From: Wing, Damon
To: Parks, Linda
Subject: FW: Mapping wildlife corridors
Date: Wednesday, August 9, 2017 3:43:50 PM

From: Wilkinson, Whitney
Sent: Wednesday, August 09, 2017 3:39 PM
To: Wing, Damon <Damon.Wing@ventura.org>; Sussman, Shelley <Shelley.Sussman@ventura.org>
Cc: Convery, Abigail <Abigail.Convery@ventura.org>
Subject: RE: Mapping wildlife corridors

Hi Damon,

The County's wildlife corridor layer is adapted from the South Coast Missing Linkages Study. We also use a vegetation layer developed by David Magney in 2008 for the County that incorporates various vegetation mapping efforts including those for the Santa Clara River and Santa Monica Mountains, here is a description:

"A vegetation cover GIS database was created using available existing datasets to provide complete coverage for all of Ventura County, California. Numerous vegetation/land cover maps have been created for parts of Ventura County, at different scales, using different classification schemes. This project sought to create one GIS vegetation/land cover database and map using the currently accepted vegetation classification system, the National Vegetation Classification (NVC), which is a subset and consistent with the International Vegetation Classification system. Available GIS vegetation databases were merged to create one database, and adding one attribute field for all polygons to create the consistent vegetation/land cover classification across the county. The most accurate or refined data were used to clip data from parts of or the entire county to provide the best available vegetation cover data where available."

We also use the California Natural Diversity Database Layer, maintained by CDFW, to determine which wildlife could be present. We can then look for potentially occurring wildlife habitat preferences within the 2008 vegetation layer to know if there is suitable habitat.

I'm not exactly sure what specific data goes into the National Geographic layer. I will say that the mapping that was done for the South Coast Missing Linkages Project and the 2008 vegetation layer we use appear to be mapped at a finer scale than the NG layer, but may take into account similar criteria e.g. topography, suitable species habitat, and rare plant communities as criteria used for the South Coast Missing Linkages map.

Please let me know if you would like additional info or would like me to clarify something.

Cheers,

Whitney

From: Wing, Damon
Sent: Wednesday, August 09, 2017 12:11 PM
To: Wilkinson, Whitney <Whitney.Wilkinson@ventura.org>; Sussman, Shelley <Shelley.Sussman@ventura.org>
Subject: Mapping wildlife corridors

Hi Shelley and Whitney,

We received an inquiry about habitat mapping and are wondering if you could describe the GIS mapping the County does or uses for wildlife corridors and/or vegetation and habitats. How would it compare to this ESRI mapping:
http://www.nationalgeographic.com/magazine/2016/12/green-spaces-supplement/

Thank you,
Damon

Damon Wing
Aide to Ventura County Supervisor Linda Parks
625 West Hillcrest Drive
Thousand Oaks, CA 91360
(805) 214-2510

From:	Carla Bollinger
To:	Parks, Linda; Bennett, Steve; Supervisor Foy, Supervisor Foy; Long, Kelly; Zaragoza, John
Cc:	jhcasitas@gmail.com; Dina Fisher (l@dinafisher.net)
Subject:	SAVING THE SIMI HILLS: A critical wildlife movement region - Historic Santa Susana site secured as open space habitat
Date:	Friday, April 28, 2017 2:50:26 PM
Attachments:	image001.png
Importance:	High

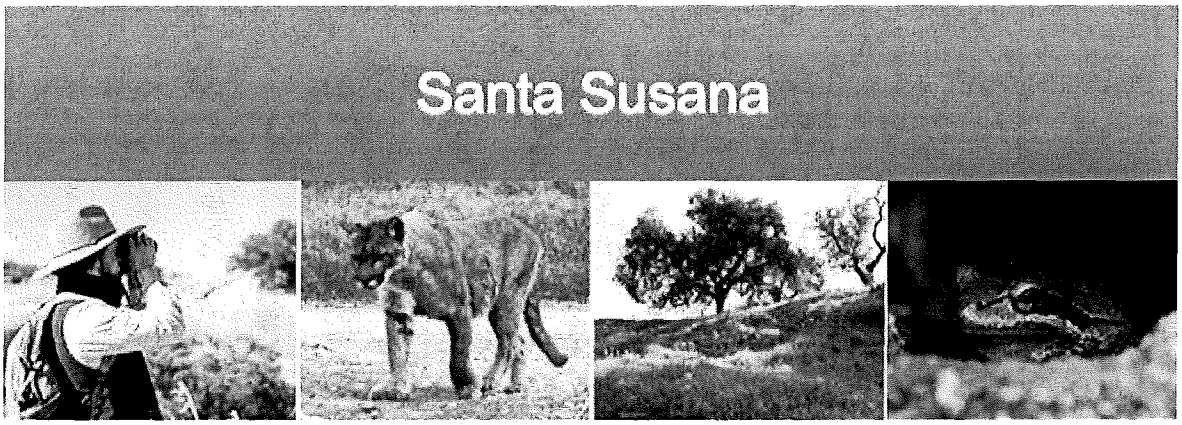
Hi Ventura County Board of Supervisors,

Recently Kamara Sams, Boeing Community Environmental Relations, shared a night video discovery of two mountain lion cubs and mom at their water guzzler. Boeing also reports important news ... their community commitment to saving nearly 2400 acres of land at Santa Susana as open space habitat is in writing! You can see in their announcement that follows.

The first attachment is a map of the Simi Hills land parcels created by Dina Fisher, Chatsworth Nature Preserve Coalition. You can see the importance of saving the 2400 acres as urban sprawl moves closer and closer to the Santa Susana site. The areas in Red are developments in process, 460 KB Homes, in Runkle Canyon-Simi Valley; Dayton Canyon homes at Roscoe and Valley View Circle, bordering Ventura County, and Andora Estates, in Los Angeles County, and being considered for over 30 large estate residential homes that will cut off the wildlife link between the Simi Hills and the Chatsworth Nature Preserve. The Pink area shows land currently for sale. Attachment 2 is a photo of the Simi Hills – east side, straddling Ventura and Los Angeles Counties. Large mansions not only threaten this strategic wildlife movement corridor, they are visually ugly in a historic-scenic corridor. A new wildlife passage threat (attachment 3) located in Ventura County is a residential development under the landmark rock formation "12 Apostles". In order to stop the extinction of our wildlife caused by habitat fragmentation, we need your efforts to not approve any further development, singles estates or residential communities, in the Simi Hills. I am grateful for your approval of the Habitat Connectivity and Wildlife Movement Corridors Study ... a beginning of a win for saving wildlife and lovely places for humans to view and visit!

Boeing is offering a community air-conditioned bus tour of the Santa Susana site, Saturday, May 20 with two tour times: 9 – 12 am and 1 – 4 pm. The site is especially beautiful during springtime. Reservations are required: E-mail communitytours@boeing.com

Carla Bollinger
Sierra Club and Audubon Society Member and PLAN
planopenspace@gmail.com



At the former Santa Susana Field Laboratory, mountain lions roam and cultural resources endure. Thanks to a new agreement, Boeing's land will stay that way forever.

Boeing yesterday recorded a conservation easement held by North American Land Trust (NALT) to secure the future of nearly 2,400 acres of land at Santa Susana as open space habitat.

The conservation easement is a legally enforceable document that forever prohibits residential or agricultural development. It permanently protects the property, regardless of who owns the land. NALT, an established land trust that holds more than 480 conservation easements in 18 states, will monitor and enforce the easement.

The easement is another sign of our ongoing commitment to completing a cleanup that fully protects everyone who will enjoy this vast open space as well as our neighbors in the community.

Boeing is proud to fulfill a commitment we made 10 years ago to preserve Santa Susana as open space to protect wildlife habitat and the site's rich cultural heritage. And we are thrilled that the experienced and enthusiastic NALT team will bring their passion to preserving the invaluable natural and cultural resources on Boeing's Santa Susana property.

Our focus remains on ensuring Santa Susana's unique natural beauty, wildlife habitat and cultural significance are protected with the right cleanup. Learn more about what this means and how you can get involved at www.protectsantasusana.com.

Kamara Noelle Sams
Environmental Community Relations
The Boeing Company
818.466.8793
kamara.sams@boeing.com

From: Wing, Damon
To: Wing, Damon
Subject: Planners needed to work on the wildlife corridor overlay zone!
Date: Wednesday, February 8, 2017 3:44:00 PM

Dear All,

There was great news last month when the Ventura County Board of Supervisors voted to establish a Wildlife Corridor Overlay Zone. The next step is to prepare goals and policies aimed at protection of habitat and corridor movement in these areas for the County's General Plan and zoning. Ventura County Planning Division is looking to hire an experienced planner with a background in biology who can work well with all stakeholders. If you know of anyone, please have them apply promptly.

If you know of any good candidates, please have them contact Planning Director Kim Prillhart at kim.prillhart@ventura.org or (805) 654-2481.

Best regards,
Damon Wing
Aide to Ventura County Supervisor Linda Parks
625 West Hillcrest Drive
Thousand Oaks, CA 91360
(805) 214-2510

From: Merrill Berge
To: Parks, Linda
Cc: Wing, Damon
Subject: Re: Wildlife corridor map of Cam Springs golf course?
Date: Friday, February 3, 2017 10:28:00 AM

Ooops...when I realized I could zoom in...it looks like it specifically has a perimeter line running around the golf course, though the corridor surrounds it.
M

On Fri, Feb 3, 2017 at 10:25 AM, Merrill Berge <camarillosustainablegrowth@gmail.com> wrote:

> Yes, on page 18 of the South Coast Missing Linkage report, the map of the Santa Monica/Sierra Madre connection shows the linkage area overlapping the Camarillo Springs Golf Course.
> http://www.scwildlands.org/reports/SCMLRegionalReport.pdf
>
> On Fri, Feb 3, 2017 at 9:05 AM, Parks, Linda <Linda.Parks@ventura.org> wrote:
>
> > Does South Coast missing linkage study show Golf course in Camarillo that is threatened?
> >
> > Linda Parks
> > Supervisor, District 2
> > 625 W. Hillcrest Drive
> > Thousand Oaks, CA. 91360-4235
> > (805) 214-2510 Linda.Parks@ventura.org

From: Parks, Linda
To: Mary Wiesbrock
Subject: Fw: Ventura Corridor efforts
Date: Tuesday, January 24, 2017 6:18:18 PM
Attachments: SCML_Ventura_BoardofSups.pdf

Hi Mary, Here's more info the the South Coast Missing Linkages Study

---

From: Wing, Damon
Sent: Tuesday, January 24, 2017 9:24 AM
To: Parks, Linda
Subject: FW: Ventura Corridor efforts

Here is another presentation that Kristeen Penrod gave to the BOS in 2009.

From:	Debra Tash
To:	Pettit, Mike
Subject:	RE: OPEN PLEASE Tash Biological Easement Inclusion of Easements in New OrVentura County - Habitat Connectivity and Wildlife Corridor Project Update
Date:	Thursday, October 11, 2018 6:12:36 PM

Dear Mike, If I May,

Thank you so much for time once again. Charmaine and yourself showed true concern and helped me address it. You are both a credit to the County of Ventura.

Warmest regards,
Debbie

From: Pettit, Mike [mailto:Mike.Pettit@ventura.org]
Sent: Wednesday, October 10, 2018 4:00 PM
To: Debra Tash
Subject: RE: OPEN PLEASE Tash Biological Easement Inclusion of Easements in New OrVentura County - Habitat Connectivity and Wildlife Corridor Project Update

Ms. Tash,

Thank you very much for sending this over. I think your input will be very important in helping to draft the ordinance. I appreciate your taking the time to provide this input as involved communities make for much better government, especially where regulations are being drafted.

With kind regards,

Mike Pettit

From: Debra Tash <debratash@gmail.com>
Sent: Wednesday, October 10, 2018 12:09 PM
To: Sussman, Shelley <Shelley.Sussman@ventura.org>
Cc: Prillhart, Kim <Kim.Prillhart@ventura.org>; Stephens, Chris <Chris.Stephens@ventura.org>; Uhlich, Kim <Kim.Uhlich@ventura.org>; 'Whitney Wilkinson' <wwilkinson@reconenvironmental.com>; Long, Kelly <kelly.long@ventura.org>; Miller, Brian <Brian.Miller@ventura.org>; Terry, Vanise <Vanise.Terry@ventura.org>; Parks, Linda <Linda.Parks@ventura.org>; Buehner, Charmaine <Charmaine.Buehner@ventura.org>; Pettit, Mike <Mike.Pettit@ventura.org>; Zaragoza, John <John.Zaragoza@ventura.org>; Solorzano, Lourdes <Lourdes.Solorzano@ventura.org>; Bennett, Steve <Steve.Bennett@ventura.org>; Cantle, Cindy <Cindy.Cantle@ventura.org>; Supervisor Foy <Supervisor.Foy@ventura.org>; 'Mayor Huber' <MHuber@simivalley.org>; 'George Tash' <george@gtwaterproducts.com>; Kate Neiswender <katelawventura@gmail.com>
Subject: OPEN PLEASE Tash Biological Easement Inclusion of Easements in New OrVentura County - Habitat Connectivity and Wildlife Corridor Project Update
Importance: High

Dear Ms. Sussman:

Please find my letter regarding existing restrictive biological easements and maps and example existing biological Tash property easement attached regarding the ordnance you are working on for Wildlife Connectivity. I am formally asking that existing biological easements be codified in the proposed wildlife ordinance now being drafted by your office. That properties already burdened by such easements should be exempt from further developmental restrictions within the new ordinance. That these easements are, in fact, the required biological mitigation.

I ask that my proposal be part of the record and that it be considered for inclusion in the proposed ordinance and that it be included in the Planning Commission packet.

If you have questions, please do contact me. I will be sending this out via email and snail mail to all parties CC'ed.

Thank you for time and consideration.

Best regards,
Debra Tash

From: Debra Tash
To: Pettit, Mike
Cc: "George Tash"
Subject: RE: Please Open - Question on our Biological Restrictive Covenant
Date: Tuesday, September 25, 2018 12:06:59 PM
Attachments: Tash.parcel.4.Wildlife.Retrictive.Covenant.pdf
Tash-BioConvenant-TRV.pdf
Importance: High

Dear Mr. Pettit,

Thank you for your prompt reply. I have attached a recorded covenant, all read pretty much the same on each parcel, for your review. Also is the County's response. Monday October 8th at 2PM would be perfect for us to come to your office. If memory serves it's in the government building on the 4th floor.

Thank you so much and look forward to meeting you face to face.

Warmest regards,
Debra Tash

From: Pettit, Mike [mailto:Mike.Pettit@ventura.org]
Sent: Tuesday, September 25, 2018 10:39 AM
To: Debra Tash
Cc: 'George Tash'
Subject: RE: Please Open - Question on our Biological Restrictive Covenant

Dear Ms. Tash,

I would be happy to meet with you in person or via phone to review the circumstances you have outlined. If you would like to send over the information ahead of time so I can review that would be very much appreciated. As possible dates/times for a discussion, I am available on Thursday, October 4th at 9AM and also on Monday, October 8th at 2PM if either of those openings work with your schedule.

Thank you very much for reaching out and I look forward to speaking with you.

With kind regards,

Mike

From: Debra Tash <debratash@gmail.com>
Sent: Tuesday, September 25, 2018 8:48 AM
To: Pettit, Mike <Mike.Pettit@ventura.org>
Cc: 'George Tash' <george@gtwaterproducts.com>
Subject: Please Open - Question on our Biological Restrictive Covenant
Importance: High

Dear Mr. Pettit:

I want to send this email to you as an initial contact to a very troubling situation regarding our property in the Tierra Rejada Valley. In 2012 we subdivided our 56 acre property into four lots and a remainder. At the time, and after long negotiations and great expense, we reached an acceptable comprise on a Biological Restrictive Covenant. Presently, with the impending wildlife ordinance now being cooked up in Planning, we are concerned that our property will be further burdened by development requirements. Having contacted Planning with our concerns they responded with an overreaching reply. In it they stated the current covenant on record only deals with the channel on the property and that they can further impose even more restrictions. It was the "having their cake and eating it, too, and we can come back for more cake," response.

Our contention is that the covenant relates to the whole of each parcel created when we did the subdivision, not just the channel. That on its face, and on its execution, protects wildlife sufficiently when the property is developed for what is allowable in the open space zone. That further burdening our property with even MORE unreasonable restrictions will, in effect, make them un-developable and therefore greatly decrease their value.

I would like to send you a recorded copy of one of the covenants on record, Planning's response, and then talk to you and/or Mr. Powers, whether by phone or in person regarding the situation, which understandably has alarmed us.

Please advise how I may proceed.

Your assistance would be greatly appreciated on this matter.

Best regards,
Debra Tash

From:	Zack Schuler
To:	Sussman, Shelley
Cc:	Prillhart, Kim; Pettit, Mike
Subject:	RE: Draft Wildlife Corridor Ordinance
Date:	Tuesday, September 18, 2018 3:42:40 PM
Attachments:	image002.png image003.png

Hi Shelley,

I understand your position, and I understand that it is still in draft phase.

For the record, I will summarize to the best of my memory, what we talked about.

Currently, there is a motocross track on the property. My worry was that I was going to have to knock it down, and let the area grow back to it's normal state. You indicated that I was completely wrong, that is not the case, and that there is nothing in the draft to that effect. Since the motocross track existed before the proposed ordinance, it can stay.

We have a cooperative agreement with the Library whereby we don't ride on days that the Library is having events. I've talked to the guy living at my place now, and showed him the website where he can see the events going on at the Library. He said "absolutely no problem" The Library has actually been a great neighbor to us.

During our discussion of the track, I used the word "grading" of the track when I really should have used "grooming" We have a small tractor that we use to maintain the track. The more the track is ridden, the more is gets "ruts". When we groom the track, we make it smooth, and take out the ruts. You seemed to be OK with that. Then the question that you asked was whether or not the track was within 200ft of a waterway. I told you that it was, but I don't recall you saying anything further, but you seemed to hint that the waterway could pose an issue. I now know that one section is very close to a waterway, probably within 25 ft. If there were a 100ft ordinance from the waterway, we can easily take out a couple of sections of the track, and have the waterway cleared by 130ft. I know the last draft had 200ft from the waterway.

I talked about how in the beginning of building the track, I got a notice from Jim O'Tousa of "Unauthorized Grading." He met me at my house, we went over the problem areas. I had them fixed shortly thereafter, he came by and did another inspection and signed off my file (File was UN-0901 I believe) and I paid roughly $388 to the County.

We talked about building a tennis court, and your comments were that there had to be "downlights" and that you can't have those lights on after 10PM. Other than that, there'd be no issue in building a tennis court.

You asked about the tractor and it's resting spot- I told you that it was next to the barn, and probably 100ft from the waterway, (it's actually 139ft) but that I could move it practically anywhere else and get it 200ft from the waterway. Having said that, it currently sits right next to my barn, which is about 150 feet from the waterway, and we are mandated by Ventura County Fire to keep brush

cleared 100ft from any structure, so that would leave 50ft from the waterway maintained, unless the fire department is going to change that rule.

We talked about fencing. Today I measured the perimeter of my property of which came out to 4,253 ft. I then measured my fencing, which only goes around the part of my home where the road is, and that is 540 ft. You asked what type of fence it was and I said that the base is stone and above the base is wrought iron. I didn't have any dimensions at that time, so I don't recall you talking about our fencing situation any further.

I have one completely enclosed fence surrounding our solar field, I didn't know the dimensions at the time. It is 200ft enclosed, with wrought iron.

You ended with the conversation saying "The people who are really going to be impacted by this the most are the 2 acre parcels of land whereby there has been no development."

You expressed to me that I didn't read or interpret things correctly, and that these restrictions, by and large, you stressed are going to be for NEW proposed uses of the property.

I asked you to summarize what we talked about, and you said you couldn't because it is still a draft. I then encouraged you that you could preface every sentence with "According to this Draft...." And that this draft is not and won't be the final draft. You then agreed to do so.

I understand that you can't, but as you know, my home is in a lease to buy with the purchase price set at 3.7M, and the guy buying it rides dirt bikes. He's older, and doesn't have kids who ride. If he were unable to maintain the track, he would back out of the deal. My realtor then said we should relist the house at 2.9M and be willing to take 2.5M, so this draft is a 1.2 million dollar issue for me.

At the end of the call, I felt a lot of relief, so thank you for having that call with me. If any of the above is inaccurate, if you can, you are free to make it accurate, based on the draft as it stands today. If you can't do that through email, then I'm happy to have a call.

Thanks Shelley-

Warm Regards,

Zack Schuler

Zack Schuler
Founder/CEO
NINJIO
zack@ninjio.com
O: (805) 864-1992
M: (805) 501-2505

From: Sussman, Shelley <Shelley.Sussman@ventura.org>
Sent: Tuesday, September 18, 2018 11:33 AM
To: Zack Schuler <zack@ninjio.com>
Cc: Prillhart, Kim <Kim.Prillhart@ventura.org>
Subject: Draft Wildlife Corridor Ordinance

Hello Mr. Schuler,

This email is a follow-up to our phone call on September 11, 2018 regarding the County of Ventura's draft ordinance related to habitat connectivity and wildlife movement. Following our conversation, I consulted with County management regarding your additional request for a written summary describing how the draft ordinance may relate to conditions on your property. Because the ordinance is still in draft form, it is subject to revision by County staff, the Ventura County Planning Commission and the County Board of Supervisors. This matter is tentatively scheduled for consideration by the Ventura County Planning Commission on October 25, 2018. In accordance with state law and Planning Division policies, the final draft of the ordinance will be released for public review and comment by 5:00 p.m. on October 18, 2018. Until that time, staff will continue to work to further revise and refine the draft ordinance. For this reason, it is not appropriate for staff to provide written information related to, nor for any interested party to rely upon, the draft ordinance, or the particulars of how any draft development standards contained therein may or may not apply to specific properties.

As a property owner within the habitat connectivity and wildlife movement corridors, you will receive a postcard notifying you of the hearing date and the website location for the staff report, which will include the draft ordinance. Given that you are no longer residing at this property, please provide me with your current mailing address so I can ensure that you receive notification.

You mentioned that you had reviewed the draft ordinance that was available on the project website. It has since been removed because it continues to be revised. However, the version that was previously published is attached for your convenience.

Shelley Sussman, I Senior Planner
shelley.sussman@ventura.org

Ventura County 2040 GENERAL PLAN

Ventura County Resource Management Agency | Planning Division
P. (805) 654 – 2493 | F. (805) 654-2509
800 S. Victoria Ave., L #1740 | Ventura, CA 93009-1740
Visit the Planning Division website at vcrma.org/planning
Ventura County General Plan Update. Join the conversation at VC2040.org

For online permits and property information, visit VC Citizen Access

Pursuant to the California Public Records Act, email messages retained by the County may constitute public records subject to disclosure.

From:	Sanchez, Monica
To:	Benitez, Cruz; Bennett, Steve; Carroll, Matt; Foy, Peter; Gonzalez, Veronica; Ho, Jennifer; Long, Kelly; Miller, Brian; Parks, Linda; Pettit, Mike; Phillips, Nancy; Powers, Michael; Solorzano, Lourdes; Zaragoza, John; Rafelson, Melody
Cc:	Sussman, Shelley; Gaines, Lori
Subject:	BOS Correspondence from Performance Nursery
Date:	Friday, September 7, 2018 4:46:53 PM
Attachments:	2018-09-07 Correspondence - Performance Nursery.pdf

Good afternoon,
Attached is correspondence from Performance Nursery regarding opposition to proposed Wildlife Corridor Ordinance.

Thank you,

Monica Sanchez
County Executive Office
Clerk of the Board of Supervisors
800 South Victoria Ave., L#1920
Ventura, CA 93009
(805) 654-2251

From: Zack Schuler
To: Pettit, Mike
Subject: Critical Wildlife Passage Area/Regional Wildlife Corridor
Date: Tuesday, September 4, 2018 7:56:10 PM
Attachments: image001.png

Mike,

Thank you so much to speaking with me tonight. I'm writing this to summarize what we talked about so that you can forward this to Mike Powers, and anyone else you feel can benefit from it.

As we discussed, my parcel borders the Reagan Library and I'm the last parcel to the east in the CWPA (Critical Wildlife Passage Area)

Here is a summary of my grievances:

1. I was never notified that such a drastic change was in the works, nor were any of my neighbors. We have about 8 neighbors up here, and none received any postal mail regarding what was going on. As I was telling Jacqui Irwin about this, she was floored. We (myself and the neighbors) found out about this through an opposition group that has formed.
2. Here's how this hurts me, very badly. I've got a motocross track on my property that the county actually signed off on in 2011. We moved out of the property in February and bought a new home with out first selling this one. We put this home on the market about a year ago, and after almost a year, we are actually in escrow! The buyer is giving us 200k more than we are asking, as he was a backup offer and wanted to make sure he got it. The primary driver behind him buying our home at 3.7M is the fact that he is a dirtbike rider, and wants a home with a track. Well, when he reads all of the disclosures we've sent him, including what we are about to send (the website address from the county talking about this), he is sure to back out, as the track will certainly run along the side of the property that we are not allowed to touch. My realtor says if that happens, I might as well list my house at 2.7M figuring I'd get 2.5M for it. That's a 1.2M loss in value.
3. They are asking for a 200 ft clearance from a water source of leaving vegetation in-tact. It's 10ft now. How do they get to 200ft? I only have water in that waterway when it rains. The next day it is completely gone- it is simply run off from the house and the hill above me.

In summary, #2 is obviously top-of-mind for me. If there were some way for the planning committee to exempt me from the CWPA that would be amazing. I'm the last house to the east, so they would just need to cut the line down my road, as I'm the only house to the east of Esperance Dr. If they used Esperance Dr., starting near the library as their east end point of the CWPA, I would be saved. I'm OK with the Regional stuff (lights, etc) although there are a ton of cattle places down there with big huge lights up, and they will be required to replace them in a year. Some of them certainly won't have the money to do so.

Last point (actually my first point, repeated)- how can they do this without a legit form of communication? I heard there were 30 people at the last meeting. That's because nobody knew about it, including myself. I've missed multiple meetings because I didn't receive a notification.

Thanks for listening and forwarding this on.

Also, thanks for taking my "cold call" and talking to me for so long. You were very generous with your time.

Regards,

Zack Schuler

P.S.- I just got a text from Jacqui- she forwarded my email I wrote to her to Mike Powers. This one is a bit more in depth, so feel free to send it along.

Zack Schuler
Founder/CEO
NINJIO
zack@ninjio.com
O: (805) 864-1992
M: (805) 501-2505

From:	Sanchez, Monica
To:	Benitez, Cruz; Bennett, Steve; Carroll, Matt; Foy, Peter; Gonzalez, Veronica; Ho, Jennifer; Long, Kelly; Miller, Brian; Parks, Linda; Pettit, Mike; Phillips, Nancy; Powers, Michael; Solorzano, Lourdes; Zaragoza, John; Rafelson, Melody
Subject:	BOS Correspondence from Victor Mellon
Date:	Tuesday, August 28, 2018 11:31:26 AM
Attachments:	Objection Ltr Snabe.pdf Objection Ltr Beans Ranch.pdf

Good morning,
Attached is correspondence from Victor Mellon regarding Opposition to Proposed Wildlife Corridor Ordinance.

Thank you,

Monica Sanchez
County Executive Office
Clerk of the Board of Supervisors
800 South Victoria Ave., L#1920
Ventura, CA 93009
(805) 654-2251

From:	Stephens, Chris
To:	Jensen, Lynn; jhecht@sespe.com; ASLOAN5119@gmail.com
Cc:	Powers, Michael; Pettit, Mike
Subject:	RE: More Meeting Follow-Up
Date:	Monday, August 20, 2018 8:19:50 AM
Attachments:	image001.png image002.png

Lynn, I can appreciate the challenge in figuring this issue out. I think the simple way to describe it is that there is no express appeal right or process outlined for the revisions to the list, therefore there is none. As you have no doubt read, there are express appeal processes for the CEQA Supplement and the ISAGs themselves, but the description of the process for updating the Locally Important Species list does not identify such an appeal process. Instead, it outlines a different process whereby the Planning Division confers with biologists prior to revisions.

Chris

Chris Stephens, Director
Resource Management Agency
County of Ventura

From: Lynn Gray Jensen <execdirector@colabvc.org>
Sent: Friday, August 17, 2018 1:53 PM
To: Stephens, Chris <Chris.Stephens@ventura.org>; jhecht@sespe.com; ASLOAN5119@gmail.com
Cc: Powers, Michael <Michael.Powers@ventura.org>; Pettit, Mike <Mike.Pettit@ventura.org>
Subject: RE: More Meeting Follow-Up

Chris,
Thank you for the response on the Event Ordinance – looking forward to reading the court cases... Not sure we fully understand the Locally Important Species process in terms of how these lists are managed, by what authority, and how a decision to place or remove a species from a list could not be appealed.
Thank you,
Lynn

"Collaboration for Sensible Regulatory Solutions"

Lynn Gray Jensen, P.G.
Executive Director
Ventura County Coalition of Labor Agriculture and Business
Phone (805) 633-2291
Email: execdirector@colabvc.org
Website: www.colabvc.org

From: Stephens, Chris <Chris.Stephens@ventura.org>
Sent: Friday, August 17, 2018 8:52 AM

To: jhecht@sespe.com; ASLOAN5119@gmail.com; Lynn Gray Jensen <execdirector@colabvc.org>
Cc: Powers, Michael <Michael.Powers@ventura.org>; Pettit, Mike <Mike.Pettit@ventura.org>
Subject: More Meeting Follow-Up

All,

I wanted to get back on the couple of the remaining items from our meeting that required discussion with County Counsel. First, revisions to the Locally Important Species list are not "appealable" in the sense that a formal appeal is heard by the Planning Commission and/or Board. However, I believe the ISAGs speak to the issue somewhat in that information at any time can be brought forward to support a change to the list. The second item was related to your request for court case citations regarding the Outdoor Events ordinance revisions. The following were provided by Counsel for your consideration:

Epona v. County of Ventura (2017) 876 F.3d 1214
Real v. City of Long Beach (2017) 852 F.3d 929
44 Liquormart, Inc. v. Rhode Island (1996) 517 U.S. 484
City of Cincinnati v. Discovery Network, Inc. (1993) 507 U.S. 410
Central Hudson Gas & Electronic v. Public Service Commission (1980) 447 U.S. 557

Hopefully these citations are helpful and informative. Take care and have a good weekend.

Chris

Chris Stephens, Director
Resource Management Agency
County of Ventura

From:	Pettit, Mike
To:	Welch, Jennifer
Subject:	RE: URGENT PLEASE OPEN Hearing on Wildlife Corridor today?
Date:	Tuesday, August 14, 2018 12:23:00 PM

Thank you Jennifer.

Mike

From: Welch, Jennifer
Sent: Tuesday, August 14, 2018 11:37 AM
To: Pettit, Mike <Mike.Pettit@ventura.org>
Cc: debratash@gmail.com; Prillhart, Kim <Kim.Prillhart@ventura.org>
Subject: RE: URGENT PLEASE OPEN Hearing on Wildlife Corridor today?

Good Morning Mr. Petit:

The Wildlife Corridor project is being managed by Shelly Sussman. Shelly can be reached at (805) 654-2493. I have also cc'd Shelly to this e-mail.

Jennifer

From: Pettit, Mike
Sent: Tuesday, August 14, 2018 11:19 AM
To: Welch, Jennifer <Jennifer.Welch@ventura.org>
Subject: Fwd: URGENT PLEASE OPEN Hearing on Wildlife Corridior today?

Hi Jennifer.

I would appreciate any background you might have regarding this inquiry.

Thank you,

Mike

Begin forwarded message:

> **From:** "Debra Tash" <
> **Date:** August 14, 2018 at 10:11:27 AM PDT
> **To:** "'Prillhart, Kim'" <Kim.Prillhart@ventura.org>, "'Pettit, Mike'" <Mike.Pettit@ventura.org>
> **Subject: URGENT PLEASE OPEN Hearing on Wildlife Corridior today?**
>
> Hello Kim,

I just got wind of a hearing of sorts at the government center of an overreaching "wildlife corridor" that will affect our property, and those of other property owners, in the Tierra Rejada Valley. Will there be a hearing/meeting on the proposal today at the government center's Pacific Conference Room? And if so, why weren't we properly noticed? If it is the case that there is a hearing planned for the proposal we ask that you postpone it to give us and our lawyers time to review it. If what I am hearing is true it is a taking, no doubt about it, of the use of our property.

Please advise and thank you in advance, and as always, for your time.

Best regards,
Debra Tash

From:	Debra Tash
To:	Sussman, Shelley
Cc:	Pettit, Mike; Prillhart, Kim; Kate Neiswender; "George Tash"
Subject:	RE: URGENT PLEASE OPEN Hearing on Wildlife Corridior today?
Date:	Tuesday, August 14, 2018 11:45:50 AM
Attachments:	image001.png

Hello Shelley,

May I ask how it is that I and some of the other property owners were not given proper notice of these meetings? Also I already have a recorded agreement with county on the wildlife corridor on my property? I am going to have our attorney make county counsel aware of this lack of notice and of our agreement which is recorded and signed off by the county.

I do appreciate your prompt response but we have not been allowed any input and we are prime stakeholders. You can cure this by postponement and rescheduling and by acknowledging that we already have an agreement with the county on such matters.

Thank you for your consideration.
Debra Tash

From: Sussman, Shelley [mailto:Shelley.Sussman@ventura.org]
Sent: Tuesday, August 14, 2018 11:19 AM
To: Debra Tash
Cc: Pettit, Mike; Prillhart, Kim
Subject: RE: URGENT PLEASE OPEN Hearing on Wildlife Corridior today?

Hello Ms. Tash,

I am following up on your phone message to me and your email to Kim Prillhart and Mike Pettit regarding the stakeholder meeting scheduled for this afternoon regarding the Habitat Connectivity and Wildlife Corridor Project. Today's meeting is not a hearing. The project team is holding a final meeting with a group of stakeholders that has been providing guidance on the project. The Planning Commission is tentatively scheduled to hold a hearing on this project on September 6 and the Board of Supervisors is tentatively scheduled to hold its hearing on October 30, 2018. Property owners within the Tierra Rejada Valley will receive notice of both hearings and project materials will be available for the public to review prior to the hearings.

There is a project website where you can access a draft of the Ordinance. However, please note that staff has recently made some clarifications and corrections to the Ordinance. A revised version will be posted to the website by the end of the week.

https://www.vcrma.org/habitat-connectivity-and-wildlife-movement-corridors

Thank you.

Shelley Sussman, I Senior Planner
General Plan Update Team
shelley.sussman@ventura.org

Ventura County Resource Management Agency | Planning Division
P. (805) 654 – 2493 | F. (805) 654-2509
800 S. Victoria Ave., L #1740 | Ventura, CA 93009-1740
Visit the Planning Division website at vcrma.org/planning
Ventura County General Plan Update. Join the conversation at VC2040.org
For online permits and property information,visit VC Citizen Access

From: Debra Tash <debratash@gmail.com>
Sent: Tuesday, August 14, 2018 10:25 AM
To: Sussman, Shelley <Shelley.Sussman@ventura.org>
Cc: Pettit, Mike <Mike.Pettit@ventura.org>
Subject: URGENT PLEASE OPEN Hearing on Wildlife Corridior today?
Importance: High

This meeting must be canceled and the property owners invited to ANY AND ALL STAKEHOLDERS MEETING – URGENT

Call me at 805-428-2939.

We have to have our lawyers review this and we must have INPUT AT EVERY STAGE.

From: Debra Tash [mailto:debratash@gmail.com]
Sent: Tuesday, August 14, 2018 10:11 AM
To: 'Prillhart, Kim'; 'Pettit, Mike'
Subject: URGENT PLEASE OPEN Hearing on Wildlife Corridior today?
Importance: High

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Debra Tash

From: Sussman, Shelley
To: Debra Tash
Cc: Pettit, Mike; Prillhart, Kim
Subject: RE: URGENT PLEASE OPEN Hearing on Wildlife Corridior today?
Date: Tuesday, August 14, 2018 11:18:40 AM
Attachments: image001.png

Hello Ms. Tash,

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https://www.vcrma.org/habitat-connectivity-and-wildlife-movement-corridors

Thank you.

Shelley Sussman, I Senior Planner
General Plan Update Team
shelley.sussman@ventura.org

Ventura County 2040 GENERAL PLAN

Ventura County Resource Management Agency | Planning Division
P. (805) 654 – 2493 | F. (805) 654-2509
800 S. Victoria Ave., L #1740 | Ventura, CA 93009-1740
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Ventura County General Plan Update. Join the conversation at VC2040.org
For online permits and property information,visit VC Citizen Access

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Please advise and thank you in advance, and as always, for your time.

Best regards,
Debra Tash

From:	Gonzalez, Veronica
To:	Powers, Michael; Pettit, Mike
Subject:	COLAB : Requested Discussion Topics for CoLAB / County Meeting today
Date:	Wednesday, August 1, 2018 9:41:38 AM
Attachments:	County - CoLAB Meeting Discussion Items 8-1-18.docx image001.png image002.png

From: Lynn Gray Jensen <execdirector@colabvc.org>
Sent: Wednesday, August 1, 2018 9:09 AM
To: Gonzalez, Veronica <Veronica.Gonzalez@ventura.org>
Subject: Requested Discussion Topics for CoLAB / County Meeting today

Veronica,
Attached is the Requested Discussion Topics Agenda for today's meeting for distribution to your group.
Thank you for setting this up.
Lynn

"Collaboration for Sensible Regulatory Solutions"

Lynn Gray Jensen, P.G.
Executive Director
Ventura County Coalition of Labor Agriculture and Business
Phone (805) 633-2291
Email: execdirector@colabvc.org
Website: www.colabvc.org

From:	Nash, Bill
Subject:	Executive News Summary for Thursday, February 2, 2017
Date:	Thursday, February 2, 2017 8:22:10 AM
Attachments:	2-2-17 County riders face overly long commutes, connection issues and hourly rate problems.pdf 2-2-17 Denser, taller developments key to easing housing shortage.pdf 2-2-17 Editorial - Save wildlife without over-regulating.pdf 2-2-17 Growth takes off at Camarillo Airport.pdf 2-2-17 Local farmworker sues over new pesticide rules.pdf 2-2-17 Supervisor Kelly Long seeking volunteers.pdf 2-2-17 Supervisors vote for animal protection with wildlife zone.pdf

Stories of interest for Thursday, February 2, 2017. Some stories are also attached as PDF files from sites that are password protected.

VC REPORTER:
County riders face overly long commutes, connection issues and hourly rate problems
https://www.vcreporter.com/2017/02/01/waiting-game-county-riders-face-overly-long-commutes-connection-issues-and-hourly-rate-problems/

Supervisors vote for animal protection with wildlife zone
https://www.vcreporter.com/2017/02/01/in-brief-23/

VIDA NEWSPAPER:
Supervisor Kelly Long seeking volunteers (PDF only)

PACIFIC COAST BUSINESS TIMES:
Denser, taller developments key to easing housing shortage (PDF only)

ACORN – THOUSAND OAKS:
Groups gather to discuss homelessness (link only)
http://www.toacorn.com/news/2017-02-02/Community/Groups_gather_to_discuss_homelessness.html

DAILY BULLETIN (SAN BERNARDINO):
San Bernardino County supervisors select interim CEO (link only)
http://www.dailybulletin.com/government-and-politics/20170131/san-bernardino-county-supervisors-select-interim-ceo

VENTURA COUNTY STAR:
Growth takes off at Camarillo Airport
http://www.vcstar.com/story/news/2017/02/01/growth-takes-off-camarillo-airport/97289204/

Local farmworker sues over new pesticide rules
http://www.vcstar.com/story/news/2017/02/01/local-farmworker-sues-over-new-pesticide-rules/97350556/

Editorial: Save wildlife without over-regulating
http://www.vcstar.com/story/opinion/editorials/2017/02/01/editorial-save-wildlife-without-over-

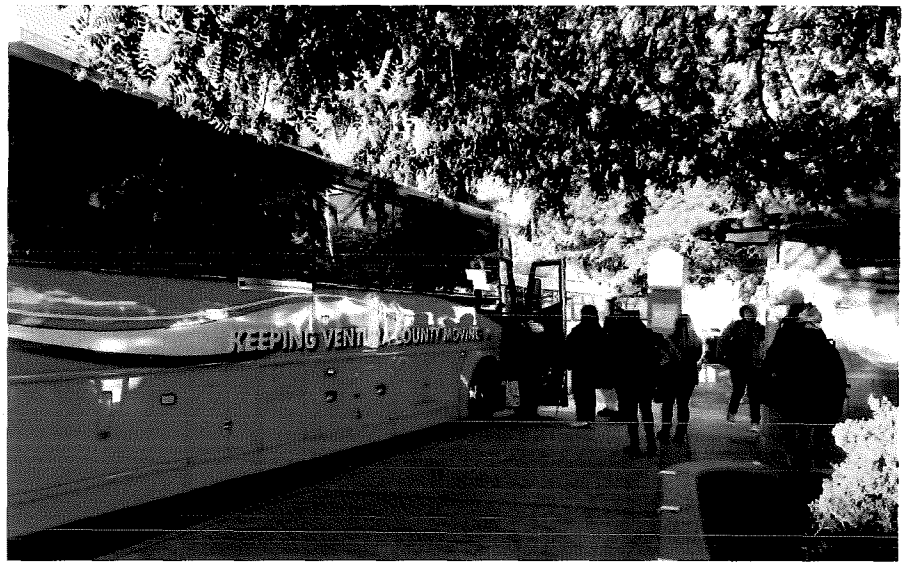
regulating/97370766/

VENTURA COUNTY NEWS CHANNEL:
Crisis Stabilization Unit opens- Board passes no-smoking ordinance – Watershed Protection Dist. receives grant for Matilija Dam removal – More ...
http://www.vcnewschannel.com/latest-news

Bill Nash
Public Information Officer
Ventura County Executive Office
Tel: (805) 654-2640 Cell: (805) 701-3168
Email: bill.nash@ventura.org
for Ventura County government news, go to:
www.vcnewschannel.com

WAITING GAME | County riders face overly long commutes, connection issues and hourly rate problems

Feb 1, 2017 | Cover Story, David Michael Courtland, Oxnard, Ventura, Ventura County | 0 |



Riders board a northbound VCTC Coastal Express bus at the Ventura Transit Center.

Getting to destinations in Oxnard and Ventura by bus is easier than going elsewhere in the county, just because those cities are where most of the public transportation is concentrated.

More problematic is going to or from more remote places like Ojai and Thousand Oaks. Bus riders may have long rides ahead of them, as much as 90 minutes, depending on traffic – and that's assuming the rider only needs to make one connection without transferring to still another bus.

"I live up in Santa Paula. Early in the morning I catch a VISTA at Santa Paula and Third streets by the police station," explains Oxnard College political science major Josue "Joshua" Ruiz.

The southbound Route 6 (traveling from Downtown Ventura to Oxnard) is packed on a Friday evening.

For Ruiz, who not only has classes to attend but meetings as the Ventura Community College

District's student trustee, that means catching a VISTA bus at 5 a.m. to make sure he's able to catch another at Ventura's Government Center at about 7 a.m.

"I only have about three minutes to cross Victoria Avenue" and make the next of two more transfers that finally get him to Oxnard College in South Oxnard on time for classes.

"It's a pretty tough journey," says Ruiz, who says he performs the routine about three times a week. "I used to do it daily."

Missing a bus or even just having a long wait between buses can throw off a whole day's carefully planned schedule.

"If your (two-hour) transfer has expired, or you don't have the right change, you're stuck," says Ruiz.

When a Board of Trustees meeting runs late and there are no buses available, that presents a whole different dilemma.

"Sometimes I'll wait at a Subway or Jack in the Box for somebody to pick me up," says Ruiz, and other times, "I'll start walking; sometimes somebody will recognize me and give me a ride."

Ruiz says he and other student leaders have talked to Gold Coast Transit about using student fees to add more routes and provide students free rides.

But for now, discussions are on hold while Gold Coast prepares to move its maintenance yard from Third and Garfield streets in Oxnard to East Ventura Boulevard.

Not every Oxnard College student has as wearying a bus riding experience as Ruiz. Sociology student Alec Hamrick says that for the past four years his bus-riding routine has been "pretty nice."

"I get on (the bus) about an hour before class. It takes about 40 minutes" to get to the campus, says Hamrick, who boards the bus at Victoria Avenue and Wooley Road.

Hamrick says he uses the time on the bus to send email or do homework, and has always felt safe riding the bus even though he rides "at all different times of the day."

"I have a lot of friends that take the bus as well," says Hamrick, "and I'm friends with a lot of the drivers; I don't have to worry about driving."

