubating, branching, and fledging of the breeding cycle.

Findings

Between January 2008 and June 2011, 188 bird species have been recorded in Coyote Valley through this research. Including historical and recent confirmed records from credible sources, 218 species of birds have been observed in Coyote Valley (S. Rottenborn, M. Rogers, B. Bousman pers. comm.). This represents 54% of the total number of species recorded in Santa Clara County (387 species) including vagrant species (accidental occurrence) according to the 2005 Santa Clara County checklist (Bousman 2005). If vagrants are excluded, this represents 66% of the species recorded in Santa Clara County. Out of the 218 species recorded, 21 species were raptors including a California vagrant, Crested Caracara (Caracara cheriway), which was the second county record (B. Bousman pers comm.) 86 permanent resident species, those species that are found throughout the year in Coyote Valley but may not breed in the area, were recorded. 74 "winter" resident species (September-April) and 18 "summer" resident species (March-September) were recorded during the study period. Transient or migrant only species included sixteen species and vagrant or casual species added sixteen species to the total species composition. During the Breeding Bird Atlas period for four breeding seasons (2008-2011) we recorded evidence of breeding for 96 species. We confirmed breeding of 57 species, where 39 were observed in the probable or possible breeding category.

According to the Santa Clara County rarity scale of 1-6, with 1 being the most common and 6 being the rarest, there were four 6's, twelve 5's, twenty-four 4's, twenty-seven 3's, fifty-nine 2's, and eighty-one 1's recorded (Bousman and Smith 2011).

Highest species diversity and abundance was most prominent in the Coyote Creek riparian corridor from March-October and in the agricultural fields in the mid Coyote Valley surrounding Laguna and Richmond Avenue from November-February. Tulare Hill lacked species diversity, but held many serpentine and grassland specialists, including Rock Wren *(Salpinctes obsoletus)* Horned Lark *(Eremophila alpestris)*, Western Meadowlark *(Sturnella neglecta)* American Pipit *(Anthus rubescens)*, Burrowing Owl *(Athene cunicularia)*, Rufous-crowned Sparrow *(Aimophila ruficeps)*, and Say's Phoebe *(Sayornis saya)*. The southern portion of Coyote Valley, which consisted mainly of the "green" belt zone was lacking species richness and diversity with the most common species being Rock Pigeon *(Columba livia)*, House Sparrow *(Passer domesticus)*, House Finch *(Carpodacus mexicanus)*, European Starling *(Sturnus vulgaris)*, and Mourning Dove *(Zenaida macroura)*.

Many species of raptors including both breeding and non-breeding individuals use this area and rely on it for either breeding or preparation for breeding. For instance, the Ferruginous Hawk *(Buteo regalis)*, a rare migrant that is found in Coyote Valley from October-March and breeds in the Montana area, spends 6 months of its life each year in Coyote Valley preparing to migrate north to breed in March. Without an abundant food supply and good non-breeding habitat for the Ferruginous Hawk and many other species, they would not be able to build up their fat supplies in preparation for a long migration and breeding season. Studies show that the better a bird's non-breeding habitat the more successful it will be during the breeding season. We need to protect both breeding and non-breeding habitat, as both are equally important.

21 species of raptors have been recorded, as well as over 50 active raptor nests of 8 species throughout Coyote Valley, which is a density of 1 nest per 1.2 km². Out of the 21 species, 12 have had or have special status, which include the Bald Eagle *(Haliaeetus leucocephalus)*, Northern Harrier (Circus cyaneus), Swainson's Hawk *(Buteo swansoni)*, Peregrine Falcon *(Falco peregrinus)*, and Short-eared Owl *(Asio flammeus)*. Comparing this density to the Snake River Bird of Prey National Conservation Area, which has the highest density of nesting raptors in the world (800 pairs per 1,964 km² = 1 nest per .41 km²), Coyote Valley has a comparable density. The reason for this high density and diversity in Coyote Valley is due to the many types of habitats, high prey density, a good amount of suitable nesting trees surrounded by open fields for foraging on the valley floor and the lack of development. Coyote Valley is one the richest areas in California for raptor diversity and abundance both during the breeding and non-breeding seasons.

In 2004, The Riparian Bird Conservation Plan was produced by the Riparian Habitat Joint Venture (RHJV 2004) in an effort to reduce the decline of riparian associated birds in California. The focal species of this plan includes the following seventeen species: Swainson's Hawk, Spotted Sandpiper *(Actitis macularius)*, Western Yellow-billed Cuckoo *(Coccyzus americanus)*, Willow Flycatcher *(Empidonax traillii)*, Warbling Vireo *(Vireo gilvus)*, Least's Bell's Vireo *(Vireo bellii)*, Bank Swallow *(Riparia riparia)*, Tree Swallow *(Tachycineta bicolor)*, Swainson's Thrush *(Catharus ustulatus)*, Yellow Warbler *(Setophaga petechia)*, Common Yellowthroat *(Geothlypis trichas)*, Wilson's Warbler *(Cardellina pusilla)*, Yellow-breasted Chat *(Icteria virens)*, Song Sparrow *(Melospiza melodia)*, Black-headed Grosbeak *(Pheucticus melanocephalus)*, Blue Grosbeak *(Passerina caerulea)*, and Tricolored Blackbird *(Agelaius tricolor)* (RHJV 2004). These species were selected by the RHJV to emphasize the ecological associations of individual species as well as those of conservation concern in California. Finding this suite of focal species in a given riparian area is attributed as having a "healthy" riparian ecosystem, as these species primarily breed in riparian habitat, are species of concern, have exhibited a decline from their historical range, commonly breed throughout California's riparian areas, and their breeding requirements represent the full range of successional stages of riparian ecosystems.

Coyote Valley contains the largest fresh water wetland in Santa Clara County, Laguna Seca, and two main tributaries, Coyote Creek and Fisher Creek. Understanding the healthiness of these riparian corridors in Coyote Valley will assist in understanding the healthiness of Coyote Valley as an entire ecosystem. This report focuses on the Coyote Creek watershed and did not survey Fisher Creek. During this research, fourteen of the seventeen focal species were recorded on Coyote Creek during breeding months. The Western Yellow-billed Cuckoo, Least's Bell's Vireo, and Bank Swallow were not observed during the study period. Six species, Warbling Vireo, Tree Swallow, Yellow Warbler, Common Yellowthroat, Song Sparrow, and Black-headed Grosbeak, were confirmed breeding on Coyote Creek, where the others were observed, but were not confirmed breeding.

Coyote Valley Mammal Research

Methods

Mammal surveys were conducted along the Highway 101 crossing structures including 3 foot and 6 foot culverts, 30 foot underpasses and overpasses. To determine mammal presence or absence, species composition, movement patterns, seasonality, and high usage areas, noninvasive field techniques were used involving digital remote-sensored field cameras and line-transects using formal tracking protocols (live sightings, tracks and sign). Cameras were installed on 15 crossing structures, including 1 overpass, 2 underpasses, and 6 culverts (Culverts 2, 5, 7, 20, 23 and 25) with varying attributes. Subject to technological limits, cameras were actively running throughout a full year, so seasonality could be determined. Line-transects were conducted quarterly, throughout the year in different locations in the study area. Field cameras were installed on both the east and west sides of selected crossing structures (based on access restrictions), so that passage could be determined. Also cameras were set opposite one another, so individuals could be identified through individual characteristics, which would determine the number of individuals using the structures. Cameras were checked monthly, data was downloaded, filtered and entered into Microsoft Excel and Access databases. Geospatial analysis of the data was done using ArcGIS 9.3 and ArcGIS 10. Data will be stored at the WCT Program's Database-Archive at the Kirsch Center for Environmental Studies.

Findings

Twenty-six mammal species have been identified within the study area. A total of 9000 camera events were recorded on the field cameras for 2011.

This analysis demonstrates that wildlife species are using at least six monitored Highway 101 culverts, 2 underpasses and 1 overpass. The initial study indicates that this section of the Highway 101 corridor is a biodiversity hotspot for mammals and is permeable for wildlife, facilitating species movement from the east hills (Coyote Ridge including the Mount Hamilton region of the Diablo Range or Northern Diablo) under Highway 101 to access Coyote Creek and surrounding hills to the west including Santa Teresa Hills and the Santa Cruz Mountains.

Coyote Valley Plant Research

A checklist of the coyote valley landscape flora was prepared using the California Native Plant Society (CNPS) rapid vegetation assessment (RVA) method. Although the RVA method focuses on habitat assessment, a species checklist was derived during the assessment. The checklist includes threatened and endangered plant species in Coyote Valley and provides a broad representation of floral diversity within Coyote Valley.