CSU, Channel Islands, student Angelek Abarca likewise uses the bus to save herself the hassle of finding a place to park her car on campus.

Instead she parks her car at the Metrolink station in Camarillo before getting on a VISTA for a 10- to 15-minute ride to the campus, generally catching a bus between 7:30 and 9 a.m., depending on when her first class of the day is.

"You get free parking at Metrolink, and it's easy to find a spot," as opposed to searching for one on campus, said Abarca. "If you miss the bus, trying to find a parking spot kind of sucks."

Just as much of bus ridership is made up of students who find that riding buses to and from classes saves time and parking fees, the disabled and homeless likewise find public transit a tremendous advantage.

Wheelchair-bound Bill Swearingen says he uses the buses, which are equipped with wheelchair access, to get to appointments "a lot, three or four times a day."

Besides doctors' appointments and shopping, Swearingen uses the buses to get to community meals provided for the homeless and senior citizens by Catholic Charities and other organizations in Ventura.

"Plus it's an outing," says Swearingen, adding that he appreciates being able to "get out and enjoy the fellowship."

Swearingen, who gets bus passes through the Ventura Area Agency on Aging, says the only downside of frequent bus riding is that if a bus transfer expires during a two-hour layover, "you're out of luck; you've got to pay fare again."

Being able to get a bus or have fare ready is also a concern for the homeless, who can sometimes get passes for a single ride from social workers but are often stuck panhandling for bus fare.

At the emergency weather shelter in Oxnard, a budget shortfall has forced managers to distribute only one bus pass to each person as they arrive at the shelter in the evening. Previously people received two passes for use after leaving the shelter in the morning.

"I usually have fare anyway," says Bill Eagle, who regularly uses Gold Coast Transit routes 6 and 4B to go to Pacific View Mall or Walmart, "but I'm saving my (bus passes) just in case."

But it's more of an issue for Larry Dennis, who has had strokes and uses a cane to walk from the shelter's

location at Second and K streets in Oxnard's National Guard armory to its downtown library.

Relatively long trips such as those for doctor appointments at the Magnolia Clinic on Gonzales Road are only practical if Dennis has a bus pass.

"It takes me a couple of hours just to walk to the library," says Dennis, who in recent months has lost one phone and had another stolen, leaving him out of touch with social workers who might be able to help.

Social workers Ken Porter and Ken Belden say Dennis' problem is a common one made even more difficult by the limited number of bus passes distributed to agencies that work with the homeless.

"The availability of case managers to clients is low because they lose their phones," says Porter, who is a homeless outreach worker for Ventura County's Behavioral Health Dept.

"We don't have (bus passes); we haven't had them since 2015," says Ken Belden, who works for Ventura County's Healthcare for the Homeless program. "I think they should be able to provide the funds."

Frank Kelm says it's doubly inconvenient that the only places someone can get monthly bus passes are at the Ventura County Transportation Commission offices in the Government Center and at the Oxnard Transportation Center.

Even so, Kelm has only one complaint about Ventura County's public transportation system.

"The restrooms at VTC haven't been fixed, there's only one available," Kelm says, referring to the transfer center at Pacific View Mall. "Nothing's been done about it for more than a month."

Brad Denemark is one of VISTA's regular passengers, taking the Hwy. 101 bus to and from the Thousand Oaks Transportation Center each workday for the last 14 years.

At the transportation center he transfers to the Thousand Oaks Transit No. 2 (Gold Route) bus that takes him to his job at Marty's Hobbies, where he is a salesman.

"I don't have a car and it's the only way I can get to work," Denemark explains. "I really like riding the buses; the drivers and passengers are super, they really are."

In fact, he knows exactly how many different VISTA buses he has ridden, having kept track of their assigned numbers: 65 different buses, mostly Van Hools and MCIs, during those 14 years.

Denemark has been such a fixture on VISTA's Hwy. 101 morning route, which stops at the Thousand Oaks Mall before going to the transportation center, that one driver let him keep track of how many people got on and off the bus, which at the time was part of a driver's job.

"The difference is, now they have these fare machines that do it automatically," says Denemark. "Everything has just continued to steadily improve; the on-time ratio is a lot better than it was — they're on time much more now than they were then."

Denemark says the Thousand Oaks Transit Gold Route driver that he rides with each morning is "the best one they have." The only thing he would change about the

Thousand Oaks bus service would be to add buses to the routes to shorten waiting time.

"They added one recently to Route 2; instead of waiting two hours, you wait one," said Denemark. "That really helps out."

VCTC WANTS YOUR INPUT

People with specific suggestions or complaints about the county's bus service (Ventura County Transportation Commission) can attend a public hearing at 9 a.m. on Feb. 3 in the Camarillo City Hall Council Chambers at 601 Carmen Drive, Camarillo.

Others can take the brief online survey at https://www.surveymonkey.com/r/Z6TFWTT or email comments to etalbo@goventura.org. The comment period will close on Feb. 13.

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DAILY BULLETIN

LOCAL NEWS

San Bernardino County supervisors select interim CEO

Dena Smith, San Bernardino County's chief operating officer, will serve as interim chief executive officer beginning April 1, according to the county Board of Supervisors.

By THE INLAND VALLEY DAILY BULLETIN | dailybulletin@dfmdev.com | January 31, 2017 at 5:35 pm

SAN BERNARDINO >> The county Board of Supervisors appointed Dena Smith, the county's current chief operating officer, to serve as the interim chief executive officer following Greg Devereaux's retirement at the end of June.

The decision was announced Tuesday after the board met in closed session to select an interim chief executive and determine that a nationwide recruitment will be conducted for a new CEO, according to a county news release.

Smith's appointment is effective April 1, the county said. She will be the first African-American and only the second woman to serve the county as its chief executive or chief administrator on an interim or permanent basis.

"The board has the utmost confidence in Dena's ability to carry out board policy and lead the county organization as we conduct our due diligence to ensure we make the best choice for our next CEO," said Board of Supervisors Chairman Robert Lovingood in the news release. "The board has directed county Human Resources to hire a recruitment firm and open the recruitment to internal and external candidates."

Devereaux, who has served as CEO for seven years, will continue to serve the county in an advisory role per the terms of his 10-year contract. On Jan. 19, Devereaux announced his decision to retire as CEO and step into the role of adviser.

Smith has worked for the county since 1999, serving first as chief learning officer and then as clerk of the board and director of Land Use Services, according to the news release. She was promoted to deputy executive officer in 2011 and to chief operating officer last year.

Smith, as COO, is principal assistant to the CEO for operational and administrative issues. She assists in the implementation of policies and directives from the Board of Supervisors and oversees the Government Relations, Legislative Affairs, Public Information and Special Projects Units of the County Administrative Office.

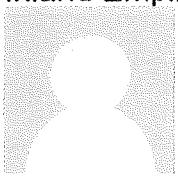
"The faith placed in me by the Board of Supervisors is truly humbling, and the opportunity to follow in the footsteps of someone as effective and as successful as Greg Devereaux is an honor," Smith said in the release. "It will be a pleasure to serve this board, and to work with and lead the talented, hardworking people that make our county a great organization."

Devereaux, 65, has been the county's top unelected official since February 2010. He

previously served as city manager for Ontario and Fontana. Devereaux earns a yearly salary of $318,909, county spokesman David Wert said.

Devereaux had previously said that after retirement he would advise the Board of Supervisors for about three years to complete the 10-year contract that called for him to be paid $91,000 for consulting work.

Tags:
Inland Empire



Polling shows Democrats, in particular, viewing the ideology championed by Bernie Sanders and Alexandria

For a growing number of Americans, socialism is OK

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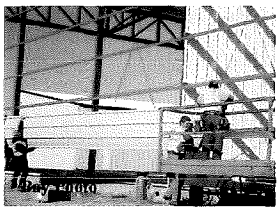
Growth takes off at Camarillo Airport

John Scheibe, john.scheibe@vcstar.com, 805-437-0270 Published 4:39 p.m. PT Feb. 1, 2017 | **Updated 7:05 p.m. PT Feb. 1, 2017**



(Photo: JUAN CARLO/THE STAR)

A construction crew is busy putting the final touches on a building that will soon house about a dozen much-needed hangars at the Camarillo Airport.

Construction of the building on the east side of the 650-acre airport is expected to be finished within weeks, Nicholas Martino, airport operations supervisor, said Wednesday morning as he toured the area.

For many pilots, the hangars can't come soon enough.

"There's about a five-year waiting list right now," Todd McNamee, Ventura County's director of airports, said this week, noting that there are more than 150 names on that list.

To help satisfy at least some pent-up demand, more hangars are in the works to be built along the airport's east end during the coming months, Martino said. Under the current plan, the construction eventually will bring the number of hangars to about 450.

The new hangars are coming online as more pilots, along with corporate executives and other well-heeled commuters, are choosing to land at the airport instead of other places, including the Van Nuys Airport, which ranks as one of the busiest general-aviation airports in the nation, according to officials there.

As many as 140 new hangars have either been built or are planned for construction at the Camarillo Airport, McNamee said.

The airport also is seeing increased interest from pilots looking for an alternative to the Santa Monica Airport. The growth in interest is being spurred in part by a recent announcement from the Federal Aviation Administration allowing the city of Santa Monica to shorten the runway there from about 5,000 to 3,500 feet within a year. The FAA also announced the airport's permanent closure at the end of 2028.

The Camarillo Airport now has about 300 hangars, McNamee said, with about 170 of them privately owned. The others are owned by the county, he said. Owners of private hangars pay 12½ cents a month per square foot to the county, since the land on which the hangar sits is publicly owned, McNamee said.

Those using county-owned hangars pay 33 cents per square foot per month, he said.

The Camarillo Airport will be closed for a time in 2021 as workers repave the runway. It's been about 25 years since the 6,000-foot-long runway was repaved, Martino said. The runway project is expected to cost about $14 million.

McNamee told the Camarillo City Council in 2016 that the airport will likely be closed for about three months as the runway undergoes reconstruction. The Oxnard Airport will be shut down for about the same duration in 2019, he said, as its runway undergoes reconstruction. Officials are staggering the projects in part to accommodate those who use the Camarillo or Oxnard airports, allowing them to use the other one while work is being done.

To make room for construction projects, Camarillo Airport officials have been steadily reducing the number of cars stored there. Hyundai and Kia had been using about 35 acres of land at the airport to store new vehicles, a measure taken after they ran out of space on land leased near the Port of Hueneme, where the cars are shipped from abroad.

area economy, he said, noting a 2008 study that found it contributed $165 million a year.

"That amount is substantially more now," he said. Included in this amount, are the 2,500 or so jobs generated by the Camarillo and Oxnard airports, he said.

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Lawsuit targets new pesticide rules

Kathleen Wilson, kathleen.wilson@vcstar.com Published 6:15 p.m. PT Feb. 1, 2017 | **Updated 2:23 p.m. PT Feb. 2, 2017**

(Photo: ANTHONY PLASCENCIA/THE STAR)

A Ventura County farmworker has sued a state agency over new rules for a pesticide heavily used in the strawberry industry.

In the lawsuit filed Tuesday, strawberry harvester Juana Vasquez and two advocacy organizations claimed that the process followed by the Department of Pesticide Regulation violated state law. Pesticide regulators failed to allow for public scrutiny or heed the advice of scientists in another state agency before adopting rules for the pesticide 1,3-Dichloropropene, the suit alleges.

The agency "abused its discretion, acted in excess of its statutory power and authority, and failed to proceed in the manner required by law," the 12-page complaint states.

Federal authorities have classified the pesticide a likely carcinogen, although regulators say it can be safely applied with proper precautions.

The department announced the new rules in October after concluding that the target for air concentration could be raised from 0.14 parts per billion to 0.56 parts and still protect human health. The rules set a fixed limit of 136,000 pounds for the annual amount that can be applied in each 36-square-mile township area instead of the flexible cap of 90,250 pounds that had been regularly exceeded.

In a related move, the department suspended a system that had allowed farmers to use allotments saved from previous years. The agency also prohibited applications in December, when weather conditions can elevate the concentrations of the pesticide in the air.

The rules took effect in January.

Citing the pending litigation, a spokeswoman for the Department of Pesticide Regulation said the agency would have little to say on the issues raised in the lawsuit.

"The department believes this lawsuit is without merit and that DPR will prevail in court," spokeswoman Charlotte Fadipe said in an email. "The way this pesticide is used in California allows growers to tackle agricultural pests while remaining protective of public health."

The plaintiffs are seeking a court order requiring the agency to develop regulations based upon the more conservative conclusions of the Office of Environmental Health Hazard Assessment. In a memorandum filed last year, the environmental agency expressed reservations with the new limit.

Chief Deputy Director Allan Hirsch said the agency did not believe the 136,000-pound cap could assure adequate health protection of all residents living in a township. Measurements taken at one spot in the township may not apply to the entire area, he said.

Hirsch said additional consideration should be given to the potential for the increased sensitivity of children to carcinogenic effects and the likelihood that many bystanders exposed to 1,3-D will also be exposed to chloropicrin. Many formulations for 1,3-D contain chloropicrin, which has been shown to cause lung cancer in test animals at a much higher potency than 1,3-D does, he said in the memo.

The 1,3-D pesticide, commonly known by the brand name Telone, is a fumigant that is injected into the soil to sterilize it before a crop is planted. In 2007, the U.S. Environmental Protection Agency classified it as a likely carcinogen, and it is included on California's Proposition 65 list of chemicals "known to the state to cause cancer."

Besides Vasquez, other plaintiffs are Californians for Pesticide Reform and Pesticide Action Network North America.

The suit was filed in Alameda County Superior Court because one of the attorneys is based in Berkeley. The plaintiffs can file in a variety of jurisdictions because the lawsuit is against a state agency, Ospina said.

Read or Share this story: https://www.vcstar.com/story/news/2017/02/01/local-farmworker-sues-over-new-pesticide-rules/97350556/

Parks - PRA

Parks Tash Biological Easement Inclusion ...

From:	Debra Tash
To:	Sussman, Shelley
Cc:	Prillhart, Kim; Stephens, Chris; Uhlich, Kim; "Whitney Wilkinson"; Long, Kelly; Miller, Brian; Terry, Vanise; Parks, Linda; Buehner, Charmaine; Pettit, Mike; Zaragoza, John; Solorzano, Lourdes; Bennett, Steve; Cantle, Cindy; Supervisor Foy; "Mayor Huber"; "George Tash"; Kate Neiswender
Subject:	OPEN PLEASE Tash Biological Easement Inclusion of Easements in New OrVentura County - Habitat Connectivity and Wildlife Corridor Project Update
Date:	Wednesday, October 10, 2018 12:11:18 PM
Attachments:	Tash.Bio.Easement.Maps.Parcel.3.pdf Tash.Letter Ventura County Habitat Connectivity and Wildlife Corridor Project and Existing Restrictive Biological Easements.pdf
Importance:	High

Dear Ms. Sussman:

Please find my letter regarding existing restrictive biological easements and maps and example existing biological Tash property easement attached regarding the ordnance you are working on for Wildlife Connectivity. I am formally asking that existing biological easements be codified in the proposed wildlife ordinance now being drafted by your office. That properties already burdened by such easements should be exempt from further developmental restrictions within the new ordinance. That these easements are, in fact, the required biological mitigation.

I ask that my proposal be part of the record and that it be considered for inclusion in the proposed ordinance and that it be included in the Planning Commission packet.

If you have questions, please do contact me. I will be sending this out via email and snail mail to all parties CC'ed.

Thank you for time and consideration.

Best regards,
Debra Tash

Question 1-2

HCOZ 8-8-17 County Planning Powerpoint

HCOZ_080817 FINAL
for web.pdf

Sonoma Land Trust

Sonoma land trust
Wildlife-Strategy.pdf

Habitat Connectivity and Wildlife Corridor Stakeholder Meeting

VENTURA COUNTY PLANNING DIVISION

AUGUST 8, 2017

Agenda

- Introductions, Meeting Goal, and Format
- Review of Project Objectives
- Topic Discussions
  - Direct Barriers - Fencing
  - Indirect Barriers - Lighting
  - Habitat Fragmentation/Vegetation Removal
  - Chokepoints
- Wrap-up and Next Steps

Meeting Goal

- **Primary goal is to get feedback from all parties**
  - Property owners (including growers and ranchers), environmental advocates, cities, regulators, oil/gas operators, and other interested stakeholders
- What ideas sound feasible or infeasible?
- What do we need to know and understand about your operation?
- What ideas do you have that can help meet project objectives?

Meeting Format and Logistics

- Staff will provide summary of each topic area, followed by discussion
  - To assist notetaker, please state your name and organization before you share your comment

- A time-keeper will notify the group when 5 minutes remain for each topic discussion

Project Purpose and Intent

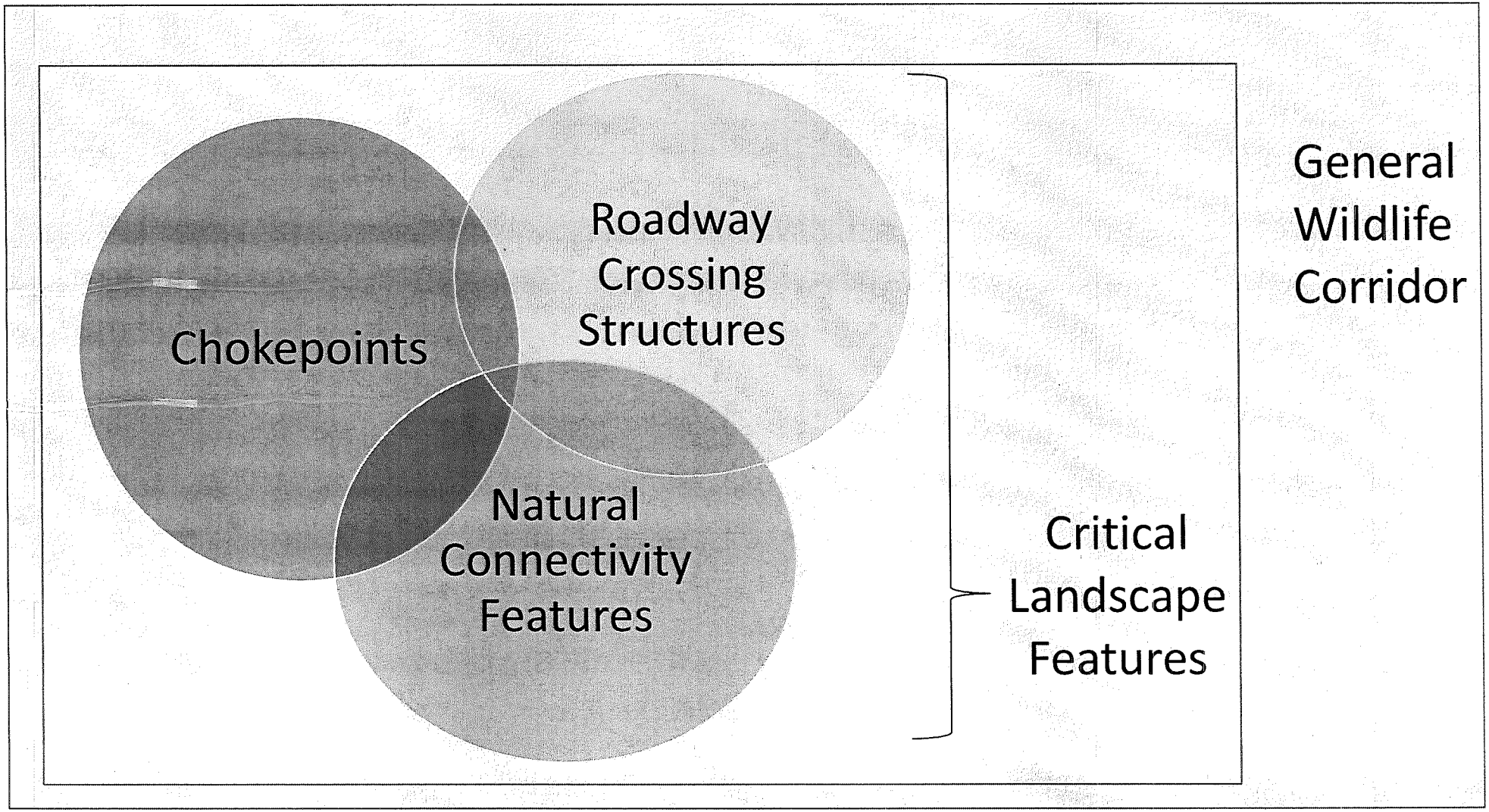
The purpose of the project is to preserve and enhance habitat connectivity.

The intent of the project is to ensure that development is designed and constructed to allow native wildlife and plant species to move or migrate between natural lands, while protecting individual property rights.

Project Objectives

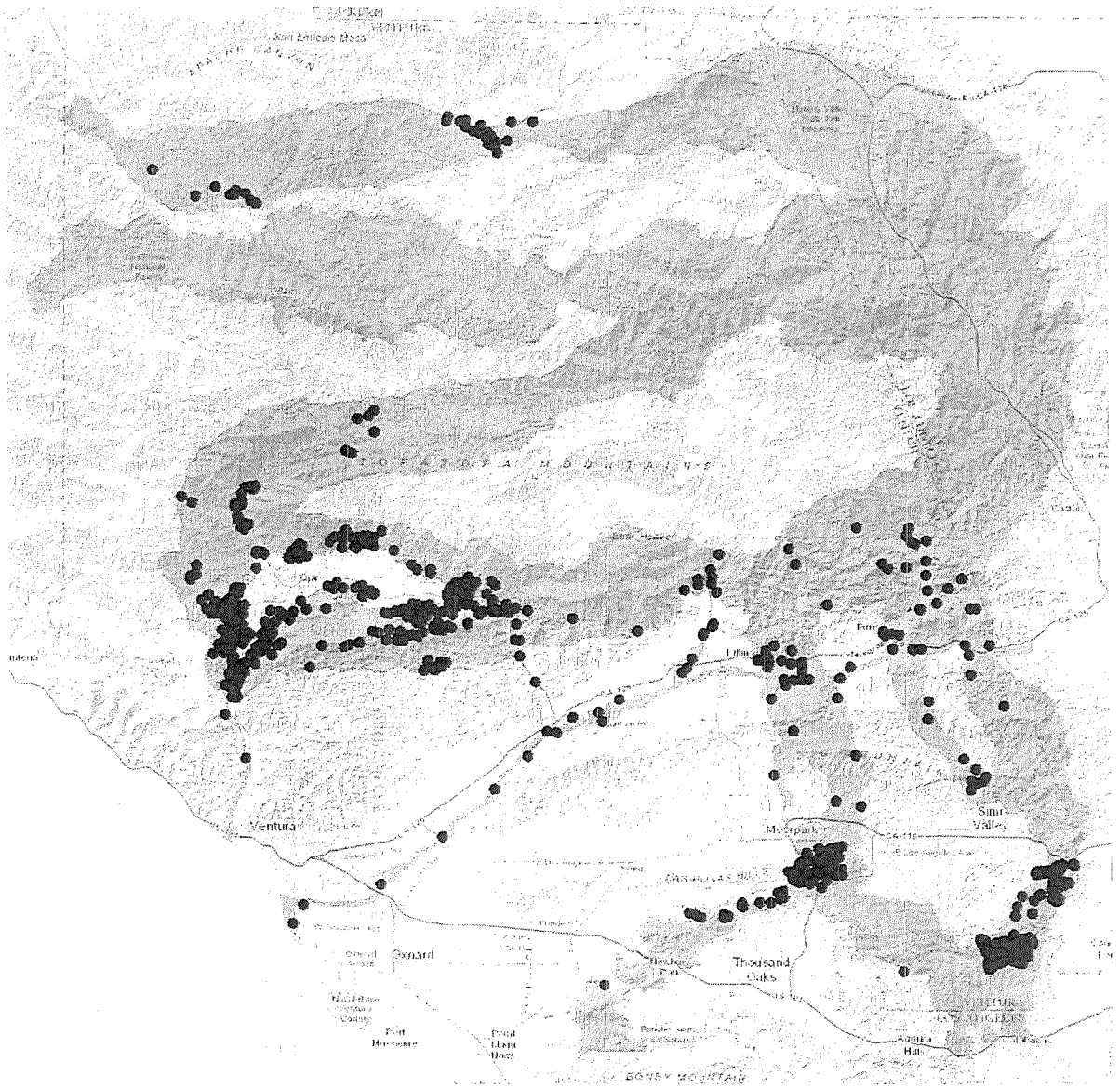
Based on January 2017 Board action, General Plan policies and zoning standards will be developed to address four project objectives:

- Minimize Indirect Barriers
- Minimize Direct Barriers
- Minimize Vegetation Loss and Habitat Fragmentation
- Protect/Enhance Chokepoints


Chokepoints
Roadway Crossing Structures
Natural Connectivity Features
Critical Landscape Features
General Wildlife Corridor

Ministerial Permits

- Over 1,000 approved zoning clearances 2005 – 2016
- Examples of common ZCs:
  - Fences/Walls over 6 ft.
  - Greenhouses (up to 20,000 sq. ft.)
  - Accessory Structures (up to 2,000 sq. ft.)

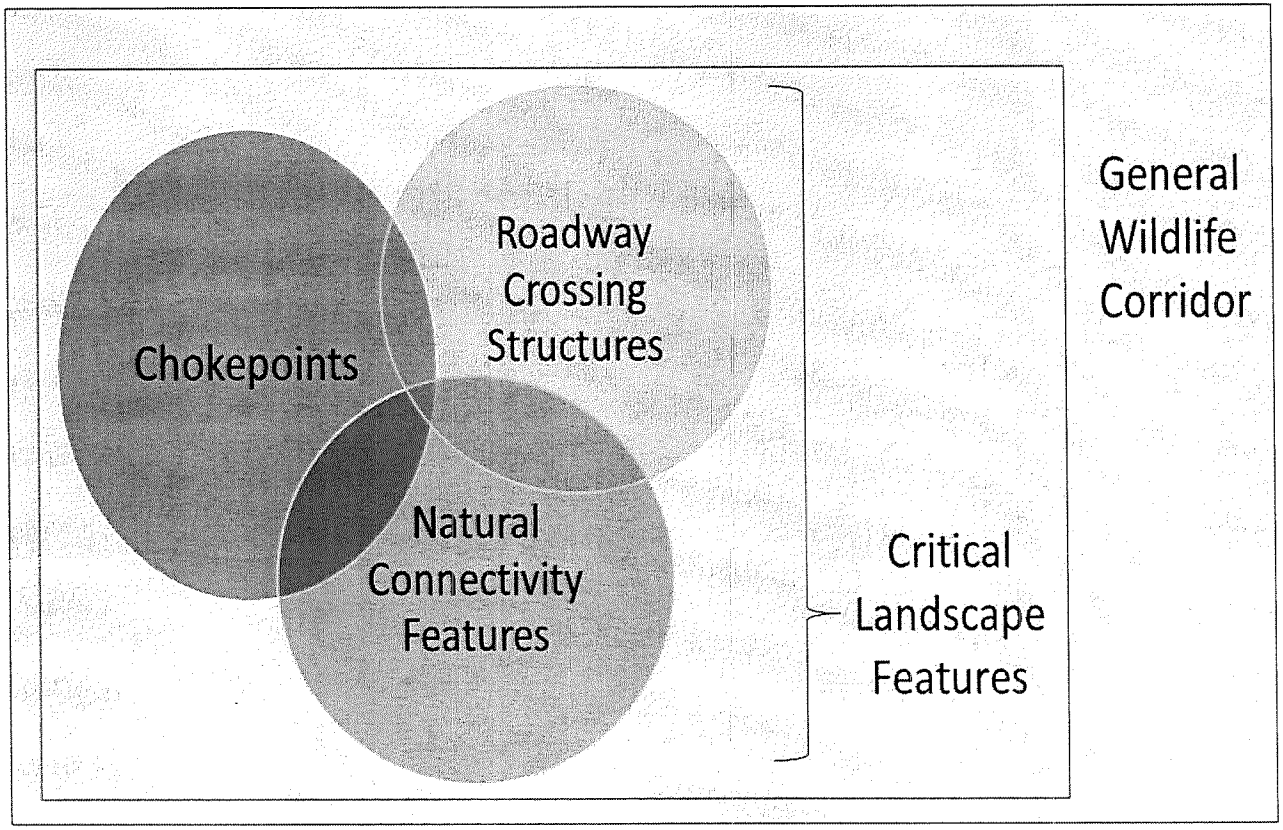


Ministerial Standards for Entire Corridor

- Fencing
- Lighting

Would apply in all locations within mapped wildlife corridor.

If a project occurs within a critical corridor feature, more stringent regulations may apply.



Fencing

PROPOSED APPROACH

Fencing challenges for wildlife

- Too high to jump over
- Too low to crawl under
- Have loose wires
- Have wires spaced too close together
- Are difficult for fleeing animals or birds to see
- Create a complete barrier

Fencing – Basic Provisions

- All new fences, walls, and hedges within the mapped corridors will be required to be "wildlife permeable" and will require a ministerial zoning clearance.

- If at least 50 percent of the fence, wall or hedge is being replaced, the entire fence, wall, or hedge would need to be wildlife permeable.
  - **We recognize that some fences can be very long, so we're exploring threshold for when replacement rule would apply.**

Fencing – Proposed Exemptions

Wildlife Permeable Fences would not be required for any of the following uses:

- Located within 100 feet from structures;
- Protection of row crops and orchards;
- Located adjacent to major roadways for the purposes of funneling wildlife to roadway crossing structures;
- Retaining walls; and
- In cases where fencing standards are regulated by state or federal government.

Fencing – Proposed Design Standards

A "Wildlife Permeable Fence" would include all the following design features:

- The top rail or wire is no more than 42 inches above the ground;
- The top 2 rails or wires are at least 12 inches apart;
- The bottom wire or rail is at least 16 inches above the ground;
- Both the top and bottom wires or rails are smooth (no barbed wire on the top or bottom wires);
- No vertical stays are used; and
- Posts are no more frequent than 10-foot intervals.

Fencing – Design Standards for Livestock

Wildlife Permeable Fences used for livestock/ranching/grazing only:

- May be up to 60 inches above the ground
- May use barbed wire on the top
- Distance between top two wires may be 10 inches
- May be electric Portable? Stationary?

Fencing – Open Discussion

- Length of fence that would trigger 50 percent replacement threshold.
- Fence standards for non-farm uses adjacent to highways that are intended to move wildlife toward crossing structures (e.g., heights, underground anchoring).
- Electric Fences (How common? Temporary? Portable?)
- Other Issues?

Exterior Lighting

PROPOSED APPROACH

Exterior Lighting – Definitions

- **Color Temperature:** A measure of a light's warmness or coolness. (Blue-white = cool; pink-yellow = warm)
- **Foot candle**: A way of measuring the amount of light that reaches from a light source to a point beyond the light source.
- **Fully Shielded fixture:** A fixture that allows no emission above a horizontal plane through the fixture.
- **Light Trespass**: Light falling where it is not wanted or needed. (Also called spill light.)
- **Lumen**: A way to measure how bright a light source is. (Watts measure energy use, not light output.)
- **Sky Glow:** Brightness of the night sky from artificial light sources.

Exterior Lighting – Basic Approach

- Intent is to avoid lighting of habitat areas outside of development envelope and minimize sky glow.
- Ministerial standards would apply to new development, redevelopment of at least 50 percent of existing footprint, and as replacement lights are installed.
- Exemptions:
  - Temporary agricultural activities requiring night lighting
  - Where lighting is regulated by state or federal government
  - Seasonal/Holiday lights
  - Lights for signs as currently regulated by NCZO (Sec. 8110-5.1)

Exterior Lighting – Basic Approach

- **Considerations for Lighting Fixtures**:
  - Brightness (using lumens)
  - Allowable light (*light trespass)* at the property line (in foot candles)
  - Color temperature (blue/white = cool; yellow/pink = warm)
  - 2016 Energy Code compliance requiring programmable and motion sensor features
  - Shielding and direction of light
  - Height and placement considerations

Exterior Lighting – Basic Approach

- Standards will address uses such as exterior lights used for walking paths, parking areas, service areas, buildings and structures, security, gates, driveways, landscaping, residential entrances and porches.

- Lighting used for outdoor recreation (e.g., pools, BBQ areas, tennis courts, arenas) will require shielding and be directed downward, except when it would make it impossible to conduct the recreational activity.

- Perimeter lighting at lot boundaries would be prohibited (entrance gates exempted).

Exterior Lighting – Open Discussion

- What uses may require special lighting considerations?
  - Enclosures used for animal keeping
  - Arenas
  - Outdoor areas used for livestock/horse breeding
  - Agricultural activities (nurseries)
  - Oil and gas facilities
  - Development within chokepoints

- Others?

Proposed Approach for Invasive Plants and Noise

- Invasive Plants

If development requires compliance with the State's Water Efficient Landscape Ordinance, then installation of invasive plants will be prohibited.

- Noise

Intend to rely on existing noise thresholds and regulations unless additional information determines alternative standards are required.

Will be consistent with state and federal regulations.

Invasive Plants and Noise Open Discussion

Any issues or questions?

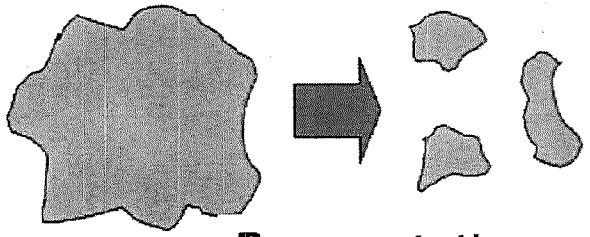
Project Objective

Minimize Vegetation Loss and Habitat Fragmentation

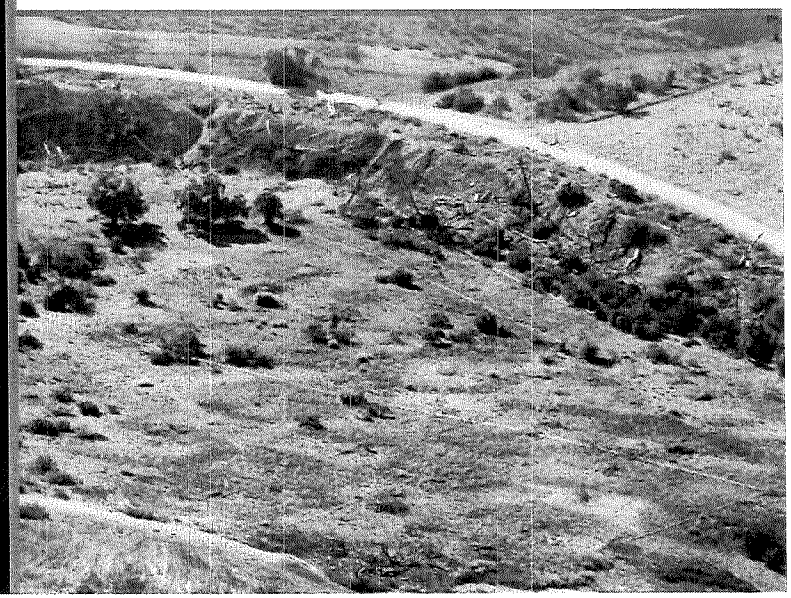
Why Does It Matter?

Result of Vegetation Loss and Habitat Fragmentation on Species Movement

- Species movements are constrained because of inhospitable gaps in habitat
  - Increase risk of predation and mortality
  - Lack of resources to survive while moving through corridor to core areas
  - Directly affects the quality of the remaining habitat areas



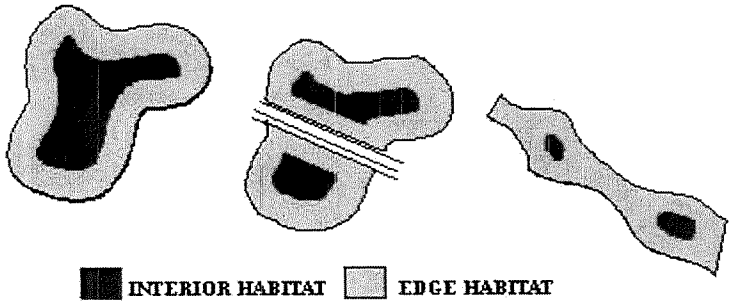
Fragmentation

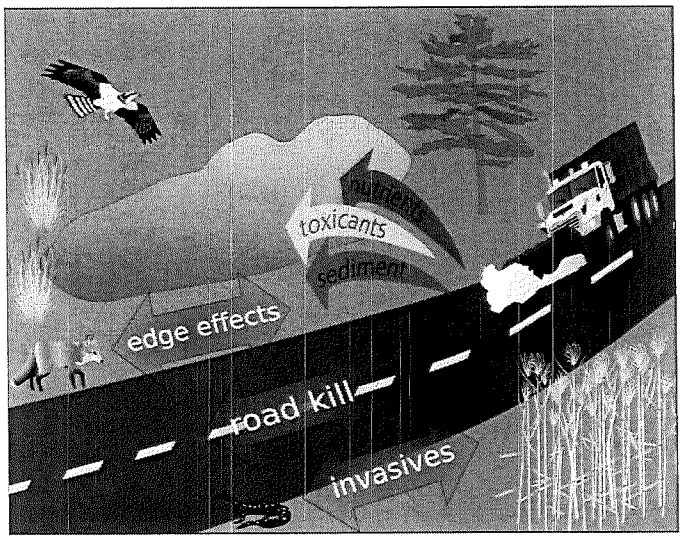


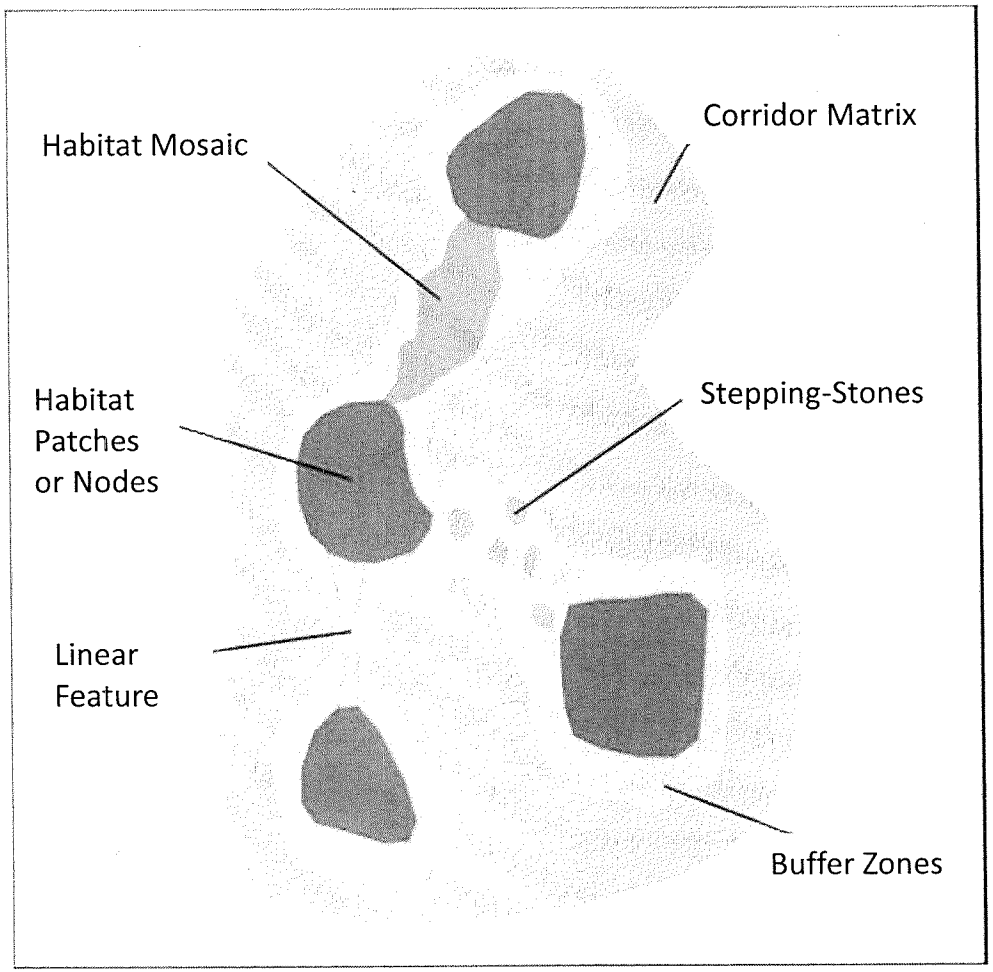
Edge Effects

Adverse changes to species abundance, presence, and behavior occurs when adjacent to development areas. They can be caused by:

- Irrigation
- Artificial night lighting
- Predation/competition from pets
- Habitat degradation and removal
- Introduction of invasive species
- Other



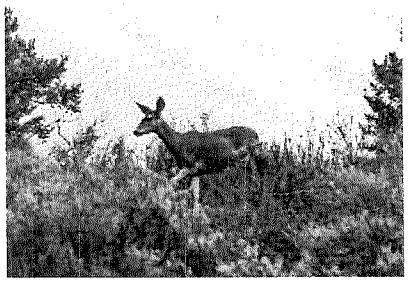


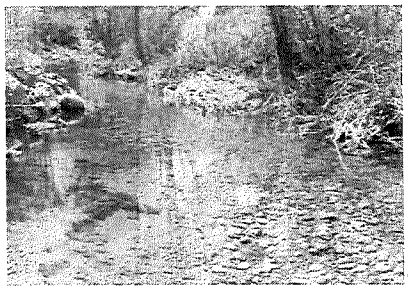


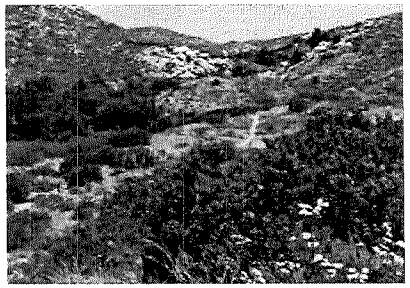
Maintaining Connectivity in Landscape Matrix

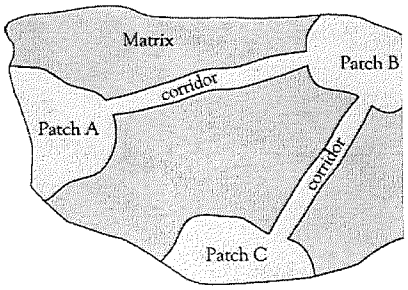
- Natural habitat patches with more compact shapes minimize *edge effects*.
- *Buffer zones* between habitat patches and development protect habitat quality of patches.
- Ensure existing natural habitat patches are close to surrounding patch areas (creation of habitat *stepping-stones*).

Natural Habitat Connectivity Features









- Wetlands, water features and their associated vegetation communities
- Ridgelines
- Habitats that maintain continuity of vegetation between natural features

Scientific Research

- Larger habitat patches host more species than smaller ones.
- Small habitat patches adjacent to large patches host more species due to proximity than those habitat patches with larger distances between them.
- Non-native species decrease in larger habitat patches.
- Minimum width of a natural corridor feature can range from 33 - 5,000 feet, dependent on adjacent land uses, vegetation, slope, and target species.
- Average recommended buffer for wildlife movement associated with ridgelines and watercourses is approximately 100m (330 feet).
- Distances needed to maintain connectivity between habitat patches are species dependent (lizard, bird, bat, etc.).

Water Resource Protections in Ventura County

- Within the Planning Division, **only discretionary uses** are evaluated for adverse impacts on any watercourse in the County and subject to CEQA requirements.
- Within Watershed and Public Works Departments, **any project** requires **water quality control measures** that fall within 200 feet of an *environmentally sensitive area (ESHA);* or where development will discharge stormwater runoff that is likely to impact *a sensitive biological species or habitat* **AND** create 2,500 sq. ft. of impervious surface.
- Within the Environmental Health Department, advance treatment is required for On-Site Wastewater Treatment Systems (OWTS) within 600 feet of an impaired waterbody (Clean Water Act). Setbacks for OWTS range from 50-150 feet from waterbody (depending on type of OWTS).
- CDFW requires notification of clearing in and adjacent to streams to determine whether a streambed alteration agreement is needed

Summary of Water Resource Protections

- Initial analysis shows significant development occurring adjacent to water features, ~ 600 ministerial permits within 200 ft. of a watercourse (2006-2017)
- The County only has setbacks for discretionary development. Ministerial development can occur immediately adjacent to river or streams if they meet stormwater and floodplain standards (banks and riparian areas).
- Clearing vegetation adjacent to waterways is allowed without a planning permit.
- Tree protections do not protect all common trees within watercourses (Oak, Sycamore, Heritage, and Historic Trees Only). Vegetation communities associated with ephemeral watercourses (most of the county) are not evaluated for ministerial permits.

Ridgeline Development Standards

There are no ridgeline protections for plant migration or wildlife movement within the corridor.

What's Missing for Corridor Protection?

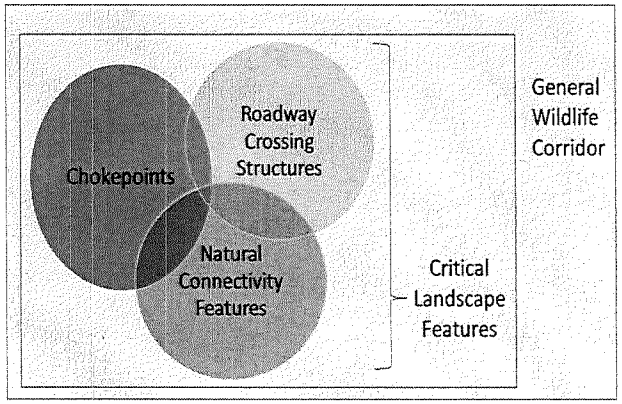
- Many exempted and ministerial land uses can impact wildlife movement features
- Most ridgelines in the corridor do not fall within the scenic protection overlay zone
- No development setbacks associated with vegetation adjacent to watercourses or ridgelines for ministerial development
- No regulatory mechanism to address vegetation loss or habitat fragmentation for natural connectivity features

Potential Approaches to Maintain Natural Connectivity Features

- Development Setbacks

  Water Features and Ridgelines Only

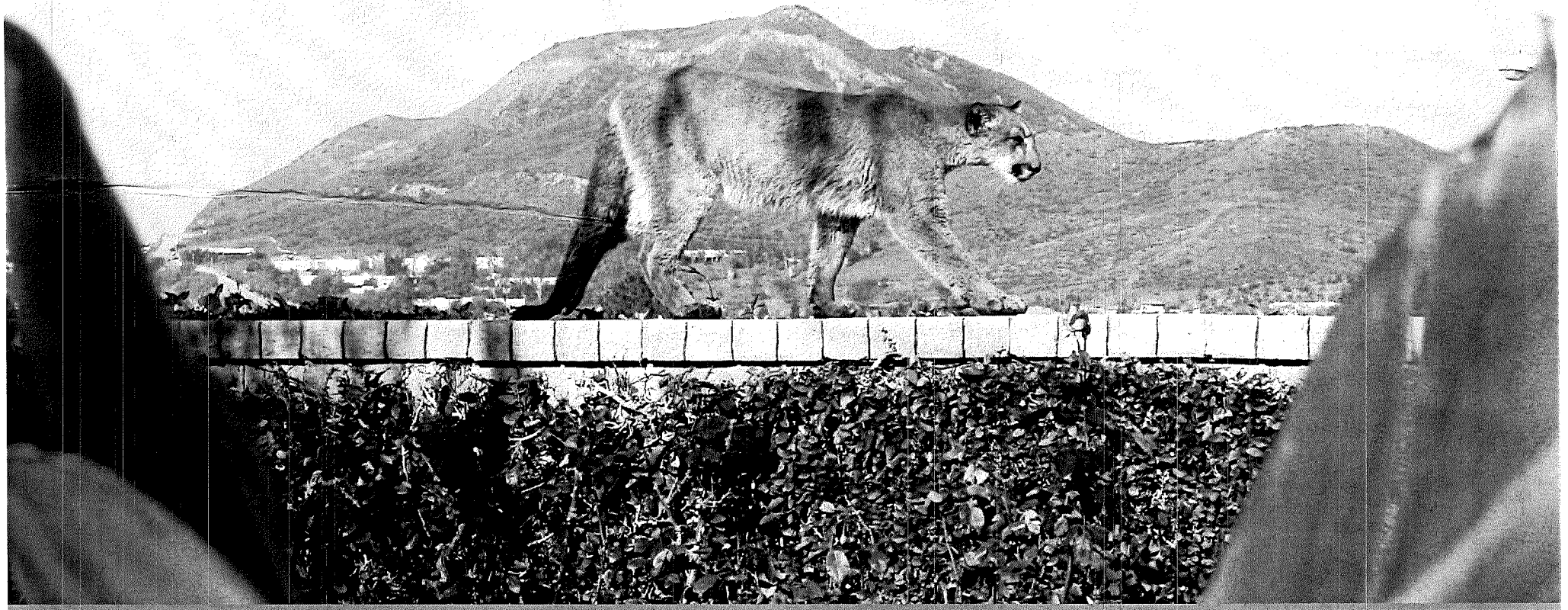
  - Ministerial standards for vegetation clearing and grading within general corridor
  - Discretionary permits required for vegetation removal within 200-300 feet
    - Limit construction of those structures requiring fuel clearance to within 200-300 feet of natural connectivity features
    - No vegetation removal within 200 feet of natural connectivity features, exemptions for crop production and grazing



- Clustering Development within Parcels and Subdivisions
- Other Approaches?

Discussion

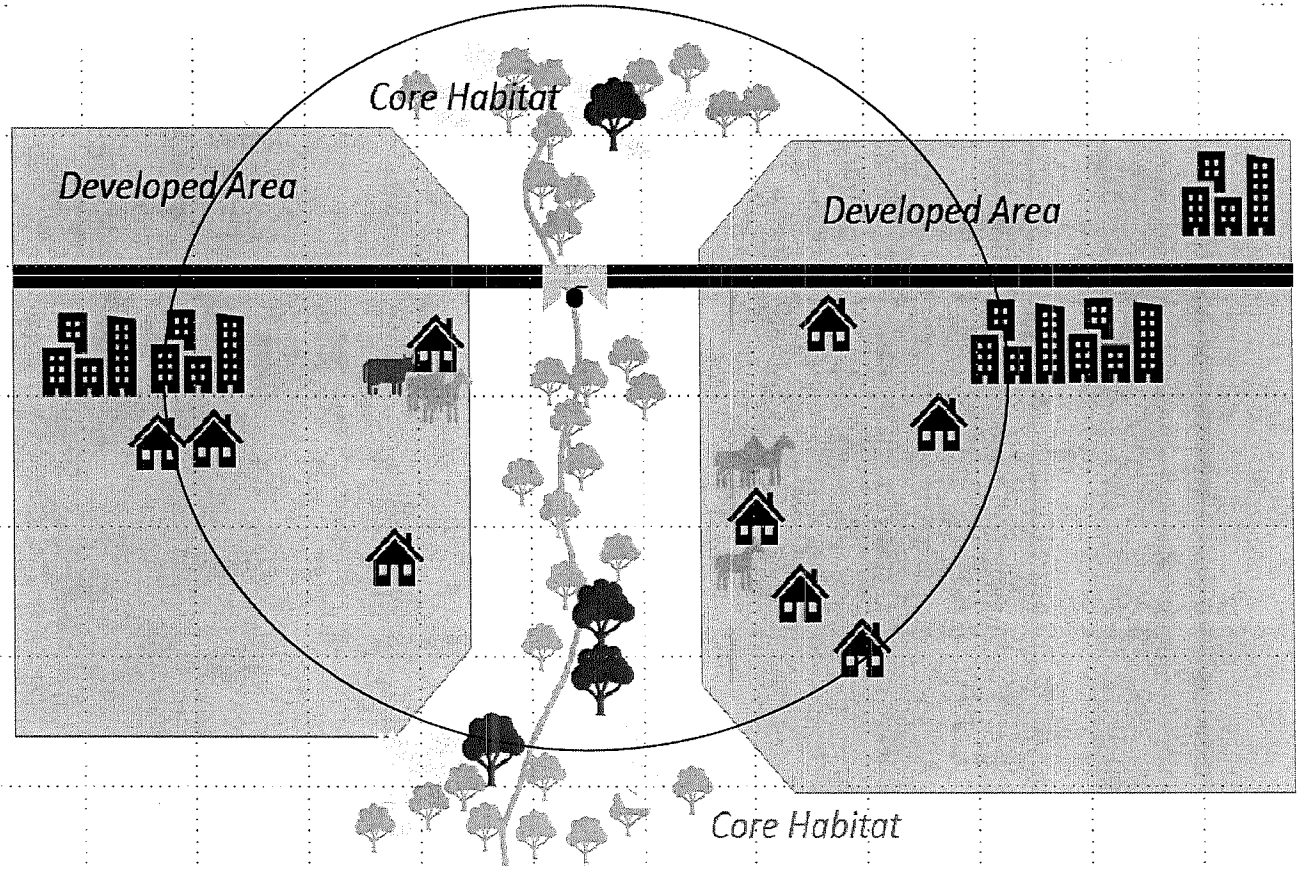
LOSS OF NATIVE VEGETATION AND HABITAT FRAGMENTATION



Project Objective:
Protect/Enhance Chokepoints

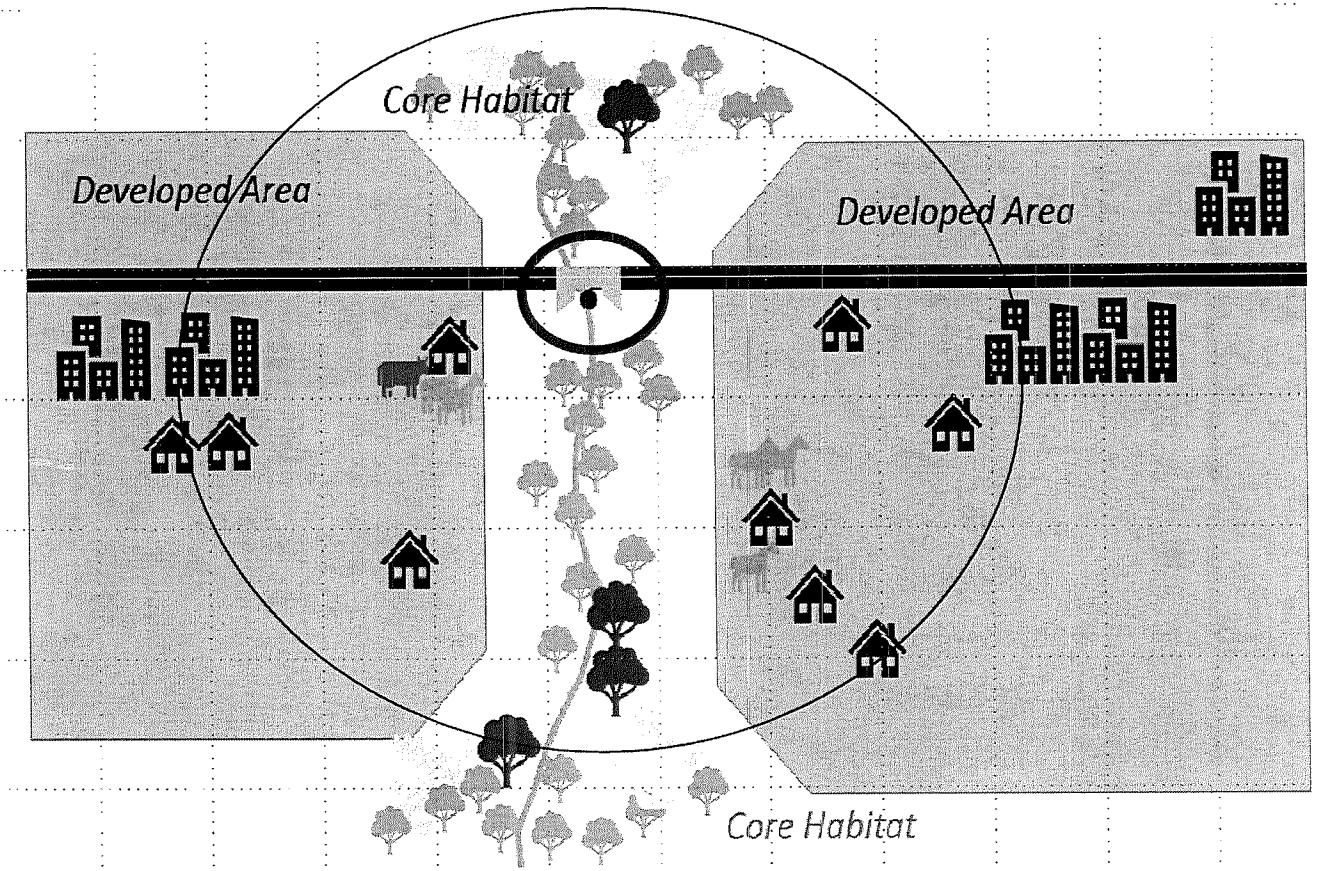
Chokepoints

A narrow physically constrained passage that constricts species movement between large core habitat areas.

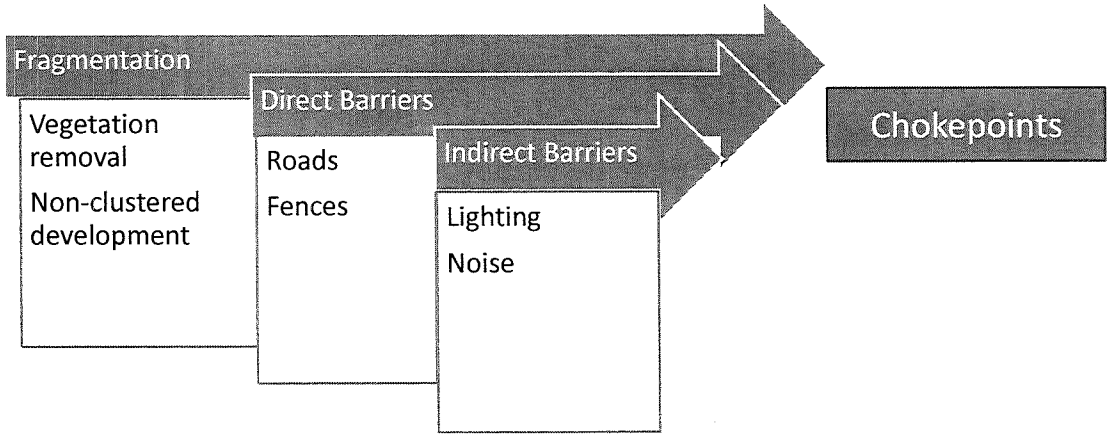


Chokepoints

A passage that allows wildlife to overcome a significant direct barrier (e.g., roadway crossing structure on a major highway).



Q: Why Focus on Chokepoints?
A: Connectivity Issues get Amplified in Chokepoints



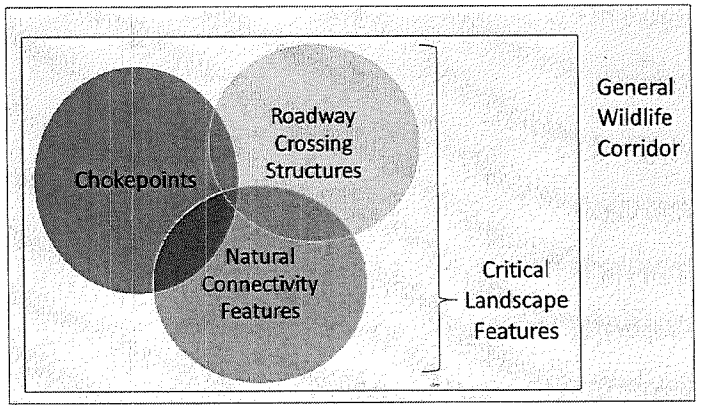
Chokepoints are ***critical*** to maintain wildlife movement through corridor.

These ***high risk*** areas could be severed and wildlife cut off from ***critical resources.***

Populations can decline and suffer a loss of genetic diversity.

Research on Chokepoints & Edge Effects

- Areas with high connectivity are the "path of least resistance."
- Chokepoints may include gaps in natural landcover that an animal might not be willing to traverse because they are narrow or do not have vegetative cover.
- The extent and type of edge effects (e.g. invasive species, pollution) will be factored in when conducting final chokepoint analysis.



Research on Roadway Crossing Structure Use

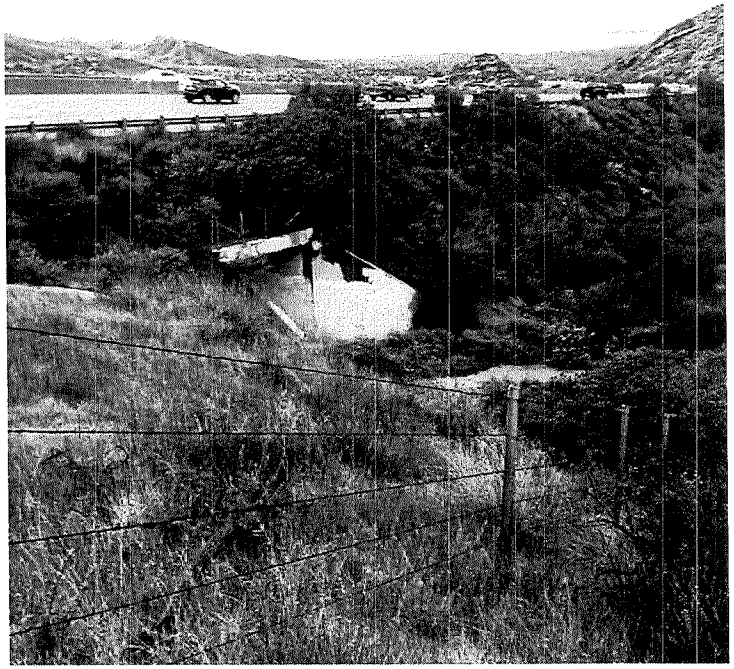
- Use of crossing structures by wildlife depends on factors such as:
  - Structure type (underpass, culvert, etc.)
  - Length
  - Cross-Sectional Area
  - Vegetative cover
- Some wildlife species use crossing structures, while others are more at risk of mortality because they prefer roads over crossing structures.
- Vegetation at entrance/exits increases crossing rates for wildlife.
- Vegetation height correlates with higher use.
- Structures closer to natural habitats increase their use .

Chokepoints: What Criteria Are Used to Identify Them?

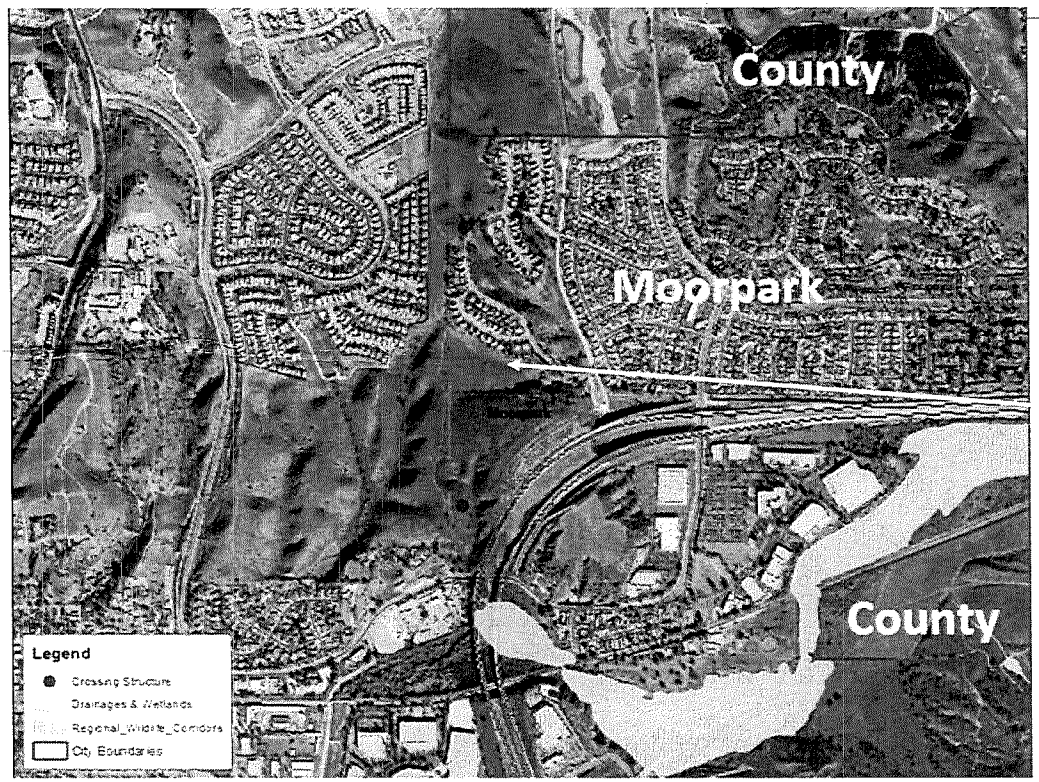
- Narrow Areas of the Corridor
- Development Encroachment within Corridor
- *Edge Effects*
  (e.g., noise, light, human presence, domesticated animals)
- Presence/Absence of Protected Lands & Open Space
- Permeability of Direct Barriers such as major roads through roadway crossing structures

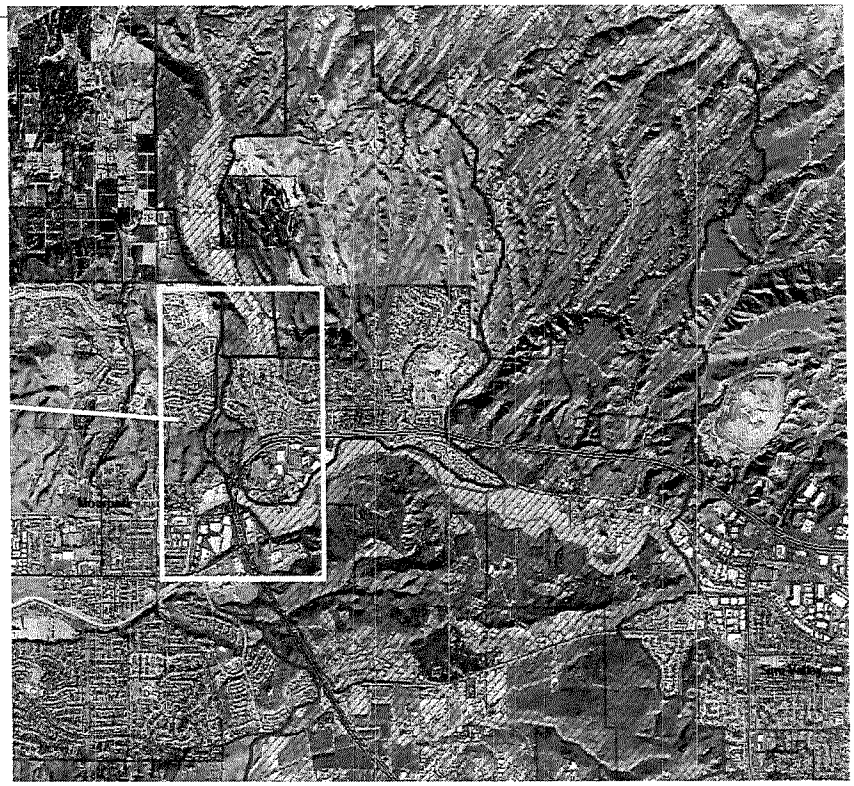
Chokepoint Example- Roadway Crossing Structure

- Often installed for drainage
- Crucial for allowing wildlife to overcome direct barriers (e.g., US 101, SR-126, SR-23, SR-118, etc.)



Chokepoint Example- Moorpark near SR 118/ SR 23 Interchange





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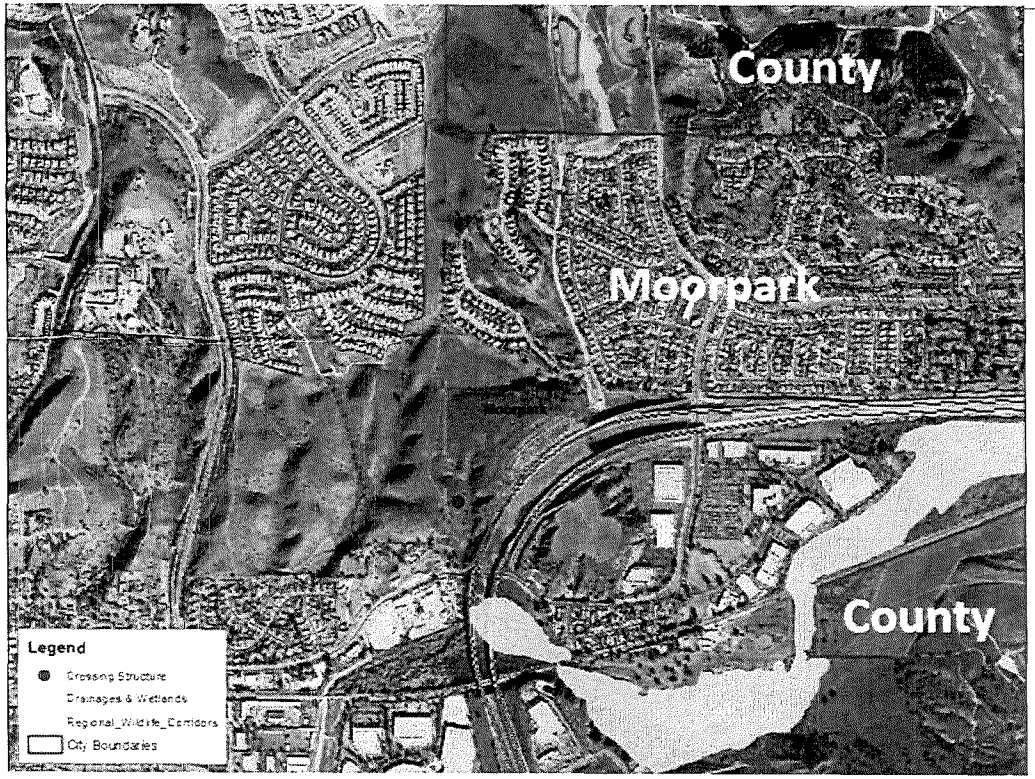

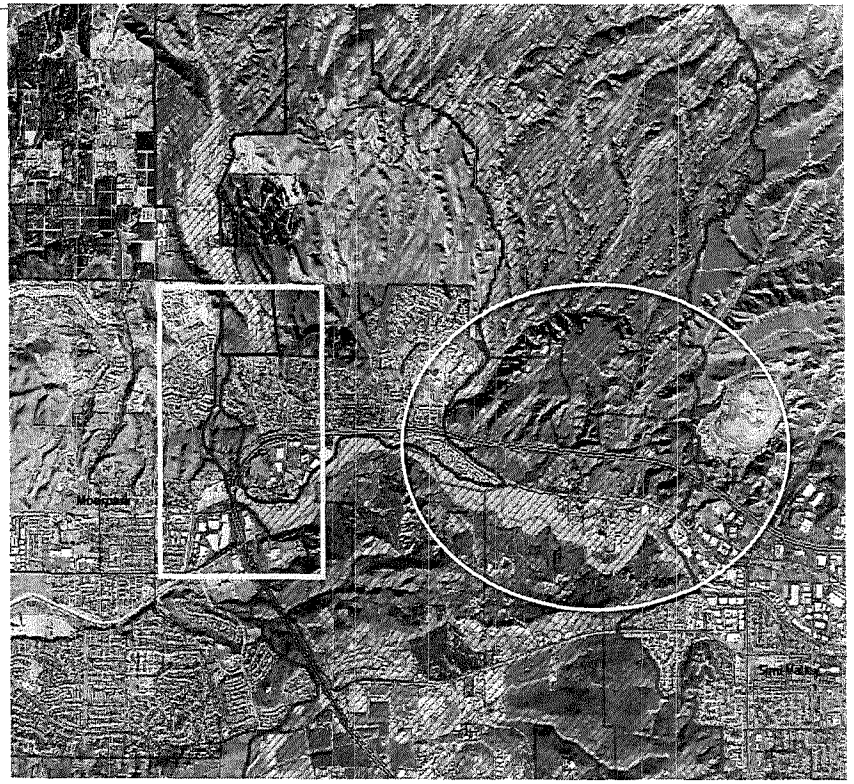

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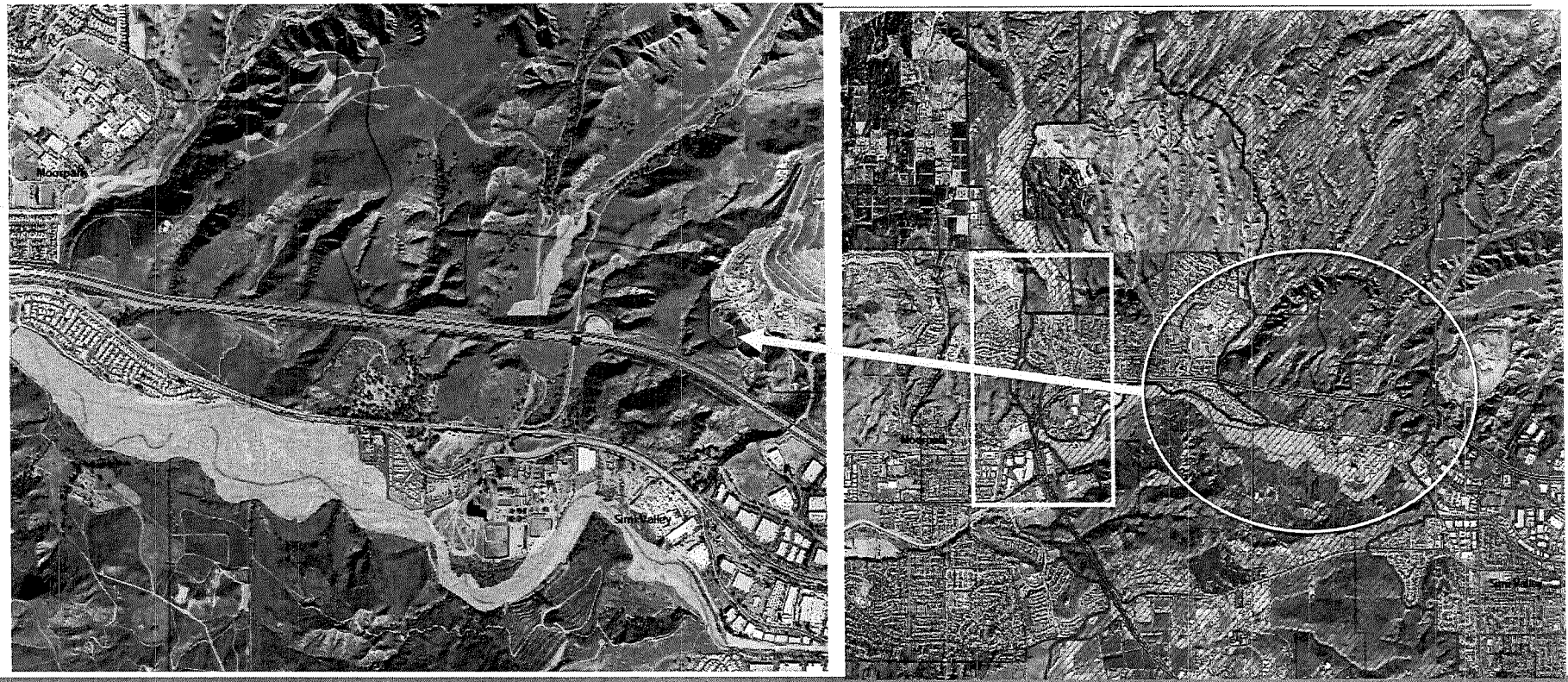
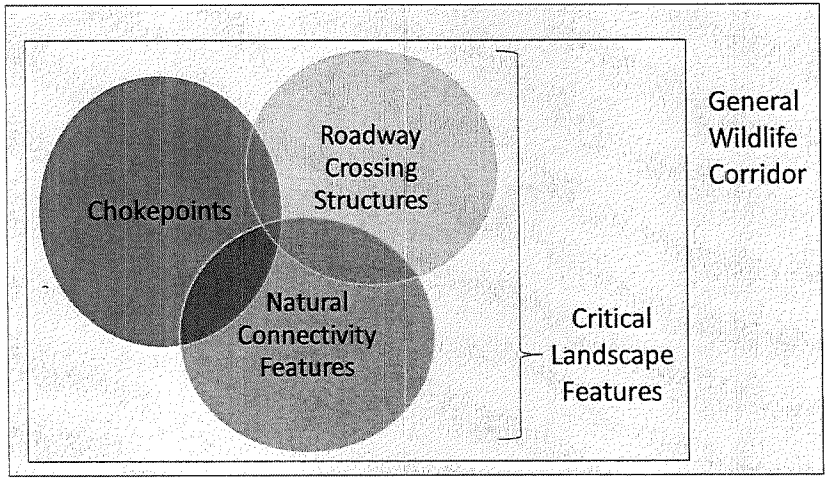


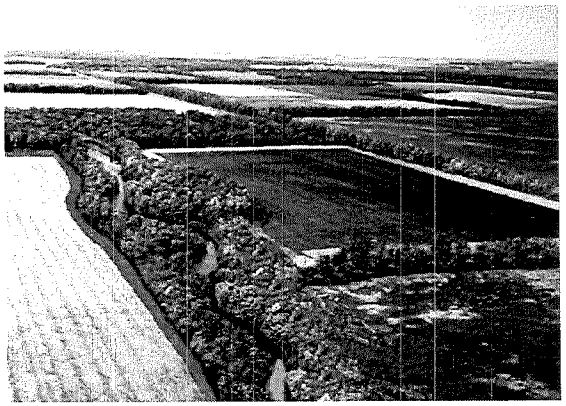
Potential Management Approaches – Chokepoints

- Apply buffers around Crossing Structures and Natural Connectivity Features.
- Coordinate with cities, agencies, and conservation organizations on land preservation options.
- Develop incentive program for landowners willing to enhance and restore chokepoint areas.
- Clustering development and limiting vegetation clearing.



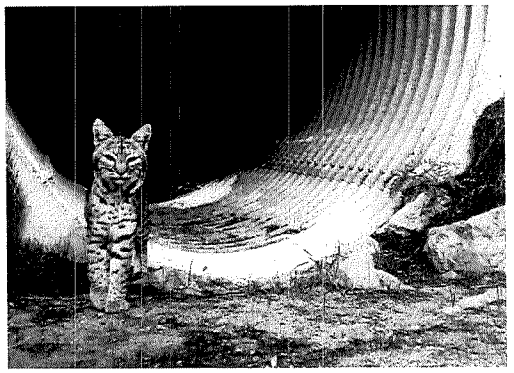
Potential Management Approaches – Chokepoints (continued)

- Identify the areas of high connectivity within a lot and limit development within this area.
- Criteria for identifying these areas include:
  - Form a continuous protected corridor which traverses the property and links to nearby open space, core habitats, and crossing structures
  - Incorporate natural pathways such as water features, wooded areas, and native vegetation if they exist on the property
  - Maintains minimum width throughout its length
  - Not lead wildlife to a dead end which cannot connect to large areas of natural open space



- Once areas of high connectivity are protected, ministerial permits for most uses outside these areas can be issued on the property.

Potential Management Approaches – Crossing Structures



- Identify existing uses and development that occur close to these crossing structures.
- Determine a buffer distance that prevents degradation and enhances the functionality of the structures for wildlife movement.
- Additional coordination with Caltrans and city/county public works agencies on structures and areas within their jurisdictions.
- Develop incentive program for landowners willing to enhance and restore areas adjacent to crossing structures.

Discussion

CHOKEPOINTS AND ROADWAY CROSSING STRUCTURES

Wrap Up and Next Steps

- Any remaining questions/comments?
- Additional stakeholder meetings may be issue-area specific
- Planning Commission hearing before close of 2017
- Board of Supervisors hearing Spring 2018

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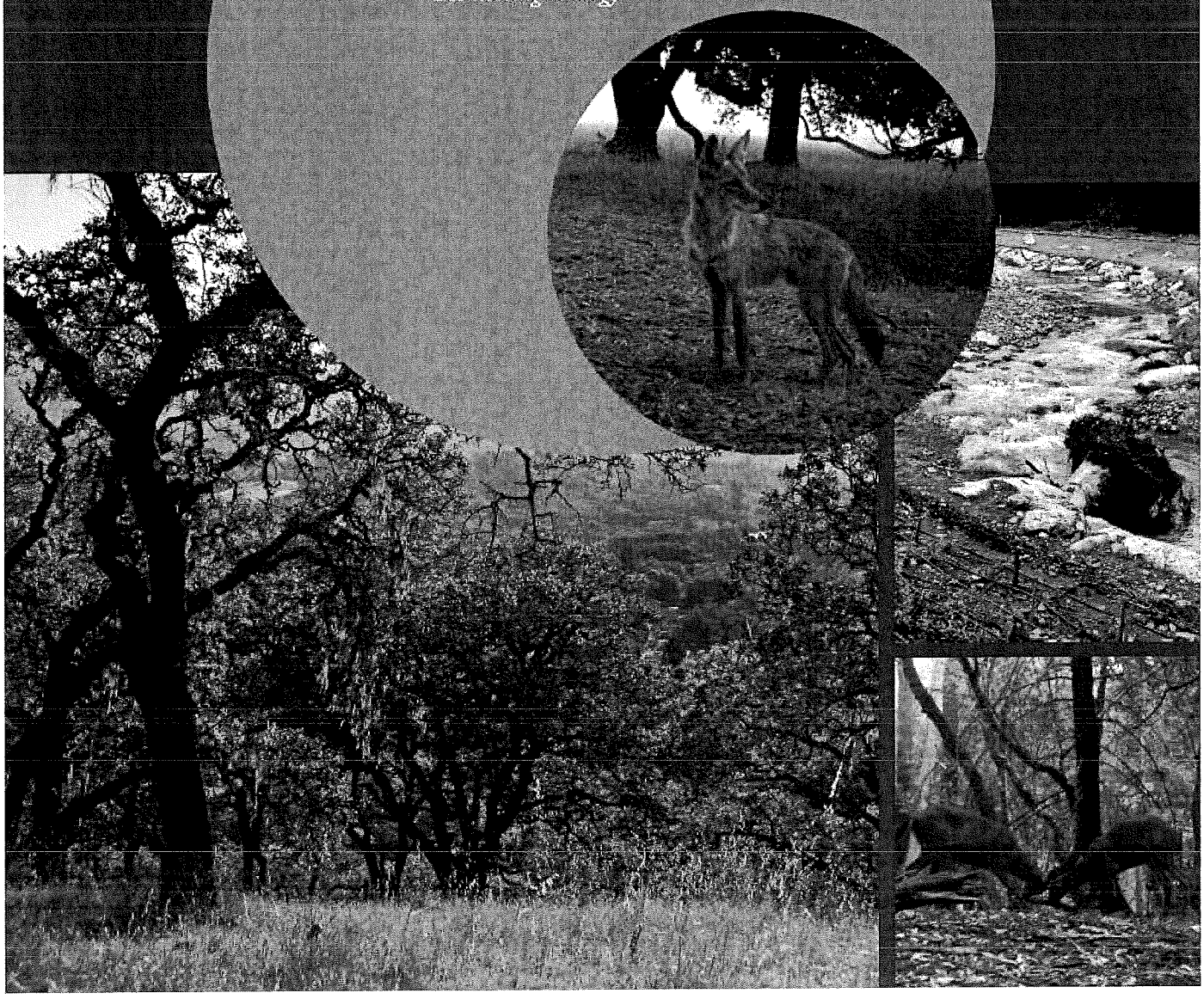
Sonoma Valley Wildlife Corridor Project

Management and Monitoring Strategy



Sonoma Valley Wildlife Corridor Project: Management and Monitoring Strategy

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Acknowledgements

The Sonoma Valley Wildlife Corridor Project was conceived in response to the visionary work, as described in the Conservation Lands Network, Bay Area Critical Linkages, Mayacamas Connectivity Report, and Sonoma County General Plan, of a consortium of scientists and planners who provided a framework for wildlife conservation in the region.

This Management and Monitoring Strategy would not have been possible without the guidance of the Corridor Technical Advisory Group members who generously dedicated their time and expertise. We are also grateful to the landowners in the Corridor for their ongoing support of this project and the Corridor, and their commitment to stewarding their lands for the benefit of all wildlife in the region. We especially thank the Gordon and Betty Moore Foundation and Resources Legacy Fund for their conservation leadership and for providing significant funding for the Sonoma Valley Wildlife Corridor.

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The Sonoma Valley Wildlife Corridor Project: Management and Monitoring Strategy

Executive Summary

One night in 2009, a black bear was spotted near a creek in Petaluma. After being chased by a helicopter, the bear followed the creek back up and over Sonoma Mountain to return to Napa County from whence it had probably started its journey. It is likely that this venturesome bear was using existing land and creek corridors – including the Sonoma Valley Wildlife Corridor - to travel a long distance, safely and mostly unseen, between Marin and Napa Counties. Such corridors are essential for wildlife passage for large species like bear, mountain lion and deer, as well as for many smaller creatures such as fox, bobcat and ringtail cat.

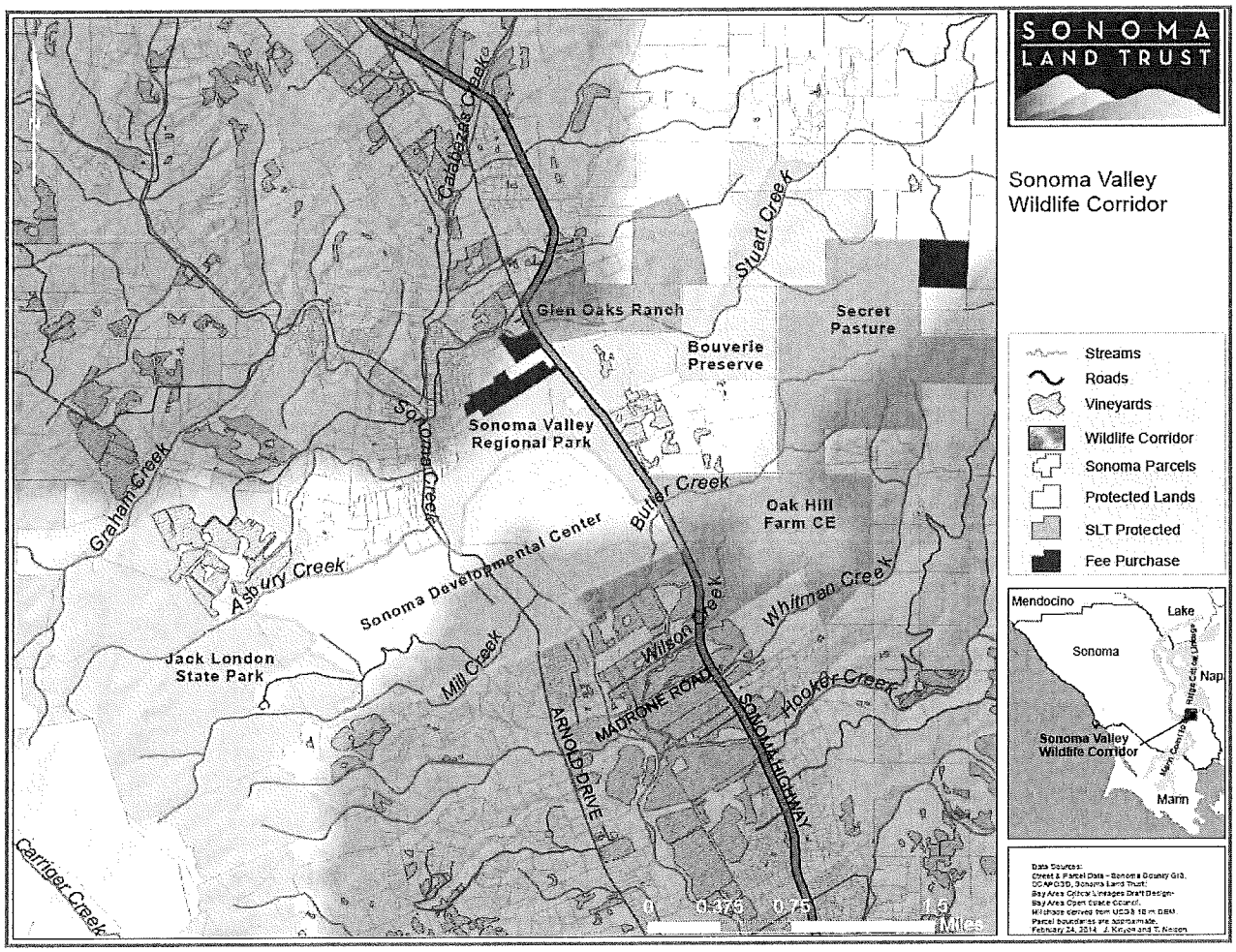
The Sonoma Valley Wildlife Corridor (Corridor) is a constricted, yet vital, connection in this larger wildlife linkage (Figure A). It is also at serious risk of being lost. The world class scenery of Sonoma Valley with its forested hills, meandering creeks, open grasslands, and oak woodlands are attractive to humans and wildlife alike. Vineyards, farms, residences, roads, and the Sonoma Developmental Center comprise the human footprint that constricts the Corridor and creates obstacles for wildlife to navigate.