The RVA was preformed from April through July of 2008. Special attention was given to the identification of species with special status, such as *Cirsium fontinale* var. *campylon*, the Mount Hamilton Thistle (a candidate species for listing on the federal endangered species list). Of the 124 species identified, 42 were introduced species. Of special note was the Mount Hamilton Thistle which was typically found in seeps and drainages in the Coyote Creek County Park and adjacent lands of Coyote Ridge

Site Selection

Survey sites were selected based on vegetation assessment technique (rapid plot vegetation assessment vs. belt transect), habitat diversity, community structure, and likelihood of presence of species of concern.

- The first site for analysis represented valley grasslands dominated by non-native annuals which are typical of the valley floor. (RVA)
- The second site represented the typical riparian ecosystems that run through Coyote Valley and are part of the Greenbelt. (RVA)
- The third site represented the unique old growth cottonwood forest along the west side of Highway 101. (RVA)
- The fourth site represented hillside/chaparral vegetation on Tulare Hill which commonly has serpentine soil and rock outcrops. (Belt Transect)
- The fifth site represented more valley grassland ecosystems at the south end of Coyote Valley near the Ogier ponds. (Belt Transect)


California Buckeye, a common plant along Coyote Creek


Purple Needlegrass, state grass of California


Valley Oak, a heritage symbol of the valley


Flowering lupines


Flowering Blue Elderberry


California Poppy, state flower of California

Floral Checklist of Coyote Valley

^ = Introduced species
* = Noxious weed (based on CAL-IPC)
R = Rare

Nomenclature according to Jepson, 1993 and www.Calflora.org

FERNS and FERN ALLIES	
DENNSTAEDTIACEAE	**Common Name**
Pteridium aquilinum var. pubescens	Bracken Fern

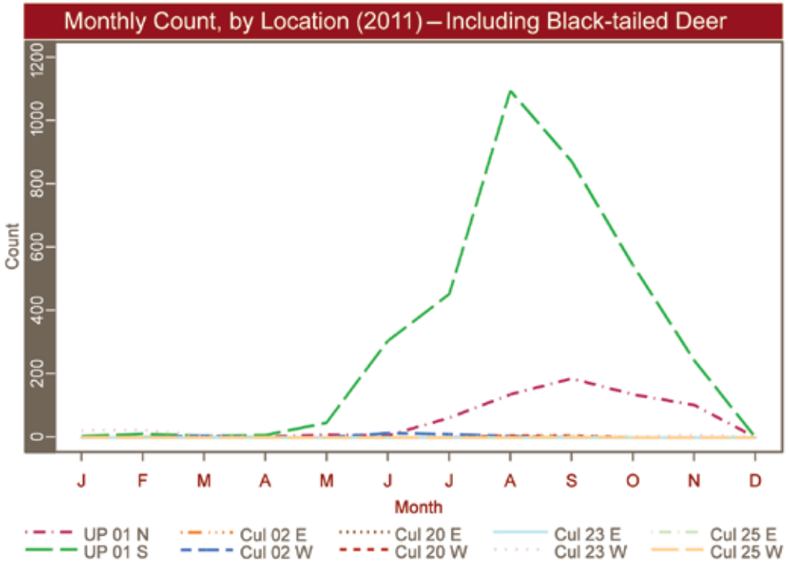
FLOWERING PLANTS – DICOTS	
ADOXACEAE	**Common Name**
Sambucus mexicana (Caprifoliaceae)	Blue Elderberry
ANACARDIACEAE	
*Schinus molle^*	Peruvian Pepper Tree
Toxicodendron diversilobum	Poison Oak
APIACEAE	
*Conium maculatum^**	Poison-Hemlock
*Foeniculum vulgare^**	Fennel
*Scandix pectin-veneris^*	Shepherd's Needle
*Torilis arvensis^*	Hedge-Parsley
ASCLEPIADACEAE	
Asclepias fascicularis	Narrowleaf Milkweed
ASTERACEAE	
Achillea millefolium	Yarrow
Artemisia californica	California Sagebrush
Artemisia douglasiana	CA. Douglas Mugwort
Baccharis pilularis	Coyote Brush
Baccharis salicifolia	Mule Fat, Seep Willow
*Carduus pycnocephalus^**	Italian Thistle
*Centaurea melitensis^**	Tocolate
*Centaurea solstitialis^**	Yellow Star Thistle
*Chicorium intybus^*	Chicory
*Cirsium vulgare^**	Bull Thistle
Cirsium fontanale ssp. fontanale^R	Mt. Hamilton Thistle
*Cynara scolymus^*	Artichoke
*Hypochaeris glabra^**	Cat's Ear
*Lactuca serriola^**	Prickly Lettuce
Microseris douglasiana	Douglas' Microseris
*Picris echioides^**	Ox-tongue
*Silybum marianum^**	Milk Thistle
Tragopogon dubius	Yellow Salsify
BORAGINACEAE	
Amsinckia sp.	Rancher's Fireweed
Cryptantha sp.	Cryptantha
BRASSICACEAE	
*Barbarea verna^*	Early Winter Cress
*Brassica nigra^**	Black Mustard
*Capsella bursa-pastoris^*	
Shepherd's Purse	
*Raphanus sativus^**	Wild Radish
Rorippa sp.	Cress
CARYOPHYLLACEAE	
*Stellaria media^*	Common Chickweed
CAPRIFOLIACEAE	
Symphoricarpos mollis	Creeping Snowberry
CONVOLVULACEAE	
Calystegia purpurata ssp. purpurata	Morning Glory
*Convolvulus arvensis^**	Field Bindweed
CRASSULACEAE	
Crassula aquatica	Pygmy Weed
Dudleya sp	Canyon Liveforever
CUCURBITACEAE	
Marah sp.	Wild Cucumber
DIPSACACEAE	
*Dipsacus sp.^**	Teasel
EUPHORBIACEAE	
Eremocarpus setigerus	Doveweed
FABACEAE	
Lupinus microcarpus (purple)	Annual, Miniature Lupine
*Medicago polymorpha^**	Burclover
Melilotus indica	Sour Clover
Thermopsis macrophylla	Yellow False Lupine
Trifolium hirta	Rose Clover
*Vicia sativa ssp. sativa^*	Vetch
*Vicia villosa ssp. villosa^**	Hairy Vetch
FAGACEAE	
Quercus agrifolia	Coast Live Oak
Quercus douglasii	Blue Oak
Quercus lobata	Valley Oak
GERANIACEAE	
*Erodium botrys^**	Long-Beaked Filaree
*Erodium brachycarpum^**	Short-Beaked Filaree
*Erodium cicutarium^**	Red-Stemmed Filaree
*Geranium dissectum^**	Cut-Leaved Geranium
GROSSULARACEAE	
Ribes sp.	Gooseberry
HIPPOCASTANACEAE	
Aesculus californica	California Buckeye
JUGLANDACEAE	
Juglans californica	Northern California Black Walnut
LAMIACEAE	
*Lamium amplexicaule^*	Henbit
*Marrubium vulgare^*	Horehound
Stachys sp.	Hedge Nettle
LAURACEAE	
Umbellularia californica	California Bay Laurel
MYRTACEAE	
Eucalytus sp.	Eucalyptus
ONAGRACEAE	
Epilobium ciliatum	Common Willowherb
OROBANCHACEAE	
Castilleja exserta ssp. exserta	Purple Owl's Clover
Orobanche fasciculata	Broomrape
PAPAVERACEAE	
Eschscholtzia californica	California Poppy
Platystemon californicus	Cream Cups
PHRYMACEAE	
Mimulus aurantiacus	Sticky Monkeyflower
Mimulus guttatus	Common Monkeyflower
PLANTAGINACEAE	
Plantago erecta	Dwarf Plantain
*Plantago lanceolata^*	English Plantain
PLATANACEAE	
Platanus racemosa	California Sycamore
POLEMONIACEAE	
Gilia tricolor	Bird's Eye Gilia
POLYGONACEAE	
Eriogonum sp.	Buckwheat
*Rumex acetosella^**	Dock
*Rumex conglomerata^*	Dock
*Rumex crispus^**	Dock
PRIMULACEAE	
*Anagallis arvensis^*	Scarlet Pimpernel
RHAMNACEAE	
Rhamnus californica	California Coffeeberry
ROSACEAE	
Prunus sp.	Domestic Fruit Tree
Rosa californica	California Rose
Rubus discolor	Himalayan Blackberry
Rubus ursinus	California Blackberry
RUBIACEAE	
Galium porrigens	Climbing Bedstraw
SALICACEAE	
Populus fremontii	Fremont Cottonwood
Salix exigua	Narrow-Leaved Willow
Salix laevigata	Red Willow
SCROPHULARIACEAE	
Verbascum sp.	Mullein
SOLANACEAE	
*Nicotiana glauca^*	Tree Tobacco
Solanum sp.	Blue Nightshade
URTICACEAE	
*Urtica dioica^*	Stinging Nettle
VISCACEAE	
Phoradendron villosum	Oak Mistletoe

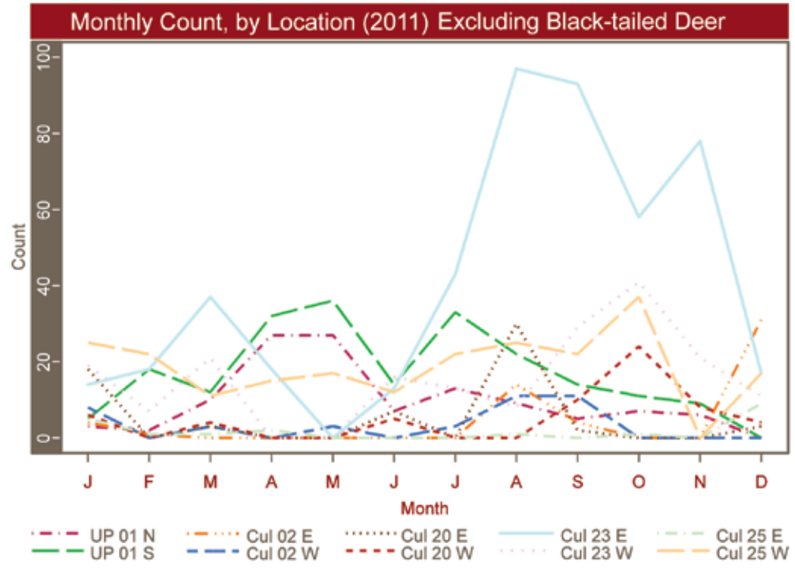
FLOWERING PLANTS – MONOCOTS	
CYPERACEAE	**Common Name**
Eleocharis macrostachya	Spikerush
JUNCACEAE	
Juncus patens	Common Rush
LEMNACEAE	
Lemna sp	Duckweed
LILIACEAE	
Allium sp.	Onion
Calochortus venustus	White Mariposa Lily
Chlorogalum pomeridianum	Common Soap Plant, Amole
Dichelostemma sp.	Blue Dicks
Tritelela laxa	Ithuriel's Spear
POACEAE	
*Aira caryophyllea^**	European Hairgrass
Arundo donax	Giant Reed
*Avena barbata^**	Slender Wild Oat
*Bromus diandrus^**	Ripgut Grass
*Bromus hordeaceus^**	Soft Chess
*Bromus madritensis ssp. rubens^*	Foxtail Chess
*Bromus tectorum^**	Cheat Grass, Downy Brome
Elymus glaucus	Blue Wild Rye
*Gastridium ventricosum^*	Nit Grass
Hordeum brachyantherum	Meadow Barley
*Hordeum marinum spp. gussoneanum^*	Mediterranean Barley
Koeleria macrantha	June Grass
*Lamarckia aurea^*	Golden Top
Leymus triticoides	Creeping Wild Rye
*Lolium multiflorum^**	Italian Ryegrass
Nassella pulchra	Purple Needlegrass
*Phalaris aquatica^**	Harding Grass
Piptatherum miliaceum	Smilo Grass
*Poa annua^*	Annual Blue Grass
TYPHACEAE	
Typha sp.	Cattail

Highway 101 Wildlife Data

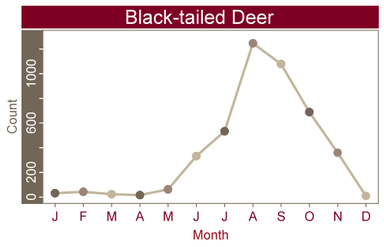
SEASONAL ACTIVITY

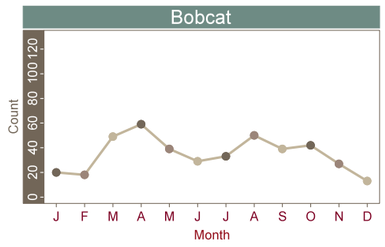
These charts are the number of events from the camera-trapping data collected in 2011 of Underpass 1, Culvert 2, Culvert 20, Culvert 23 and Culvert 25 on Highway 101 of the six most frequent mammal species using the crossing structures. They represent the seasonal activity and usage of the selected mammals at each crossing structure, including both the east and west sides of the highway.

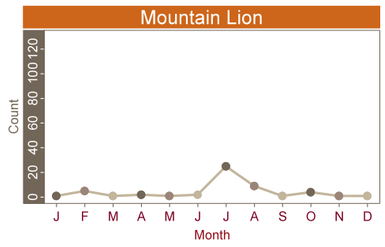


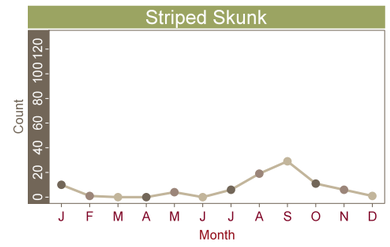


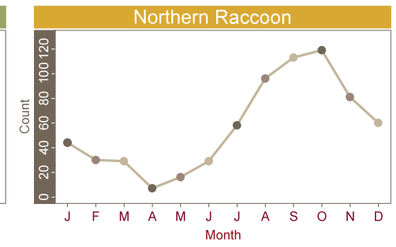
SEASONAL ACTIVITY—BY SPECIES

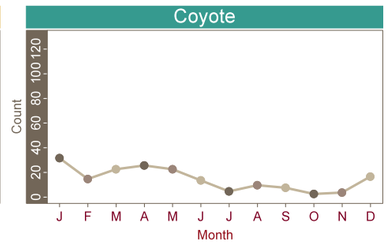




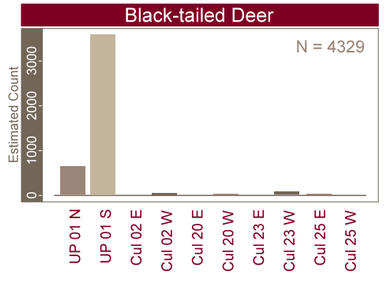


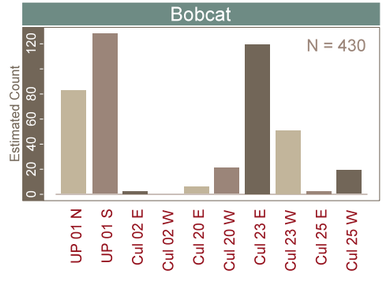


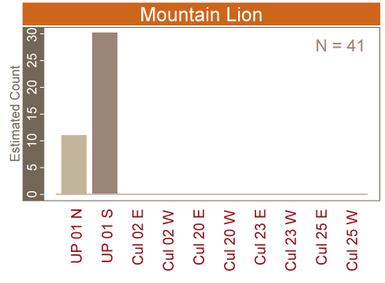


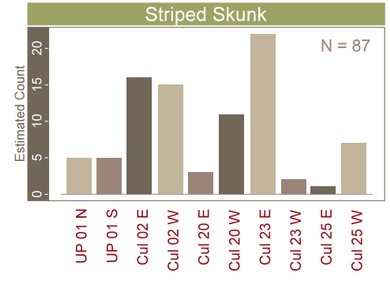


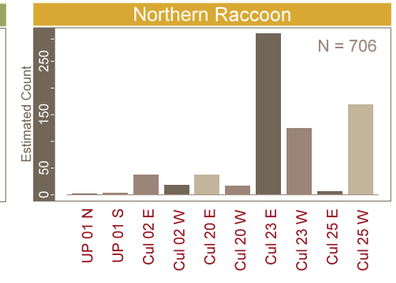
ACTIVITY—BY CULVERT

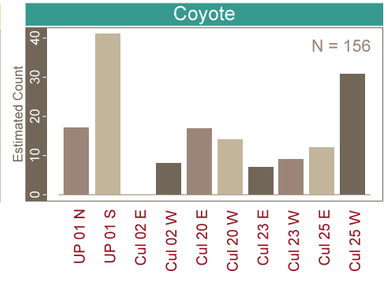












Species-Specific Considerations

Crossing Structure Considerations for Selected Target Species

Planning must occur to enhance habitat connectivity and safe passage based on multiple species' crossing structure requirements. The WCT Program focused on the following target species that were observed at the Coyote Valley culverts, underpasses and overpasses.

AMERICAN BADGER *(Taxidea taxus)*

American Badger sightings in Coyote Valley have been significantly high, with ten badgers being observed from 2006 to 2008. Unfortunately, most of these sightings have been of badger road kill, with Highway 101, Santa Teresa Boulevard, and Bailey Avenue having the highest mortality rates. The WCT team recorded one crossing at one of the Highway 101 underpasses.