Why Wildlife Corridors Matter

Wildlife corridors are patches or strips of habitat that allow wildlife to safely move between larger blocks of habitat. These corridors or linkages enable animals to escape predators, find a mate, better habitat, food and water, or habitat essential for a specific life stage. Dispersal is essential for maintaining genetic diversity in wildlife populations and for adaptation to shifts in temperature, vegetation, and water availability due to a changing climate. Corridors can also provide live-in habitat for small to medium size animals.

And yet, as the bear in Petaluma and several scientific exercises imply, the Corridor allows wildlife to disperse across wide areas in search of food, water, new territories, a mate, or to escape predators. The challenge is to sustain and improve the Corridor's permeability for all wildlife found in the region from the Coast fence lizard to the mountain lion. To meet this challenge, Sonoma Land Trust (SLT) embarked on the multi-year Sonoma Valley Wildlife Corridor Project (Project) in 2013. SLT is assessing the Corridor's current permeability, developing management recommendations to maintain and enhance wildlife passage, implementing a monitoring plan, and permanently protecting key properties that link large blocks of habitat to the east and west. Preliminary results are encouraging and suggest more gains can be made through the efforts of Sonoma Land Trust and its partners.

Figure A. The Sonoma Valley Wildlife Corridor.

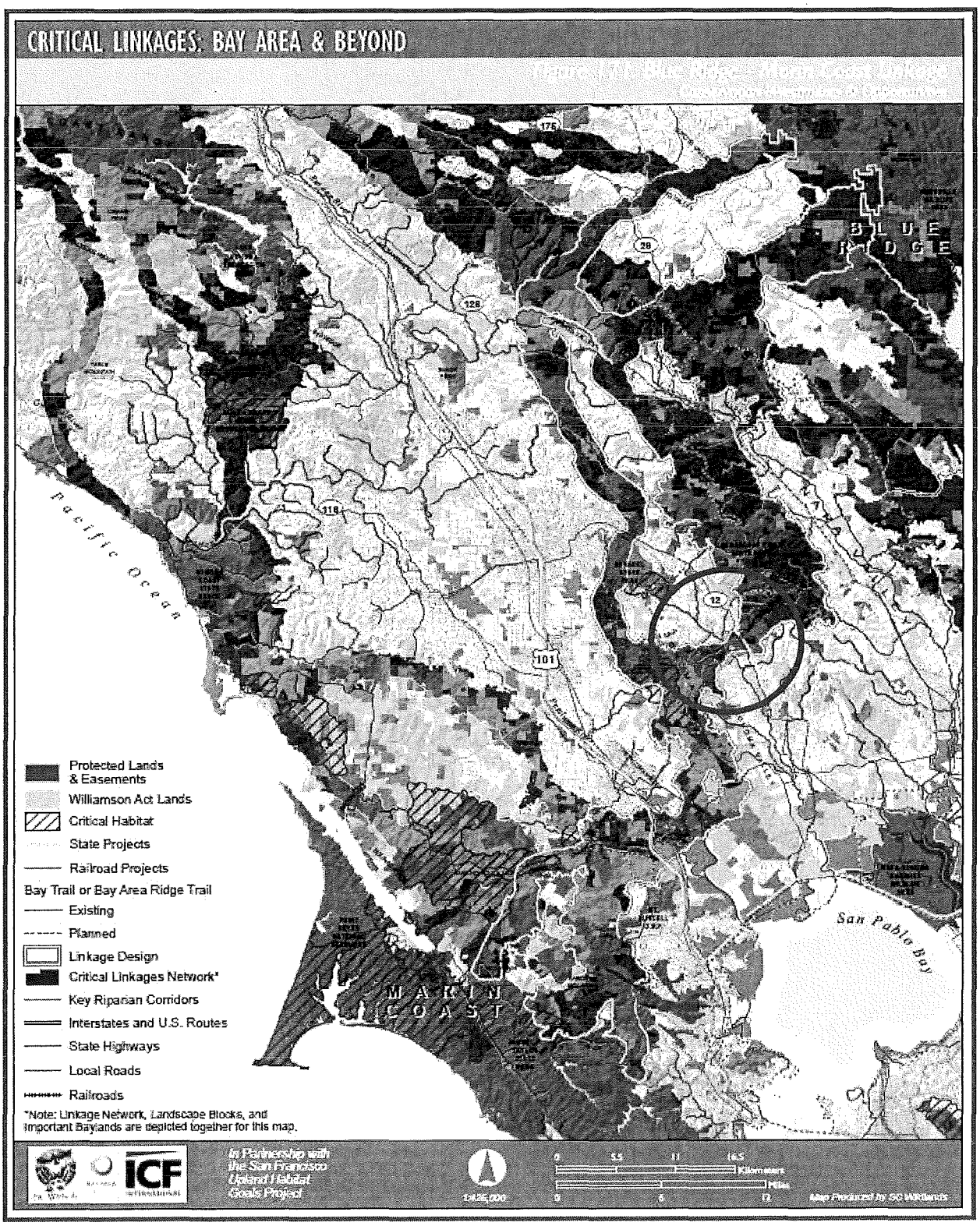


The Management and Monitoring Strategy (Strategy), a component of the larger Project, captures the permeability assessment and enhancement recommendations synthesized from current literature, biological surveys, permeability assessments, and the Corridor Technical Advisory Group, a panel of experts convened to advise the Project. The Strategy evaluates current conditions limiting wildlife passage and proposes actions to mitigate for or remove barriers on Corridor lands. It also articulates a monitoring plan that presents a picture of wildlife in the region, assesses wildlife use of the culverts and bridges along State Route 12 and Arnold Drive, the two main roads in Sonoma Valley, and gathers roadkill information to identify mortality hotspots.

A Critical Linkage Connecting Marin and Napa Counties

The Corridor is an important component of the much larger Blue Ridge to Marin Coast Critical Linkage (Figure B) that spans three counties – Marin, Sonoma, and Napa – along several tendrils of habitat extending from the Blue Ridge-Berryessa region in northeastern Napa County west across the Mayacamas Mountains on the Napa – Sonoma County line, then south and west to Pt. Reyes National Seashore on the Marin County coast. The Sonoma Valley Wildlife Corridor, located near the geographic center of the larger linkage, spans approximately five miles from Sonoma Mountain eastward across

Figure B. Blue Ridge to Marin Coast Linkage. The Sonoma Valley Wildlife Corridor is an important segment of the much larger Blue Ridge to Marin Coast Linkage identified by the Bay Area Critical Linkages Project completed by SC Wildlands and the Bay Area Open Space Council. The Sonoma Valley Wildlife Corridor is highlighted by the red circle.



Sonoma Creek and the valley floor near the town of Glen Ellen, and up to the crest of the Mayacamas Range (Figure A). On the valley floor, the Corridor is reduced to only three-quarters of a mile wide by residential and agricultural development thus creating a "pinch point." The Corridor encompasses approximately 10,000 acres with just over 5,000 of these acres permanently protected and managed for natural resources and recreation by state and county agencies and nonprofit organizations, including Sonoma Land Trust. At the heart of the Corridor lies the state-operated Sonoma Developmental Center and its 700 acres of wildlands which presents both a threat and an opportunity as the state reviews alternative uses for the facility.

Keeping the Sonoma Valley Wildlife Corridor Open

Sonoma Land Trust and the Corridor Technical Advisory Group, after conducting field visits, biological surveys, permeability assessments, a literature review, and reviewing preliminary monitoring results are confident that the Corridor is permeable to wildlife species occurring in the region and that permeability can be enhanced by incorporating wildlife needs into property management practices on public and private lands in the Corridor. The following recommended actions chart the course for Corridor partners and landowners to achieve this goal.

Corridor Technical Advisory Group: Factors impacting wildlife passage in the Sonoma Valley Wildlife Corridor

- roads and driveways
- fencing
- reduced structural and compositional diversity of vegetation
- agricultural cultivation
- free roaming pets and feral cat feeding
- exterior nighttime lighting
- excessive noise
- excessive fire hazard reduction and post-fire restoration
- timing of mechanical weed control
- roadside vegetation management (mowing or spraying)
- pesticide use
- trails and recreational uses

1. **Improve permeability on both public and private lands.** Sonoma Land Trust and the CTAG found numerous opportunities to enhance permeability of public and private properties in the Corridor. Raising awareness of the Corridor's importance among the Valley's residents could yield significant benefits. Even small lot homeowners can make just a few changes - keeping lights off and pets inside at night for instance - that can make a big difference. Enhancing the landscape for wildlife will require collaboration with SLT's partners and cooperation from the diverse Sonoma Valley landowners. Some strategies for making changes both big and small are summarized below.

    - **Carry out management recommendations for properties with completed permeability assessments.** SLT should meet with the owners of the six properties with completed permeability assessments to share the results and encourage implementation of the recommended actions.

    - **Complete permeability evaluations for critical properties.** Bouverie Preserve, Sonoma Valley Regional Park, and Sonoma Developmental Center are important properties in the heart of the Corridor. More detailed permeability assessments of these properties will determine if there are threats to wildlife passage or opportunities for enhancement.

- **Work with partners to develop outreach strategies for key audiences.** Sonoma Valley has several different types of landowners – residential, agricultural, and conservation – each representing a different audience. Drafting an outreach plan that identifies key audiences, messages for each audience, and a strategy for putting the plan into action can focus limited resources. Figure C presents draft Sonoma Valley Wildlife Corridor guidelines that can be tailored for outreach materials for diverse audiences.

2. **Engage regional and state transportation agencies to improve wildlife crossing safety.** A number of structural and management changes were recommended for the 21 undercrossing structures (e.g., bridges and culverts) on Arnold Drive and State Route 12. Arnold Drive is under the jurisdiction of the Sonoma County Transportation Authority and State Route 12 is overseen by Caltrans. Motion-activated cameras installed in undercrossing structures and roadkill data will provide valuable information on the use of these structures by wildlife and identify stretches of road with excessive roadkill. Presenting monitoring results and highlighting the importance of the Corridor to these agencies can lay the foundation for the inclusion of permeability enhancements in future road improvement projects.

3. **Advocate for stronger policy protections.** A milestone was achieved when Corridor advocates, led by the Sonoma Ecology Center, were successful in designating the Corridor as a Habitat Connectivity Corridor in the Sonoma County General Plan 2020. Corridor advocates should work with County officials to develop strong ordinances that support the general plan's intended protection of wildlife and riparian corridors in the Corridor and throughout the County.

4. **Continue to use monitoring results to guide management strategies.** As knowledge of wildlife presence, road undercrossing structures use, and permeability throughout the Corridor increases, monitoring should focus on evaluating and refining the effectiveness of actions taken to improve wildlife passage.

The land conservation and policy successes achieved since the 1990's when Christy Vreeland, a Sonoma Developmental Center staff member, observed wildlife using the Corridor and began advocating for its protection are formidable. But more work remains to permanently protect these essential strands of habitat and ensure their suitability for all types of wildlife. The Sonoma Valley Wildlife Corridor Management and Monitoring Strategy offers a road map to meet this goal.

Figure C. DRAFT Sonoma Valley Wildlife Corridor Management Guidelines

Limit the construction of new roads. Roads and driveways reduce the number of wildlife using the Corridor so the construction of new roads should be minimized. If new roads are constructed or old roads upgraded, crossing structures should be installed to accommodate wildlife in the area.

Maintain crossing structures. Culvert and bridge crossing structures should be checked periodically for debris, vegetation overgrowth, and other blockages.

Limit fencing and use wildlife-friendly fence designs. Fencing can prevent wildlife from moving freely between wildlands.

- The construction of new fencing is discouraged, but if it must be built, wildlife-friendly fence designs should be used and the fenced area should be minimized.
- Whenever old fencing needs to be replaced, encourage the use of wildlife-friendly fence designs.
- Maintain barbed wire fences to avoid entanglement from loose wire.
- Remove old fencing that is no longer needed.

Be fire safe and wildlife-friendly. Excessive clearing of vegetation reduces the effectiveness of the wildlife corridor. Meet, but do not exceed, the defensible space requirements of the local fire authority so wildlife habitat beyond the defensible space zone remains intact.

Limit mowing. Mowing may be necessary to comply with defensible space requirements, but the mowed area should be as small as safety and fire regulations allow.

Residential landscape designs should be fire safe and incorporate predominantly native plants. Native plants require significantly less water and are beneficial for native bees and butterflies.

Do not allow pets to roam freely in wildlands. Pets can chase and prey on wildlife. Keep pets in fenced backyards unless accompanied by the owners, and bring all pets and pet food inside at night.

Minimize outdoor night lighting. Lighting should be the minimum needed for safety, restricted to within 50' of houses, point toward the structure or immediate ground, and use the lowest wattage possible.

Do not use pesticides. Pesticides can cause secondary poisoning in wildlife.

Timber harvesting should benefit wildlife corridor habitat. Timber harvesting should be very limited and, if at all possible, should enhance the vegetative structural diversity. Standing or downed dead trees should be left for wildlife habitat where permissible.

CHAPTER

1 Introduction

The Sonoma Valley Wildlife Corridor has long been recognized as an important east-west linkage allowing wildlife to move relatively freely between large tracts of wildlands on either side of the valley floor. Where the linkage crosses the Sonoma Valley, it is constrained by development and the specter of more habitat loss raised concern about the long-term efficacy of this critical connection that is part of a larger wildlife corridor spanning three counties. To address this problem, the Sonoma Land Trust initiated the Sonoma Valley Wildlife Corridor Project in 2013 with funding from the Gordon and Betty Moore Foundation and Resources Legacy Fund. The goal is to ensure that the linkage continues to offer safe passage for wildlife by assessing, protecting, and enhancing essential corridor components.

Wildlife corridors are patches or strips of habitat across a landscape that facilitate movement of animals, between larger blocks of habitat, or core areas, with a high probability of successful passage. Corridors may be large enough to provide live-in habitat for small and medium sized species, but due to encroachment by human land uses (e.g., residences, agriculture, roads) are often too narrow or lack preferred habitat for occupancy by animals with large home ranges. Corridors enable the dispersal of species escaping predators or in search of a mate, better habitat, food and water, or habitat essential for a specific life stage. Dispersal is essential for maintaining genetic diversity and persistence in wildlife populations, and for successful adaptation to projected shifts in temperature, vegetation, and hydrology due to a changing climate.

The most permeable wildlife corridors consist of continuous habitat or landscape linkages connecting core areas that permit all species to move easily between these wildland blocks (Figure 1). Habitats fragmented by roads, cultivated agriculture, commercial and residential development are less permeable and not all species are able to navigate through the hazards.

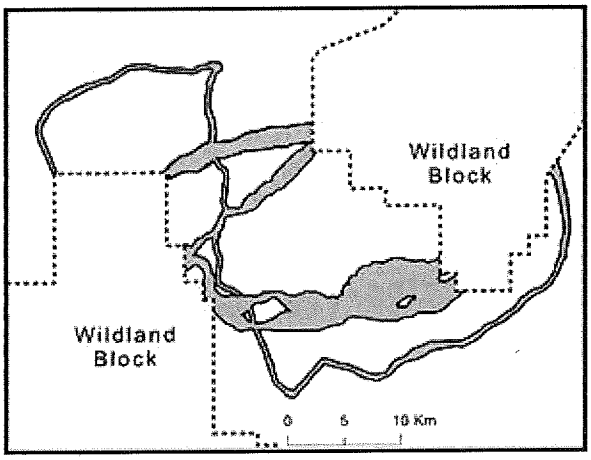


Figure 1. Wildlife corridors.
Landscape linkages provide the best opportunity for the most species to safely move between large blocks of wildlands.

The Sonoma Valley Wildlife Corridor (Corridor), encompassing approximately 10,000 acres, stretches from Sonoma Mountain eastward across Sonoma Creek and the valley floor, and continues to the crest of the Mayacamas Mountains (Figure 2). Just over 5,000 acres within the Corridor are permanently protected for conservation purposes by state and county agencies and private non-profit organizations. The Corridor is one section of a much larger linkage that connects the large block of core habitat on the Marin Coast to the expanse of wildlands in the Blue Ridge - Berryessa region of eastern Napa County (Figure 7).

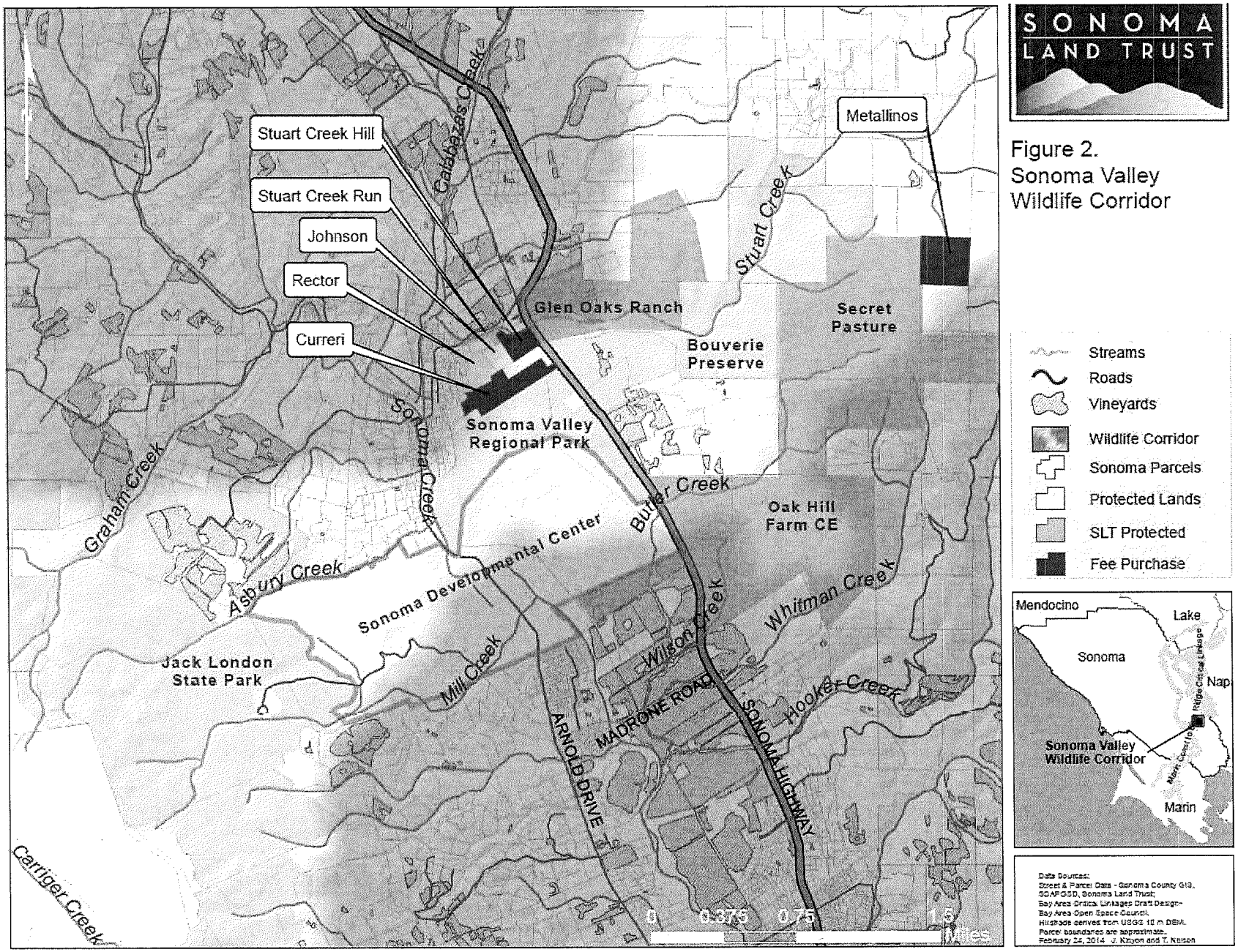


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Figure 2.
Sonoma Valley
Wildlife Corridor

Even though habitats within the Corridor have been altered by roads, residences, businesses, agriculture, and recreational uses, they are dominated by the common vegetation types of the region and have varied structural diversity and composition, excellent cover and food resources, and numerous permanent and intermittent creeks. Oak woodland and savanna, evergreen forests, grasslands, chaparral, lakes, wetlands, and stream corridors provide a continuous network of habitats through the matrix of human land uses in the narrowest part of the Corridor on the valley floor. Based on the diversity and condition of habitats within the Corridor, modeling results from two conservation planning studies, expert observation, and anecdotal evidence, it is presumed that the Corridor supports the diversity of wildlife expected to occur in the region and affords passage between Sonoma Mountain and the Mayacamas Range.

Development and intensive land use in the region, concentrated in the valley, have fragmented habitat and created a constriction or "chokepoint" in the Corridor near the small town of Glen Ellen. Further fragmentation or loss of this chokepoint to development would jeopardize the future permeability of the Corridor, the integrity of the larger linkage, and the ability of wildlife populations to persist in the region. The goal and objectives of this project are designed to address these threats.

Figure 3. Key Wildlife Corridor Terms

Crossing structure: A physical structure, such as an over- or undercrossing that facilitates wildlife movement across movement barriers or filters, such as a highway or a canal.

Connectivity: The degree to which a landscape facilitates movement by organisms or processes; the antithesis of habitat fragmentation.

Corridor or linkage: A landscape connection that facilitates movement between large, core habitat areas for diverse organisms and processes.

Habitat fragmentation: The process of breaking large areas of habitat into multiple smaller unconnected patches.

Least-cost corridor: A continuous connection to facilitate wildlife movement between habitat patches, sometimes through areas that are less suitable for movement. Corridors are usually identified for particular species based on species-specific requirements, and may or may not be linear habitat features.

Movement barrier: A physical obstruction or break in habitat continuity that prevents all or nearly all movement by a particular species or process, such as a major freeway or an unpassable fence that isolates wildlife populations on either side.

Passage: The action of wildlife moving between habitat patches using wildlife corridors.

Permeability: The ease with which wildlife can move from one habitat area to another.

Riparian corridor: Vegetation along creeks, streams, and rivers that provides cover, facilitates movement of aquatic and terrestrial species, and promotes ecological processes and flows, such as movement of sediment, water, and nutrients.

1.1 Sonoma Valley Wildlife Corridor Project Goal and Objectives

The goal of the Sonoma Valley Wildlife Corridor Project (Project) is to ensure the permeability of this critical linkage for all wildlife in the region to move freely across the network of public and private lands illustrated in Figure 2. Project objectives are to employ a variety of conservation tools to assess current permeability of the Corridor, develop and implement monitoring and management recommendations to maintain and enhance permeability, and permanently protect key properties that provide connectivity between large blocks of habitat to the east and west. These objectives are described below.

1. **Corridor permeability assessment.** To evaluate the current permeability of the Corridor, Sonoma Land Trust (SLT) gathered available wildlife habitat and use data specific to the Corridor, scientific literature on wildlife corridor management, wildlife and vegetation studies on a few key properties, and the expert opinion of the Corridor Technical Advisory Group (CTAG). SLT is also collecting data from motion-activated cameras and roadkill observations to document current

wildlife use of the Corridor. As more data is gathered the effectiveness of permeability improvements for adaptive management applications can be evaluated.

2. **Management and monitoring recommendations.** The information gathered from the permeability assessment shaped the management recommendations to reduce or eliminate movement barriers, and the monitoring objectives to assess current and future wildlife use of the Corridor. These recommendations are documented in this Sonoma Valley Wildlife Corridor Management and Monitoring Strategy (Strategy). SLT is committed to implementing the recommended permeability improvements identified in this Strategy on its fee properties, securing permanent wildlife movement protections for the Rector, Johnson, and SDC properties, implementing priority monitoring efforts, and disseminating outreach materials to key audiences as described in Chapter 8.

3. **Permanent land protection.** SLT identified three key properties for protection in the Corridor chokepoint - Stuart Creek Hill, Metallinos, and Curreri - to expand conserved lands and secure critical wildlife passage features. SLT recently purchased the Stuart Creek Hill and Metallinos properties, and will purchase and transfer Curreri to Sonoma County Regional Parks in July 2014. In addition, SLT will develop model conservation easement and deed restriction language that promotes wildlife passage for other willing landowners within the Corridor and to share with the conservation community. Discussions have been initiated with additional landowners in the chokepoint have been initiated to place such restrictions on their properties. Landowners throughout the Corridor may be approached to explore further opportunities.

   At the heart of the Corridor is the approximately 950 acre Sonoma Developmental Center (SDC) owned and operated by the State of California. In operation since 1891, this health care facility provides residential services for individuals with severe developmental and physical disabilities. The SDC is one of the county's largest employers, and arguably the most ecologically significant property in Sonoma Valley. Through a cooperative planning effort with state agencies, Sonoma County, Sonoma Ecology Center, and other community groups, SLT is working to ensure that the roughly 750 acres of wildlands on the property are preserved, and eventually transferred to an organization that will provide permanent protection for open space, watershed, and wildlife corridor conservation and management purposes.

The successful implementation of this project will demonstrate the feasibility of protecting a functioning wildlife corridor utilizing a range of innovative tools across multiple property ownerships. It is hoped that the project can serve as a model for other watersheds and regions that face multiple threats to the integrity of large, intact natural landscapes.

1.2 Purpose of the Sonoma Valley Wildlife Corridor Management and Monitoring Strategy

This Strategy captures the management and monitoring recommendations for improving the permeability of the Corridor developed by the Sonoma Valley Wildlife Corridor Project. It explains the approach and methodology used to assess the Corridor and develop monitoring objectives and management recommendations (Chapter 2); offers a brief overview of conservation efforts related to the Corridor (Chapter 3); documents existing conditions (Chapter 4); summarizes the factors that impact permeability and mitigating actions (Chapter 5); describes detailed management recommendations for the properties visited by the CTAG (Chapter 6); outlines the objectives and potential protocols for a monitoring plan (Chapter 7); and, finally, presents a summary of the recommendations and management guidelines in Chapter 8.

CHAPTER

2 Approach and Methodology

To develop the monitoring objectives and management recommendations for the Sonoma Valley Wildlife Corridor (Corridor), we employed a review and synthesis of scientific literature on corridor ecology, local wildlife habitat and use data, expert opinion from scientists and land managers, preliminary observations of road undercrossings (bridges and culverts) in the Corridor, and permeability field assessments for six properties located in the Corridor chokepoint.

The methodology involved four main steps:

1. **Literature review and resource reports.** A literature search was conducted for data, research, and reports related to the Sonoma Valley Wildlife Corridor area as well as factors known to impact wildlife permeability of core areas and linkage lands, and management practices to maintain or improve permeability. A wildlife biologist was engaged to complete a wildlife composition assessment for Curreri, Stuart Creek Hill and Metallinos (Prunuske Chatham, Inc. 2013), and a botanist surveyed and prepared vegetation composition descriptions for Glen Oaks Ranch, Curreri, Secret Pasture and Metallinos (Warner 2013). Summaries of the literature review and biotic assessments are provided in Chapter 4 Existing Conditions.

2. **Expert opinion.** The Corridor Technical Advisory Group, or CTAG (Figure 4), convened to provide guidance in the development of the monitoring and management strategies. The CTAG was comprised of scientists and land managers from public agencies, nonprofit organizations, and universities with wildlife linkage expertise and/or specific knowledge of the Corridor and its wildlife. The role of the CTAG was to provide direction on methodologies, review property conditions, recommend management practices to improve permeability, and assist in developing monitoring objectives and priorities.

Figure 4. Corridor Technical Advisory Group

Caitlin Cornwall, Sonoma Ecology Center
Tanya Diamond, Connectivity for Wildlife
Wendy Eliot, Sonoma Land Trust
Christina Freeman, California Dept Parks and Recr
Sandra Jacobson, US Forest Service
Adina Merenlender, UC Cooperative Extension Berkeley
Lisa Micheli, Pepperwood Preserve
Bob Neale, Sonoma Land Trust
Tony Nelson, Sonoma Land Trust
Nancy Schaefer, SLT consultant
Gail Seymour, California Department of Fish and Wildlife
Fraser Shilling, Road Ecology Center, UC Davis
Ahiga Snyder, Connectivity for Wildlife
Stu Weiss, Creekside Center for Earth Observation
Jeff Wilcox, Sonoma Mountain Ranch Preservation Foundation
Jeanne Wirka, Audubon Canyon Ranch

3. **Permeability assessments and monitoring strategies.** CTAG members met for four days over a six month period to conduct permeability assessments for six properties and five undercrossing structures, and provide guidance on monitoring objectives and priorities.

On March 27, 2013, several CTAG members explored five road undercrossings along the two main roads that bisect the Corridor. On State Route 12, Stuart, North and South Butler Creeks were visited, and on Arnold Drive, the CTAG surveyed Asbury Creek and an unnamed creek in Jack London Village. The CTAG reviewed these undercrossings for factors affecting the ability of wildlife to pass through safely, potential improvements to increase wildlife use, and techniques to monitor wildlife use or avoidance of the structure. Specific culvert recommendations from the site visit are listed in Chapters 5 and 6 and highlighted in Figure 21.

On April 18 and 19, 2013, CTAG members walked the six properties listed in Figure 5 to evaluate permeability, discuss improvements for wildlife movement, and identify monitoring objectives and methods. The properties selected for permeability field assessments – Oak Hill Farms, Glen Oaks Ranch, Stuart Creek Hill, Johnson, Rector and Curreri – were chosen because of their location within the Corridor chokepoint and ownership by either Sonoma Land Trust (SLT) or private landowners who expressed interest in permanently restricting land uses to promote wildlife permeability. During the field visits, five of the six landowners met with CTAG members to offer their observations of wildlife presence and movement, and answer questions regarding land management practices.

Figure 5. Sonoma Valley Wildlife Corridor properties assessed for wildlife permeability by the Corridor Technical Advisory Group.

Property	Acreage	Ownership	Conservation Status
Oak Hill Farms	700	private	SLT easement
Glen Oaks Ranch	234	Sonoma Land Trust	SLT owned
Stuart Creek Hill	14	Sonoma Land Trust	SLT owned
Johnson	9	private	proposed for landowner agreement
Rector	14	private	proposed for landowner agreement
Curreri	37	private	under purchase contract by SLT

The final CTAG meeting was held on May 29, 2013 to review findings and recommendations from the field visits and develop monitoring objectives and priorities. Chapter 7 summarizes the recommendations from the day-long meeting. The results, ideas, and recommendations that emerged from these site visits and meetings are described in Chapters 5 - 8.


CTAG members with Mark Johnson.

4. **Draft the Sonoma Valley Wildlife Corridor Management and Monitoring Strategy.** This Strategy summarizes the results of the literature review, field visits, and Corridor Technical Advisory Group recommendations. It also presents management recommendations to improve wildlife permeability, a Corridor monitoring strategy, and outreach guidance for Corridor landowners to promote implementation of the recommendations.

CHAPTER

3 Sonoma Valley Wildlife Corridor Studies and Planning Efforts

The Sonoma Valley Wildlife Corridor (Corridor) began gaining recognition as a region of significant wildlife presence and movement in the 1990s. Christy Vreeland, an employee of Sonoma Developmental Center, recognized the region as unique and approached the Sonoma Ecology Center (SEC) with a vision to protect the linkage (Hilty *et al.* 2006). With funding from the Community Foundation of Sonoma County, SEC produced maps and successfully advocated for the Corridor's recognition in the Sonoma County General Plan 2020 update.

In recent years, the Corridor has been identified in, or the subject of, several conservation planning efforts and studies as a key connection and potentially at risk from development. The Bay Area Critical Linkages Project, Conservation Lands Network, and Sonoma County 2020 General Plan highlight the Corridor as land highly suitable for conservation due to the presence of listed species, habitat, priority streams, and connectivity to large protected lands on Sonoma Mountain and in the Mayacamas Mountains.

More localized studies have been undertaken in response to development threats and to bolster support for protection of the Corridor. Some of these studies culminated in the transfer of a portion of the Sonoma Developmental Center wildlands to Jack London State Park and conservation easements to Sonoma County Agricultural Preservation and Open Space District. A brief overview of these conservation studies and plans are summarized in the following sections.

3.1 The Conservation Lands Network and Bay Area Critical Linkages

The Conservation Lands Network (CLN) is a biodiversity conservation plan for the nine-county Bay Area completed in 2011 by the Bay Area Open Space Council. The purpose of the CLN is to offer guidance for conservation investments and encourage proactive conservation. The CLN identified the Corridor as an important linkage with several Priority 1 and 2 streams (see Chapter 4 Existing Conditions for a description of priority streams). Figure 6 displays the Conservation Lands Network in the Sonoma Valley area.

Building on the work of the CLN, the Gordon and Betty Moore Foundation funded Science and Collaboration for Connected Wildlands (SC Wildlands) to complete a detailed linkage analysis as a refinement to the CLN. Called *Critical Linkages: The Bay Area and Beyond* (Bay Area Critical Linkages), this collaborative project covered the nine Bay Area counties plus several counties to the north and south. The study identified 14 landscape level connections including constrictions within these linkages. The Sonoma Valley Wildlife Corridor is part of the Blue Ridge to Marin Coast Linkage (Figure 7) that spans three counties – Marin, Sonoma and Napa – stretching from the Blue Ridge-Berryessa region in eastern Napa County to Pt. Reyes National Seashore to the south and west.

The project employed the focal species method selecting 66 plant and animal species, and conducting least-cost corridor analyses for a subset of the focal species in each of the 14 linkages. A least-cost corridor is the path of least resistance offering connectivity between habitat patches as determined for each focal species. The Blue Ridge to Marin Coast linkage was delineated based on the habitat

Figure 6. The Conservation Lands Network for Sonoma Valley. The Conservation Lands Network identified Sonoma Valley as an important linkage with numerous Priority 1 and 2 streams. **It should be noted that the map in this figure and Figure 7 on the following page show Sonoma Developmental Center land between Arnold Drive and State Route 12 as "Protected Lands." Although the SDC lands are publicly owned, they are NOT protected from development and fragmentation.**

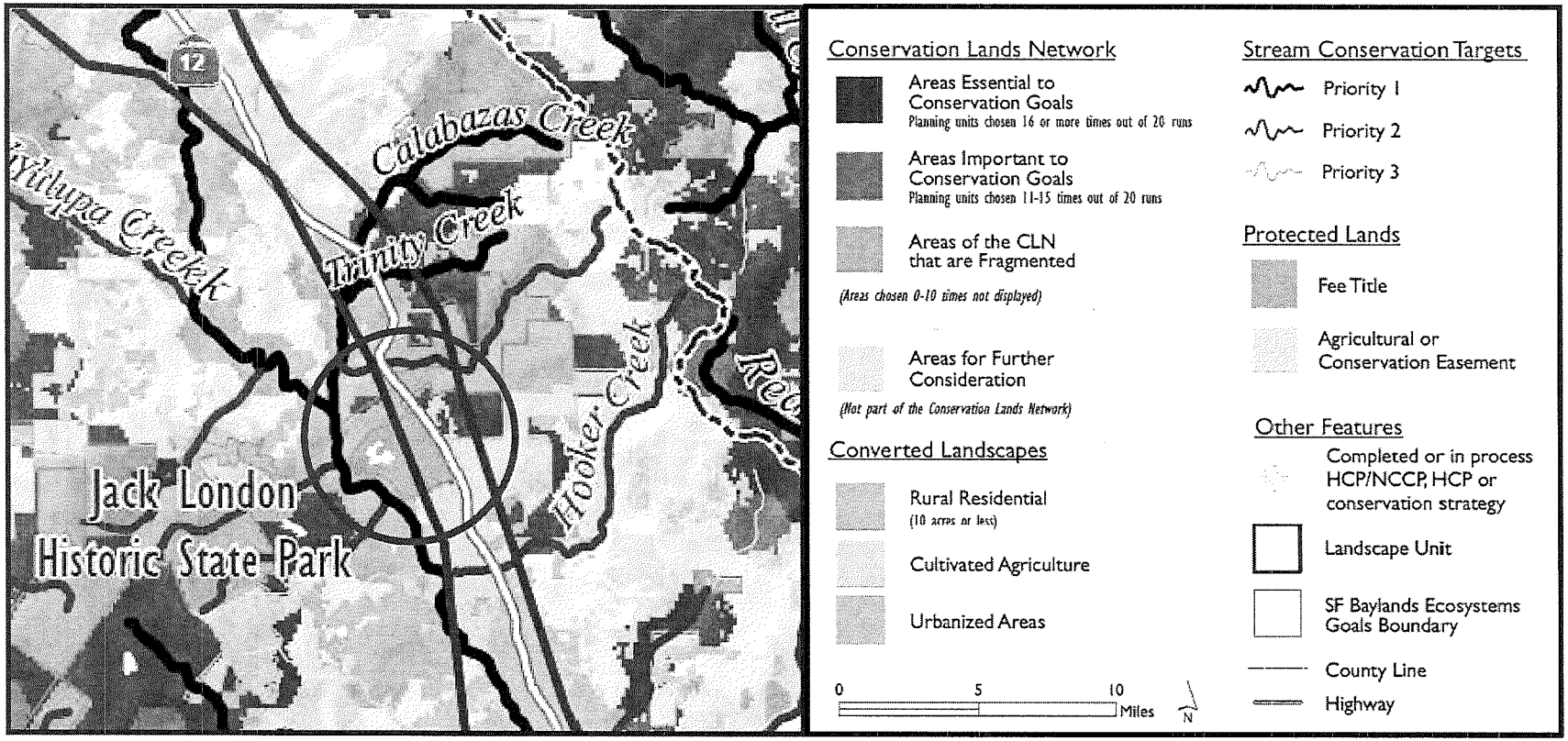
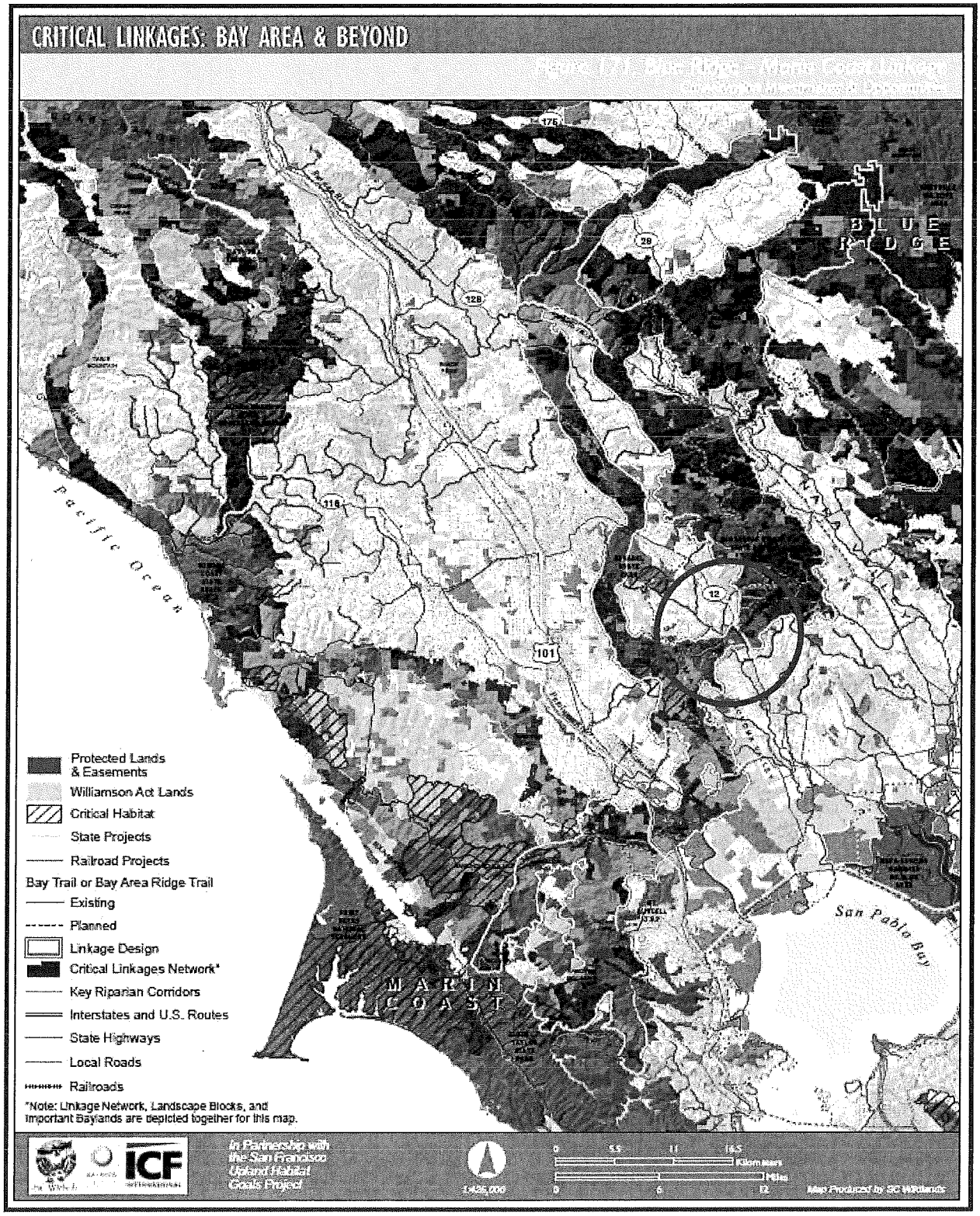


Figure 7. Blue Ridge to Marin Coast Linkage. The Sonoma Valley Wildlife Corridor is highlighted by the red circle.



requirements of mountain lion and badger, but is presumed to be suitable for most species known in the region such as spotted owl, pileated woodpecker, acorn woodpecker, kingsnake, western toad, yellow-legged frog, and long-eared myotis.

3.2 Mayacamas Connectivity Report

In 2010, the Sonoma County Agricultural Preservation and Open Space District commissioned Adina Merenlender, PhD, and her students at the University of California Berkeley to identify and prioritize linkages within the Mayacamas Mountains and among neighboring habitat patches. Unlike the least-cost corridor approach used by Bay Area Critical Linkages that overlays focal species corridors to delineate a linkage, the project team estimated permeability in a continuous manner for the entire mixed oak woodland community found in the study area. This approach, termed a "biologically-informed structural habitat connectivity model," considers the landscape structure, particularly the built environment consisting of buildings and roads, in evaluating habitat suitability and connectivity for communities of species.

The project first identified habitat patches with a minimum size greater than or equal to 4 hectares, then conducted a permeability analysis utilizing distance to nearest road, parcel size, and median patch size. Expected carnivore and bird responses to the three permeability metrics were used to create landscape response models that were then combined to create permeability (or combined cost) layers to estimate a continuous surface of travel cost between habitat patches where cost is determined by distance and habitat permeability. Figure 8 is the continuous map resulting from the combined permeability layers and the SVWC is denoted by the red circle. The permeability layers were used to identify least-cost pathways between existing protected layers using FunConn, an ArcGIS program.

This modeling exercise identified the Corridor as an important connection between Sonoma Mountain and the Mayacamas Mountains, and also highlighted the strong threat to the Corridor from vineyard development.