MOUNTAIN LION *(Puma concolor)*

The Mountain Lion is a key umbrella species for the Central Coast region and connectivity is critical for their survival and ecological requirements. Mountain Lion-vehicle collisions occur frequently throughout California and crossing structures must be considered in its habitat. Multiple studies have shown that Mountain Lions prefer underpasses significantly more than overpasses. The WCT team recorded multiple camera events of Mountain Lion utilizing an underpass.

Open-span bridge underpasses are the most preferred underpass type, but they will infrequently use box culverts, creek bridge underpasses, and the occasional overpass. Habitat quality and density of habitat are important characteristics when determining the placement of the structure, as well as the presence of its primary prey, Mule Deer. The presence of humans in the structure area does not correlate with Mountain Lion activity and usage of the structure. Mountain Lions are able to jump and climb fencing, so a minimum height of 8 feet is recommended to be effective. The most effective safe passage of highways and roads for Mountain Lions in California is to convert culverts into underpasses, enhance the existing underpasses through habitat restoration, and to install 8-10 foot tall fencing to funnel them into the structure. This is much more cost effective and more feasible than constructing land bridges for Mountain Lions. However, if funding is available and highways do not have culverts or underpasses, overpasses may be the only alternative. If overpasses are built for Mountain Lions they should be a minimum of 150 feet wide, densely vegetated with fencing to funnel them in. It is also recommended that the overpass not be arched, so they have a large field of view and are not deterred from using the structure.

TULE ELK *(Cervus elaphus nannodes)*

Over 3,000 Tule Elk reside throughout California with a healthy herd inhabiting the edge of Coyote Valley. Crossing structures have been designed specifically for elk outside of California. Similar structures should be considered in California, especially where elk-vehicle collisions have been recorded and where there is potential for such collisions.

Studies across the United States have shown that elk will use multiple types of crossing structures. This has not been studied in detail in California and needs further investigation. Clevenger and Waltho (2000) found that usage of crossing structures in Banff National Park correlated with the structure's width, length, height and openness, as well as the noise levels, human use, and distance to forest cover. Elk have been observed using a wide range of crossing structures including overpasses, underpasses, and culverts. It has been found that the larger the openness ratio the more conducive it is to elk usage, whereas long, narrow culverts prove to be ineffective.

The most effective crossing structures for Tule Elk in California may be a combination of wide, short, undisturbed underpasses and overpasses, where they are funneled in through an 8-10 foot tall fence. Elk can effortlessly jump a 5-foot fence, so a minimum 8-foot tall fence is recommended. However, since Tule Elk disturb easily and suitable habitat for Tule Elk in California is limited, these structures should be constructed where Tule Elk habitat exists, where elk are present and there is little or no human presence.

Since most or all overpasses, underpasses, and culverts were not designed for wildlife when constructed, these existing structures should be modified or replaced for wildlife, which would reduce the costs of building new structures. This could be done by replacing culverts with open span bridges, so the openness is increased. It has also been shown that when a crossing structure appears more natural, such as the absence of concrete walls, the rate of use increases dramatically. With the enhancement or installation of elk friendly crossing structures and fencing, the number of elk related collisions would decrease considerably, as well as for deer and other species. Arizona observed nearly a 99% decrease in elk related accidents with the installation of fencing and underpasses.

In Coyote Valley, elk have not been observed using the existing crossing structures, but potential structures are present in the way of overpasses and underpasses. A considerable Tule Elk herd inhabits the east side of Highway 101 in Coyote Valley, and credible reports of elk sign have been made in the west side of Coyote Valley where there is suitable elk habitat. With the establishment of elk friendly crossing structures and fencing through Coyote Valley, the potential for an elk-related accident would dramatically reduce, which would make Highway 101 safer for people and wildlife.

BOBCAT *(Lynx rufus)*

The Bobcat population of California is unknown at this time. Through the use of camera traps placed along Highway 101 in Coyote Valley at culverts, underpasses and overpasses over 4 years, the WCT team has recorded multiple camera events of Bobcats using both culverts and underpasses as they cross Highway 101. Providing safe crossing structures focused on an umbrella or keystone species in Coyote Valley, such as Tule Elk, would inevitably enhance safe passage for Bobcats.

Roads create barriers for most animals, making them extremely vulnerable when trying to make a safe passage. Fortunately, as a medium size carnivore, Bobcats are able to use a range of crossing structures from small underpasses, dry culverts, and ephemerally flooded drainage culverts to large underpasses, box culverts and open span bridges that can accommodate most ungulates and large carnivores.

Crossing Structure Profiles

This Section Includes two examples of attributes collected at existing crossing structures utilized by multiple species. The culverts and underpasses were designed for water drainage along Highway 101 and not wildlife. These attributes could serve as a model for studying other roads, highways and freeways.

Culvert 20 East

GPS coordinates: (not included)

Camera direction: West into the culvert

Description: Culvert is 3.5 feet in diameter and made of concrete. A 6 ft chain-link fence with barbed wire is located on the east side of the culvert. This fence separates the culvert and freeway on the west from land on the east. A marshland habitat about 50 ft x 10 ft is located on the east of the culvert.

Challenges: There is no fencing between the culvert entrance and the freeway, which fails to prevent wildlife from entering the freeway. The 6 ft chain-link fence with barbed wire disrupts wildlife exiting the culvert from accessing the marshland and drainage on the east. Rocks (riprap) line the culvert entrance with no natural detritus material. The primary challenge of this culvert is that the size limits or prevents access to medium and large sized mammals.

Recommendations: Add a fence to separate the freeway from the culvert. If fencing is needed on the east side, use wildlife friendly fencing. This will funnel animals into the culvert instead of blocking access, and deter wildlife from entering the freeway. Remove non-native plants and replace with native vegetation. Riprap need to be enhanced. This area is one of the proposed locations for a land bridge or underpass.

Species observed: Coyote, Bobcat, Northern Raccoon, Virginia Opossum, Brush Rabbit, Desert Cottontail, Barn Owl, Greater Roadrunner, Western Scrub-Jay, Black Phoebe, Western Fence Lizard, Iedidopterans.

Culvert Attributes

Crossing Structure ID	Type	Diameter	Length	Light	Detrutus Pit	Distance to Cover	Fencing		O-5	O-5
All measurements in meters							Cul-RD	Cul-LS	Human Activity	Noise Level
CV 2 W	Concrete culvert	1.83	60	Y	Y	100	N	Y	3	5
CV 2 E	Concrete culvert	1.83	60	Y	N	100	N	Y	0	5
CV 5 W	Concrete culvert	1.83	100	Y	Y	3	N	Y	1	5
CV 5 E	Concrete culvert	1.83	100	Y	N	50	Y	Y	0	5
CV 7 W	Concrete culvert	0.91	90	Y	Y	100	N	Y	1	5
CV 7 E	Concrete culvert	0.91	90	Y	N	500	N	Y	1	5
CV 20 W	Concrete culvert	1.07	60	Y	N	1	Y	N	5	4
CV 20 E	Concrete culvert	1.07	60	Y	N	40	N	Y	1	5
CV 23 W	Concrete culvert	1.83	60	Y	Y	0	Y	N	4	4
CV 23 E	Concrete culvert	1.83	60	Y	N	5	Y	N	4	4
CV 25 W	Metal culvert	1.22	100	N	N	0	Y	N	1	3
CV 25 E	Metal culvert	1.22	100	N	N	5	N	Y	3	5
CV 1	Open-span Underpass	105 **	60	Y	N	0	Y	N	5	4
CV 1	Open-span Underpass	105 **	60	Y	N	0	Y	N	5	4

** This measurement is the width of the underpass
0-5 Scale: 0 = lowest human activity and noise level, 5 = highest

Cul-RD: A fence between the crossing structure entrance and Highway 101
Cul-LS: A fence between the crossing structure entrance and the landscape

Culvert 20 West

GPS coordinates: (not included)

Camera direction: East into the culvert

Description: Culvert is 3.5 feet in diameter and made of concrete. Fencing is found along this stretch of the highway between the culvert and the freeway, which may help keep wildlife off the freeway. Natural detritus lines the entrance to this culvert and there is no fencing to the west to public land.

Challenges: There is much garbage and silt has filled up the drainage that follows this culvert, especially to the north, which causes the culvert to fill up with water during the wet season. This makes the culvert even smaller. The culvert does not drain well as there is standing water for extended periods of time. The primary challenge of this culvert is that the size limits or prevents access to medium and large sized mammals.

Recommendations: Nonnative plants need to be removed and replaced with native vegetation. Garbage needs to be removed. These steps would make the culvert more accessible. This area is one of the proposed locations for a land bridge or underpass.

Species observed: Bobcat, Coyote, Northern Raccoon, Brush Rabbit, Desert Cottontail, Western Fence Lizard, California Ground Squirrel, rodents.

Underpass 1

GPS coordinates: (not included)

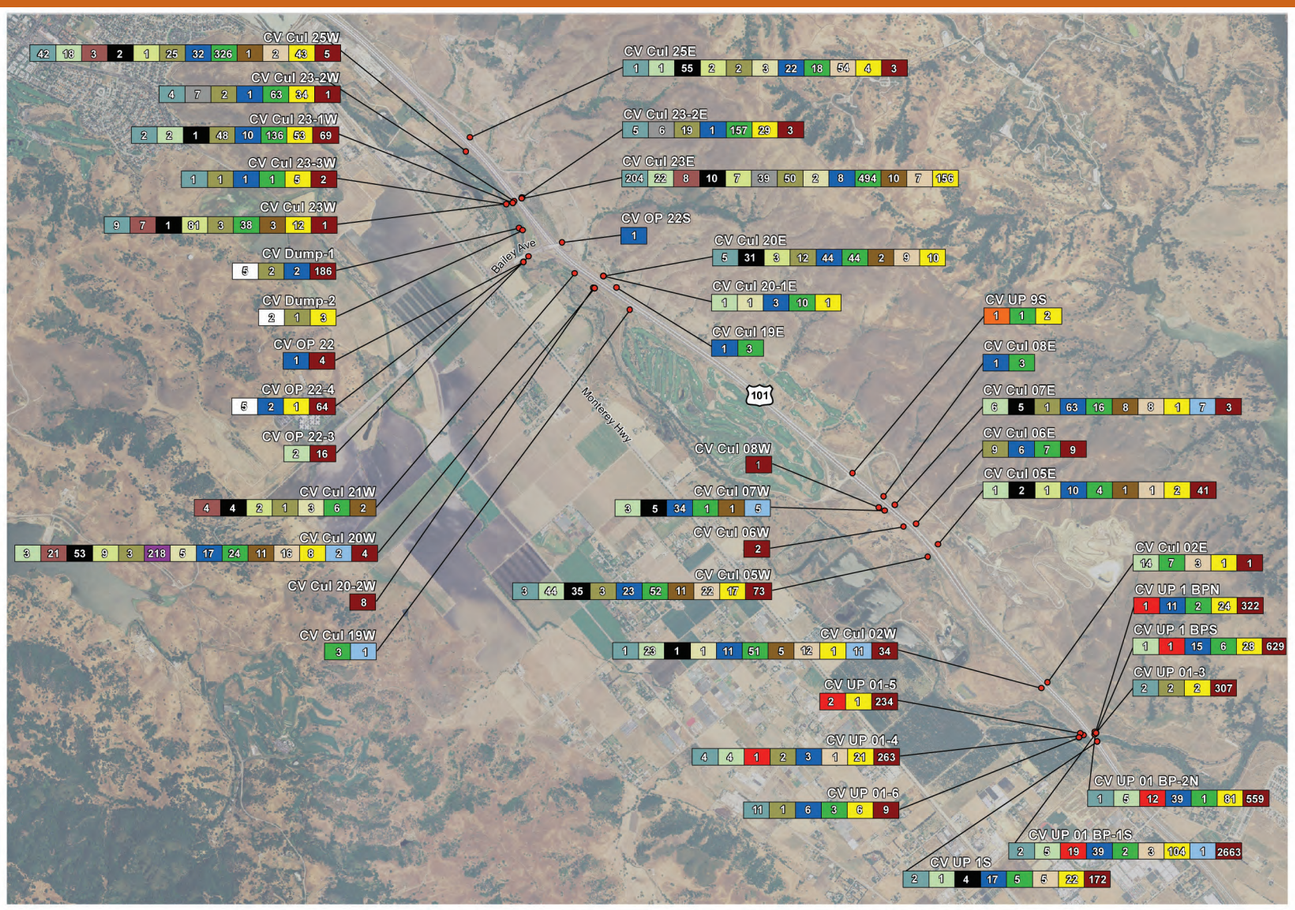
Description: The underpass is approximately 200 feet long and 345 feet wide with a height of 45 feet. The camera is installed south of the underpass along the bike path on a fence.

Challenges: This underpass is a choke point for wildlife. This is a high use area for pedestrians, bicyclists, dog walking, some vehicles and other human activities. Any increase in human activities could negatively impact usage by wildlife at this underpass.

Species observed: Mountain Lion, Mule Deer, Bobcat, Coyote, Striped Skunk, Northern Raccoon, Brush Rabbit, Desert Cottontail, Virginia Opossum, Wild Turkey

Secured Scrubjard camera trap

Camera Events: Highway 101 Crossing Structures



SPECIES	EVENTS
Black-tailed Deer	5,688
Black-tailed Jackrabbit	27
Bobcat	672
Brush Rabbit	143
California Ground Squirrel	53
Northern Raccoon	1,485
Coyote	402
Desert Cottontail	15
Dusky-footed Woodrat	218
Eastern Gray Squirrel	187
Wild Boar	12
Gray Fox	52
Mountain Lion	36
Mouse*	106
North American Badger	1
Rabbit*	210
Rat*	43
Striped Skunk	156
Virginia Opossum	299
Total	**9,806**

Cul = Culvert, UP = Underpass, OP = Overpass
*Particular species not yet identified.

N

500 250 0 500

Meters

Sources:
Data, Wildlife Corridor Technician Program at De Anza College, Nov. 2008 - Dec 2011.
Imagery, Bing, Accessed March 21, 2012.

Wildlife Corridor Technician Program at De Anza College
21250 Stevens Creek Boulevard
Cupertino, California 95014

Coyote making a safe passage through one of the many Highway 101 culverts

Bobcat creeping away from the camera

Mountain Lion captured on a camera-trap

Tule Elk bulls engaged in battle during the rut season in the Diablo Range

Mammal Species Observed on Camera Stations / # of Camera-trapping Events

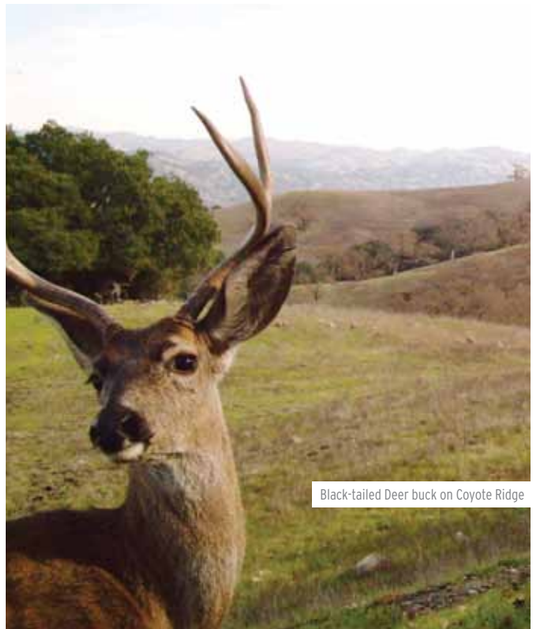
Black-tailed Deer *(Odocoileus hemionus)* / 4433
Northern Raccoon *(Procyon lotor)* / 894
Bobcat *(Lynx rufus)* / 489
California Ground Squirrel *(Spermophilus beecheyi)* / 292
Coyote *(Canis latrans)* / 215
Dusky-footed Woodrat *(Neotoma fuscipes)* / 215
Virginia Opossum *(Didelphis virginiana)* / 181
Eastern Gray Squirrel *(Sciurus carolinensis)* / 96
Striped Skunk *(Mephitis mephhitis)* / 83
Brush Rabbit *(Sylvilagus bachmnai)* / 65
Gray Fox *(Urocyon cinereoargenteus)* / 49
Mountain Lion *(Puma concolor)* / 34
Wild Boar *(Sus scrofa)* / 12
Black-tailed Jackrabbit *(Lepus californicus)* / 10
Desert Cottontail *(Sylvilagus audubonii)* / 6