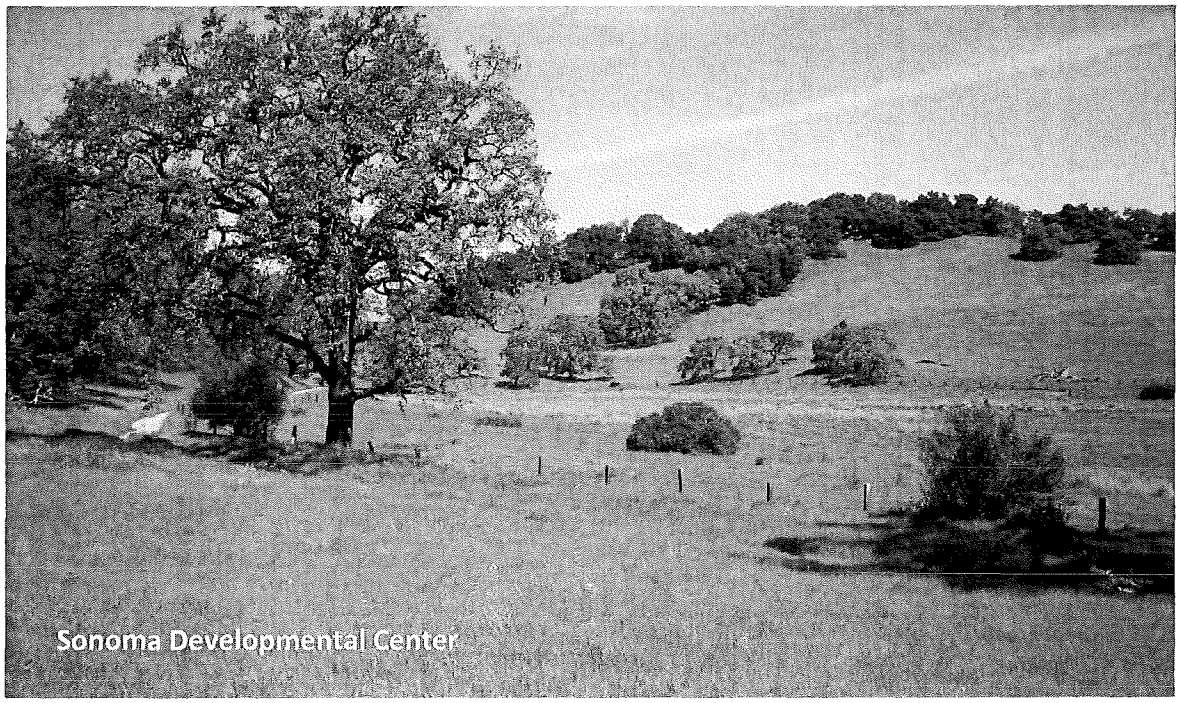
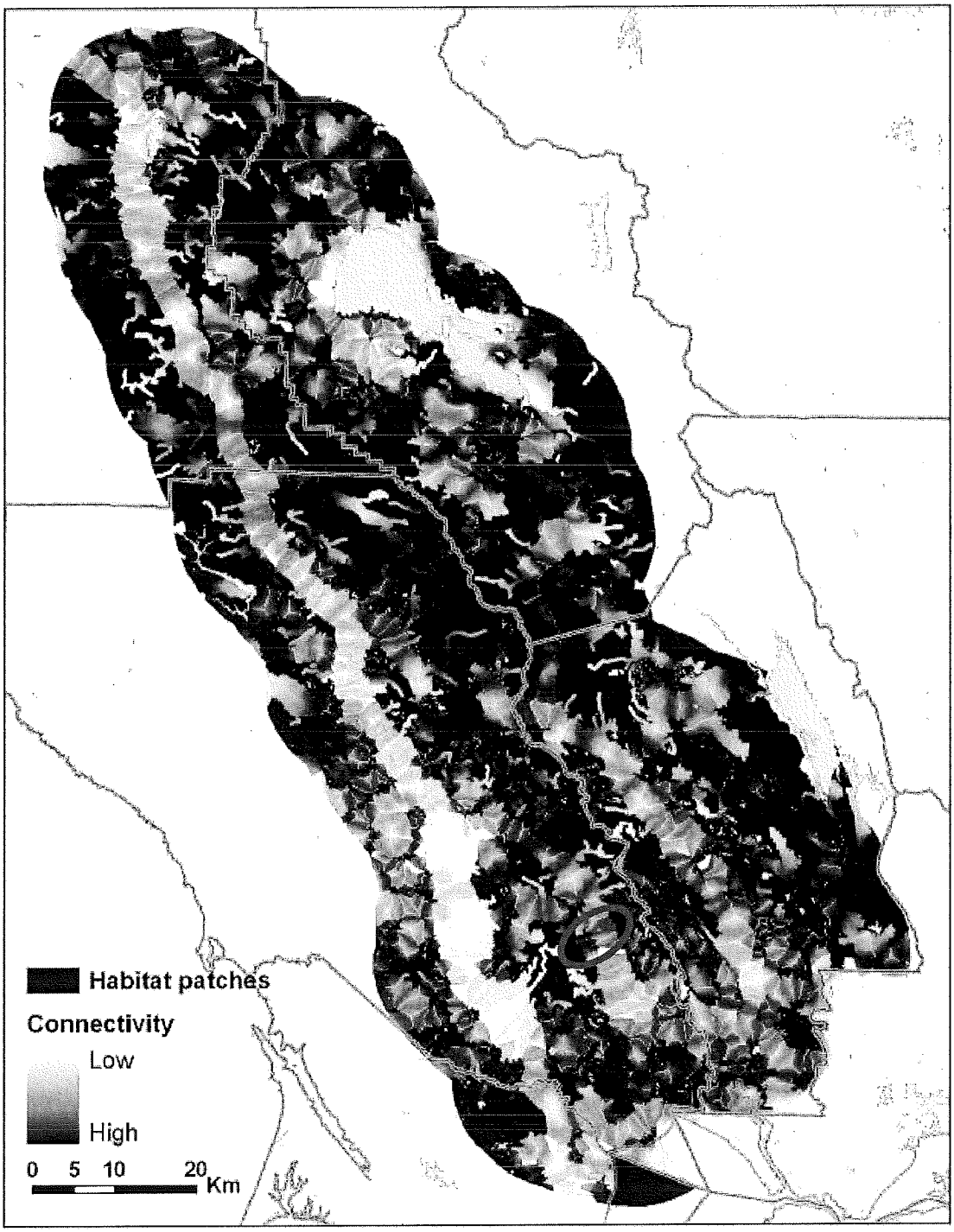


Figure 8. Mayacamas Connectivity report results. The continuous map of permeability shows the areas with low connectivity in yellow and increasing connectivity in green to dark blue. The approximate location of Sonoma Valley Wildlife Corridor is identified by the red circle.



3.3 Sonoma County General Plan 2020

Completed in 2010, the Sonoma County General Plan 2020 update was the first plan to designate the area around Glen Ellen as a Habitat Connectivity Corridor. The area designated in the General Plan (Figure 9) encompasses roughly the same lands included in the Sonoma Valley Wildlife Corridor Project.

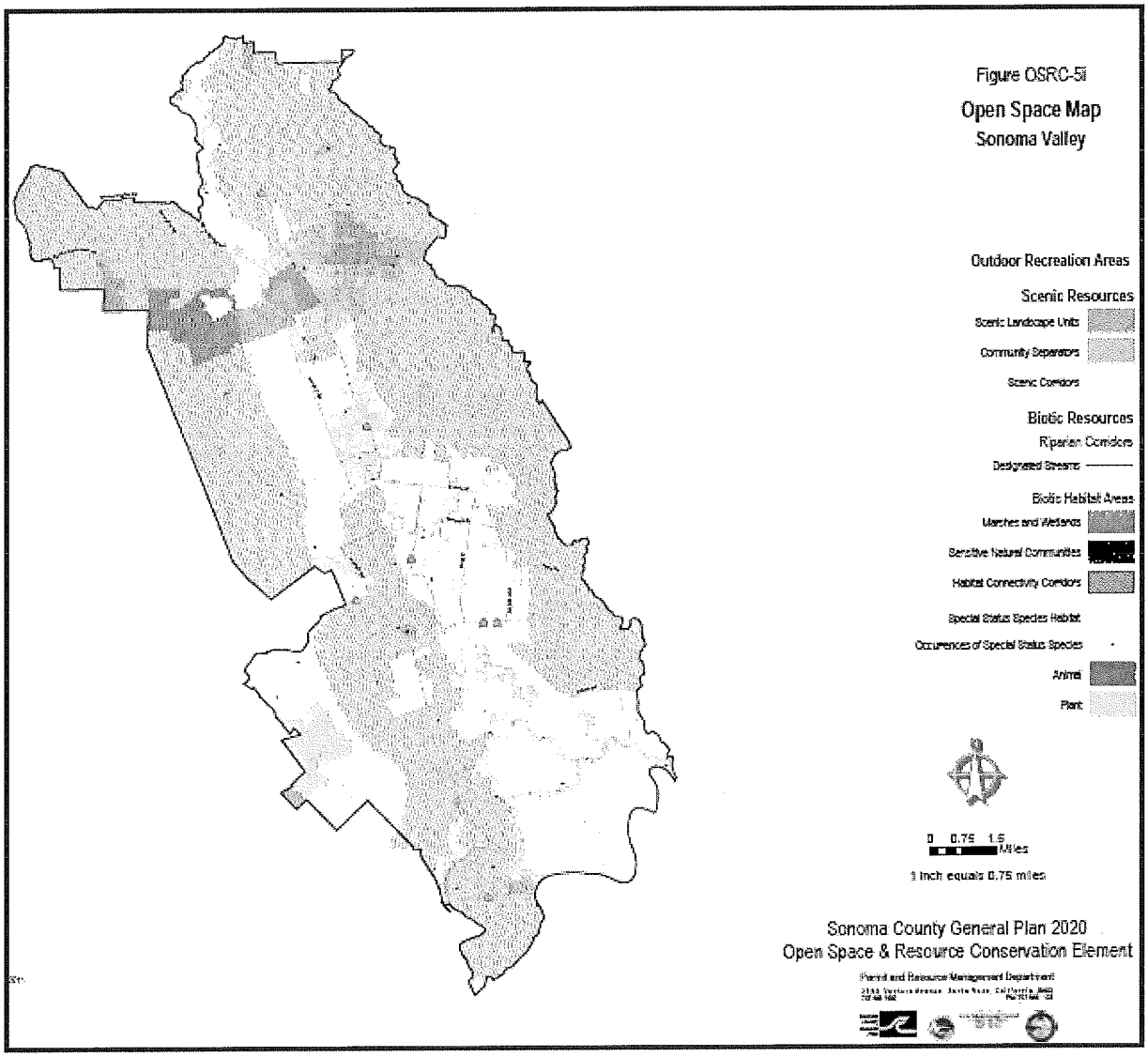
The General Plan goal for Habitat Connectivity Corridors is to protect the county's natural habitats and diverse plant and animal communities. Objectives to support that goal include maintaining connectivity, establishing guidelines for protecting these areas, and encouraging voluntary restoration and enhancement efforts. The plan further recommends that Habitat Connectivity Corridors be rezoned as Biotic Habitat Areas and an ordinance be developed that encourages property owners to consult with California Department of Fish and Wildlife, install wildlife friendly fencing, and provide for roadway undercrossings that allow for the movement of wildlife. Efforts are underway at Sonoma County Planning and Resource Management Department to develop a riparian corridor ordinance that may be followed by a biotic habitat ordinance (Lyle pers. comm. March 2014). These objectives give the Project partners new regulatory tools to protect the integrity of the corridor when new construction is proposed on parcels within the Corridor.

3.4 Additional Studies and Plans

Several other studies were done prior to the Conservation Lands Network, Bay Area Critical Linkages, and Mayacamas Connectivity Study. One of the earliest studies is Dr. Jodi Hilty's dissertation work that included a 1998 pilot study using cameras at three undercrossings in Sonoma Valley to determine which species, if any, utilize the structures to safely pass under Highway 12 and Arnold Drive. Shortly thereafter, the state contemplated the sale of 500+ acres of the Sonoma Developmental Center (SDC) and commissioned LSA Associates, Inc. to complete the May 2001 Land Use Feasibility Study (LUFS) and April 2003 Upper Watershed Land Use Alternatives Study to evaluate the best disposition of these lands. The outcome was the 1999 sale of a 290-acre conservation easement to the Sonoma County Agricultural Preservation and Open Space District and the transfer of 250 acres to Jack London State Historic Park in 2003. The LUFS also includes the findings of the biological surveys LSA conducted. Dr. Hilty's and LSA's survey results are included Chapter 4 Existing Conditions.

In 2003, Sonoma Ecology Center completed a study of the Corridor entitled "Wildlife Use and Habitat Connectivity on Private Lands in the Sonoma Valley Habitat Corridor Study." The study focused on private lands on both sides of State Route 12 and included the private lands between Bouverie Preserve and Oak Hill Farm. After reviewing 20 properties (including Bouverie Preserve, Oak Hill Farm, SDC, Sonoma Valley Regional Park, Rector, and Curreri), the report listed fencing, vineyards, houses with garden areas and limited safe crossings of State Route 12 as the main barriers to wildlife passage.

Figure 9. Sonoma County General Plan 2020 Open Space Map for Sonoma Valley. The Habitat Connectivity Corridor is designated by cross-hatching in the northern region of the Sonoma Valley planning unit.



CHAPTER

4 Existing Conditions

The Sonoma Valley Wildlife Corridor (Corridor) consists of approximately 10,000 acres that span an elevation gradient of approximately 2,080 feet. Just over half of that acreage has been conserved by public agencies and conservation non-profit organizations. This chapter documents the current status of conserved land, land uses, roads and associated undercrossing structures, and vegetation communities and wildlife populations based on existing data and studies commissioned by Sonoma Land Trust for key Corridor properties.

4.1 Conserved Lands in the Sonoma Valley Wildlife Corridor

The importance of the Sonoma Valley Wildlife Corridor is evidenced by the 5,058 acres of lands already conserved in the linkage. Sonoma Land Trust (SLT) has been active in the Corridor for many years protecting just under 1,400 acres to date by acquiring fee title and conservation easements. The Sonoma County Agricultural Preservation and Open Space District, Sonoma County Regional Parks, Audubon Canyon Ranch, and California State Parks all own property within the Corridor. The table in Figure 10 lists conserved properties as well as key parcels proposed for conservation.

The 935-acre Sonoma Developmental Center (SDC) is a state-owned facility in the heart of the Corridor and is the largest property within the narrowest section of the linkage. Permanently conserving the ~750 acres of wildlands that surround SDC's cluster of buildings and streets on the valley floor is pivotal to maintaining the permeability of the Corridor. Increasing costs and a dwindling residential client base have the State of California considering alternative uses for the property. A consortium of local government representatives, non-profit groups including SLT and Sonoma Ecology Center, advocates for current SDC residents, and community members have initiated a site assessment and planning process to assure continued services for the developmentally disabled, permanent protection of the wildlands, and increased opportunity for low-intensity recreation that is compatible with corridor function.

4.2 Land Uses in the Sonoma Valley Wildlife Corridor

The majority of the development in and around the Sonoma Valley Wildlife Corridor is found on the valley floor. Figure 11 illustrates the diversity of land uses creating a patchwork of variously-sized rural residential parcels with homes, barns, and outbuildings; private agricultural lands; and protected agricultural, park, and wildlands. These developments have constrained the Corridor in the area bounded by Arnold Drive and State Highway 12 just south of the small town of Glen Ellen creating a chokepoint in the Corridor. With the exception of Oak Hill Farm, most of the agricultural lands are in vineyards including approximately 290 acres located within the chokepoint.

Figure 11 also illustrates the significance of the SDC property to maintaining the integrity of the Corridor. At 935 acres, SDC is the largest property situated within the Corridor's chokepoint. The SDC core campus, occupying roughly 200 acres, consists of numerous buildings and is surrounded by open space and relatively undisturbed wildlands rising west toward Sonoma Mountain. Roughly 100 acres on the northeast side, including Suttonfield Reservoir, adjoin Sonoma Valley Regional Park and have recreational trails connecting to the park. Suttonfield and Fern Lake Reservoirs are on the SDC property and provide water for the facility.

Protected Lands	
Sonoma Land Trust - Fee Ownership	**Acreage**
Glen Oaks Ranch	234
Metallinos	40
Stuart Creek Hill	14
Secret Pasture	300
Stuart Creek Run	4
Sonoma Land Trust - Easement	
Oak Hill Farm	700
Elarra	60
Happ	10
Other Protected Lands - Fee Ownership	
Audubon Canyon Ranch - Bouverie Preserve	535
California State Parks - Jack London State	1,461
Sonoma County Agricultural Preservation & Open Space District - Sonoma Mountain	302
Sonoma County Regional Parks - Sonoma Valley Regional Park	162
Sonoma Mountain Ranch Preservation Foundation	632
Other Protected Lands - Easement	
Sonoma County Agricultural Preservation & Open Space District - various easements	570
TOTAL Protected	5,024

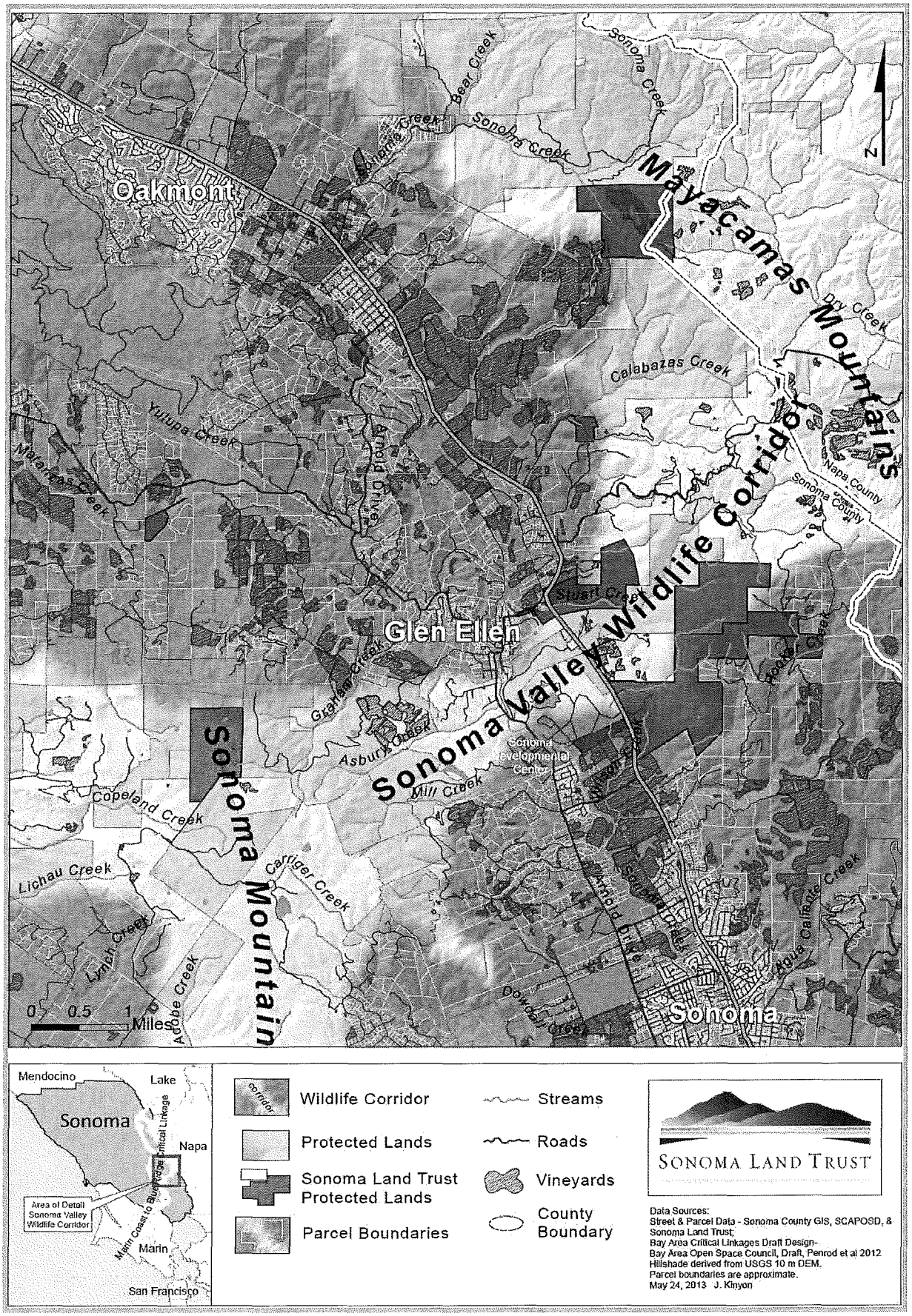
Lands Proposed for Protection	
Sonoma Land Trust - Fee Ownership	**Acreage**
Curreri	37
Sonoma Land Trust - Landowner Agreement	
Johnson	9
Rector	14
Sonoma Developmental Center	935
TOTAL Proposed	995

Figure 10. Sonoma Valley Wildlife Corridor protected lands and lands proposed for protection.

Lands Proposed for Protection	
Sonoma Land Trust - Fee Ownership	**Acreage**
Curreri	37
Sonoma Land Trust - Landowner Agreement	
Johnson	9
Rector	14
Sonoma Developmental Center	935
TOTAL Proposed	995

A few hundred acres of conserved lands in the Corridor are used for recreational and environmental education purposes. The Sonoma Valley Regional Park and the adjoining SDC property have numerous trails around the reservoir and into the oak-studded hills that are used regularly by hikers. Sonoma County Regional Parks staff estimate usage for the fiscal years 2011-2012 and 2012-2013 at 225,000 and 230,500 visitors, respectively (Tam pers. comm. April 2014). Although dogs are allowed on leash only, many visitors allow their dogs to run off leash which may be impacting wildlife use of the Corridor (Tam pers. comm. April 2014). Other recreational uses include trails at Jack London State Park and school-sponsored field trips that bring approximately 4,000 children to Audubon Canyon Ranch's Bouverie Preserve each year.

Figure 11. Land uses in the Sonoma Valley Wildlife Corridor. Vineyard development, shown in purple, has contributed to the constriction of the Corridor.



4.3 Roads and Undercrossings in the Sonoma Valley Wildlife Corridor

The Corridor has a relatively low density of roadways, but those that exist may pose challenges for wildlife permeability. State Route 12 and Arnold Drive are the two main roads bisecting the Corridor and may pose an impediment to safe wildlife movement. These two busy roads run parallel to one another on the valley floor until they converge just north of Glen Ellen (Figures 11 and 12). State Route 12 is the busier of the two and according to Caltrans' *2012 Traffic Volumes on California State Highways*, for the stretch of State Route 12 between Arnold Drive south to Madrone Road, the Annual Average Daily Traffic Volume[1] falls between 13,300 and 15,400 vehicles during peak hours. In addition to these main arteries, the Corridor has many two lane roads and driveways serving residences and businesses that may also be an impediment to wildlife movement.

Twenty one culvert or bridge undercrossings that may provide safe passage for wildlife have been identified along State Route 12 and Arnold Drive within and just outside of the Corridor. Five of the twenty one undercrossings are bridges and the remainder are concrete box culverts. Figure 12 shows the undercrossing locations with numbers corresponding to descriptions of each in Figure 13. The majority of the undercrossing structures appear to be aging and in deteriorating condition, but this has not been confirmed by the transportation agencies.

Very little data is available on species use of these undercrossings to safely traverse the roads with the exception of the track plate and remote-triggered camera data collected by then-graduate student Dr. Jodi Hilty in 1998 (Hilty and Merenlender 2002). Dr. Hilty's study evaluated wildlife use of two undercrossings: the large bridge over Whitman Creek (#18 in Figures 12 and 13) and a small box culvert adjacent to SDC lands, but it is not clear which culvert (personal communication, Caitlin Cornwall). Forty three animals were photographed passing under the Whitman Creek bridge including mule deer, western gray squirrel, striped skunk, opossum, raccoon, and domestic cat. Only a raccoon was photographed using the smaller culvert.

Roadkill data can indicate whether roads pose a particular challenge to certain species and identify mortality hot-spots, but there is very little data available for Sonoma Valley. The California Roadkill Observation System or CROS, operated by the UC Davis Road Ecology Center, captures roadkill data entered by volunteers, but no records were found within the Corridor. Two observations were recorded further north on State Route 12 near Annadel State Park. A bobcat was hit on May 26, 2013, and in the same vicinity, a northern river otter was reported on February 2, 2014. A search for records from the California Highway Patrol and Caltrans did not yield any roadkill data.

[1] Annual average daily traffic is the total volume for the year divided by 365 days. The traffic count year is from October 1st through September 30th.

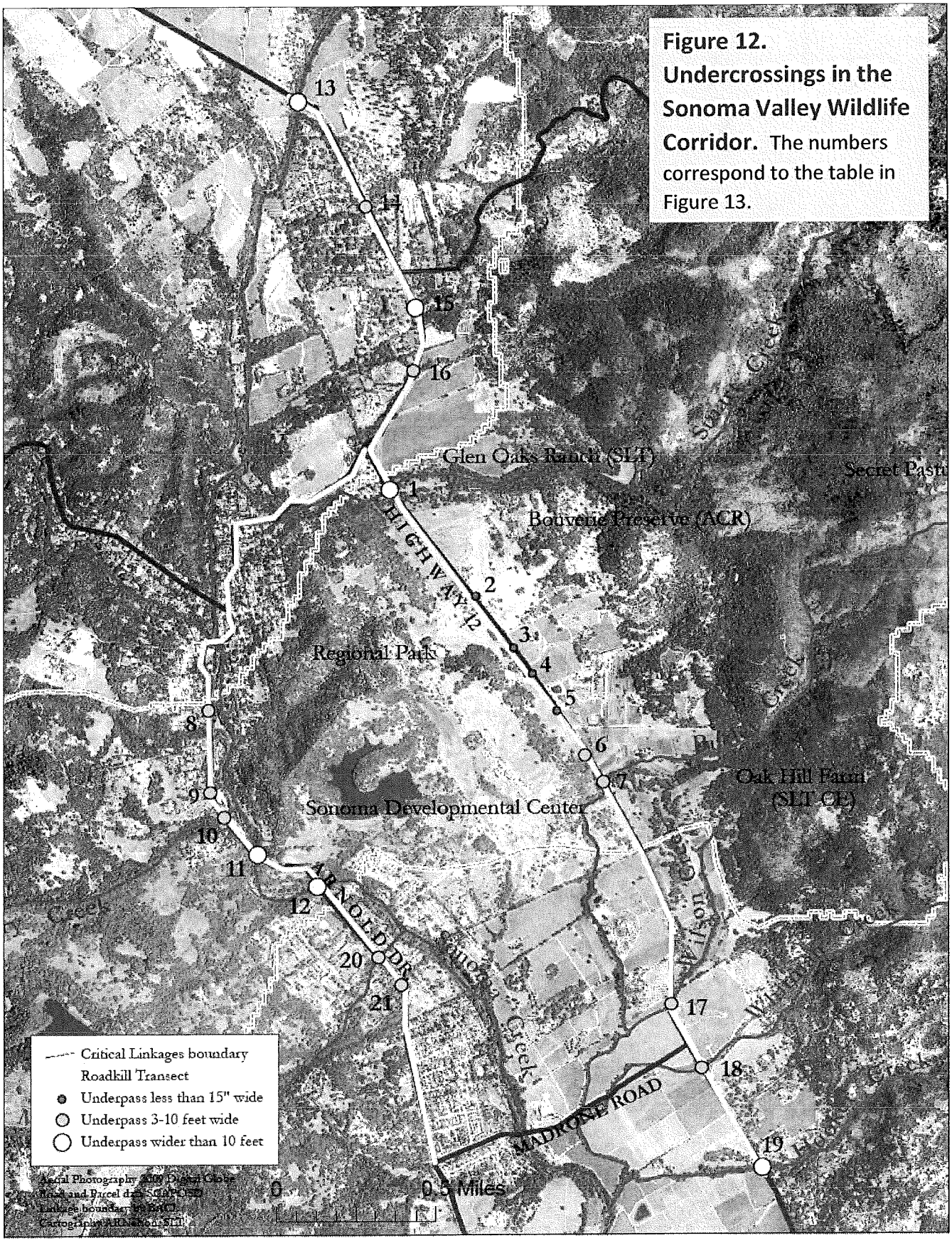


Figure 12. Undercrossings in the Sonoma Valley Wildlife Corridor. The numbers correspond to the table in Figure 13.
13
14
15
16
1
2
3
4
5
6
7
8
9
10
11
12
20
21
17
18
19
Glen Oaks Ranch (SLT)
Bouverie Preserve (ACR)
Regional Park
Sonoma Developmental Center
Oak Hill Farm (SLT CE)
Secret Pasture
HIGHWAY 12
ARNOLD DR
MADRONE ROAD
Sonoma Creek
Critical Linkages boundary
Roadkill Transect
Underpass less than 15" wide
Underpass 3-10 feet wide
Underpass wider than 10 feet
0
0.5 Miles

Figure 13. Table of Sonoma Valley Wildlife Corridor Undercrossings. The crossing numbers correspond to the map in Figure 12. All of the undercrossings are concrete.

Crossing #	Crossing Type	Undercrossing Name	Undercrossing Dimensions (measured from current levels of ceiling and bottom)	Location
Within the Sonoma Valley Wildlife Corridor				
State Route 12				
1	bridge	Stuart Creek	7' high by 25' wide	Glen Oaks Ranch
2	culvert	no name	8" high by 15" wide	Bouverie Preserve
3	culvert	no name	8" high by 15" wide	private
4	culvert	no name	15" high by 15" wide	private
5	culvert	no name	15" high by 15" wide	private
6	culvert	North Butler Creek	4' high by 8' wide	Oak Hill Farm on east side, Sonoma Developmental Center on west side
7	culvert	South Butler Creek	5' high by 6' wide	Oak Hill Farm
Arnold Drive				
8	culvert	Kohler Creek	6' high by 5' wide	private
9	culvert	Jack London Village (no creek name)	4' high by 4' wide	private
10	culvert	Asbury Creek	5' high by 3' wide	private
11	bridge	Sonoma Creek North	15' high by 40' wide	Sonoma Developmental Center
12	bridge	Sonoma Creek South	20' high by 60' wide	Sonoma Developmental Center
Outside the Sonoma Valley Wildlife Corridor				
State Route 12				
13	bridge	Calabazas Creek	20' high by 75' wide	private
14	culvert	unnamed Calabazas Creek Tributary 1	6' high by 7' wide	private
15	culvert	Horse Farm (no creek name)	8' high by 15' wide	private
16	culvert	unnamed Calabazas Creek Tributary 2	8' high by 6' wide	private
17	culvert	Wilson Creek	4' high by 7' wide	private
18	culvert	Whitman Creek	6' high by 5' wide	private
19	bridge	Hooker Creek	10' by 20' wide	private
Arnold Drive				
20	culvert	Mill Creek	5' high by 8' wide	Sonoma Developmental Center
21	culvert	unnamed tributary to Mill Creek	none listed	Sonoma Developmental Center

4.4 Wildlife Habitat of the Sonoma Valley Wildlife Corridor

Wildlife observed in the Corridor include deer, mountain lion, coyote, bobcat, and black bear (spotted in Glen Ellen in 2009). In order to gain a better understanding of wildlife living in and using the Corridor, Sonoma Land Trust commissioned a wildlife biologist with Prunuske Chatham, Inc. (PCI) in February 2013 to characterize biological communities found on three Corridor properties, develop wildlife species composition lists, and determine if suitable habitat for special-status animal species is present. The properties evaluated were Stuart Creek Hill (14 acres) and Curreri (37 acres) on the valley floor within the chokepoint, and Metallinos (40 acres) higher up in the Mayacamas. SLT owns Stuart Creek Hill and Metallinos, and is under contract to purchase 29 acres of Curreri and transfer it to Sonoma County Regional Parks in late 2014. A brief summary of the PCI report is presented here, an abbreviated list of species observed or with the potential to occur is included at the end of this chapter as Figure 18, and the full report is available from SLT.

The report describes six California Wildlife Habitat Relationships (CWHR) plant communities occurring on the three properties – oak woodlands, grassland, evergreen forest, chaparral, riparian woodland and stream channel, and freshwater emergent and seasonal wetland. Special-status species occurrence data was drawn from the California Natural Diversity Database (CNDDB). The report evaluates the condition of each habitat type for the three properties. The results of the CWHR habitat type assessment are summarized in Figure 14.

Oak woodland habitat on Curreri and Stuart Creek Hill is in good condition and has the structural diversity necessary to support diverse wildlife communities. The grassland communities found on Curreri and Stuart Creek Hill are dominated by non-native plants which have lower value for wildlife, but pockets of native grasses were found. These habitats are common at lower elevations throughout the region. Metallinos, located at higher elevations in the Mayacamas Mountains, supports evergreen forest and chaparral habitats. The evergreen forest on Metallinos is limited in extent, but is in good condition. The chaparral habitat appears to be relatively undisturbed and in good condition displaying structural diversity.

Riparian woodland and stream channel habitats are found on Stuart Creek Hill where Stuart Creek crosses the property, and on a small unnamed Stuart Creek tributary on Metallinos. The riparian habitats on Stuart Creek Hill are only in fair condition due to surrounding development, and those occurring on Metallinos were not observed. Lastly, freshwater emergent and seasonal wetland habitats are only found on the Curreri property at the man-made pond and a swale located at the property's lower elevations. The habitat provided by the pond is in good condition supporting a diversity of waterfowl, amphibians and invertebrates. The wetland associated with the swale could not be assessed due to a low rainfall winter.

The report concludes that the properties surveyed have the potential to support a wide variety and abundance of wildlife species due to the diverse mixture of habitats that offers nesting habitat, food, shelter and movement corridors for native species. The author noted that in just one day of field surveys, five mammals, 36 bird species, one reptile and one amphibian were observed. Extrapolating from this report, it is assumed that most of the species observed or listed as likely to occur will be found in similar habitats throughout the Corridor.

Another source of wildlife data is the 2001 Land Use Feasibility Study completed on approximately 477 acres of the SDC property by LSA Associates, Inc., in June and July 2000. The primary focus of the survey was to determine whether northern spotted owls, nesting hawks and owls, and California red- and yellow-legged frogs occupied the area and if there was suitable habitat for these species. The biologists

also recorded species they observed during their surveys and these are noted in the table in Figure 18 at the end of this chapter. Another column lists the special status species that may be found on or in the vicinity of the property as indicated by occurrence records in the California Natural Diversity Database (CNDDB).

Figure 14. Vegetation types and habitat condition of the properties in the Prunuske Chatham, Inc., Wildlife Corridor Assessment (February 2013).

CWHR Habitat Type	Curreri	Stuart Creek Hill	Metallinos	Habitat Condition
oak woodland	X	X		good, structurally diverse with low-growing herbaceous layers
grassland	X	X		fair, dominated by non-native plants, some of which are invasive
evergreen forest			X	good, structurally diverse
chaparral			X	good, near diversity of habitats
riparian woodland & stream channel		X	X	fair due to past land use practices and development on right bank of Stuart Creek Hill – not observed on Metallinos
freshwater emergent & seasonal wetland	X			good

4.5 Vegetation in the Sonoma Valley Wildlife Corridor

Sonoma Land Trust engaged botanist Peter Warner to conduct vegetation surveys and map vegetation types on Curreri, Stuart Creek Hill, Secret Pasture/Metallinos and Glen Oaks Ranch. The surveys were conducted between February and April 2013. While all properties in the Corridor could not be surveyed, these properties represent a transect across elevations and land uses that offer a general description of the types and conditions of vegetation occurring in the Corridor. Curreri and Stuart Creek Hill both front the west side of State Route 12 in the valley bottom, rising from an elevation of 290 feet near the highway up to about 490 feet towards Sonoma Mountain to the west. Glen Oaks Ranch borders State Route 12 along its eastern boundary and rises to 850 feet in the lower Mayacamas. Secret Pasture/Metallinos includes lower elevations in creek canyons and rises further into the upper Mayacamas east of Glen Oaks up to 1,950 feet.

For each property, Mr. Warner created a hand-drawn vegetation map, described vegetation alliance presence and condition, documented observed and potential rare plants, and indicated occurrences of non-native plants of concern. The Manual of California Vegetation (Sawyer *et al.* 2009) was used to identify vegetation alliances. Brief summaries of Mr. Warner's findings are included here, and the complete reports, property vegetation maps, and tables of observed and potential vegetation and plants are available from SLT.

Vegetation Alliances

Mr. Warner documented 18 vegetation alliances and six potential alliances on the four properties surveyed, with patterns of dominance and presence generally occurring along elevational gradients. A

few of the observed alliances have restricted ranges, such as the mosquito fern mats found only at the Curreri pond and the narrow band of white alder (*Alnus rhombifolia*) at Glen Oaks Ranch, but most are well-represented throughout the region. While not all of the alliances are detailed here, all are important elements of wildlife habitat diversity and collectively provide the matrix where wildlife can live and move through safely.

Unlike other alliances, grasslands are not limited to certain elevations, occurring from the valley bottom to the higher slopes of Secret Pasture/Metallinos, particularly where land has been cleared for agriculture and livestock grazing has occurred. Large areas of non-native grassland dominated by wild oats (*Avena* spp.) and bromes (*Bromus* spp.) as well as fields of perennial ryegrass (*Lolium perenne*), as found on Curreri, are common on the valley floor, and occur in patches of various size through mid-elevations as at Secret Pasture/Metallinos. Grassland is a dominant cover type on Sonoma Mountain, but becomes less prominent with fewer and smaller patches in the upper Mayacamas. Species constituting these grasslands also dominate the understory of nearby blue oak woodlands.

While individual valley oaks (*Quercus lobata*) are scattered along the valley's lower elevations, particularly older gallery trees, valley oak woodland is largely restricted to the lower portions of creeks and nearby floodplains, as seen along Stuart Creek. South of Stuart Creek on Glen Oaks Ranch, the oak woodland is well-developed with multiple age-classes while north of the creek, near the farmstead and more intensive human activities, it is comprised of relatively few very large trees with a grass understory and no recruitment.

Blue oak (*Quercus douglasii*) woodlands occur on low, rolling hills as exemplified at Stuart Creek Hill and Glen Oaks Ranch. Canopies range from almost fully closed to open with mostly grass understories. Blue oak recruitment is not extensive, though young trees are found in some limited areas. Contiguous with blue oak woodlands are small stands of Oregon white oak (*Quercus garryana*) with some hybridization evident.

Coast live oak (*Quercus agrifolia*) woodlands occur mainly on upper alluvial terraces at mid-elevations, though coast live oak has a broader presence and grades into most of the other upland woodland types as a lesser component. This woodland is defined by the relative dominance of coast live oak and includes blue oak, California bay (*Umbellularia californica*), manzanita (*Arctostaphylos* spp.), madrone (*Arbutus menziesii*), knobcone pine (*Pinus attenuata*), and chaparral species. Manzanita shrubland is a less common vegetation type of mid-elevations. A small remnant stand occurs on Curreri. California bay forest occurs as stands within other alliances.

Rising above the oak woodlands, chamise (*Adenostoma fasciculatum*) chaparral is common and widespread in upper watersheds of the Mayacamas, dominating rocky, shallow soils and slopes and plateaus with south and west facing exposures. It is less common on the east slopes of Sonoma Mountain. Several other shrub species grow along the margins of chamise-dominated stands, creating a complex mosaic of multiple shrub-dominated alliances. Knobcone pine forest prefers high slopes and ridges to the northeast in the Mayacamas at Secret Pasture/Metallinos. Associated trees include madrone, California bay, coast live oak, and Douglas-fir (*Pseudotsuga menziesii*). Madrone forest also occurs on north and east facing slopes in upper creek tributaries.

Riparian vegetation occupies creeksides and proximal zones influenced by greater water availability than surrounding upland areas. Within the Corridor, most of the alliances described above occur along the major creeks and waterways. In upper watersheds, as observed on Glen Oaks Ranch and Secret Pasture/Metallinos, riparian vegetation is well-developed with mature canopies and diverse shrub, forb, and grass understories. Approaching the valley bottom and floodplains, where human uses are more

prevalent, riparian vegetation narrows and becomes less dense and diverse. Yet even here, bands of mature trees and vegetation remain and provide cover for passing wildlife, albeit of diminished value and safety.

Rare Plants

Prior to conducting surveys, Mr. Warner compiled a list of rare plant species that could possibly be found in the Corridor region. While none were found on Curreri or Stuart Creek Hill, suitable habitat was observed for 19 rare plant species. Twelve are wetland species that could potentially occupy vernally wet swales on the Curreri property adjacent to and immediately west of State Route 12. A total of six rare plants were observed on Glen Oaks Ranch and Secret Pasture/Metallinos and are listed in Figure 15.

Non-native Invasive Plants

Invasive plant species in the Corridor are more varied and extensive in lower areas where human activities are concentrated. Eleven non-native invasive plants, as defined by the California Invasive Plant Council, common to the region were documented on or immediately adjacent to the Curreri, Stuart Creek Hill, and Glen Oaks Ranch properties: French broom (*Genista monspessulana*), Spanish broom (*Spartium junceum*), oblong spurge (*Euphorbia oblongata*), English ivy (*Hedera helix*), periwinkle (*Vinca major*), Italian thistle (*Carduus pycnocephalus*), yellow starthistle (*Centauria solstitialis*), Armenian blackberry (*Rubus armeniacus*), Klamath weed (*Hypericum perforatum*), and scattered individuals or small stands of Tasmanian bluegum (*Eucalyptus globulus*) and cherry plum (*Prunus cerasifera*). Most of these weeds occur primarily along Stuart Creek and as a component of oak woodland understories. While some are found as scattered individuals, many are locally dense, particularly blackberry, and threaten to displace significant areas of native plant cover.

Upper elevations within the Corridor exhibit fewer weed species, though they can be equally invasive. Five invasive species were found on Secret Pasture/Metallinos. Yellow starthistle covers approximately ten acres of open grassland habitat, and Armenian blackberry grows densely along portions of creek channels. Tasmanian bluegum, Klamath weed, and cherry plum also occur here in small amounts but may increase in extent.

Figure 15. Rare plants observed on Secret Pasture, Metallinos, and Glen Oaks Ranch. No rare plants were observed on Curreri or Stuart Creek Hill.

Plant	CRPR*	Glen Oaks Ranch	Secret Pasture/ Metallinos	Approximate Location
Napa false-indigo *(Amorpha californica* ssp. *Napensis)*	CRPR 1B.2	X		A single plant was found on an alluvial terrace north of the Stuart Creek corridor.
Sonoma ceanothus *(Ceanothus sonomensis)*	CRPR 1B.2	X	X	At least 50 individual plants of this shrub species were found growing in the chamise chaparral and knobcone pine woodland on **Glen Oaks Ranch**. One shrub was observed immediately along the main trail through **Secret Pasture/Metallinos**, and at least two others along the trail through chaparral adjoining the Secret Pasture property and the Oak Hill Farm property. Other individuals of this taxon are likely present in these two areas, as well as in adjacent stands of chaparral within and upslope from Butler and Stuart Canyons.
Napa lomatium *(Lomatium repostum)*	CRPR 4.3	X	X	Associated with the knobcone pine forest on **Glen Oaks Ranch**. Along the main trail on **Secret Pasture/Metallinos**, downslope towards Butler Canyon towards the southwest corner of the property.
green monardella *(Monardella viridis)*	CRPR 4.3	X	X	Associated with the knobcone pine forest on **Glen Oaks Ranch**. In chaparral vegetation along the main trail through **Secret Pasture/Metallinos**, and in chaparral across the upper watershed of Butler Canyon. It is expected to be relatively widespread throughout chaparral on the property, and may also grow in knobcone pine and coast live oak woodland.
Sonoma canescent manzanita *(Arctostaphylos canescens* ssp. *Sonomensis)*	CRPR 1B.2		X	Near Cavedale Road.
dark-mouthed triteleia *(Triteleia lugens)*	CRPR 4.3	X		Associated with the knobcone pine forest.

*CRPR stands for California Rare Plant Rank.

4.6 Watersheds and Streams of the Sonoma Valley Wildlife Corridor

Stream riparian corridors are used by many species to travel between habitat areas and thus serve a vital role in the Corridor. Riparian and stream habitat also provide cover and food resources for aquatic and terrestrial species that live within the Corridor. Sonoma Creek, which bisects the Corridor, is a major tributary to San Pablo Bay and one of the county's most significant streams for federally threatened steelhead trout. Stuart Creek, identified as an aquatic linkage in Bay Area Critical Linkages and as a Priority 2 stream in the Conservation Lands Network (CLN), originates in the Mayacamas Mountains and flows through the Corridor into Calabazas Creek that drains to Sonoma Creek.

The Corridor encompasses sections of 14 streams in four watersheds with Sonoma Creek being the largest (Figure 16). Stuart, Calabazas, Carriger and Sonoma Creeks are Priority 1 streams according to the CLN. Priority 1 streams, shown in bold italics, have existing steelhead populations, available rearing habitat, and historic or current coho populations. Priority 2 streams have smaller steelhead runs, land-locked rainbow trout populations and/or other healthy assemblages of native fish.

Figure 16. Streams within the Sonoma Valley Wildlife Corridor. Priority rankings are from the Conservation Lands Network (CLN). Creeks shown in ***bold italics*** are Anchor Watersheds as delineated in Becker *et al.* 2007.

Stream	CLN Priority
Laguna de Santa Rosa Watershed	
Copeland Creek	3
Petaluma River Watershed	
Upper Lichau Creek	2
Santa Rosa Creek Watershed	
South Fork Matanzas Creek	3
Sonoma Creek Watershed	
Asbury Creek	2
Butler Creek	3
Upper Calabazas Creek	***1***
Upper Carriger Creek	***1***
Upper Hooker Creek	2
Mill Creek	2
Sonoma Creek	***1***
Stuart Creek	2
Upper Whitman Creek	3
Upper Wilson Creek	3

The table in Figure 17 is excerpted from the CLN final report and was compiled by Rob Leidy, PhD, fisheries biologist for the US Environmental Protection Agency. The table provides detailed information about each stream including fish species present and recommended conservation actions. According to Becker *et al.* 2007, the mainstem of Sonoma Creek, Calabazas, and Carriger Creeks are considered "Anchor Watersheds" which means they have the highest probability of restoring steelhead populations if protected and restored and are critical to the conservation of regional steelhead populations. This determination was based on the presence of reproducing steelhead populations, and the amount of available rearing habitat. The underlying assumption is that watersheds with the greatest amount of functioning steelhead rearing habitat are most likely to contribute to smolt production, which ultimately strengthens the regional spawning run.