Mammals of Coyote Valley

California Ground Squirrel closely investigating a camera-trap

Black-tailed Jackrabbit utilizing a culvert

Gray Fox captured on a camera-trap



Black-tailed Deer buck on Coyote Ridge

Northern Raccoon, the culvert bandit

Wild Boar moving through the landscape

Mammal Species Observed in the Coyote Valley Landscape

Virginia Opossum *(Didelphis virginiana)*
Common Muskrat *(Ondatra zibethicus)*
California Ground Squirrel *(Spermophilus beecheyi)*
Eastern Gray Squirrel *(Sciurus carolinensis)*
Eastern Fox Squirrel *(Sciurus niger)*
Botta's Pocket Gopher *(Thomomys bottae)*
Western Harvest Mouse *(Reithrodontomys megalotis)*
House Mouse *(Mus musculus)*
American Deer Mouse *(Peromyscus maniculatus)*
Dusky-footed Woodrat *(Neotoma fuscipes)*
Black Rat *(Rattus rattus)*
Norway Rat *(Rattus norvegicus)*
California Vole *(Microtus californicus)*
Brush Rabbit *(Sylvilagus bachmnai)*
Desert Cottontail *(Sylvilagus audubonii)*
Black-tailed Jackrabbit *(Lepus californicus)*
Black-tailed Deer *(Odocoileus hemionus)*
Tule Elk *(Cervus elephus)*
Wild Boar *(Sus scrofa)*
Bobcat *(Lynx rufus)*
Mountain Lion *(Puma concolor)*
Coyote *(Canis latrans)*
Gray Fox *(Urocyon cinereoargenteus)*
Northern Raccoon *(Procyon lotor)*
American Badger *(Taxidea taxus)*
Striped Skunk *(Mephitis mephhitis)*

The WCT engages in a mapping exercise with Wendy Lao leading

Culvert Charrettes

To make recommendations to improve the existing culverts, the WCT Program has developed a design process called "Culvert Charrettes." These charrettes are interactive workshops and are a design method informed by scientific data. The Culvert Charrettes produce specific, low cost design recommendations in a visual, clearly communicated way. Their most important aspect is that they are done right on the site — at the culvert in question — so that "ground truth" is an inherent part of the work.

Since the ultimate purpose of the charrettes is to communicate specifics to many different stakeholders, the process of including real data (real dimensions, specific species, specific materials) is invaluable. The discourse is certainly more interesting with specifics, and the recommendations will have a much better chance of being implemented accurately and quickly.

THE CULVERT CHARETTES INCLUDE 3 MAIN STEPS:

STEP 1: BACKGROUND WORK & BASE DRAWINGS

- Receive permits to access culvert from responsible jurisdiction
- Research data about wildlife presence
- Create reference large scale map of the area to study larger patterns
- Survey culvert site: compile photos, measurements, concept sketches.
- Draw large scale "base drawings" approximately to scale; document the culvert in plan view, section view, elevation view, etc.
- Use approximately 2 sq. ft. easel tablet sheets to engage large groups.

STEP 2: IN-FIELD BRAINSTORMING

- Take 30 minutes to have individual, quiet, focused observation. Consider patterns on the land, fences, vegetation and cover, substrate wild animals are walking on, specifics of the culvert's construction and layout, and recent animal signs and activity.
- Set up a portable field table, and place the Base Drawings of the different views of the culvert on it. Cover the Base Drawings with clear tracing paper overlays.
- Use markers to have all participants jot down observations, ideas, and designs.
- The facilitator must ensure that all ideas are welcome. At this stage, it is not recommended for anyone to critique and edit others' ideas.

STEP 3: EDITING, CONSENSUS & PRODUCT

- Evaluate the in-field generated materials with a small group of experts. Edit, judge, and prioritize the content of the recommendations.
- Visually organize the content to communicate to the audience. It should be partial text and partial graphics. The graphics should include the plan view, section view, elevation view drawings, and more.

Present this to implementers. This is now the chance to offer the wildlife-friendly specific improvements for specific culverts. It is the chance to learn more about the opportunities and constraints the implementers need to work with. Together we can craft a way forward that will make a difference.

The team engages in a discussion on culvert enhancement for wildlife

Project Leader, Julie Phillips, enlightens students with her vast knowledge of corridor ecology

Culvert 2 on the edge of Highway 101 in Coyote Valley

7.0

Our Recommendations

The WCT 5 Strategies

The purpose of the **WCT 5 strategies** for safe passage is to design effective wildlife crossings, protect wildlife habitat linkages and preserve land for the Coyote Valley Landscape.

The 5 strategies proposed by the WCT Program are:

1. Enhance existing culverts and crossing structures for wildlife safe passage.
2. Enhance Underpass 1 and Bailey Avenue underpass to facilitate safe passage – to convert them to wildlife overpasses and underpasses in coyote valley.
3. Add two land bridges at Culvert 20 and Culvert 2 to facilitate safe passage for wildlife.
4. Protect Mid-Coyote Valley as critical habitat for connectivity and safe passage.
5. Enhance Monterey Highway and Santa Teresa Boulevard to facilitate safe passage.

In addition, the WCT recommends the creation of the Coyote Valley Linkage Conservation Area by designating this region as a viable wildlife corridor in the State of California. This would commence the implementation phase of the vision of AB 2785.

The overall goal should be to acquire roughly 1,500 acres and designate it as the Coyote Valley Linkage Conservation Area. The heart of the Conservation Area with the highest abundance and productivity is along west Laguna Avenue in the mid and north Coyote Valley. If protected, there should be a combination of management techniques. A riparian restoration project along Fisher Creek to reestablish stands of sycamores, cottonwoods and willows and a reestablishment of Valley Oaks throughout the valley is recommended. Lastly, wildlife friendly fencing for free movement should be installed where necessary, to reduce injuries to animals and to funnel them through the linkage.

This Coyote Valley Linkage Conservation Area would protect the heart of the Coyote Valley linkage and the animals that use it, while functioning as an outdoor classroom for students throughout California where they can learn about wildlife, corridors, connectivity, ecosystems and connect with the outdoors. We envision student interns helping make management decisions, while teaching the general public about the value of Coyote Valley. The birding community, which frequent Coyote Valley will be able to observe this bird "hotspot" for many generations. Also, ecotourism can be a part of Santa Clara County, bringing people from all around the world, much like Florida, Banff National Park, and Arizona. This Conservation Area will benefit the general public, students of all ages, the wildlife that uses it and would also protect the last parts of the Santa Clara valley floor from development.

California is a leader in solar energy, and should be a leader in corridor ecology too. California is starting to take the right steps in **corridor ecology,** and San José and the region can be the leaders in this movement. This honors the work that has been done in key legislation AB 2785 California Essential Habitat Connectivity. California is taking a big step forward to produce this linkage map of California, and San José can lead this movement by being the first to implement a wildlife corridor.

This region could be among the first to build wildlife land bridges in California designed specifically for wildlife. Not a single land bridge has been designed and constructed specifically for wildlife in California; one underpass in Southern California has been altered for wildlife, specifically mountain lions. Land bridges do not have to meet the same engineering requirements as roads, so are more cost effective.

Public safety should be a key consideration in regards to construction and alteration of highways and roads, as wildlife-vehicle collisions occur frequently. This would help keep wildlife out of urban areas, specifically predators, which satisfies those concerned about predators such as Mountain Lions entering urban areas.

8.0

Wildlife Crossing Checklist

Selecting and Designing Effective Wildlife Crossings

Area: Coyote Valley Linkage Conservation Area, 15 mile segment of Highway corridor segment (Morgan Hill at County Park Headquarters, Anderson Reservoir — north to Metcalf Road)

Target species: Tule Elk, Bobcat, American Badger, Mountain Lion, Mule Deer, Dusky-footed Woodrat, Golden Eagle, Bald Eagle, Greater Roadrunner, Mount Hamilton Thistle, and California Red-Legged Frog

Signs: None used to date along this segment of the Highway 101 conservation corridor

Recommendations

Recommendations include the addition of directional fencing, the removal of already present fencing, restoration and enhancement of vegetation and riparian corridors, and additional crossing structures, which would result in increased permeability across the landscape. In addition, this would result in a reduction in the frequency of wildlife / human vehicle collisions.

Recommendations include culvert modifications such as removal of fencing where they are a barrier to wildlife movement; add more vegetation at culvert entrances and along underpasses to enhance habitat for species movement. This would include more vegetation along the culverts to enhance habitat for species movement.

Recommendations include multiple new crossing structures for wildlife over Highway 101, Monterey Highway, Bailey Avenue and Santa Teresa Boulevard. Additional crossing structures at Culvert 2 and Culvert 20 are recommended. These structures must be incorporated into any plans to route the California High Speed Rail through the Coyote Valley Landscape.