Many creeks within the Corridor have barriers to fish passage as documented in Katopothis *et al.* 2005. Stuart Creek, a major tributary to Sonoma Creek, historically provided significant spawning and rearing habitat for steelhead. The habitat in Stuart Creek is very high quality and over 90% of the anadromous stretch of the creek is permanently protected, but three in-stream barriers have kept steelhead from the upstream reaches for decades. Sonoma Land Trust received grants from the California State Coastal Conservancy and the California Department of Fish and Wildlife Fisheries Restoration Grant Program to

remove or remediate the three barriers, allowing steelhead to once again reach the high-quality spawning and rearing areas. Construction began in the summer of 2014.

Butler Creek on Secret Pasture

Figure 17. Essential Watersheds and Priority Stream Segments for Focused Conservation Actions to Protect Native Fishes (Leidy 2008).

Priority Stream Segment	Target Species / Assemblage Present AN – anadromous LL – land-locked RA– reservoir anadromy	Notes	Priority Actions
Petaluma River Watershed			
Lichau Creek	rainbow trout (AN?) Sacramento sucker threespine stickleback		1, 2, 3, 4
Sonoma Creek Watershed			
Asbury Creek	rainbow trout (AN)	This is an important steelhead stream.	1, 2, 3, 4
Calabazas Creek, Atwood Ranch upstream to falls	California roach (lower only) rainbow trout (AN) riffle sculpin	This is a critical stream for steelhead production in the Sonoma Creek watershed. This reach is perennial with many seeps and springs maintaining cool water temperatures through summer. The riparian canopy is well-developed. There is a waterfall in the lower canyon that blocks upstream migration of steelhead. Land use is agricultural on lands below the canyon mouth. There is some low density residential land use within the canyon; the upper watershed is largely private open space and grazing.	1, 2, 3, 4
Calabazas Creek, confluence with Sonoma Creek upstream to Atwood Ranch	California roach rainbow trout (AN) riffle sculpin Sacramento pikeminnow Sacramento sucker	The fish assemblage is almost entirely dominated by native fishes. This is a critical stream for steelhead production in the Sonoma Creek watershed, in large part as a migration corridor between Sonoma Creek and the upper watershed. The riparian canopy is well developed. Land use is mostly agricultural with associated low density residential.	1, 2, 3, 4
Carriger Creek	prickly sculpin rainbow trout (AN)	This stream is likely important for steelhead production; its location in the lower watershed may afford survival benefits to migrating fish. The watershed is in ranching and low-density residential land uses.	1, 2, 3, 4
Hooker Creek	rainbow trout (AN?)	This stream appears to support steelhead.	1, 2, 3, 4
Sonoma Creek Mainstem, above waterfall, Sugarloaf Ridge State Park	rainbow trout (LL)	There is an isolated population of rainbow trout above the falls. The upper watershed is almost entirely within Sugarloaf Ridge State Park.	1, 2, 3, 4

Priority Stream Segment	Target Species / Assemblage Present AN – anadromous LL – land-locked RA– reservoir anadromy	Notes	Priority Actions
Sonoma Creek Mainstem, non-tidal	California roach Chinook salmon (AN) Pacific lamprey prickly sculpin rainbow trout (AN) riffle sculpin Sacramento pikeminnow Sacramento sucker threespine stickleback tule perch	This reach is highest priority for the conservation of native fishes.	1, 2, 3, 4
Mill Creek	California roach rainbow trout (AN) riffle sculpin	From its confluence with Sonoma Creek upstream to Hwy 12, Mill Creek supports three native fishes, including steelhead. The culvert at Hwy 12 may continue to be a barrier to upstream migration. The upper watershed is primarily undeveloped open space. The lower watershed flows through the grounds of Sonoma State Hospital.	1, 2, 3, 4
Stuart Creek, above falls	rainbow trout (LL?)	This stream has resident rainbow trout. Land use is private open space.	1, 2, 3, 4
Stuart Creek, mouth to falls	California roach rainbow trout (AN) riffle sculpin	This stream supports steelhead and two other native fishes below the falls.	1, 2, 3, 4

Recommended Priority Actions (1- 5 in Table)

1. Limit additional streamside encroachment by establishing appropriate riparian buffers.
2. Implement channel and riparian restoration measures, including the strategic removal of structures where appropriate.
3. Implement aggressive sediment and/or non-point source pollution control measures.
4. Secure remaining sensitive undeveloped streamside lands through easements and fee acquisition.
5. Investigate seasonal water releases to benefit native fishes, especially rearing and smolting steelhead.

Note: Anchor watersheds and essential streams (after Becker *et al.* 2007) are highlighted in grey.

Figure 18. Wildlife species in the Sonoma Valley Wildlife Corridor. The species lists are taken from the Prunuske Chatham, Inc., Wildlife Composition Assessment and 2001 Sonoma Developmental Center Land Use Feasibility Study (LSA Associates).

Wildlife Composition Assessment, Prunuske Chatham, Inc., April 2013			2001 SDC Land Use Feasibility Assessment on part of SDC Lands	
Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	**COMMON NAME**			
Reptiles				
Actinemys marmorata	Pacific Pond Turtle**	high potential		
Charina bottae	Northern Rubber Boa			
Coluber constrictor mormon	Western Yellow-bellied Racer			
Contia tenuis	Sharp-tailed Snake			
Crotalus oreganus oreganus	Northern Pacific Rattlesnake			
Diadophis punctatus amabilis	Pacific Ring-necked Snake		x	
Elgaria coerulea coerulea	San Francisco Alligator Lizard			
Elgaria multicarinata multicarinata	California Alligator Lizard			
Lampropeltis getula californiae	California Kingsnake			
Pituophis catenifer catenifer	Pacific Gopher Snake			
Plestiodon skiltonianus skiltonianus	Skilton's Skink			
Sceloporus occidentalis bocourtii	**Coast Range Fence Lizard**		x	
Thamnophis atratus	Aquatic Gartersnake			
Thamnophis elegans terrestris	Coast Gartersnake			
Thamnophis sirtalis infernalis	California Red-sided Gartersnake			

This wildlife species list is based on preliminary assessments of habitats occurring on the properties and regional occurrence information for the various taxa. Additional species may occur on the property and some may not be present; however, further assessments and surveys of the sites would be needed to further refine the list.

*denotes non-native species

**Special-status or animal species of interest considered in the evaluation of the Sonoma Valley Wildlife Corridor properties based on the background literature review and field surveys.

Wildlife Composition Assessment, Prunuske Chatham, Inc., April 2013			2001 SDC Land Use Feasibility Assessment on part of SDC Lands	
Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	COMMON NAME			
Amphibians				
Anaxyrus boreas halophilus	California Toad			
Aneides flavipunctatus flavipunctatus	Speckled Black Salamander			
Aneides lugubris	Arboreal Salamander			
Batrachoseps attenuatus	California Slender Salamander		x	
Dicamptodon ensatus	California Giant Salamander			
Ensatina eschscholtzii oregonensis	Oregon Ensatina			
Rana catesbeianus	American Bullfrog*			
Pseudacris sierra	**Sierran Treefrog**			
Rana boylii	Foothill Yellow-legged Frog**	high potential		x
Rana draytonii	California Red-legged Frog**	high potential		x
Taricha granulosa	Rough-skinned Newt			
Taricha torosa	California Newt			

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Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	COMMON NAME			
Mammals				
Antrozous pallidus	Pallid Bat**	high potential		x
Bassariscus astutus	Ringtail			
Canis latrans	Coyote		x	
Corynorhinus townsendii	Townsend's Long-eared Bat			
Didelphis virginiana	Virginia Opossum*			
Dipodomys californicus	California Kangaroo Rat			
Eptesicus fuscus	Big Brown Bat			
Felis rufus	Bobcat			
Lasionycteris noctivagans	Silver-haired Bat			
Lasiurus blossevillii	Western Red Bat			
Lasiurus cinereus	Hoary Bat			
Lepus californicus	Black-tailed Jackrabbit		x	
Mephitis mephitis	Striped Skunk		x	
Microtus californicus	California Vole			
Mustela ermine	Short-tailed Weasel (Ermine)			
Mustela frenata	Long-tailed Weasel			
Myotis californicus	California Myotis			
Myotis evotis	Long-eared Myotis			
Myotis lucifugus	Little Brown Myotis			
Myotis thysanodes	Fringed Myotis			
Neotamias sonomae	Sonoma Chipmunk			
Neotoma fuscipes	**Dusky-footed Woodrat**			

Wildlife Composition Assessment, Prunuske Chatham, Inc., April 2013			2001 SDC Land Use Feasibility Assessment on part of SDC Lands	
Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	COMMON NAME			
Mammals continued				
Puma concolor	Mountain Lion			
Reithrodontomys megalotis	Western Harvest Mouse			
Scapanus latimanus	**Broad-footed Mole**			
Sciurus griseus	**Western Gray Squirrel**		x	
Sorex trowbridgii	Trowbridge's Shrew			
Spermophilus beecheyi	California Ground Squirrel			
Spilogale putorius	Spotted Skunk			
Sylvilagus bachmani	Brush Rabbit			
Thomomys bottae	**Botta's Pocket Gopher**		x	
Urocyon cinereoargenteus	Gray Fox			

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Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	COMMON NAME			
Birds				
Accipiter cooperii	Cooper's Hawk**	high potential	x	
Accipiter striatus	Sharp-shinned Hawk			x
Aegolius acadicus	Northern Saw-whet Owl			
Aeronautes saxatalis	White-throated Swift			
Agelaius phoeniceus	Red-winged Blackbird		x	
Aimophila ruficeps	Rufous-crowned Sparrow			
Aix sponsa	Wood Duck			
Ammodramus savannarum	Grasshopper Sparrow**	high potential		
Anas platyrhynchos	**Mallard**		x	
Aphelocoma californica	**Western Scrub-jay**		x	
Aquila chrysaetos	Golden Eagle**	high potential		x
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron**	high potential	x	
Baeolophus inornatus	**Oak Titmouse**		x	
Bombycilla cedrorum	Cedar Waxwing			
Branta canadensis	Canada Goose			
Bubo virginianus	Great Horned Owl		x	
Bucephala albeola	**Bufflehead**			
Buteo jamaicensis	**Red-tailed Hawk**		x	
Buteo lineatus	**Red-shouldered Hawk**		x	
Callipepla californica	California Quail		x	
Calypte anna	**Anna's Hummingbird**		x	
Carduelis pinus	Pine Siskin			
Carduelis psaltria	Lesser Goldfinch		x	
Carduelis tristis	**American Goldfinch**			
Carpodacus mexicanus	**House Finch**		x	

Wildlife Composition Assessment, Prunuske Chatham, Inc., April 2013			2001 SDC Land Use Feasibility Assessment on part of SDC Lands	
Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	COMMON NAME			
Birds continued				
Carpodacus purpureus	Purple Finch		x	
Cathartes aura	Turkey Vulture		x	
Catharus guttatus	Hermit Thrush			
Certhia americana	Brown Creeper		x	
Ceryle alcyon	Belted Kingfisher			
Chaetura vauxi	Vaux's Swift			
Chamaea fasciata	**Wrentit**		x	
Chondestes grammacus	Lark Sparrow			
Colaptes auratus	**Northern Flicker**		x	
Columba fasciata	Band-tailed Pigeon			
Contopus cooperi	Olive-sided Flycatcher		x	
Contopus sordidulus	Western Wood-pewee			
Corvus brachyrhynchos	**American Crow**		x	
Corvus corax	**Common Raven**		x	
Cyanocitta stelleri	**Steller's Jay**		x	
Cypseloides niger	Black Swift**	low potential		
Dendroica coronata	**Yellow-rumped Warbler**			
Dendroica nigrescens	Black-throated Gray Warbler		x	
Dendroica townsendi	Townsend's Warbler			
Dryocopus pileatus	**Pileated Woodpecker**		x	
Elanus leucurus	White-tailed Kite**	moderate potential	x	
Empidonax difficilis	Pacific-slope Flycatcher			
Euphagus cyanocephalus	Brewer's Blackbird			
Falco columbarius	Merlin			
Falco peregrinus	Peregrine Falcon			x
Falco sparverius	American Kestrel			
Glaucidium gnoma	Northern Pygmy-owl			

Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	**COMMON NAME**			
Birds continued				
Haliaeetus leucocephalus	Bald Eagle**	low potential		
Hirundo rustica	Barn Swallow		x	
Icterus bullockii	Bullock's Oriole			
Ixoreus naevius	Varied Thrush			
Junco hyemalis	**Dark-eyed Junco**		x	
Loxia curvirostra	Red Crossbill			
Melanerpes formicivorus	**Acorn Woodpecker**		x	
Meleagris gallopavo	Wild Turkey		x	
Melospiza lincolnii	Lincoln's Sparrow			
Melospiza melodia	Song Sparrow		x	
Mimus polyglottos	Northern Mockingbird			
Molothrus ater	Brown-headed Cowbird			
Myiarchus cinerascens	Ash-throated Flycatcher		x	
Oreortyx pictus	Mountain Quail			
Otus kennicottii	Western Screech-owl			
Passerella iliaca	Fox Sparrow			
Passerina amoena	Lazuli Bunting			
Petrochelidon pyrrhonota	Cliff Swallow			
Phalaenoptilus nuttallii	Common Poorwill			
Pheucticus melanocephalus	Black-headed Grosbeak		x	
Picoides nuttalli	**Nuttall's Woodpecker**		x	
Picoides pubescens	Downy Woodpecker			
Picoides villosus	Hairy Woodpecker		x	
Pipilo crissalis	**California Towhee**		x	
Pipilo maculatus	**Spotted Towhee**		x	
Piranga ludoviciana	Western Tanager			
Podilymbus podiceps	**Pied-billed Grebe**		x	

Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	COMMON NAME			
Birds continued				
Poecile rufescens	**Chestnut-backed Chickadee**		x	
Polioptila caerulea	Blue-gray Gnatcatcher			
Progne subis	Purple Martin			
Psaltriparus minimus	**Bushtit**		x	
Regulus calendula	**Ruby-crowned Kinglet**			
Regulus satrapa	Golden-crowned Kinglet			
Riparia riparia	Bank Swallow**	low potential		
Salpinctes obsoletus	Rock Wren			
Sayornis nigricans	**Black Phoebe**		x	
Selasphorus rufus	Rufous Hummingbird			
Selasphorus sasin	Allen's Hummingbird			
Sialia mexicana	**Western Bluebird**		x	
Sitta canadensis	Red-breasted Nuthatch			
Sitta carolinensis	**White-breasted Nuthatch**		x	
Sphyrapicus ruber	**Red-breasted Sapsucker**			
Spizella passerina	Chipping Sparrow			
Stelgidopteryx serripennis	Northern Rough-winged Swallow			
Strix occidentalis	Spotted Owl			
Strix occidentalis caurina	Northern Spotted Owl**	high potential		x
Sturnella neglecta	**Western Meadowlark**			
Sturnus vulgaris	**European Starling ***			
Tachycineta bicolor	Tree Swallow			
Tachycineta thalassina	Violet-green Swallow		x	
Thryomanes bewickii	**Bewick's Wren**		x	
Toxostoma redivivum	California Thrasher			

Vertebrate Wildlife Species Observed or Potentially Occurring on the Sonoma Valley Wildlife Corridor Properties (bold indicates species observed during site visit)		Special-Status or Species of Special Interest**	Species Observed (June & July 2000)	Special Status Species Potentially Occurring
SCIENTIFIC NAME	COMMON NAME			
Birds continued				
Troglodytes aedon	House Wren		x	
Troglodytes troglodytes	Winter Wren			
Turdus migratorius	**American Robin**		x	
Tyrannus verticalis	Western Kingbird			
Tyto alba	Barn Owl			
Vermivora celata	Orange-crowned Warbler			
Vireo cassinii	Cassin's Vireo		x	
Vireo gilvus	Warbling Vireo		x	
Vireo huttoni	Hutton's Vireo		x	
Wilsonia pusilla	Wilson's Warbler		x	
Zenaida macroura	**Mourning Dove**		x	
Zonotrichia albicollis	White-throated Sparrow			
Zonotrichia atricapilla	**Golden-crowned Sparrow**			
Zonotrichia leucophrys	**White-crowned Sparrow**			
This wildlife species list is based on preliminary assessments of habitats occurring on the properties and regional occurrence information for the various taxa. Additional species may occur on the property and some may not be present; however, further assessments and surveys of the sites would be needed to further refine the list.				
*denotes non-native species				
**Special-status or animal species of interest considered in the evaluation of the Sonoma Valley Wildlife Corridor properties based on the background literature review and field surveys.				

CHAPTER

5 Managing for Wildlife Corridor Permeability

Wildlife corridors are important landscape features comprised of linear strips or patches of habitat that allow the movement of species, often through less suitable habitat, to larger blocks of wildlands with a relatively high likelihood of successful passage. Corridors may be large enough to provide live-in habitat for many small and medium-sized species, but are often too limited in width or preferred habitat for animals with large home ranges to permanently occupy. Corridors aid the dispersal of species escaping predators or in search of a mate, better habitat, or habitat essential for a specific life stage. Dispersal is essential for maintaining genetic diversity and persistence in wildlife populations, and is a vital process that facilitates species adaptation to shifts in temperature, vegetation, and hydrology due to a changing climate. Without connectivity, species can become locally extinct.

5.1 Characteristics of functional wildlife corridors.

The utility of a wildlife corridor is determined by a number of factors that influence its use by wild animals in the region. A functional corridor is one that provides freedom of movement at multiple scales with relatively low "costs" as measured by energy expended and risk of injury or mortality, compared to the surrounding landscape.

The most effective corridors are characterized by:

- high quality habitat regardless of whether it is of sufficient size to provide permanent occupancy
- varied composition and structure of vegetation with significant tree and shrub canopies, particularly along watercourses, and dead and downed trees
- few barriers to movement, such as human infrastructure and activities
- sufficient length and width to accommodate the full spectrum of species in the region (Metro 2010)
- larger blocks of high quality habitat on either end

Wildlife linkages can consist of patches of habitat or continuous habitat called landscape linkages. Landscape linkages are the most permeable type of wildlife corridors connecting core areas that permit all species to move easily between large wildland blocks (Figure 19). Habitats fragmented by roads, cultivated agriculture, and commercial and residential development are less permeable and not all species are able to navigate through the hazards.

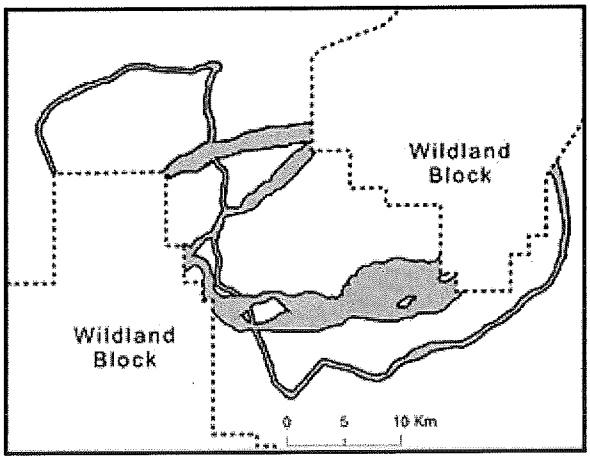


Figure 19. Wildlife corridors.
Landscape linkages provide the best opportunity for the most species to safely move between large blocks of wildlands.

Well-vegetated, wider corridors provide more food resources and escape cover for safety as well as greater opportunities for a diversity of species to find suitable routes. In a review of wildlife corridor literature, Diamond (pers. comm. August 2014) concludes that a corridor width of at least two kilometers (1.2 miles) is required to provide the needs of medium and large mammals. Narrower corridors increase risk, particularly for prey species, and offer fewer safe pathways which is especially hazardous for small

and slow-moving species with limited mobility such as amphibians. Multiple corridors in a region are preferable to maximize the probability that animals can find and successfully navigate a suitable pathway to reach productive habitat, but become even more important where corridors are long and narrow.

In the Sonoma Valley, agricultural, rural residential, and near-urban development patterns present significant challenges for large and small wild animals attempting to move between wildlands on Sonoma Mountain and the Mayacamas Mountains. The Corridor, with relatively less human infrastructure and more continuous and varied habitats, is anticipated to provide the most hospitable avenues for dispersal across the valley. Yet many of the factors impacting animal movement in the broader landscape also occur, to a lesser extent, within the Corridor.

Reflecting the conditions described above, the Corridor Technical Advisory Group (CTAG) listed the following factors as possibly influencing wildlife passage in the Sonoma Valley Wildlife Corridor.

- roads and driveways
- roadside vegetation management (mowing or spraying)
- fencing
- timing of mechanical weed control
- reduced structural and compositional diversity of vegetation
- agricultural cultivation
- free roaming pets and feral cat feeding
- exterior nighttime lighting
- excessive noise
- excessive fire hazard reduction and post-fire restoration
- pesticide use
- trails and recreational uses

Many of the factors overlap (e.g., fencing can be associated with roads, rural residences, and agricultural development). The problems and recommended actions for permeability factors of concern in Corridor, as well as a few general recommendations, are described in the following sections. Specific observations and permeability recommendations for the properties visited by the CTAG are detailed in Chapter 6.

5.2 Residential and Rural Residential Development

The problem: Rural residential development, one of the predominant land uses in Sonoma Valley, results in numerous impacts that fragment habitat, decrease abundance and diversity of native species, and promote displacement of natives by non-native species. These effects stem from, among other things, the development of access roads and driveways, free roaming domestic dogs and cats, feral cat feeding, fencing, night-time lighting, noise, and pesticide use. The introduction of non-native plants in landscaped yards can disrupt the vegetation composition in nearby habitats, diminishing their value to wildlife. Rural residential areas typically see changes in the composition of bird communities (Merenlender *et al.* 2009), and an increase in predators such as coyotes, raccoons, foxes, rats, and brown-headed cowbirds that outcompete and prey on other native species (Crooks and Soule 1999), and contribute to decreased wildlife diversity. Studies have shown that detrimental impacts are observed at housing densities as low as 1 dwelling unit per 40-50 acres (Beier *et al.* 2008). As development encroaches on lands that support wildlife occupancy and dispersal routes, human-wildlife conflicts, such as perceived dangers to pets or damage to landscaped yards, often arise and lead to removal of native animals and installation of impervious barriers to movement.

Recommended Actions: Population and concomitant development are expected to continue increasing in most areas, placing further pressure on the ability of wildlife to find suitable habitats. While the built environment will inevitable expand, steps can be taken now to educate communities and

officials on the importance of corridors and ensure that the needs of wildlife are a priority in regional planning and project design review.

1. **Collect and share wildlife data.** Use the data collected on wildlife occupancy and movement patterns throughout the Corridor to identify important connections for wildlife passage that should remain undeveloped.

2. **Outreach to private landowners.** Develop and disseminate outreach materials for private landowners that describe the significance of the Corridor and actions they can take to improve permeability.

3. **Engage partners to assist with outreach and permeability enhancement projects.** Work with the Sonoma County Resource Conservation District and the local office of the Natural Resources Conservation Service to assist with outreach. These agencies can provide technical and/or financial assistance to improve permeability on private landowner property.

4. **Advocate for compliance with corridor objectives in the Sonoma County General Plan 2020 update, adoption of a wildlife corridor ordinance, and the designation of additional corridors.** Prevent future development impacts by encouraging compliance with the Sonoma County Habitat Connectivity Corridor land use designation, pressing for the adoption of an implementing ordinance as described in the Sonoma County General Plan, and presenting additional corridors for designation.

5.3 Agricultural Development

The problem: Agriculture is a vital element of the human landscape and has a long history in Sonoma Valley. The relationship of cultivated agriculture to wildlife and their habitats is not always understood and regional planning efforts to incorporate both in a mutually beneficial way may miss the mark. Cultivated agriculture negatively impacts wildlife passage with the effects varying according to size of the fields and management practices. While some animals will traverse some cultivated fields, the conversion from native plants reduces habitat as well as escape cover for most species. Legal and illegal water diversions from creeks for cultivating crops can damage aquatic habitats by reducing water quantity and quality, reduce food and water sources for resident and migrating aquatic and terrestrial wildlife, reduce riparian habitats, and create dry creek reaches that are barriers for fish and other aquatic species.

Roads constructed to service the fields disrupt habitat continuity, can result in mortality, cause sedimentation in nearby creeks, and the application of pesticides can harm or kill fish and wildlife far from the source of application. Of primary concern in many corridors is the installation of fences to prevent crop damage. These fences often exclude all terrestrial animals larger than a rat. Depending on size of the fenced field and its juxtaposition to other fences or movement barriers, wildlife can be completely excluded from preferred dispersal pathways, if not prevented entirely from reaching their destination.

Recommended Actions: There are tools available that can help safeguard wildlife corridors in agricultural landscapes, and mitigating actions that can be implemented by agricultural landowners to increase permeability for wildlife without sacrificing productivity. Several agencies, including local Resource Conservation Districts, Natural Resources Conservation Service, and University of California

Cooperative Extension offer information, education, and in some cases, funding assistance to private landowners willing to undertake improvements.

1. **Avoid agricultural conversion of native land cover within wildlife corridors.** Future agricultural conversions of key properties can be averted by purchasing fee title or conservation easements from willing sellers that restrict agricultural conversion and associated infrastructure development.

2. **Advocate compliance with corridor objectives in the Sonoma County General Plan 2020 update, adoption of a wildlife corridor ordinance, and the designation of additional corridors.** Encourage compliance with county zoning, development of complementary land use ordinances, and designation of additional wildlife corridors to limit agricultural conversation of key Corridor properties.

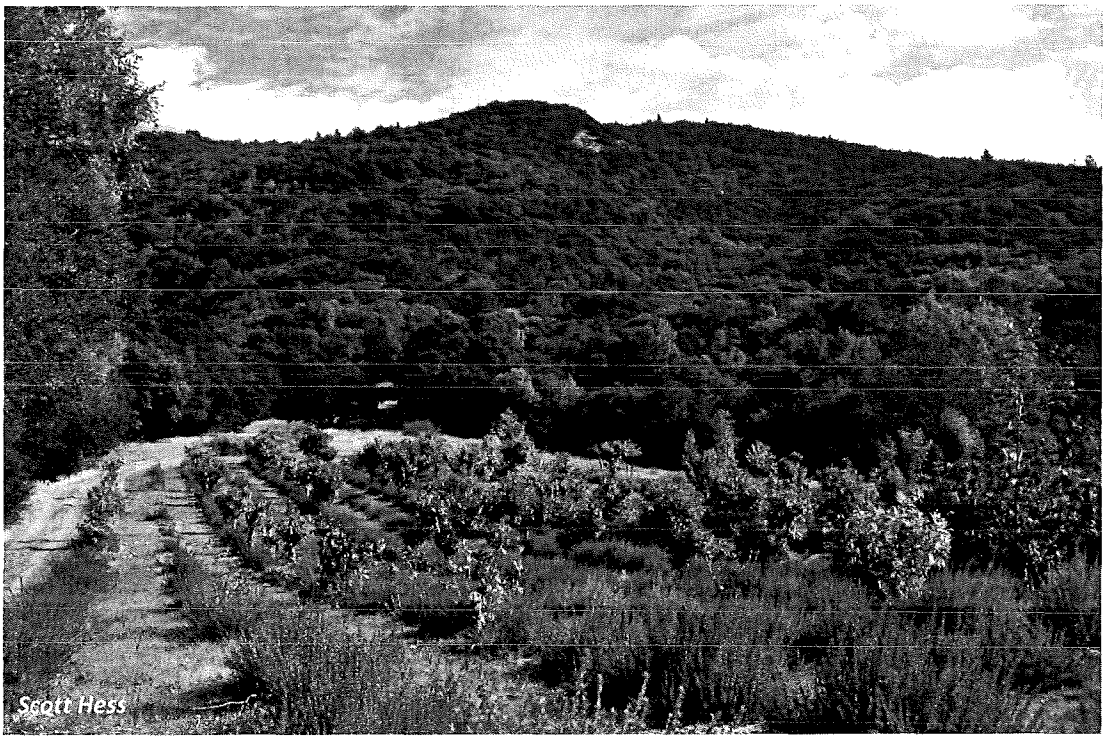
3. **Encourage wildlife-friendly fencing.** Farmers and ranchers can be encouraged to modify or replace fencing to more wildlife-friendly forms (as described in Section 5.5 below). Matching funds for fencing may be available from Sonoma County Resource Conservation District, Natural Resources Conservation Service, US Fish and Wildlife Service Partners for Wildlife Program, and the California Department of Fish and Wildlife.

4. **Eliminate or avoid fencing that bisects or crosses streams and important wildlife corridors.** Riparian areas, waterways, and important corridors should be excluded from fencing to facilitate wildlife movement along stream corridors.

5. **Eliminate or minimize the application of fertilizers and pesticides.** Encourage local farmers and ranchers to minimize the application of fertilizer and pesticide if not eliminate use altogether. Enlist assistance from UC Cooperative Extension specialists, Natural Resources Conservation Service, and Sonoma County Resource Conservation District.

6. **Create native plant hedgerows in cultivated agricultural fields.** In the vineyard and row crop areas, native plants can be established between the rows to provide cover for small to medium size wildlife species as Oak Hill Farm has done in some of its fields (Figure 20).

Figure 20. Native plant hedgerows in cultivated fields at Oak Hill Farm.



5.4 Roads and Undercrossings

The problem: Roads are one of the most significant factors reducing linkage permeability and the Sonoma Valley Wildlife Corridor is bisected by two major roads carrying a significant volume of traffic. Many animals are struck by vehicles while attempting to cross and others avoid roads entirely (Beier *et al.* 2008). Beier cites the example of some reptiles that are warned away by the vibrations from even low speed roads noting that even roads with very little traffic are avoided by some mammals. Roadside vegetation management, spread of noxious weeds, night time lighting, and fencing associated with roads also impact the willingness or ability of animals to cross.

Undercrossings include bridges and culverts through which wildlife may pass. Bridges typically have a wider span than culverts, with a relatively natural ground surface and often a greater presence of vegetation. Culverts have smooth concrete floors and are narrower with less vertical clearance, which can discourage some species from passing through. When designed and located appropriately for wildlife found in the region, culvert and bridge undercrossings provide safe avenues for most species to cross and reduce vehicle-wildlife collisions.

Recommended Actions: The following list includes CTAG recommendations and standards as well as guidelines from *Best Management Practices for Wildlife Corridors* (Beier *et al.* 2008). Figure 21 presents the CTAG recommendations for State Route 12 and Arnold Drive crossing structures.

1. **Determine Permeability of Major Roads.** In order to determine if Highway 12 and Arnold Drive are acting as barriers to wildlife movement across the Corridor, it is important to ascertain whether a range of species occurring on either side are willing and able to cross safely. Chapter 7 describes monitoring objectives and steps that are being taken to address this question, including roadkill surveys to determine if particular species are challenged by the roads and if fatality "hotspots" occur,

and focused camera studies at undercrossings. While major roads are of greatest concern, permeability assessments of less used roads should be conducted where feasible.

2. **Engage Caltrans, Sonoma County Transportation Authority, and Public Works.** Communicate the road permeability monitoring results to Caltrans and Sonoma County to ensure that wildlife permeability can be maintained or improved when road improvement projects are planned and implemented. Several of the undercrossing structures in the Corridor will likely be in need of repair or replacement in the near future, as will sections of the roads themselves. Incorporating wildlife passage elements into road improvement projects increases costs and will need to be justified. Highlighting the importance of the Corridor and presenting undercrossing and roadkill data to Caltrans and Sonoma County will increase the probability that permeability improvements will be incorporated into road improvement plans. Most road improvement projects require some environmental mitigation and this may be a funding source for non-road needs such as bank layback or drift fencing.

3. **Provide multiple crossing structures to promote passage for all species likely to use a given area.** Different species prefer different types of structures. Culverts and concrete box structures are used by many species, including mice, shrews, foxes, rabbits, river otters, opossums, raccoons, ground squirrels, skunks, coyotes, bobcats, mountain lions, black bear, great blue heron, long-tailed weasel, amphibians, lizards, and snakes (Yanes *et al.* 1995; Brudin 2003; Dodd *et al.* 2004; Ng *et al.* 2004). For small mammals, pipe culverts from 1 - 3 feet in diameter are preferable. For medium-sized mammals, black bear, and mountain lions, bridges or large box culverts with natural earthen substrate flooring are optimal (Clevenger and Waltho 2005). For deer and other ungulates, an open structure such as a bridge is crucial.

4. **Increase use of bridges by small mammals, amphibians, reptiles, and insects.** Bridge undercrossings should include uplands above the scour zone of streams, be high enough to provide passage when channels are full, and allow for vegetative growth to accommodate the need for cover and security (Beier *et al.* 2008). In the Netherlands, rows of stumps or branches in undercrossing structures have increased use by smaller species crossing bridges on floodplains (Forman *et al.* 2003).

5. **Locate at least one crossing structure within an individual's home range.** Because most reptiles, small mammals, and amphibians have small home ranges, culverts should be installed at intervals of 500 – 1,000 feet. Inadequate size and insufficient number of undercrossings are two primary causes of poor use by wildlife.

6. **Provide suitable cover and habitat on both sides of undercrossings.** This applies to both *local* and *landscape* scales. On a local scale, vegetative cover should be present near entrances to give animals security, and reduce negative effects of lighting and noise. A lack of suitable habitat adjacent to undercrossings that were originally installed for hydrologic function may prevent their use as wildlife crossing structures. At the landscape scale, the land management strategies for the surrounding areas must also promote suitable wildlife habitat for the corridor and crossing structures to be effective (Clevenger and Waltho 2005).

7. **Whenever possible, provide suitable habitat *within* undercrossings.** This can be achieved by constructing bridges that are high enough to allow light for vegetation to grow underneath, and span upland habitat that is not regularly scoured by floods. Where this is not possible, rows of stumps or branches under large span bridges can provide cover for smaller animals such as reptiles,

amphibians, rodents, and invertebrates; regular visits are needed to replace artificial cover removed by flood. Within culverts, mammals and reptiles prefer earthen to concrete or metal floors.

8. **Regularly clear undercrossings of obstructions that impede passage.** Small mammals, carnivores, and reptiles avoid traversing undercrossings with significant detritus or silt blockages and larger mammals may be blocked entirely. Box culverts are much more likely to become blocked than bridges.

9. **Utilize fencing to increase, not deter, wildlife use of undercrossings.** Fences should never block entrances to undercrossings. Where a fence must parallel a road near an undercrossing, it should be set back as far as practical and be designed to allow wildlife to pass through easily. Conversely, fences and guard rails at least 6 feet high located in critical areas discourage animals from crossing roads and can be designed to direct them to the safety of undercrossings. Along stretches of road with impermeable fence, one-way ramps on the road side of the fence can allow an animal to escape if it is trapped on a road.

10. **Raise sections of road to discourage animals from crossing and direct them to undercrossings.** Clevenger *et al.* (2003) found that vertebrates were 93% less susceptible to road kills on sections of road raised on embankments compared to road segments at the natural grade of the surrounding terrain.

11. **Manage human activity near each crossing structure.** Clevenger and Waltho (2000) indicate that human use of crossing structures, including undercrossings, diminishes wildlife use and should be restricted. At a minimum, night time lighting and human presence within and near undercrossings should be restricted and foot trails should be relocated elsewhere.

12. **Design crossing structures specifically to provide for animal movement**. Recent research shows that traffic noise within an undercrossing can discourage passage by wildlife, suggesting that new designs are needed to minimize vehicle noise in undercrossings. Most road culverts are designed to carry water and minimize erosion hazard to the road, and they often have eroded drop-offs at the downstream end that prevent wildlife usage. A difference of only a few inches between the culvert outlet and the ground hinders many small mammals, snakes, and amphibians from finding or using the culvert. Ungulates prefer undercrossings with sloped earthen sides rather than vertical concrete sides. Minimizing the distance an animal must travel within a structure will increase its usage.

Figure 21. Recommendations to improve permeability of bridges and culverts in the Sonoma Valley Wildlife Corridor.
Undercrossings visited by the Corridor Technical Advisory Committee are listed in bold.

Crossing #	Crossing Type	Undercrossing Name	Undercrossing Dimensions (measured from current levels of ceiling and bottom)	Location	Notes & Recommendations
Within the Sonoma Valley Wildlife Corridor					
State Route 12					
1	**bridge**	**Stuart Creek**	**7' high by 25' wide**	**Glen Oaks Ranch**	**Bridge with rocky bottom, underpass no longer aligned with stream channel, eroded vertical bank on west side, may need fencing to direct wildlife to crossing if roadkill data indicates a problem, consider adding small ledge above waterline inside for smaller species.**
2	culvert	no name	8" high by 15" wide	Bouverie Preserve	
3	culvert	no name	8" high by 15" wide	private	
4	culvert	no name	15" high by 15" wide	private	
5	culvert	no name	15" high by 15" wide	private	
6	**culvert**	**North Butler Creek**	**4' high by 8' wide**	**Oak Hill Farm on east side, Sonoma Developmental Center on west side**	**Very old bridge, west side (Sonoma Valley Regional Park) has impenetrable blackberry thicket, east side (Oak Hill Farm) has less dense blackberry, consider installing structures inside crossing for smaller species.**
7	**culvert**	**South Butler Creek**	**5' high by 6' wide**	**Oak Hill Farm**	**Open and appears to be good crossing for mesofauna. Consider installing structures to provide internal cover. Oak Hill Farm on east side, Sonoma Developmental Center on west side.**
Arnold Drive					
8	culvert	Kohler Creek	6' high by 5' wide	private	Open, drop-in box west side could inhibit ingress and egress.
9	**culvert**	**Jack London Village (no creek name)**	**4' high by 4' wide**	**private**	**Too small and close to Jack London Village for wildlife use, smaller species might use it.**
10	**culvert**	**Asbury Creek**	**5' high by 3' wide**	**private**	**Currently not usable, needs to be enlarged for wildlife use.**
11	bridge	North Sonoma Creek	15' high by 40' wide	Sonoma Developmental Center	Underpass bifurcated by wall. Evidence of beaver activity with 2-3 foot deep ponding underneath. Also dense vegetation along banks. Passage almost totally impeded.
12	bridge	South Sonoma Creek	20' high by 60' wide	Sonoma Developmental Center	wide and open with excellent passage opportnuities. Tracks of multiple species observed.
Outside the Sonoma Valley Wildlife Corridor					
State Route 12					
13	bridge	Calabazas Creek	20' high by 75' wide	private	Wide, tall and very open with earthen floor. no vegetation within underpass but dense on either side. Tracks of multiple species observed. Human use also evident though not excessive.
14	culvert	unnamed Calabazas Creek Tributary 1	6' high by 7' wide	private	Concrete culvert, accessible west side and opens to meadow and oaks east side.
15	culvert	Horse Farm (no creek name)	8' high by 15' wide	private	Woven-wire fencing across second culvert on west side blocks access from horse farm. Additional fencing on east side.
16	culvert	unnamed Calabazas Creek Tributary 2	8' high by 6' wide	private	Fencing above and within channel on west side, vineyard fence close in on both sides.
17	culvert	Wilson Creek	4' high by 7' wide	private	Concrete culvert, mostly filled with sediment (18" vertical gap remains). Roadside ditch and vineyard fence along east side right of way.
18	culvert	Whitman Creek	6' high by 5' wide	private	New vineyard fence on east side, west side constrained by ag and residences but apparently open.
19	bridge	Hooker Creek	10' by 20' wide	private	Half-pipe concrete bridge with earthen bottom. Open to passage with good vegetation cover and riparian access both sides.
Arnold Drive					
20	culvert	Mill Creek	5' high by 8' wide	Sonoma Developmental Center	open ends, very narrow band of vegetation, creek winds through Center facilities, and thorugh vineyards to the east.
21	culvert	unnamed tributary to Mill Creek	none listed	Sonoma Developmental Center	Similar to Mill Creek above

5.4.1 Roadside vegetation management

The effects of roadside vegetation management on wildlife habitat and movement patterns are complex and determining appropriate management strategies depends on the species present as well as the amount and type of traffic. Some species such as deer may be attracted to roads where roadsides offer preferred plants (Feldhamer *et al.* 1986) while other species may avoid highway corridors with little vegetative cover for protection (Clevenger and Waltho 2005). Some management strategies attempt to direct animals to crossing structures by removing wide strips of vegetation on both sides of the road and leaving vegetated strips that lead to a crossing structure. Management practices may include the application of herbicides and/or mowing to improve visibility for motorists, and both can be detrimental to some species.

Recommended actions:

1. **Conduct assessment of roadside management practices.** The current roadside practices for State Route 12 and Arnold Drive have not been assessed. Evaluating the relationship between roadside management practices and regional wildlife movement and mortality from vehicles would assist Caltrans and the county to implement management practices that promote both wildlife and motorist safety.

2. **Promote use of native vegetation.** The Caltrans Wildlife Crossings Guidance Manual (Meese *et al.* 2007) recommends the use of native plants because many invasive species are found in association with roadsides and can impact the habitats in the region. In addition, the long term maintenance costs are lower even though the initial cost may be higher (White and Ernst 2003).

3. **Minimize the use of pesticides and herbicides.** These management practices should be used very sparingly, if at all, to control invasives or to discourage use of roadsides by certain wildlife species (Meese *et al.* 2007).

5.4.2 Roadside lighting

Street lighting has been shown to be effective in reducing vehicle collisions with large mammals especially when combined with fencing and signage (Reed and Woodard 1981, Maine DOT 2001). The use of lighting is limited to areas with a nearby power source, but has generally been found to be a cost-effective solution to reduce vehicle-animal collisions, especially in urban and suburban regions with high collision rates. Lighting increases a driver's visibility and reaction time at night when many nocturnal animals become active (Reed and Woodard 1981), and some wildlife avoid lighted areas further reducing the number of wildlife-vehicle collisions. Conversely, because wildlife shy away from lights, wildlife passage interference can be minimized by limiting road lighting in areas where collisions are not a problem and wildlife can cross safely using undercrossings.

Recommended actions:

1. **Conduct roadkill surveys and gather wildlife-vehicle collision data.** Roadkill data combined with wildlife-vehicle collision data can identify road segments with high wildlife mortality rates. These data can be shared with transportation agencies to encourage changes to alleviate the impacts.

2. **Use roadside lighting according to wildlife behavior.** Consider adding street lights on roadsides where wildlife mortality is high to redirect animals to safer crossing areas. Restrict lighting where wildlife may cross safely and within 200 feet of all undercrossings.

5.5 Fencing

The Problem. Many of the connectivity benefits derived from protecting and managing lands for wildlife passage can be diminished if fencing creates an impediment to wildlife passage in otherwise high quality habitats. Fences with loose wires or inappropriately spaced wires can ensnare birds and large mammals, prevent passage entirely, and trap panicked wildlife on highways. In a landscape with smaller and more distant habitat patches, impermeable fencing reduces the effectiveness of a corridor by limiting access to food and water, to other populations to maintain genetic diversity, and makes animals more vulnerable to wildfire, disease and drought.

The CTAG noted the following fence characteristics that particularly create barriers for wildlife:

- Fences with overhanging lips along the top that prevent climbing species from getting over.
- Fences with solid opaque inserts that prevent pusher species from getting through gaps.
- Fences with extensions and lips under the ground that block digging species such as badgers.
- Tall fences that impede jumping and climbing species.
- Woven-wire fencing, especially tall ones such as vineyard fences, with very small cells at ground level that prevent passage for anything larger than a mouse.

In the Sonoma Valley Wildlife Corridor, fencing is used to control livestock and horses, exclude deer and other wildlife from agricultural lands and residential landscaping and gardens, mark a property boundary, or prevent trespassing. During the field tours, the CTAG observed barbed wire fencing in varying states of disrepair, new barbed wire fencing, 4' and 8' woven wire fences, and 6 foot chain link fence.

The CTAG noted that impermeable fences parallel to roads are known to trap animals on roadways as they have difficulty finding an escape route when in a panicked state. This problem can be alleviated by encouraging wildlife friendly fencing, installing ramps to provide an escape route over fences along roadsides, and implementing measures that encourage wildlife use of the undercrossings.

A wildlife-friendly fence is permeable for all species, is visible to wildlife, easy to get over or under, and also takes into account the purpose for the fence and potential cost to the landowner. For example, fencing built to contain cattle must have sufficient strength to prevent livestock from getting through or knocking it down while providing ample space under, over, and through the wires to allow wildlife in the area to pass through.

Recommended actions: There are numerous documents that provide guidance on wildlife-friendly fencing including one prepared in 2003 by the Sonoma County Agricultural Preservation and Open Space District, with assistance from the Sonoma Ecology Center, for owners of District easement-protected lands (http://www.sonoma-county.org/public_reports/documents/district_fencing_guidelines.pdf). One of the more thorough guides is the Montana Fish Wildlife and Parks publication, *A Landowners' Guide to Wildlife Friendly Fencing: How to Build Fence with Wildlife in Mind* (fwp.mt.gov/fwpDoc.html?id=34461).

The following general fencing guidelines are a compilation from these guides that are most relevant to the Sonoma Valley and suggestions from the CTAG.

1. **Avoid new fencing.** Discourage the construction of new fencing whenever possible, and when new fencing is necessary, minimize the size of the area fenced.

2. **Choose wildlife-friendly fence designs.** Where fencing is necessary, select a design that addresses the specific need for the fence *and* allows non-target wildlife to pass through. Avoid using fences with woven wire or barbed wire close to or at ground level, overhanging lips, underground extensions, or solid opaque inserts unless used to protect residential areas or to direct wildlife to undercrossings.

3. **Consider wildlife in the region.** Consider the type of wildlife found in the area and ensure that the fence can be crossed by young and adult animals. Understand the daily or seasonal movements of wildlife in the area and the location of their calving or nesting areas. Avoid fencing off known wildlife trails.

4. **Remove old fencing.** Remove fencing that is no longer needed. If fencing materials are too difficult to haul out of remote areas, the fence posts can be left in place and the fence material coiled or rolled, placed so as to eliminate the risk of wildlife entanglement, and left onsite.

5. **Replace old fencing with wildlife-friendly fencing.** When old fencing needs to be repaired or replaced, use and encourage others to use wildlife-friendly designs.

6. **Avoid fencing on steep slopes.** A fence of any height is more difficult to cross when placed across a steep slope or next to a deep ditch, and is more likely to cause injury to animals trying to jump the fence.

7. **Do not fence natural corridors.** Allow movement and access through natural corridors and habitats, keeping swales, gullies, ridges, and stream corridors free of fencing because they often funnel wildlife through an area.

8. **Keep fence strands tight.** Tension should be maintained on barbed and smooth wire fences to reduce the chance for entanglement.

Wildlife-Friendly Fence Designs

Barbed or smooth wire fences for livestock control. The following specifications are recommended to maximize wildlife passage through barbed and smooth wire fences needed to control cattle. Two designs illustrating these standards are shown in Figure 22.

- The fence should be no more than 42" in height and 40" is the preferred height.
- The bottom wire should be 16" to 18" off the ground, and smooth if possible.
- The top wire should be smooth, 12" from the next lower wire to preclude entanglements, and made more visible by marking with flagging or covering with PVC pipe. Installing a top rail in lieu of, or in addition to, the top wire further improves visibility.

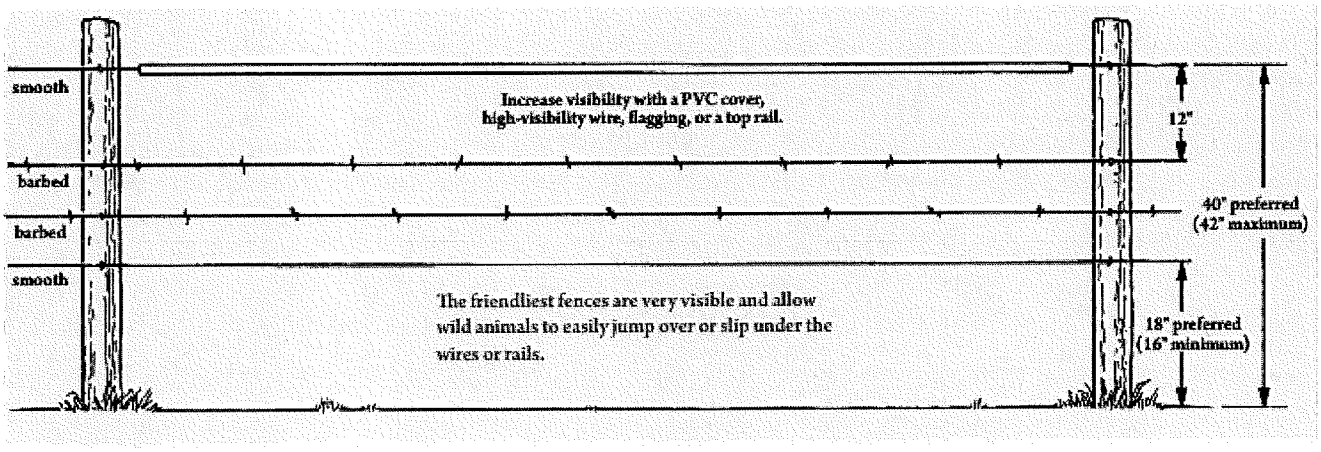
Fencing along highway and road rights-of-way need special consideration. Wildlife should be able to pass through fencing on either side of the highway quickly to minimize the amount of time an animal is in the right-of-way. The design preferred by Montana Fish, Wildlife and Parks is four strands with top and bottom smooth wire and two center barbed wires. The top wire should be no more than 42" high with 12" between the top and second wire, and the bottom wire at least 16" off the ground. This design keeps cattle off the roads while allowing wildlife of all sizes to cross. Where impermeable fences parallel roadways, ramps on the road side of the fence should be considered to allow escape.

Boundary marking fences. Several options exist for fences that are solely for marking property boundaries. Hedgerows and low, decorative fences with flat, visible tops (no spikes), and adequate ground clearance delineate property lines without inhibiting wildlife movement. "No Trespassing" sign posts placed at regular intervals along a boundary can also be an effective trespassing deterrent.

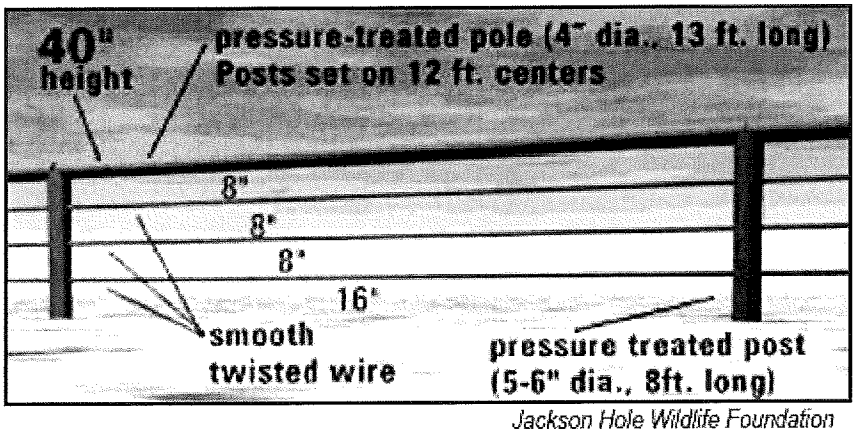
Wildlife exclosure fences. There are several situations where a fence may be required to keep wildlife out of an area. For example, property owners may want to exclude wildlife from backyards and gardens, or to keep pets in. Transportation agencies may want to prevent wildlife from accessing roads at dangerous locations and/or direct them to crossing structures.

For fencing to exclude wildlife from landscaped yards or gardens, or keep pets in, the smallest area possible should be fenced and the fence should be high enough to prevent deer from jumping over (7' to 8'). There are several electric fence configurations that can be used for deer exclosures around residences and solar panels can be installed to power the fence. The Montana Fish, Wildlife and Parks guide provides detailed information on how to select the type of electric fence for different purposes and how to construct it, and is readily accessed on their website (fwp.mt.gov/fwpDoc.html?id=34461).

Figure 22. Wildlife friendly designs for barbed and smooth wire fences.



Montana Fish, Wildlife and Parks



Jackson Hole Wildlife Foundation

Vineyard fences constructed to exclude deer should include a 12"-16" unfenced gap at ground level to allow non-target species (e.g., mountain lion, bobcat) to pass under. Impermeable vineyard and agricultural fences should be limited to just the planted area, leaving riparian and natural vegetation corridors unfenced between the fenced blocks (McGourty *et al.* 2011).

Impermeable fencing is often desirable along busy highways like State Route 12 to keep wildlife off the road and to direct animals to undercrossings. The table in Figure 23 is from the Caltrans Wildlife Crossings Guidance Manual and prescribes fence types for different wildlife species.

5.6 Excessive Fire Hazard Reduction and Post-Fire Restoration Practices

The problem. Fuel reduction for fire prevention and post-fire restoration practices often result in low quality habitat and/or abrupt changes in vegetative structures within wildlife corridors. Rural residential development typically disrupts the natural fire regime due to fire suppression and an increase in the number and severity of fires (Viegas *et al.* 2003) that can convert native vegetation to less structurally diverse habitats dominated by non-native species. Fire suppression can lead to higher fuel loads that are conducive to high intensity crown fires rather than more frequent low intensity surface fires that are beneficial to vegetation composition and structure (Keeley 2010).

Residents in rural and semi-rural areas must comply with fire regulations to maintain a "defensible space" around homes and other structures that can extend for 100' to 150'. Homeowners are required to reduce vegetation within the defensible space zone (Figure 24), but these regulations can be carried out too aggressively and for greater distances than mandated. Mowing and weed whacking are often used to create defensible spaces around wildland area residences. The timing and frequency of these practices can impact permeability by diminishing vegetation structure and diversity that reduces cover that animals require to pass through an area safely. Many species will avoid areas of uniformly open ground with few places to hide.

In Sonoma Valley, defensible space requirements are determined by vegetation type, slope, and whether a property falls within a State or Local Responsibility Area. Properties within a State Responsibility Area must meet the CAL FIRE requirements in Figure 24. If a property is in a Local Responsibility Area, the defensible space requirements extend up to 150' as shown in Figure 25. Using the State Responsibility Area viewer (http://bofdata.fire.ca.gov/sra_viewer/) and the address for Sonoma Land Trust's Glen Oaks Ranch, it was determined that much of the Sonoma Valley Wildlife Corridor falls within the State Responsibility Area with the exception of the Sonoma Developmental Center (Figure 26).

Post-fire restoration practices can exacerbate the impacts from too frequent or intense fires. The two primary concerns for post-fire restoration practices are salvage logging and artificial seeding with non-native species in burned watersheds to reduce the chance of flooding and erosion. Both of these activities result in low quality habitat and reduce the functionality of wildlife corridors.

Recommended actions.

1. **Educate the local CAL FIRE staff and Sonoma Valley Fire Department about the importance of not exceeding defensible space requirements.** Inform local fire agencies about the significance of the Sonoma Valley Wildlife Corridor and the impacts of vegetation management on wildlife permeability, and seek their assistance in encouraging adherence to defensible space requirements and discouraging excessive fuel hazard reduction beyond the distance required by the regulations. Once fire safety professionals have been educated about the Corridor, they should be encouraged to visit all key properties in the Corridor to assist landowners with interpreting and implementing the appropriate measures that protect human life and structures while minimizing impacts to wildlife permeability.

Figure 23. Suggested configurations for exclusionary or drift fencing along highways. From Caltrans' Wildlife Crossings Guidance Manual (Meese *et al.* 2007).

Wildlife Functional Group	Height	Material	Additional Considerations
Large mammals	8 – 12' (Clevenger and Waltho 2000, Putman et al. 2004, Cain et al. 2003)	Chain link (Singer and Doherty 1985, Foster and Humphrey 1995, Falk et al. 1978)	V-mesh difficult to climb, may reduce maintenance costs. Should be buried if digging by coyotes likely to be a problem (Jacobson 2002). Remove trees, large bushes, etc. that could allow an animal to climb over fence. Fencing should extend on either side of the structure the entire length of the parcel boundary or just beyond a natural break in an animal's ability to traverse the landscape. Integrate one-way gates or escape ramps to prevent animals from being trapped in the right-of-way (Ford 1976).
Medium mammals	3 – 6' to prevent medium mammals from jumping or climbing over (Dodd et al. 2004, Taylor and Goldingay 2003)	Chain link (Taylor and Goldingay 2003) or wire with large gap beneath bottom strand if pronghorn passage desired.	To prevent animals from digging under fence, fencing should be buried several inches. Remove trees, large bushes, etc. that could allow an animal to climb over fence. In general, length of fencing should exceed an an animal's ability to traverse the landscape and guide them to the crossing structure.
Small mammals	3 – 4' to prevent small animals from jumping or climbing over (Dodd et al. 2004)	Wire mesh (Lode 2000)	Many small mammals are fossorial; to prevent these animals from digging under fence, fencing should be buried several inches. Remove trees, large bushes, etc. that could allow an animal to climb over fence. In general, length of fencing should exceed an an animal's ability to traverse the landscape and guide them to the crossing structure.
Terrestrial reptiles	1.5 – 2.5' with lipped wall or overhang to prevent animals from climbing or jumping over (Dodd et al. 2004, Puky 2003)	Impenetrable materials including galvanized tin, aluminum flashing, plastic, vinyl, concrete, or a very fine mesh.	Fencing should be buried to a depth of several inches to eliminate gaps that may be caused by animals digging. In general, length of fencing should exceed an animal's ability to traverse the landscape and guide them to the crossing structure. Some snakes and treefrogs have been observed climbing vegetation along fencing (Dodd et al. 2004), thus maintenance must include regular removal of vegetation near fencing.
Amphibians and aquatic reptiles	1.5 – 2.5' with lipped wall or overhang to prevent animals from climbing or jumping over (Dodd et al. 2004)	Impenetrable materials including galvanized tin, aluminum flashing, plastic, vinyl, concrete, very fine mesh.	Regular maintenance essential for use, as substrate has been shown to affect use by amphibians (Jackson in Evink et al.1996). Some snakes and treefrogs have been observed climbing vegetation along fencing (Dodd et al. 2004), thus maintenance must include removal of vegetation near fencing.

Figure 24. CAL FIRE defensible space requirements for State Responsibility Areas.

CAL FIRE requires a 100' defensible space with two zones:

Zone 1 extends 30 feet out from buildings, structures, decks, etc.

- Remove all dead plants, grass and weeds (vegetation).
- Remove dead or dry leaves and pine needles from your yard, roof and rain gutters.
- Trim trees regularly to keep branches a minimum of 10 feet from other trees.
- Remove branches that hang over your roof and keep dead branches 10 feet away from your chimney.
- Relocate wood piles into Zone 2.
- Remove or prune flammable plants and shrubs near windows.
- Remove vegetation and items that could catch fire from around and under decks.
- Create a separation between trees, shrubs and items that could catch fire, such as patio furniture, wood piles, swing sets, etc.

Zone 2 extends 70' beyond Zone 1 for a total of 100' from buildings, structures, decks, etc.

- Cut or mow annual grass down to a maximum height of 4 inches.
- Create horizontal spacing between shrubs and trees. (See diagram)
- Create vertical spacing between grass, shrubs and trees. (See diagram)
- Remove fallen leaves, needles, twigs, bark, cones, and small branches. However, they may be permitted to a depth of 3 inches if erosion control is an issue.

Figure 25. Defensible space requirements for Local Responsibility Areas.

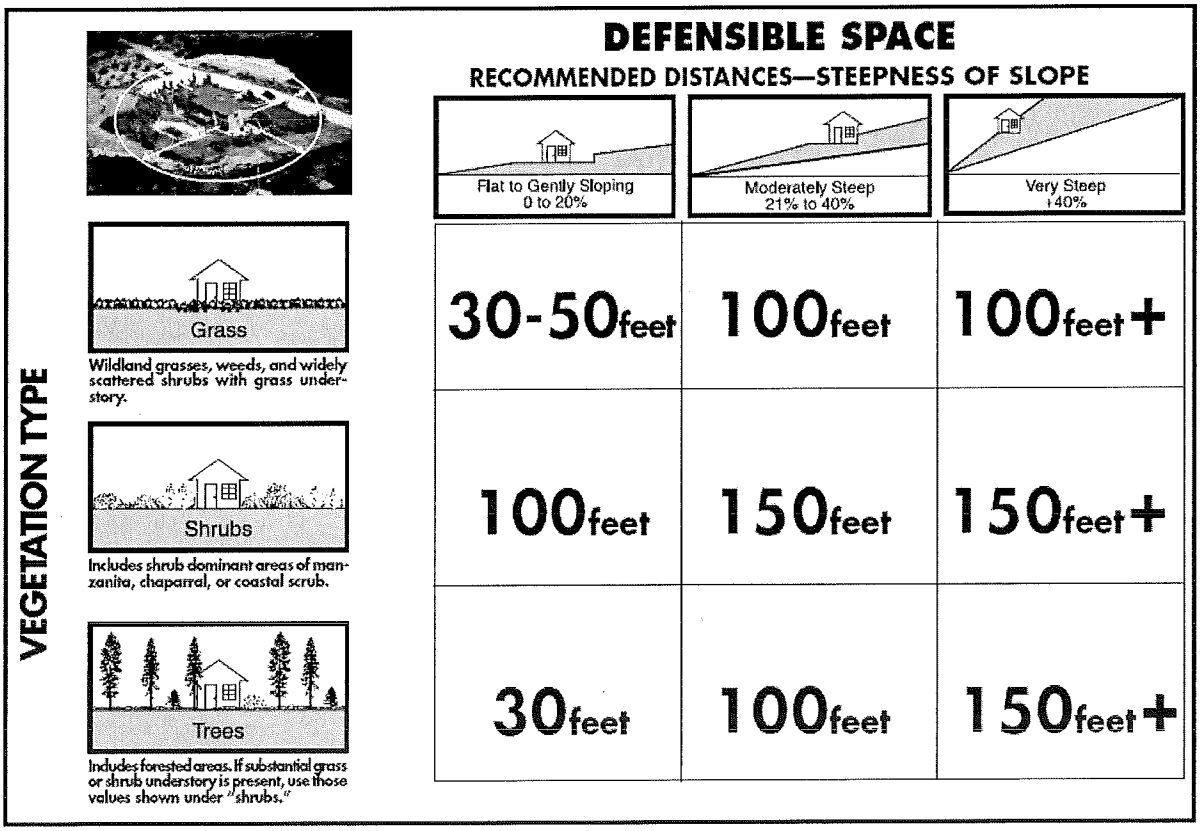
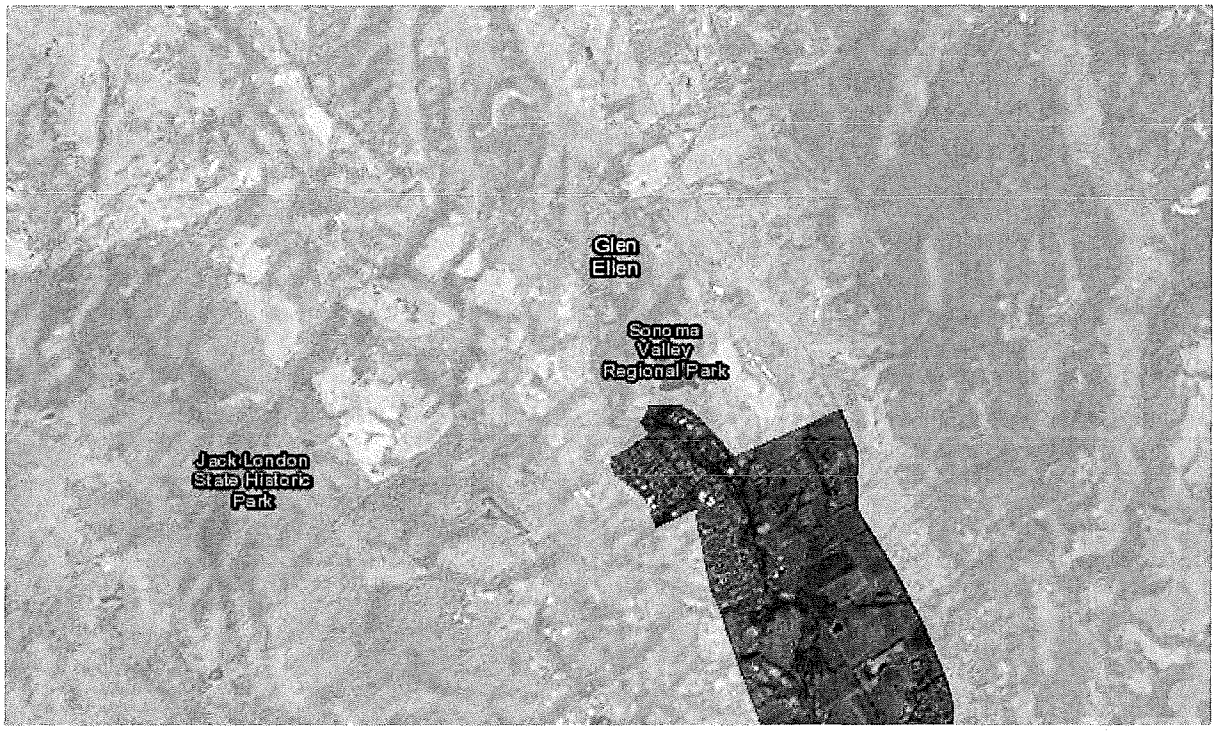
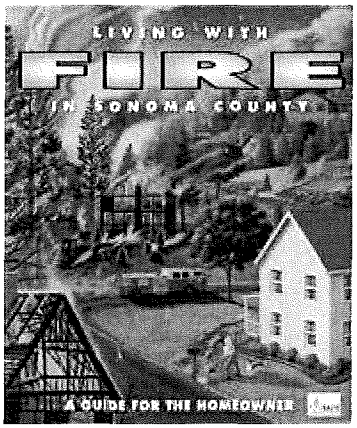


Figure 26. CAL FIRE State Responsibility Area viewer map of the Sonoma Valley Wildlife Corridor. The yellow shading designates State Responsibility Areas. The viewer is available at http://bofdata.fire.ca.gov/sra_viewer/. Property owners can enter their address into the CAL FIRE State Responsibility Area viewer (http://www.firepreventionfee.org/sraviewer_launch.php) to determine if they are within a State or Local Responsibility Area.



2. **Encourage landowners to comply with defensible space regulations but not to exceed the requirements.** Discourage vegetation removal in excess of what is required for safety, and encourage landowners not to extend vegetation removal beyond the maximum defensible space distance. Fire Safe Sonoma, a non-profit organization comprised of fire protection agencies, business owners, and others, has compiled detailed information for wildlands residents on defensible space requirements in *Living with Fire in Sonoma County* (http://www.firesafesonoma. org/main/).



3. **Encourage landowners to landscape with fire resistant native species within the defensible space.** Disseminate outreach materials that provide information on landscaping with native trees and shrubs that are fire resistant to landowners, landscaping companies, and local nurseries.

4. **Encourage the use of native species in post-fire restoration.** When fires occur, encourage public resource agencies to allow natural revegetation of burned areas, and use local, native species to seed sites that are susceptible to erosion.

5.7 Pesticide Use

The problem. The application of pesticides in and around rural residential development in wildland areas poses a risk to both native plants and animals. These poisons often impact non-target animals and also persist in the environment, killing more than the targeted species when poisoned animals are consumed by other wildlife. The application of herbicides may be necessary to control invasive plants, but their use should be limited.

Recommended actions:

1. **Educate landowners about the effects of pesticide use.** Outreach materials that detail the effects of pesticides on wildlife and discourage their use can be distributed to Corridor landowners as well as retailers that sell these products.
2. **Educate public agency staff and discourage the use of pesticides on public properties.** Determine if Sonoma County Public Works Department and Caltrans use pesticides and where they are applied, and encourage the reduction or elimination of their use.

5.8 Outdoor Night Lighting

The problem. Lighting, whether for highway safety or driveways and patios around residences, impacts wildlife in several ways. Some species avoid lighted areas, while others are attracted to artificial light and can become disoriented, increasing the likelihood of mortality resulting from collision with structures or vehicles. Lighting also affects the light-sensitive cycles of many species. For example, some predatory birds and reptiles, usually active only during the day, will forage at night under artificial lights (Longcore and Rich 2004). Prey species may suffer adverse effects over time as a result of this foraging shift.

Recommended actions. There are several good sources of information for minimizing the effects of exterior night lighting. A good example of a comprehensive approach is found in Florida where the state Fish and Wildlife Conservation Commission and the US Fish and Wildlife Service teamed up to develop the Wildlife Lighting Certification Program. The program is designed to educate the public, the building industry, and government officials about ways to minimize artificial light impacts to wildlife by using proper lighting methods and identifying appropriate lighting fixtures, shields, and lamps.

The following recommendations are a compilation of the guidelines from the Arizona Game and Fish Department *Wildlife Friendly Guidelines: Community and Project Planning* (www.azgfd.gov/pdfs/w_c/WildlifeFriendlyDevelopment.pdf), and the Florida Wildlife Lighting Certification Program (http://myfwc.com/conservation/you-conserve/lighting/certification/).

1. **Educate landowners about wildlife friendly lighting.** Provide landowners with outreach materials describing wildlife friendly lighting and its benefits to corridor permeability.
2. **Eliminate all bare bulbs and any lighting pointing upward.** Any outdoor lights should be aimed down toward the ground and light only the areas needing illumination.
3. **Keep it low.** Fixtures should be mounted as low as possible while still serving the intended purpose.
4. **Use the minimum amount of light needed for safety.** Install fixtures that use the lowest wattage for the purpose.

5. **Use narrow spectrum bulbs where feasible to lower the range of species affected by lighting.** Long wavelength bulbs make the light seem dimmer to nocturnal animals (Longcore and Rich 2004) while still producing sufficient light for safety purposes.

5.9 Trails and Recreational Uses

The problem. Hikers, equestrians, mountain bikers, dog walkers, and many others enjoy the trails found in the Sonoma Valley Wildlife Corridor. Recreational activities are not inherently incompatible with wildlife movement, but heavy use of trails can disrupt wildlife passage due to noise, off-leash dogs, speeding bicycles, and other activities that cause wildlife to shy away (Knight and Cole 1995). Off-leash dogs in wildlife areas can directly harass wildlife by chasing or digging after them, and can indirectly affect wildlife use patterns by leaving their scent, particularly in areas where dogs are a routine presence.

In the Corridor, trails are open to the public in Sonoma Valley Regional Park and Jack London State Park. Trail use at Glen Oaks Ranch and Bouverie Preserve is much more restricted. Sonoma Valley Regional Park, and the adjacent SDC lands that are used in conjunction with the park (but not under Park management), are of special concern because they are visited regularly by most of these user groups and comprise the narrowest stretch of the Corridor (Figure 2). An enclosed dog park on approximately one half acre is located next to State Route 12 and may discourage wildlife crossings in that area.

Recommended actions:

1. **Increase understanding of the interactions between recreation and wildlife in the Corridor.** Conduct a thorough review of scientific literature on the effects of recreation on wildlife occupancy, movement patterns, and strategies for mitigating such impacts. Use the results of the review to develop additional recommendations for recreation management during the planning phase for future uses of Jack London State Park, Sonoma Valley Regional Park, and Sonoma Developmental Center.

2. **Educate public and private landowners in the Corridor on ways to limit impacts of recreation on wildlife.** Ensure that this document and the findings and recommendations from #1 above are provided to Sonoma County Regional Parks and other entities providing recreation in the Corridor, and summarize pertinent sections in outreach materials to private landowners.

5.10 Streams and Riparian Zones

The problem. Streams and associated riparian zones are important habitat and movement corridors for many types of wildlife. Residential and agricultural development can encroach on riparian habitat and impact its ability to support wildlife by reducing vegetation and cover, increasing sedimentation into streams, reducing flows, installing fences and roads, and increasing the presence of non-native plants and animals. In order to maintain stream and riparian functionality as wildlife linkages, Beier *et al.* (2008) recommends the following general guidelines.

Recommended actions:

1. **Retain natural fluvial processes.** Maintaining or restoring the natural timing, magnitude, frequency, and duration of surface flows is essential for sustaining functional riparian ecosystems (Shafroth *et al.* 2002, Wissmar 2004). Elimination of unnatural perennial surface pools can eradicate water-dependent invasives such as bullfrogs, crayfish, and mosquitofish.

2. **Promote base flows and maintain groundwater levels within the natural tolerance ranges of native plant species.** Subsurface water is important for the health of the riparian habitat, and can be sustained more efficiently by reducing ground water pumping near the river, providing municipal water sources to homes, reducing agricultural water use by planting low water use crops, and routing return flows to the channel (Stromberg 2000, Colby and Wishart 2002).

3. **Maintain or improve native riparian vegetation.** Whenever possible, removing non-native vegetation and restoring native species is essential for maintaining riparian ecological functions. Hundreds of exotic species have become naturalized in riparian corridors, and a few, such as tamarisk and Russian olive, are significant problems. Removing these stresses to natural ecosystems and reestablishing natural flow regimes can help restore riparian communities, but physical eradication of some persistent exotics is necessary (Stromberg 2000, Savage 2004).

4. **Where possible, protect or restore a continuous strip of native vegetation along each side of the channel.** Buffer strips can protect and improve water quality, and provide habitat connectivity for many species. Recommended buffer widths to sustain riparian plant and animal communities vary from 90 to 1,500 feet (Wenger 1999, Fisher and Fischenich 2000, Wenger and Fowler 2000, Environmental Law Institute 2003). At a minimum, buffers should capture the stream channel and the terrestrial landscape affected by flooding and elevated water tables (Naiman *et al.* 1993) and fencing that restricts wildlife movement should be removed from within the streams and buffers.

5. **Enforce existing regulations.** Existing regulations restricting development, gravel mining, farming, dumping of soil, agricultural waste, and trash, in streams and riparian zones should be enforced.

CHAPTER

6 Recommendations for Sonoma Valley Wildlife Corridor Properties

The Corridor Technical Advisory Group (CTAG) spent April 18 and 19, 2013, walking the nine Sonoma Valley properties listed in Figure 27 to evaluate corridor permeability. On April 18, Oak Hill Farm, Glen Oaks Ranch and Bouverie Preserve were reviewed, and on April 19, Stuart Creek Hill, Johnson, Rector, Curreri, Sonoma Valley Regional Park and the Sonoma Developmental Center were visited. Bouverie Preserve, Sonoma Valley Regional Park and the Sonoma Developmental Center were not fully evaluated due to time constraints, but the CTAG made brief visits to make initial observations. The results of the field visits and recommendations for each of the properties are described below. Maps of each property are included with numbers that correspond to the numbered comments and recommendations.

Figure 27. Sonoma Valley Wildlife Corridor Project properties assessed for wildlife permeability by the Corridor Technical Advisory Group.

Property	Acreage	Ownership	Conservation Status
Oak Hill Farms	700	private	SLT easement
Glen Oaks Ranch	234	Sonoma Land Trust	SLT owned
Stuart Creek Hill	14	Sonoma Land Trust	SLT owned
Johnson	9	private	proposed for landowner agreement
Rector	14	private	proposed for landowner agreement
Curreri	37	private	under purchase contract by SLT

Note: In order to respect privacy, information specifically pertaining to Oak Hill Farm, Johnson and Rector is not included in this version of the Strategy.

6.1 Glen Oaks Ranch

Sonoma Land Trust has owned the 234-acre Glen Oaks Ranch since 2002 (Figure 29). The Sonoma County Agricultural Preservation and Open Space District holds a conservation easement on the property that designates three distinct zones: the 40-acre vineyard that is under a long term lease, the 35-acre farmstead listed on the National Registry of Historic Places, and the balance of the property is designated as "forever wild". The farmstead has three residences (only one is currently habitable), a barn, a chicken coop, and three sheds for varying uses. The entry driveway loops through the farmstead and a fork crosses a bridge over Stuart Creek and ends at the barn. This area receives light and intermittent use for events, and SLT hikes and tours. It is predominantly composed of a grass understory with large oak trees, and is mowed regularly to a height of 4 inches. Dogs are occasionally present on the farmstead, but are not allowed to roam free and are not present at night. There is no external lighting on the property and pesticides are not used. One dirt fire road proceeds east from the farmstead, through the vineyard, and into the wild area, looping at the top of a hill that overlooks Sonoma Valley. The "forever wild" portion of the property is relatively undisturbed grassland and oak

woodland and savannah on lower elevations, rising to mixed conifer forest and chaparral on upper slopes.

Stuart Creek enters the property's wildland area after exiting the steep canyon on the neighboring Bouverie Preserve, meanders through the farmstead, and passes under State Route 12 near the entrance (Culvert # 1 in Figure 21). The riparian zone is dominated by mature oak, madrone, bay and fir trees with a dense shrub understory and occasional grassy openings. The riparian habitat narrows considerably near the State Route 12 bridge and the underpass is clear on both sides. The creek alignment has moved since the bridge was created, causing bank erosion and some aggradation of cobble and rock within the bridge itself.

The vineyard is surrounded by 8' woven wire fencing. Most of the rest of the property, the "forever wild" area, has been grazed in the past, though not in the last 10 years, and a couple of 4' tall barbed wire fences are found along State Route 12 and near the barn for pastures. Some stretches of old, non-functional barbed wire fencing are located along the rugged east side property boundaries.

Permeability Recommendations:

The CTAG observations and recommendations are listed below and for those referencing a specific location, there is a corresponding number on the Glen Oaks Ranch map in Figure 29.

1. Remove the old non-functional fence at the east side property boundary to prevent wildlife from becoming entangled. The wire can be coiled, stashed to prevent injury to wildlife, and left in the area to avoid having to haul it out, and the posts can remain in place.

2. Reduce the area around the farmstead that is mowed, and/or leave areas or strips of taller vegetation to provide cover for wildlife.

3. Review the lighting around the home site for compliance with wildlife friendly lighting standards described in Chapter 5, Section 5.8. If motion-detector lights are necessary for security, they should focus on the houses rather than pointing into the grounds.

4. Remove all unnecessary fencing behind the main house, around the garden area, and in the meadow south of Stuart Creek.

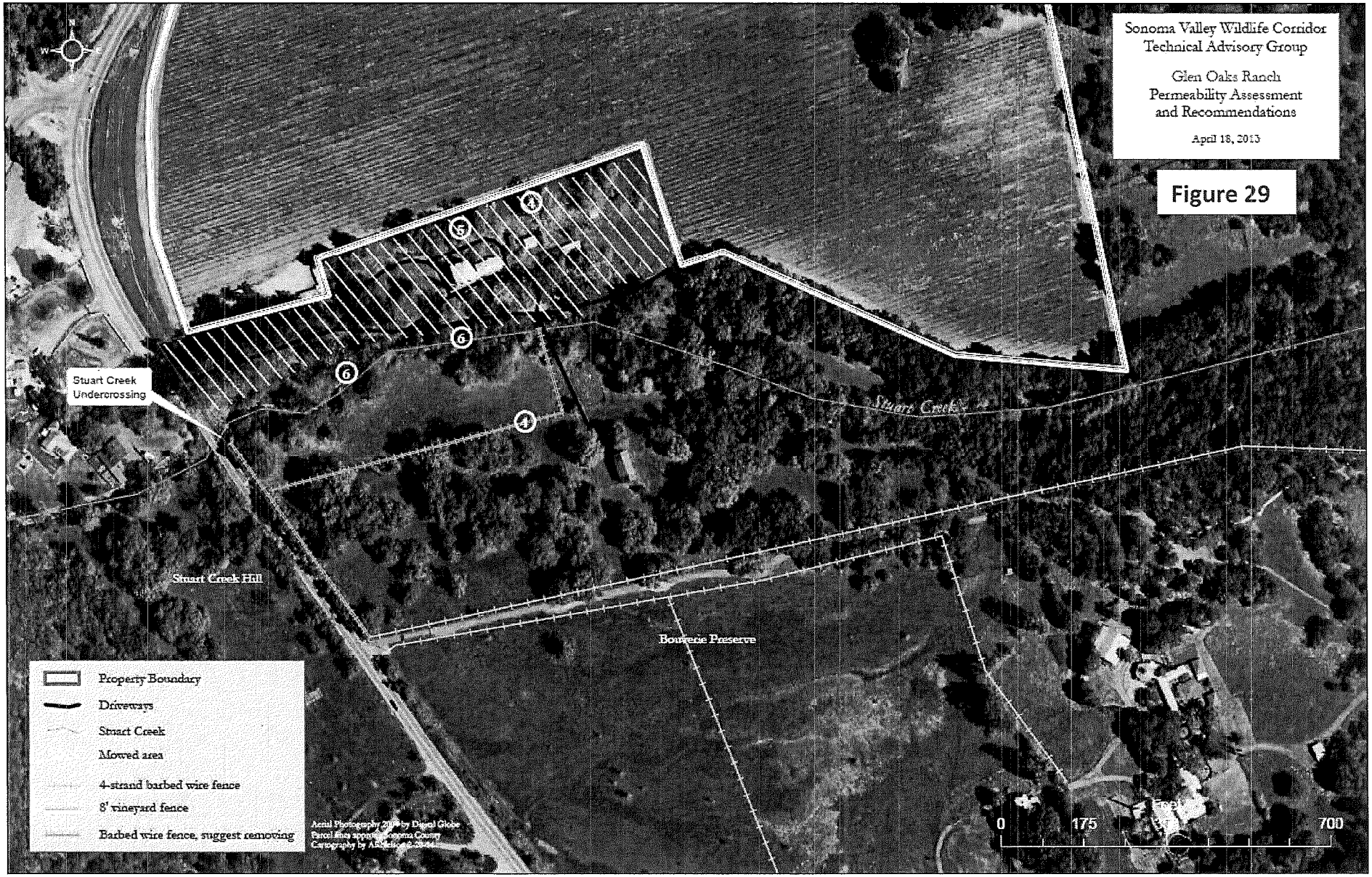
5. Plant oaks around the home site to maintain cover as the large oaks and eucalyptus trees decline.

6. Plant native riparian shrub species along Stuart Creek to create an understory, particularly between the entry drive and the rock wall where there is little cover and structural diversity.

7. The Stuart Creek undercrossing on Glen Oaks Ranch.

7. The Stuart Creek bridge undercrossing could be improved by clearing out the sediment that has accumulated at the entrance and within the structure.

8. The fencing around the vineyard should be modified so that it is more wildlife-friendly.


Sonoma Valley Wildlife Corridor
Technical Advisory Group
Glen Oaks Ranch
Permeability Assessment
and Recommendations
April 18, 2013
Figure 29
Stuart Creek
Undercrossing
Stuart Creek
Stuart Creek Hill
Bouverie Preserve
Property Boundary
Driveways
Stuart Creek
Mowed area
4-strand barbed wire fence
8' vineyard fence
Barbed wire fence, suggest removing
0
175
700

6.2 Stuart Creek Hill

Sonoma Land Trust purchased the 14-acre Stuart Creek Hill property in 2012 (Figure 30). It is located on the west side of State Route 12, and is easily accessed from Glen Oaks Ranch via the Stuart Creek bridge undercrossing. There are no structures on the property. Old, non-functional, and intermittent four-strand barbed wire fencing occurs in places including along an old rock wall that parallels the highway. Much of the property slopes upward to the west where it abuts the Johnson property. Grasslands, riparian forest, and oak woodlands are the predominant vegetation types. Medusahead and several eucalyptus trees occur in the lower portions of the property, and both can come to dominate the landscape and negatively impact habitat value and use by wildlife if not eliminated or controlled early.

To the south, Stuart Creek Hill is bounded by a tall chain link fence on the neighboring property that forms an impermeable barrier. The northern boundary incorporates a small stretch of the Stuart Creek riparian corridor. Riparian vegetation along the creek has tall oak and bay trees with a sparse understory. The creek alignment on the Glen Oaks Ranch side of the bridge has moved since the bridge was created, causing bank erosion and some aggradation of cobble and rock within the bridge itself. The south creek bank on Stuart Creek Hill at the bridge outlet has developed a 10' vertical drop that may impede entry to and exit from the undercrossing. Access to and from the undercrossing along the north bank is narrowed by a wall along the neighbor's property line, but wildlife trails and camera captures indicate the north bank is the primary access route to the undercrossing.

Permeability Recommendations:

The CTAG observations and recommendations are listed below and for those referencing a specific location, there is a corresponding number on the Stuart Creek Hill map in Figure 30.

1. Explore means of laying back and stabilizing the vertical south creek bank so that wildlife can access the underpass more freely to cross under the highway.

2. Remove old and non-functional barbed wire fencing.

3. If roadkill surveys indicate wildlife mortality is problematic on the highway along this property's frontage, a drift fence should be installed to funnel animals to the Stuart Creek undercrossing for safer passage.

4. Control current noxious non-native plants (medusa head, eucalyptus), watch for new invading weeds, and consider measures such as grazing or mowing to reduce competition from non-native species and promote native plants.

5. Very little oak regeneration was observed in the understory. Explore reasons for this and implement measures to promote oak seedling establishment and survival.

Figure 30

Sonoma Valley Wildlife Corridor
Technical Advisory Group
Stuart Creek Hill
Permeability Assessment
and Recommendations
April 19, 2013

6.3 Curreri Property

Sonoma Land Trust has entered into a purchase agreement with the Curreris to purchase 29 of the 37 acres comprising this property (Figure 33). The Curreris are retaining the westernmost six acres with the current homesite that adjoins the town of Glen Ellen. Once the purchase is complete, SLT will transfer the property to Sonoma County Regional Parks for addition to the adjacent Sonoma Valley Regional Park. Sonoma County Agricultural Preservation and Open Space District is granting funds to purchase the property and will retain a conservation easement for the protection of natural resources and wildlife permeability.

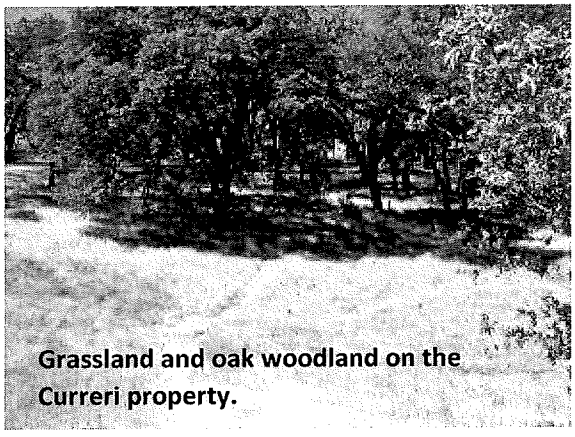
The portion of the property to be purchased supports montane hardwoods and grasslands, small vernally wet habitats, and a several acre man-made pond. Oak regeneration appears to be reasonable in the vicinity of the proposed boundary between the purchased and retained portions of the property. However, invasive French broom occurs in this area as well. In the large open area near the pond, now overgrown with grass, the landowner planted oak trees to raise truffles for market. Only a few scattered young trees remain. Another small area at the east end of the property near State Route 12 was cleared for agriculture but is now unused.

There are no buildings on the 29-acre portion of the property to be purchased. A dirt road enters off State Route 12 and heads west, terminating at the large pond. A few trails traverse the property, providing access to the Regional Park for the Curreris and nearby landowners. There is currently no fence delineating the purchased and retained portions of the property. Curreri shares a barbed-wire fence with Rector and Johnson, and a 5-strand barbed wire fence runs approximately a quarter mile or less starting at State Route 12 along the southern boundary with Sonoma Valley Regional Park. The rest of the southern boundary with the park is in disrepair. Additional fencing occurs along the east boundary with neighbors and State Route 12. The northeastern boundary has been made impermeable by the 8' foot woven-wire fence installed on the Dolan property. One internal barbed wire fence stretches across the eastern portion of the property.

Permeability Recommendations:

The CTAG observations and recommendations are listed below and for those referencing a specific location, there is a corresponding number on the Curreri property map in Figure 33.