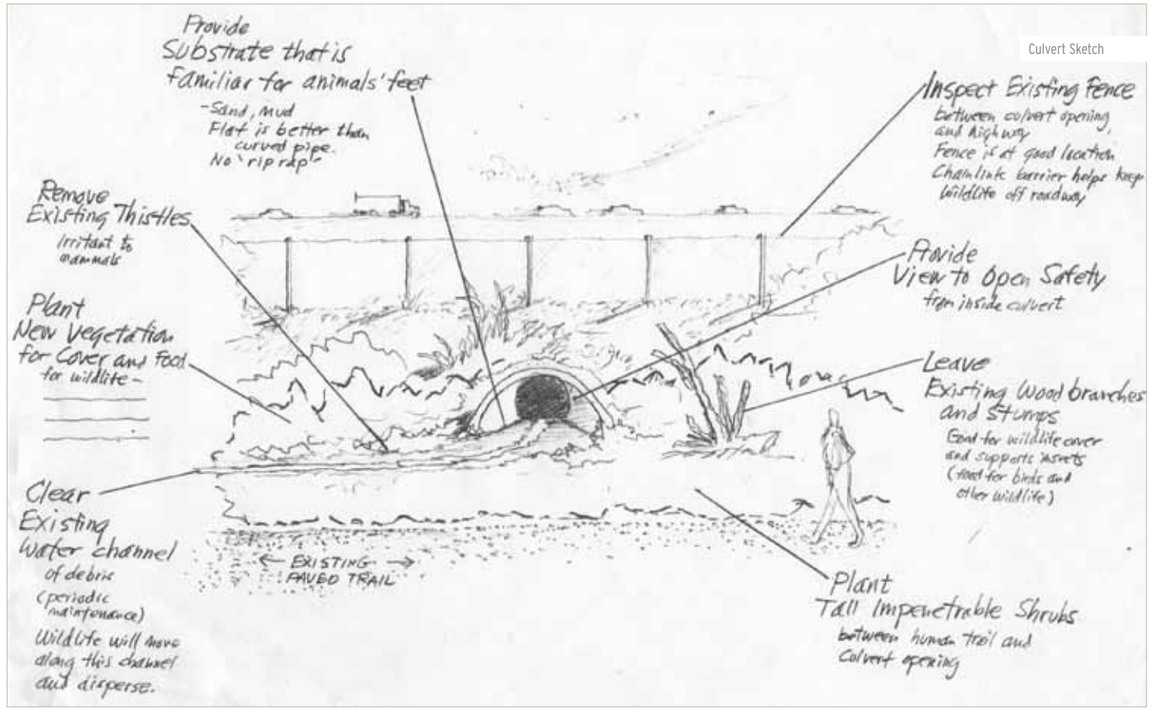
Recommendations include modifications to the center divider along Monterey Highway and Santa Teresa Blvd. to enhance wildlife movement and reduce wildlife/human vehicle collisions (pgs 56-57 Annual Report 2008).

Crossing Structure Type and Size - Alternatives By Species*

	Crossing Structure	Round Culvert	Concrete Box Culvert	Multi-plate Steel Arch	Open-Span Bridge, Bridge Extension	Overpass	Fencing
Large Carnivores	**Mountain Lion**	4m	20' wide+, 10' high+	4m x 7m+ (13 x 23feet)	13' x 50' span, 10' high+	52m width	8' page wire
Mid-Sized Carnivores	**Bobcat**	36" min, 3' high+, 6' better	36" min, 3' high+	4m x 7m+ (13 x 23feet)	13' x 50' span, 10' high+	52m width	4' wire mesh
	Coyote	7' x 4' elliptical best, 6'+ better	36"+, 3' high+	4m x 7m+ (13 x 23feet)	13' x 50' span, 10' high+	52m width	4' wire mesh
	American Badger (research needed)						
	Gray Fox (research needed)						
Small Carnivores	**Small Carnivores**	36"+ pipes with fencing	36" + pipes with fencing				4" x 2" page wire, small mesh
Ungulates	**Deer**	4m	20' wide+, 10' high+. **O**=2+	4m x 7m, 10' high +	20' wide+, 10' high+. **O**=2+	52m width	8' page wire
	Elk	4m+	32' wide+, 12' high+. **O**=2+	4m x 7m, 12' high +	32' wide+, 12' high+. **O**=2+	52m width	8' page wire

= Adequate = Best **O** = Openness Ratio

*Information in this table was established from current studies, including recommendations from biologist and engineers with extensive wildlife crossing experience. The table is a general guide to designing and choosing appropriate structures for many target species. Other factors, such as terrain, engineering feasibility, cost, and site-specific conditions are always a consideration. The table is meant only as a broad guideline to assist in the selection of wildlife crossings.



Ogier Ponds in Coyote Creek County Park, one of many critical bird sites in Coyote Valley

9.0 Bibliography

Journals

Apps, C. D., N. J. Newhouse, and T. A. Kinley. 2002. Habitat associations of American Badgers in Southeastern British Columbia. *Canadian Journal of Zoology* 80:1228-1239.

Beier, P. 1993. Determining minimum habitat areas and habitat corridors for cougars. *Conservation Biology* 7:94-108.

Beier, P.,and R.F. Noss. 1998. Do habitat corridors provide connectivity? *Conservation Biology* 12: 1241-1252.

Beier, P., D. R. Majka, and W.D. Spencer. 2008. Forks in the road: Choices in GIS procedures for designing wildland linkages. *Conservation Biology* 22:836-851.

Buza, L., A. Young, and P. Thrall. 2000. Genetic erosion, inbreeding and reduced fitness in fragmented populations of the endangered tetraploid pea Swainsona recta. *Biological Conservation* 93:177-186.

Clevenger, A.P., B. Chruszcz, and K. E. Gunson. 2001. Highway mitigation fencing reduces wildlife-vehicle collisions. *Wildlife Society Bulletin* 29: 646-653.

Clevenger, A.P., B. Chruszcz, and K. Gunson. 2001. Drainage culverts as habitat linkages and factors affecting passage by mammals. *Journal of Applied Ecology* 38: 1340–1349.

Clevenger, A.P. and N. Waltho. 2000. Factors influencing the effectiveness of wildlife underpasses in Banff National Park, Alberta, Canada. *Conservation Biology* 14: 47-56.

Crooks, K. R. 2002. Relative sensitivities of mammalian carnivores to habitat fragmentation. *Conservation Biology* 16: 488-502.

Dickson, B.G., J. S. Jenness, and P. Beier. 2005. Influence of vegetation, topography, and roads on Cougar Movement in Southern California. *Journal of Wildlife Management* 69: 264-276.

Dixon, J.D., M. K. Oli, M. C. Wooten, T. H. Eason J. W. McCown, and D. Paetkau. 2006. Effectiveness of a regional corridor in connecting two Florida black bear populations. *Conservation Biology* 20: 155-162.

Forman R.T.T. and L. E. Alexander. 1998. Roads and their major ecological effects. *Annual Review of Ecology and Systematics* 29: 207-231.

Foster M.L., and S. R. Humphrey. 1995. Use of highway underpasses by Florida panthers and other wildlife. *Wildlife Society Bulletin* 23: 95-100.

Goodrich, J.M. and S.W. Buskirk. 1998. Spacing and ecology of North American badgers (Taxidea taxus) in a prairie-dog (Cynomys leucurus) complex. *Journal of Mammalogy* 79: 171-179.

Lampe, R. P., and M. A. Sovada. 1981. Seasonal variation in home range of a female badger (Taxidea taxus). *Prairie Naturalist* 13:55-58.

Lampe, R.P.1982. Food habits of badgers in cast central Minnesota. *The Journal of Wildlife Management* 46: 790-795.

Lindzey, F.G. 1982. Movement patterns of badgers in northwestern Utah. *Journal of Mammalogy* 42:418-422.

Messick, J. P., and M. G. Hornocker. 1981. Ecology of the badger in southwestern Idaho. *Wildlife Monographs* 76:1-53.

Minta, S. 1993. Sexual differences in spatio-temporal interaction among badgers. *Oecologia* 96: 402-409.

Noss, R. F. 1987. Corridors in real landscapes: A reply to Simmberloff and Cox. *Conservation Biology* 1:159-164.

Noss, R.F., Quigley H.B., Hornocker M.G., Merril T.l, and P. C. Paquet. 1996. Conservation biology and carnivore conservation in the Rocky Mountains. *Conservation Biology* 10: 949-963.

Riley, S.P.D., J.P. Pollinger, R.M. Sauvajot, E.C. York, C. Bromley, T.K. Fuller, and R.K. Wayne. 2006. A southern California freeway is a physical and social barrier to gene flow in carnivores. *Molecular Ecology* 15: 1733-1741.

Rottenborn, S. 1999. Predicting the impacts of urbanization on riparian bird communities. *Biological Conservation* 88: 289-299.

Sargeant, A. B., and D. W. Warner. 1972. Movements and denning habits of a badger. *Journal of Mammalogy* 53:207-210.

Sekercioglu, C. H. 2002. Impacts of birdwatching on human and bird communities. *Environmental Conservation* 29: 282-289.

Thorne, J., D. Cameron., and J.F. Quinn. 2006. A conservation design for the central coast of California and the evaluation of Mountain Lion as an umbrella species. *Natural Areas Journal* 26(2):137-148.

Walker, R., and L. Craighead. Least-Cost Path Corridor Analysis: Analyzing wildlife movement corridors in Montana using GIS. 1997. *Proc. ESRI Users's Conference*.

Weiss, S. B. 1999. Cars, cows, and Checkerspot butterflies: Nitrogen deposition and management of nutrient-poor grasslands for a threatened species. *Conservation Biology* 13: 1476-1486.

Woodroffe, R., and J. R. Ginsberg 1998. Edge effects and the extinction of populations inside protected areas. *Science* 280:2126-2128.

Books

CDFG. 2003. *Atlas of the Biodiversity of California.* California Department of Fish and Game, Sacramento, CA.

Berry, Wendell. 1987. *Home Economics: Fourteen Essays.* North Point, San Francisco, CA.

Bousman, W. 2007. *Breeding Bird Atlas of Santa Clara County, California.* Santa Clara Valley Audubon Society, Cupertino, California.

Crooks, K.R. and M. A. Sanjayan. 2006. *Connectivity Conservation*. Cambridge University Press, Cambridge.

Elbroch, Mark. 2003. *Mammal Tracks & Sign: A Guide to North American Species*. Stackpole Books, Mechanicsburg, Pennsylvania.

Fascione, N., A. Delach and M. E. Smith. 2004. *People and Predators: From Conflict to Coexistence*. Island Press, Washington, DC.

Forman R.T.T., Sperling D., Bissonette, J.A., elvenger, A.P., Cutshall C.D., Dale V.H., Fahrig L., France R., Goldman C.R., Heanne K., Jones J.A., Swanson F.J., Turrentine T., and Winter T.C. 2003. *Road Ecology: Science and Solutions.* Island Press, Washington, D.C.

Hickman, J. C., ed. 1993. *The Jepson Manual of Higher Plants of California.* University of California Press, Berkeley, CA.

Hilty, J.A., W. Z., Lidicker Jr., and A.M. Merenlender. 2006. *Corridor Ecology.* Island Press, Washington, D.C.

Lidicker, W.Z. and W.D. Koenig. 1996. "Responses of Terrestrial Vertebrates to Habitat Edges and Corridors." Ed. D. R. McCullough. *Metapopulations and Wildlife Conservation*. Island Press, Washington, D.C.

Long, C.A., and C. A. Killingley. 1983. *The Badgers of the World*. Charles C Thomas Publisher, Springfield, Illinois.

Long, C.A., R.A., MacKay, P., Zielinskki, W.J., and J.C. Ray. 2008. *Noninvasive Survey Methods for Carnivores.* Island Press, Washington DC, USA.

Louv, R. 2005. *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder.* Algonquin Books of Chapel Hill, Chapel Hill, NC.

Maehr, D., R. Noss and J. Larkin. 2001. *Large Mammal Restoration: Ecological and Sociological Challenges in the 21st Century.* Island Press, Washington, DC.

McCullough, D. R., J. Ballou, B. Stith, and B. Pranty. 1996. *Metapopulations and Wildlife Conservation*. Island Press, Washington, D.C.

Neal, E. 1986. *The Natural History of Badgers*. 197-200. Facts On File. Inc., New York, NY.

Noss, R., and A. Y. Cooperrider. 1994. *Saving Nature's Legacy: Protecting and Restoring Biodiversity.* Island Press, Washington D.C.

Shuford, W. D., and T. Gardali, eds. 2008. *California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California.* Studies of Western Birds No.1. Western Field Ornithologists and California Department of Fish and Game.

Soule, M. E., and J. Terborgh. 1999. *Continental Conservation: Scientific Foundations of Regional Reserve Networks.* 1-16. Island Press, Washington, D.C.

Wilson, E. O. 1984. *Biophilia.* Harvard University Press, Cambridge, MA.

Wilson, E. O. 1992. *The Diversity of Life.* Belknap Press of Harvard University Press

Woodroffe, R. and J. R. Ginsberg. 2000. "Ranging behaviour and vulnerability in carnivores." L. M. Gosling and W. J. Sutherland (eds.). *Behaviour and Conservation.* University Press, Cambridge, U.K

Wright, R. T., and D. Boorse. 2010. *Environmental Science: Towards a Sustainable Future.* 11th ed. Pearson Education.

Meetings

Becker, H.G., and K. J. Canter. 1995. "The Continuing Story of Badgers and Their Tunnels." *Proc. of International Conference on Habitat Fragmentation, Infrastructure and the Role of Ecological Engineering*. Maastricht and The Hague, The Netherlands.

Craighead, A.C., E. A. Roberts, and L.F. Craighead. 2001. Bozeman Pass Wildlife Linkage and Highway Safety Study. *Proc. of International Conference on Ecology and Transportation.*

Reports

California Native Plant Society Vegetation Committee. 2004. Vegetation Rapid Assessment Protocol.

Conservation Biology Institute. 2003. Wildlife Corridor Monitoring Study. Conservation Biology institute, Encinitas, California.

Caltrans. 2010. California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California. Caltrans, Sacramento, CA.

County of Santa Clara. 2009. Santa Clara Valley Habitat Plan: 2nd Administrative Draft. 2009. County of Santa Clara, CA.

Federal Highway Administration. 2000. "Badger Tunnels." *Critter Crossings: Linking Habitats and Reducing Roadkill.* U.S. Dept. of Transportation, Federal Highway Administration, Washington D. C. http://www.fhwa.dot.gov/environment/wildlifecrossings/main.htm

San Francisco Estuary Institute. 2006. Coyote Creek Watershed Historical Ecology Study. Final Report prepared for Santa Clara Water District, CA.
.

Western Governors' Association. 2008. Wildlife Corridor Initiative. 2008 Annual Report.

Reports with author names

Bousman, W. 2005. Santa Clara County Bird Checklist. Santa Clara Valley Audubon Society, Cupertino, California.

Bousman, B. and K. Smith. 2009. Santa Clara County Bird list 2009. http://www.stanford.edu/~kendric/birds/SCLists/SCList09.html.

Evermann, B. W. 1916. The California valley elk. California Fish and Game II, No., 2., pp. 70-77.

Penrod, K., C. Cabañero, P. Beier, C. Luke, W. Spencer, and E. Rubin. 2006. South Coast Missing Linkages Project: A Linkage Design for the Sierra Madre-Castaic Connection. South Coast Wildlands, Idyllwild, CA.

Phillips, J. A. 1985. Acclimation of Reintroduced Tule Elk in the Diablo Range, California. Thesis, San José State University.

Phillips, J. A. 1988. Pozo Tule Elk Subherds: San Luis Obispo County, California. CDFG Final Report.

Phillips, R., T. Diamond, J. Phillips, P. Cornely, V. Jennings, and L. Morton. 2008. Coyote Valley Wildlife Corridor Monitoring Program 2008 Annual Report. De Anza College, Cupertino, California.

Spencer, W. D. 2003. Wildlife Corridor Monitoring Study, Multiple Species Conservation Program. Conservation Biology Institute, San Diego, California.

Spencer, W. D. 2005. Maintaining Ecological Connectivity Across the "Missing Middle" of the Puente-Chino Hills Wildlife Corridor. Conservation Biology Institute, San Diego, California.

Thorne, J., D. Cameron, and V. Jigour. 2002. A Guide to Wildlands Conservation in the Central Coast Region of California. *California Wilderness Coalition*, Davis, CA. http://cain.icc.ucdavis.edu/repository/CC.pdf

Williams, D.F. 1986. Mammalian Species of Special Concern in California, American Badger. Report 86-1. California Department of Fish and Game, Wildlife Management Division Administration, Sacramento, CA.

Web

Biodiversity Hotspots. Web. Dec. 2011. http://www.biodiversityhotspots.org

"Coyote Watershed." Santa Clara Valley Urban Runoff Pollution Prevention Program. Web. Dec. 2011. http://www.scvurppp-w2k.com/ws_coyote.shtml

RHJV (Riparian Habitat Joint Venture). 2004. Version 2.0. The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian Associated Birds in California. California Partners in Flight. http://www.prbo.org/calpif/pdfs/riparian_v-2.pdf

This document is based on the first full-scale study conducted in the Coyote Valley with an emphasis on connectivity and the effects of Highway 101 and other roads on wildlife movement. It is a guide for developing protected highway crossings for wildlife while connecting California's students with science and nature.

WILDLIFE • CORRIDOR • TECHNICIAN • PROGRAM

WCT

De Anza College

www.deanza.edu/es/wildlifecorrproj