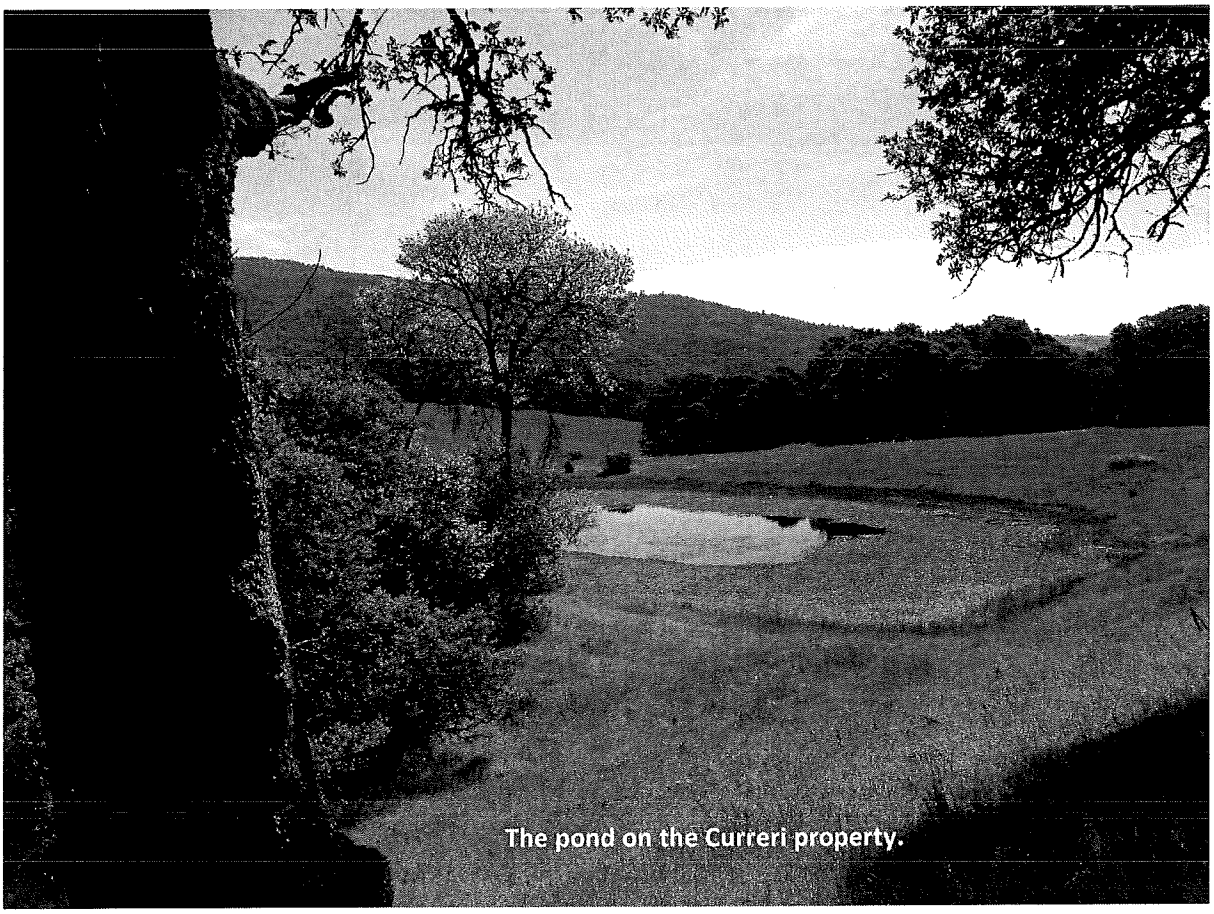
1. Remove the interior fencing.
2. When the Curreri property is added to the Regional Park, the common boundary fence should be removed retaining the eastern end only if needed to manage visitors near the State Route 12 entrance. If this portion of the fence is retained, the lowest strand should be removed or replaced with smooth wire and raised to at least 16".
3. If the Curreri family or Regional Parks wants to install a fence along the proposed lot split line, it should be located below the ridgeline and constructed using a wildlife-friendly design as described in Chapter 5, Section 5.5.



Grassland and oak woodland on the Curreri property.

4. Consider alternative, wildlife friendly means of marking property lines and preventing trespassers on the Rector and Johnson properties so that the boundary fences could be removed.

5. Control the invading French broom in the western quarter of the property. Remove all eucalyptus trees, and control yellow starthistle and Armenian blackberry to prevent expansion. Watch for new invading weeds and control early to prevent their spread.



The pond on the Curreri property.

Figure 33

Sonoma Valley Wildlife Corridor Technical Advisory Group

Curreri Property
Permeability Assessment and Recommendations

April 19, 2013

6.4 Sonoma Valley Regional Park

Sonoma County Regional Parks operates this 162 acre park, popular with hikers, bikers, and equestrians (Figure 34). Sonoma County Parks staff estimate usage for the fiscal years 2011-2012 and 2012-2013 at 225,000 and 230,500 visitors, respectively (personal communication, Ken Tam, Sonoma County Regional Parks).

The park, dominated by mature oak woodland and grassland, has paved and dirt trails as well as picnic areas with tables and lawns near the entry station and trailheads off State Route 12. A fully fenced 1-acre dog park is also located near the park entrance.

The park was not targeted for assessment, but the CTAG had sufficient time to make brief observations. The CTAG crossed from the Curreri property into the park and exited on Sonoma Developmental Center land. Though not carefully evaluated by the CTAG due to time and funding constraints, it is recognized that this park occupies a critical place in the Corridor and reductions in permeability here can have significant impacts on the function of the Corridor. As such, a more thorough evaluation of permeability factors throughout the park should be made with Regional Parks staff engagement.

Given the cursory and incomplete observations made during a brief walk-through, no specific recommendations are offered for the park. It is suggested that measures such as grazing or properly timed mowing be considered to reduce competition from non-native species and promote native plants. Studies indicate that some aspects of recreation, such as quantity of visitors, presence of dogs, night versus day use, affect the willingness of wildlife to use certain areas and these factors should be closely considered in evaluating permeability and management of the park.

6.5 Sonoma Developmental Center

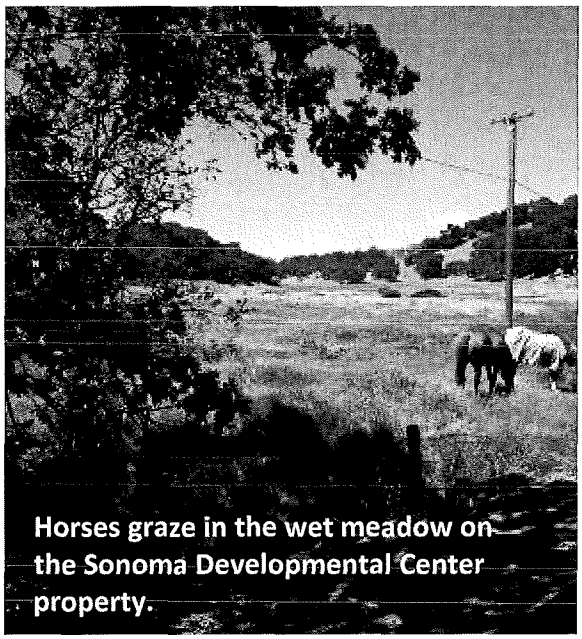
The Sonoma Developmental Center (SDC) is approximately 935 acres owned by the state (Figure 34) and is the heart of the Sonoma Valley Wildlife Corridor. SDC is operated by the California Department of Developmental Services for people with developmental and intellectual disabilities. The "core campus" of the SDC property encompasses 250 acres and comprises 130 buildings. Over the last 50 years, the SDC resident population has declined from a peak of over 3,000 to a current level of 439 resident clients. The remaining 700+ acres of SDC land surrounding the campus is a rich mixture of open space and natural habitat.

The future of the SDC is at a crossroads. State-run developmental centers are extremely expensive to operate, and serve a dwindling resident population due to legal mandates requiring transition to community-based care for most clients. In January 2014, a State Task Force concluded that developmental centers will need to transition from large 24-hour nursing and care facilities to a new model. The "new model" for the SDC, however, is unclear.

In order to serve as an organized voice for the local community, and to protect the people and the assets of the SDC, Sonoma County Supervisor Susan Gorin, county agencies, community groups and concerned citizens have formed the "SDC Coalition." Sonoma Land Trust (SLT) and its partners, the Parent Hospital Association and the Sonoma Ecology Center, are launching the "Transform SDC" Project to support the Coalition and the local community's role in developing an improvement and redevelopment plan to guide the future use of SDC's land, health care and infrastructure resources. Project objectives include developing robust community engagement in shaping the future of SDC, identifying a common vision and specific recommendations to the State for future uses of the site, ensuring that long-term care needs of the residents are considered and resolved, and ensuring that the

undeveloped lands are permanently protected and managed for open space and integrated watershed and wildlife corridor function.

The wild portions of the SDC property include montane hardwood forest, riparian, and grassland habitats. Fern and Suttonfield Lakes provide water for SDC and also serve as important perennial water sources for wildlife. A large wet meadow near the barns may be the largest in Sonoma Valley. A few dirt roads are on the property, providing access to the west and into Jack London State Park. Numerous trails also crisscross the property, particularly in the area between Arnold Drive and State Route 12, and are used fairly heavily by SDC's clients, employees, and the local community.



Horses graze in the wet meadow on the Sonoma Developmental Center property.

Though not carefully evaluated by the CTAG, SDC occupies a critical place in the Corridor and permeability constraints here can have significant detrimental impacts on the function of the Corridor. As such, a more thorough evaluation of permeability factors throughout the SDC property will be conducted as part of the Transform SDC project. Studies indicate that some aspects of recreation, such as quantity of visitors, presence of dogs, night versus day use, affect the willingness of wildlife to use impacted areas and these factors should be closely evaluated during permeability and management assessments of the SDC's undeveloped areas.

CHAPTER

7 Sonoma Valley Wildlife Corridor Monitoring Strategy

7.1 Introduction

Two independent scientific planning projects, Bay Area Critical Linkages and the Conservation Lands Network, identified the Sonoma Valley Wildlife Corridor (Corridor) as an important component to maintain wildlife connectivity and permeability for the larger Blue Ridge to Marin Coast Linkage (Figure 7). There is, however, little actual data on wildlife use of the Corridor or its surrounding landscape, and both projects relied on well-studied connectivity factors such as distance from roads, human population density, proximity and extent of conserved public and private lands, and parcel size to determine corridor location and extent. The science of corridor ecology is advancing, but results of such planning efforts require validation on the ground, and as acquisition funding dwindles, the need to evaluate the effectiveness of identified corridors becomes even more vital.

The Corridor Technical Advisory Group (CTAG) proposed that initial monitoring priorities focus on documenting which species are present in the Corridor and whether the area designated as the Corridor is in fact freely permeable to wildlife movement. Of special concern is determining if animals freely use undercrossings to safely cross State Route 12 and Arnold Drive, and whether roadkill is a significant factor for any particular species. Data gathered to address these priorities will also serve to establish baselines with which to evaluate trends in species presence and permeability over time, inform management of the Corridor, and guide design of future road improvements.

7.2 Ecological Monitoring

Ecological monitoring is frequently designed to determine the effectiveness of land management actions in achieving a specific goal. "Effectiveness monitoring" typically requires focused data collection in before - after or treatment - control designs. The impacts on permeability of many of the management actions proposed for the Corridor, such as removing a fence here or controlling a weed there, are expected to be diffuse and difficult to evaluate on a landscape scale, but could potentially be evaluated on a local scale.

Monitoring may also be used to gather information when insufficient data exists in order to develop specific hypotheses, answer foundational questions, or serve as a baseline or pilot study leading to further examination. In many cases, such "exploratory monitoring" occurs irrespective of any specific or proposed management action and can be a prelude to more specific or targeted effectiveness monitoring. Given the paucity of data on wildlife use of the Corridor, the proposed monitoring efforts will be exploratory, at least initially.

Monitoring data gathered as described in this chapter will be valuable for:

- identifying additional land protection priorities
- informing management activities on Corridor lands
- guiding design preferences for future road improvements
- prioritizing and refining further monitoring and research needs

7.3 Corridor Monitoring Priorities

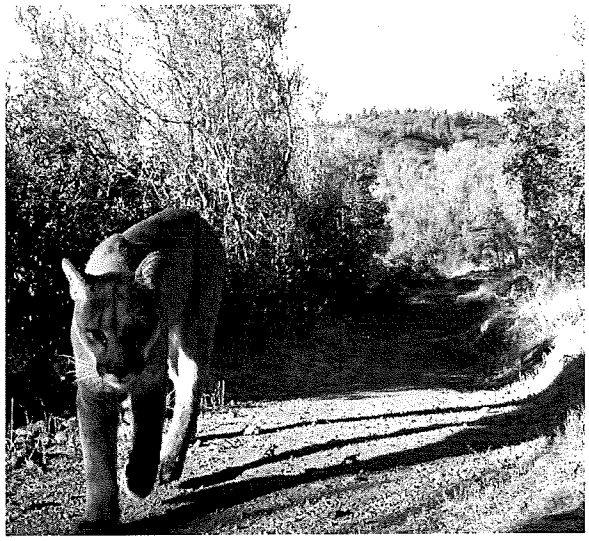
An extensive list of monitoring questions and hypotheses related to Corridor function was developed by the CTAG at the May 2013 monitoring meeting. CTAG members were asked to assign priority rankings for each question and hypothesis using the list below.

Monitoring Priority Rankings

1. Essential to evaluate corridor use and permeability
2. Important, but not essential, in evaluating corridor use and permeability,
3. Nice to have, but not critical

The full list of questions, hypotheses, and results of the prioritization exercise are presented in Figure 36 at the end of this chapter. Questions and hypotheses are grouped by topic, and redundant or similar items were lumped together for final tallying. The Weighted Total for each question or hypothesis was determined by assigning one point for each Priority 1 vote and a half point for each Priority 2 vote. No Priority 3 assignments were made so none are shown in the table.

Sufficient funding is not available to immediately begin addressing all of the ecological monitoring questions posed by the CTAG. However, Sonoma Land Trust is committed to pursuing monitoring projects that will address the highest priority monitoring hypotheses and questions as described in the following sections for two to three years. Out of 40 proposed monitoring priorities, 15 will be directly or indirectly addressed by the current monitoring program. In many cases, the resulting data will serve as a baseline for monitoring long-term trends and it is hoped that further studies will be conducted in 5 to 10 years or when significant land-use changes occur. Those questions and hypotheses listed in Figure 36 that are not a focus initially may be pursued if exploratory monitoring indicates heightened need, additional funding becomes available, or new monitoring partners such as academic researchers can be engaged. A few of the recommended monitoring priorities listed during the exercise are policy or administrative issues which are not directly addressed in this chapter.



Fully addressing the identified priority questions and hypotheses would entail utilizing an array of monitoring protocols for each class of wildlife in the region (e.g., insects, arthropods, amphibians, reptiles, mammals, fish, and birds) as well as detailed demographic studies and genetic analyses for target species as described in *Critical Linkages: Bay Area and Beyond* (2013). Funding, organizational capacity, and existing information on species presence are at present limited, and it is necessary to focus initial efforts on guilds most likely to indicate permeability, or lack thereof, in a time and cost-effective manner. Toward that end, we are focusing on medium to large mammals that represent the highest trophic levels in the community and include top carnivores, herbivores, seed dispersers, and ecosystem engineers. These species typically have large area requirements so are more susceptible to habitat loss and extinction, and it has been concluded that the status of higher trophic species may serve as an indicator for maintenance of species and ecosystem services at lower trophic levels (O'Brien *et al.* 2010). Thus, information garnered on these species may provide an early warning of depleted lower trophic species and ecosystem services on which humans

depend. If monitoring indicates that passage is restricted or prevented for particular species, further studies can be more efficiently focused where needed. Relatively inexpensive protocols can be employed to passively evaluate (i.e., without handling animals) the status of these species across large landscapes if permeability problems are uncovered.

An additional benefit of monitoring larger mammals is the appeal they have with the general public when they see photos captured by motion-activated cameras. The positive impact of the pictures on local community support for the Corridor cannot be understated.

7.4 Monitoring Protocols

Summary descriptions of the monitoring protocols that we are employing to document species presence, estimate occupancy of mobile mammals, and evaluate permeability of the Corridor are provided below. Implementation of these protocols began in 2013 and is expected to continue through May 2015. Specific methodologies will be more fully detailed in monitoring reports.

1. **Wildlife camera trapping.** Remote, motion-triggered infra-red cameras ("camera traps") are standard tools in the study of some species and are increasingly being used to study demographics and behavior of species; document presence, age class and gender, and relative quantity of mammal and bird species, and; follow trends in community structure and diversity across landscapes (O'Brien 2010). Camera trapping is a relatively non-intrusive, low cost, and reliable means to study animals that might react to other methods that require more human presence and interaction. The cameras can be left in the field for long periods in all weather conditions and are effective during the day and at night, allowing comparison of wildlife presence and activity patterns across seasons and circadian time periods, and increasing the likelihood of capturing rare species digitally. When used for scientific purposes, the cameras are usually not baited but may be opportunistically placed at sites preferred by wildlife species of interest, such as on trails or at water sources. Prices for cameras are reasonable and they are relatively easy to deploy and maintain compared to many other wildlife study techniques. A number of camera models are now available with varying specifications and settings depending on the type of data needed.

   Remote cameras have been or are currently deployed within and near the Corridor to document wildlife use of a bridge and a culvert at Oak Hill Farm (Hilty pers. comm. March 2013), evaluate wildlife richness and occupancy at Pepperwood and Modini Preserves (Townsend *et al.* 2013), study wildlife use of human trails (Reilly pers. comm. May 2012), compare wildlife presence before and after opening a new trail (Robinson pers. comm. June 2013), and study mountain lions (Felidae Conservation Fund pers. comm. March 2013).

   a. **Wildlife Picture Index.** The Wildlife Picture Index (WPI) was developed jointly by the Wildlife Conservation Society and the Zoological Society of London as an indicator of biodiversity for medium and large terrestrial mammals and birds. WPI uses camera data to develop estimates of *occupancy,* which is a statistical estimate of the proportion of camera stations in an area that are expected to capture individuals of a species in a given timeframe (Ahumada *et al.* 2011). Occupancy is considered to be a useful and more easily attainable surrogate for abundance.

      SLT, as principle investigator, contracted with wildlife biologist Sue Townsend to train SLT staff and volunteers in camera setup and data management and analysis using the WPI method. In 2013, we established two camera arrays, one east of Highway 12 in the Mayacamas Mountains (East Grid), and one west of Arnold Drive on the slopes of Sonoma Mountain (West Grid) (Figure

35). We chose this design so that we can compare WPI results from either side of the valley bottom where busy roads and other potential movement barriers occur. Based on the size of the Corridor and available funding, we planned to set 20 cameras in both the East and West Grids. Preliminary results from a WPI study at Pepperwood Preserve indicate that operating 20 cameras for 90 days each season provides adequate statistical power for occupancy analysis (Townsend pers. comm. January 2014).

The area between the two main roads on the valley bottom (Central Grid), where human presence and recreation are more prevalent, is too small for a separate WPI analysis. However, we established cameras there to detect species that reside in or pass through the area. Data from these cameras may be included in one of the other WPI analyses if appropriate.

To determine camera locations, we laid a grid of 0.5 square kilometer cells randomly over each study area. The center of each cell was a potential camera station centroid and their coordinates were downloaded into GPS units for orientation in the field. The grids encompass both private and public lands and final camera stations were established where SLT was able to secure access. There are 18 cameras in the East Grid, 19 in the West Grid, and six in the Central Grid. Each camera was set up within 100 meters of a grid centroid where animal activity was apparent, mostly along animal or human trails, and will remain in the place for 24 months (June 2013 through May 2015). Batteries and digital memory cards are replaced every 6-8 weeks. Data is downloaded every 6-8 weeks and stored at the SLT office, backed up off-site, and managed and analyzed by SLT's Project Manager and Assistant Project Manager.

Each photograph is stamped with the date and time, and tagged with camera station coordinates using Picture Information Extractor (PIE) software. Photographs are cataloged by camera station name in Excel spreadsheets where date, time, species, age (adult or juvenile where discernible), number of individuals, name of recorder, and location coordinates are recorded. Data will be analyzed to assess species presence or absence and biodiversity by year and season (December - February, March - May, June - August, September - November). Occupancy will be estimated for each species that has sufficient detection levels. Species detections may also be lumped to estimate occupancy and compare grids by trophic level or other guild.

b. Undercrossing use. Undercrossings – bridges and culverts – often provide the safest means for animals to cross roads. As described in Chapter 5, the utility of an undercrossing for a given species depends on a number of factors including height and width, ground substrate, visibility at entrances, and the proximity of cover and suitable habitat. The useable undercrossings along the main roads bisecting the Corridor are either concrete box culverts of 4-8 feet in height and

width, or taller and wider bridges with natural channel and creek bank substrate. All of them serve as water conveyances. Culverts generally serve intermittent streams and swales and can be completely encumbered during winter storms but empty and passable at other times. Bridges are located over larger creeks and most have creek banks and small terraces that remain passable at winter base flows. Given the restricted width of the Corridor in the vicinity of State Route 12 and Arnold Drive, it is important to document the use of these undercrossings to assess permeability, determine management actions that could improve permeability, and inform future road improvements as traffic density increases and infrastructure ages.

Several studies of the importance of undercrossings to wildlife populations and the amelioration of wildlife-vehicle collisions have been conducted or are underway in California that demonstrate effective methods to document wildlife passage at undercrossings with remote cameras (Freidin *et al.* 2011, Big Sur Land Trust and Pathways for Wildlife 2013, Diamond and Snyder 2013). Similar protocols were applied by placing cameras at each bridge and culvert within the Corridor where passage for medium and large mammals is possible, and at the bridges on either end of the Corridor boundary on State Route 12. We established cameras at the Stuart Creek bridge and Hooker Creek culvert (undercrossing nos. 1 and 19, respectively, in Figures 12, 13, and 21) on State Route 12 and the North Sonoma Creek bridge on Arnold Drive in 2013, and at the Calabazas bridge on State Route 12 in 2014 (undercrossing nos. 11 and 12, respectively in Figures 12, 13, and 21). These cameras will be periodically moved to the other medium and large undercrossings in the corridor, after a minimum of 30 days per location. Large undercrossings (bridges) will be camera-trapped for at least one period each season, and medium undercrossings will be camera-trapped for at least one period during spring and summer when water flows are not present.

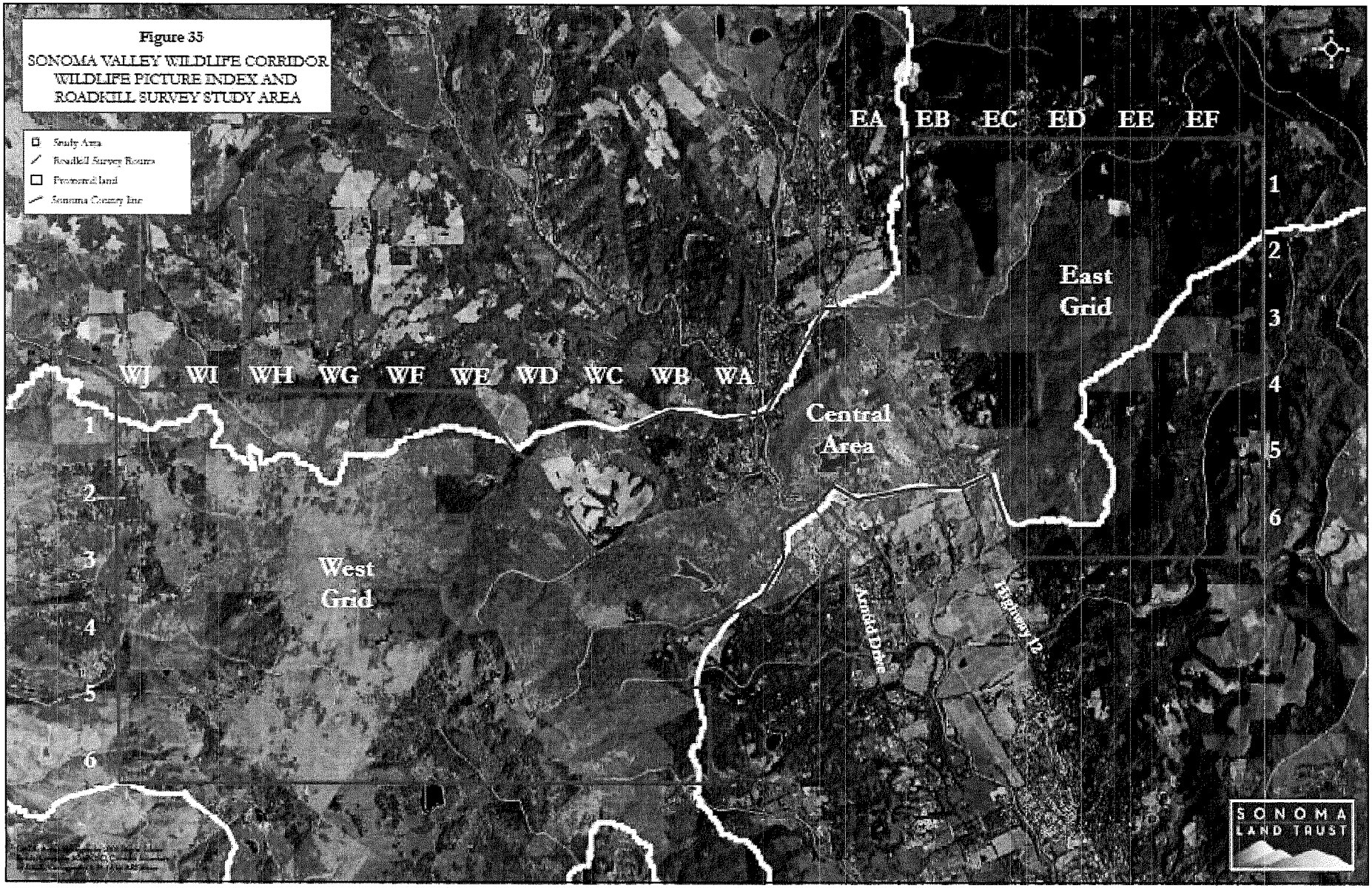


Figure 35
SONOMA VALLEY WILDLIFE CORRIDOR
WILDLIFE PICTURE INDEX AND
ROADKILL SURVEY STUDY AREA
Study Area
Roadkill Survey Routes
Protected land
Sonoma County line
EA
EB
EC
ED
EE
EF
WJ
WI
WH
WG
WF
WE
WD
WC
WB
WA
1
2
3
4
5
6
East
Grid
Central
Area
West
Grid
Arnold Drive
Highway 12
SONOMA
LAND TRUST

At each undercrossing, one camera is placed outside both openings at an appropriate distance, pointed at the entrance and positioned to capture as much of the immediate area around the openings as possible. Cameras are situated to capture paths of greatest use based on preliminary surveys of animal sign. Cameras will not be placed inside of the undercrossings to avoid losses from high water flows and theft, and avoid the expense of permits from state and county road agencies.

Photos captured on both sides of the undercrossing structures will be tabulated and evaluated to determine which undercrossings are used for passage by each species documented in the WPI Grids, and whether particular species approach structures but avoid passing through, indicating that improvements should be considered. Direction, time of travel, and use of the undercrossings by both adults and juveniles when discernible will be evaluated to help inform future undercrossing designs.

2. **Roadkill surveys.** A synthesis of literature on ecological effects of roads on wildlife by Forman and Alexander (1998) indicates that while roadkill is a primary direct source of mortality for terrestrial vertebrates, it seldom limits population size of most species. Locally rare species, however, may suffer significant population declines due to road mortality. Harris and Scheck (1991) indicate that roads are the principal source of mortality for all of Florida's "large, rare and endangered vertebrates" including Florida panther (*Felis concolor coryir*) and black bear (*Ursus americanus*). Nevertheless, the barrier effect of roads probably affects more species over a greater area than does roadkill (Forman and Alexander 1998). The barrier effect of roads can divide large contiguous populations into smaller isolated populations and block recolonization, increasing the probability of local extinctions. Road width and traffic volume are major determinants of the barrier effect. Species responses to roads and traffic varies and the intensity of the barrier effect may be compounded by other factors such as noise, artificial light, roadside vegetation management, and surrounding habitat type and extent.

   Measuring the effect of roads on wildlife is complex and the tools to do so on a landscape scale are not well-developed (Coffin 2007). Yet it is clear that the barrier effect is dependent largely on the degree to which a species avoids crossing roads, and the probability of being killed if a crossing is attempted. Answering these questions for a given species would require enumeration of roadkill, the ability to document successful road surface crossings, and an understanding of the species population size and movement patterns in the region. We do not have the ability to study successful road surface crossings, and studies of species populations and movement are beyond the scope of this monitoring strategy. Nevertheless, roadkill surveys can be instrumental in determining if certain species in the Corridor are suffering heavy mortality on roads and/or avoiding the roads and undercrossings. Roadkill spatial data can also identify any roadkill "hot spots" along the roads, prompting appropriate mitigation measures to minimize both animal mortality and auto accidents.

   SLT is conducting roadkill surveys along four miles of State Route 12, and three miles of Arnold Drive within and near the Corridor (Figure 35) approximately every two weeks. It takes approximately two hours to complete a survey of both roads. To the extent possible, surveys are conducted within three hours of sunrise. Data collected for each roadkill observation include: date, time, location coordinates, species identification, estimated time of death, speed limit, type of roadside fencing, and proximity to undercrossings. The data collected follows the general outline of the California Roadkill Observation System (CROS) with some additional observations to facilitate evaluation of roadkill incidence near undercrossings and roadside fences. Data consistent with the CROS system will be batch uploaded to that database periodically.

Roadkill observations are recorded in the field via a mobile data collection tool on a Samsung Galaxy Note 10.1 tablet. Joe Kinyon, SLT GIS Manager, created the XML-based tool for use on these tablets as well as smart phone devices with embedded high quality cameras and sensitive GPS/GNSS receivers. A digital roadkill questionnaire form was developed that converts each observation to a completed record with geographic coordinates from the GPS antenna and photos from the onboard camera automatically linked to the record. The forms are uploaded wirelessly to SLT's Google Applications hosted server and appended to the Corridor roadkill database.

7.5 Monitoring Outcomes

We anticipate that occupancy estimates in the WPI grids combined with undercrossing assessments and roadkill data for the two years specified in this Strategy will provide a picture of wildlife use of the Corridor and answer, or serve to further refine, 15 or more of the objectives in Figure 36. We assume that the Corridor is currently permeable and that most of the undercrossings are utilized freely by all species documented in the grids. In that case, species presence and occupancy estimates should be similar among the three grids, though with some likely dissimilarity due to variations in habitat quantity and quality, and all species should be documented passing through undercrossings and/or suffer little roadkill. Conversely, inconsistent presence or markedly different occupancy estimates of a species between Grids could be indicative of significant habitat variation or suppressed dispersal for the species in question. The lack of evidence of the species using undercrossings to move between Grids, and/or data showing high susceptibility to roadkill would increase the concern that permeability is hindered by roads and human activities in the valley bottom.

If monitoring results indicate that our assumption of free permeability for all species is incorrect or questionable, further research into species requirements, possible passage barriers, and mitigation measures will be necessary. Data gathered between June 2013 and May 2015 can be considered a baseline for eventual analysis of trends in species presence and occupancy and Corridor permeability over time.

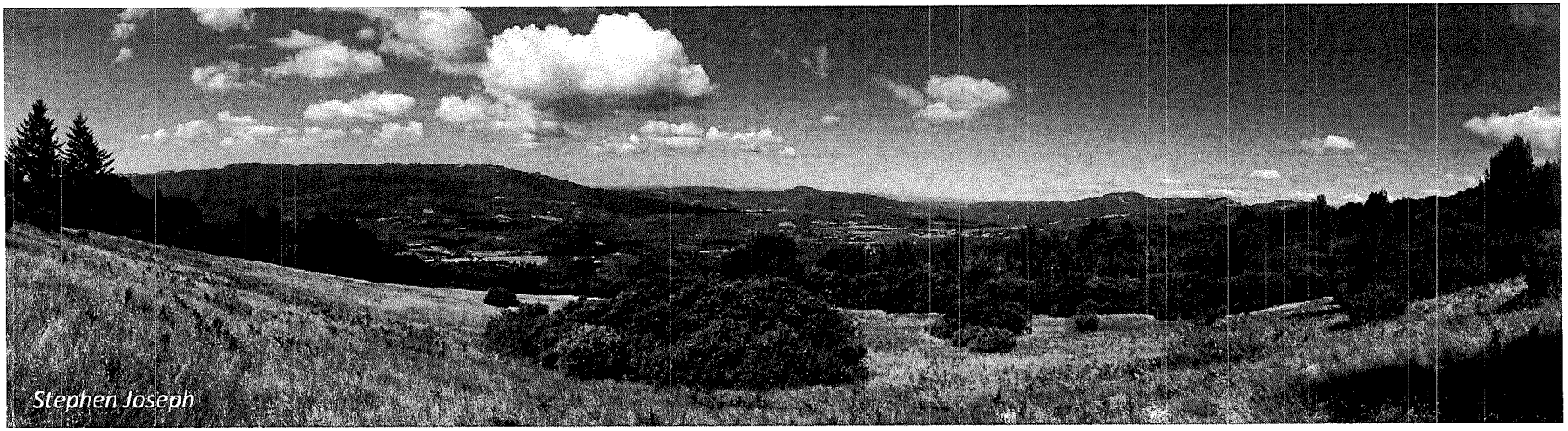
Figure 36. Monitoring priorities as recommended and ranked by the Corridor Technical Advisory Group. Questions and hypotheses shown in **bold** indicate monitoring priorities that are addressed by the June 2013 to May 2015 monitoring program implemented by Sonoma Land Trust.

No.	Question (?) or Hypothesis (H)	Monitoring Question or Hypothesis	CTAG Priority Selections		Weighted Total	Notes
			1	2		
Corridor Use						
1	H	**There is no difference in species composition and occupancy in the east, west and central parts of the corridor between 2013 and 2015.**	9	0	9	**addressed in 2013–2015 monitoring program**
2	?	**What terrestrial species currently occur within the corridor?**	8	0	8	**addressed in 2013–2015 monitoring program**
3	?	What pathways through the pinch point (central area) are animals using?	7	1	7.5	
4	?	**Where do threats to permeability occur?**	2	7	5.5	**addressed in 2013–2015 monitoring program - select property assessments completed**
5	?	**What is the significance of Sonoma Developmental Center to permeability through the Corridor?**	3	4	5	**addressed in 2013–2015 monitoring program - permeability assessment needed**
6	?	**How and where do the species occurring in the Corridor cross Arnold Drive and Hwy 12?**	5	0	5	**addressed in 2013–2015 monitoring program using undercrossing cameras and roadkill surveys**
7	?	**Does monitoring data validate that this is an important corridor as found by Bay Area Critical Linkages project?**	1	6	4	**addressed in 2013–2015 monitoring program**
8	?	How many individuals of each species captured by cameras can be identified, and how many are moving with offspring?	1	5	3.5	
9	?	**Is the trend in medium and large terrestrial mammal occupancy equivalent on either side of the Sonoma Valley floor?**	3	0	3	**baseline data being gathered in 2013-2015 monitoring program**

10	?	Where are animals moving through the Corridor, and how can permeability be improved?	3	0	3	
11	H	There is no relationship between distance from structures and roads and species composition and abundance.	0	5	2.5	
12	?	What about the upland patches? What is happening at certain points?	2	1	2.5	
13	?	How does use of the corridor change as a result of changes in land use (such as mowing or fencing)?	2	0	2	
14	?	Did completed elements of the Implementation Strategy improve permeability?	0	3	1.5	
Undercrossing Use						
15	**H**	**There is no difference in composition and abundance between species using undercrossings and those occupying the surrounding landscape.**	**10**	**0**	**10**	**addressed in 2013–2015 monitoring program using undercrossing cameras & Wildlife Picture Index**
16	H	There is no variation in animal composition and abundance using similar culverts and bridges.	7	0	7	**addressed in 2013–2015 monitoring program using undercrossing cameras**
17	?	How does use of undercrossings change after enhancement?	3	3	4.5	# baseline 2013-2015 for any future enhancement
18	**?**	**What species are currently using the culverts and bridges?**	**2**	**0**	**2**	**addressed in 2013–2015 monitoring program using undercrossing cameras**
19	**?**	**What is the relative use by wildlife of wide versus narrow undercrossings?**	**1**	**0**	**1**	**addressed in 2013–2015 monitoring program using undercrossing cameras**
Road Crossing						
20	**H**	**There is no variation in roadkill density along either Arnold Drive or Highway 12 within the study area.**	**5**	**2**	**6**	**addressed in 2013–2015 monitoring program using roadkill surveys**

21	**?**	**What is the relationship of roadside fencing and undercrossings to roadkill?**	**4**	**2**	**5**	**addressed in 2013–2015 monitoring program using roadkill surveys**
22	**?**	**Where are wildlife-vehicle collisions occurring on Arnold Drive and Highway 12 and which species are suffering mortality?**	**3**	**0**	**3**	**addressed in 2013–2015 monitoring program using roadkill surveys**
23	?	Where are important locations of on-road crossings?	0	6	3	Possibly identified by roadkill surveys
24	?	Of animals traversing roads, what proportion are using undercrossings versus crossing on-road?	0	1	0.5	
Riparian Corridor						
25	?	How important are riparian corridors to terrestrial species?	4	2	5	well-covered by literature
26	?	Does the value of riparian areas and undercrossings to terrestrial species movement fluctuate with flows?	3	4	5	possibly illuminated by undercrossing cameras
27	**?**	**What is the relative importance of Calabazas and Hooker Creeks relative to undercrossings within the Corridor?**	**2**	**3**	**3.5**	**addressed in 2013–2015 monitoring program using undercrossing cameras**
28	?	What aquatic species are moving up and downstream in the major creeks?	2	3	3.5	
29	?	Where are riparian areas that could be widened?	2	2	3	
30	?	What is the relative importance to wildlife movement of Creek passageways (undercrossings) to other avenues (road crossing)?	2	0	2	
Species-Specific						
31	?	What is the carrying capacity for mountain lion or bobcats on Sonoma Mountain?	1	4	3	
32	?	What are species preferences for different land cover types?	1	4	3	
33	?	What are impacts to species resulting from creek draw down?	1	3	2.5	
34	?	What are the impacts to herps due to land use changes such as lack of water.	0	3	1.5	

35	?	What is the composition and abundance of the small rodent population between Highway 12 and Arnold Drive? Between the east and west sections of the linkage?	0	3	1.5	
36	?	Is there variability in the trophic structure between the east, central, and west areas of the corridor?	0	3	1.5	
37	?	What are impacts to flying species such as birds and bats?	0	2	1	
Policy questions to support land use protection or designations objectives.						
38	?	What data is needed to support the protection of Sonoma Developmental Center?	5	3	6.5	
39	?	What kind of data is compelling to Caltrans and Sonoma County Transportation Agency? Road hazards? Safety index calculation?	5	2	6	
40	?	Recommend protection of riparian corridor?	0	2	1	



CHAPTER

8 Recommendations to Maintain and Enhance Sonoma Valley Wildlife Corridor Permeability

The Sonoma Valley Wildlife Corridor continues to function for wildlife passage but opportunities remain to enhance permeability. Recommendations to maintain and improve the functionality of the Corridor have been made in the preceding chapters and these are summarized below. Implementing these recommendations should safeguard and enhance permeability while monitoring will develop a baseline and help evaluate success.

8.1 Implement the monitoring strategy and use the results to enhance Corridor permeability.

Finalizing and implementing the Sonoma Valley Wildlife Corridor monitoring strategy is essential to provide insight into what species are in which areas and what species are using the crossing structures, and document permeability throughout the Corridor. In addition to establishing a baseline, the data gathered will inform additional conservation and management actions that may be necessary to sustain or improve wildlife permeability. Adaptive management based on the results from the monitoring strategy will assist with evaluating success and identify any adjustments that may be needed to maintain and enhance permeability.

8.2 Carry out the recommendations for the Corridor properties with completed permeability assessments.

Chapter 6 details management actions to improve permeability on the six properties that were the focus of the Corridor Technical Advisory Group site evaluations. Corridor advocates should begin working with the landowners to implement the recommendations.

8.3 Limit habitat conversion.

8.3.1 Continue to use fee, conservation easement, or deed restriction acquisition to protect key properties.

Sonoma Land Trust and Sonoma County Agricultural Preservation and Open Space District, along with other organizations, have conserved 5,058 acres in the Corridor to date. Where there are willing sellers, permanent protection options should be pursued. SLT will be negotiating with two property owners in the Corridor to enter into cooperative agreements or place deed restrictions that require compliance with wildlife corridor management guidelines.

8.3.2 Secure the permanent conservation of Sonoma Developmental Center.

Sonoma Land Trust and other Corridor advocates are participating in a coalition that is negotiating for the permanent protection of the Sonoma Developmental Center wildlands as the state evaluates alternatives for the future of the facility.

8.3.3 Advocate for the implementation of the Habitat Connectivity Corridor recommendations in the Sonoma County General Plan 2020.

Corridor advocates should use the Sonoma County General Plan Habitat Connectivity Corridor land use designation and riparian restrictions as tools to discourage future developments within the Corridor. Corridor advocates should also assist the County with developing a riparian corridor ordinance, rezoning the Habitat Connectivity Corridors as Biotic Habitat Areas, and establishing a companion

ordinance that encourages property owners to consult with California Department of Fish and Wildlife, install wildlife friendly fencing, and provide for roadway undercrossings that allow for the movement of wildlife. Efforts are underway at Sonoma County Planning and Resource Management Department to develop a riparian corridor ordinance that may be followed by a biotic habitat ordinance (Lyle pers. comm. March 2014). These objectives give the Project partners new regulatory tools to protect the integrity of the corridor when new construction is proposed on parcels within the corridor.

8.4 Develop and implement outreach strategies for key audiences in the Sonoma Valley Wildlife Corridor.

Several different types of landowners are found in the Corridor – residential, agricultural, and conservation (both public and nonprofit). Drafting an outreach plan that identifies key audiences, messages for each audience, and a strategy for implementing the plan can focus limited resources. Outreach materials should describe the importance of the region for wildlife movement and include wildlife corridor management guidelines to maintain or improve wildlife passage. Draft Sonoma Valley Wildlife Corridor Guidelines are in Figure 37. Key audiences are described below.

8.4.1 Residential landowners.

Conducting outreach activities for private residential landowners within the Corridor can increase awareness of the Corridor's significance and result in some property management changes. An example of outreach materials for residential landowners from the Santa Clara River Watershed is in Figure 38. Ideas for outreach activities include starting a voluntary group of landowners focused on stewardship for wildlife corridor permeability (Hilty *et al.* 2006), hosting workshops on wildlife corridor management, distributing outreach materials to local organizations, developing a calendar with wildlife corridor management activities for different months, and preparing public service announcements for local television stations.

8.4.2 Agricultural landowners.

Several vineyards are located within and adjacent to the Corridor. Some vineyard owners have expressed interest in exploring ways to improve permeability for wildlife. Partnering with groups such as the Sonoma Resource Conservation District and Natural Resources Conservation Service can be especially helpful in providing technical and financial assistance to agricultural landowners who want to modify fencing or management practices.

8.4.3 Public and private conservation landowners.

As Figure 10 indicates, several public and private conservation landowners hold land in the Corridor including Sonoma County Agricultural Preservation and Open Space District, Audubon Canyon Ranch, Sonoma Mountain Ranch Preservation Foundation, California State Parks, and Sonoma County Regional Parks. Corridor advocates should meet with representatives of these organizations to present the results of the Sonoma Valley Wildlife Corridor Management and Monitoring Strategy and encourage the use of wildlife passage management practices. Working with Sonoma County Parks on potential changes in management at Sonoma Valley Regional Park, as well as the adjoining Sonoma Developmental Center property, will be essential to minimize recreational use impacts.

Figure 37. DRAFT Sonoma Valley Wildlife Corridor Management Guidelines

Limit the construction of new roads. Roads and driveways reduce the number of wildlife using the Corridor so the construction of new roads should be minimized. If new roads are constructed or old roads upgraded, crossing structures should be installed to accommodate wildlife in the area.

Maintain crossing structures. Culvert and bridge crossing structures should be checked periodically for debris, vegetation overgrowth, and other blockages.

Limit fencing and use wildlife friendly fence designs. Fencing can prevent wildlife from moving freely between wildlands.

- The construction of new fencing is discouraged, but if it must be built, wildlife friendly fence designs should be used and the fenced area should be minimized.
- Whenever old fencing needs to be replaced, encourage the use of wildlife friendly fence designs.
- Maintain barbed wire fences to avoid entanglement from loose wire.
- Remove old fencing that is no longer needed.

Be fire safe and wildlife friendly. Excessive clearing of vegetation reduces the effectiveness of the wildlife corridor. Meet, but do not exceed, the defensible space requirements of the local fire authority so wildlife habitat beyond the defensible space zone remains intact.

Limit mowing. Mowing may be necessary to comply with defensible space requirements, but the mowed area should be as small as safety and the law allows.

Residential landscape designs should be fire safe and incorporate predominantly native plants. Native plants require significantly less water and are beneficial for native bees and butterflies.

Do not allow pets to roam freely in wildlands. Pets can chase and prey on wildlife. Keep pets in fenced backyards unless accompanied by the owners, and bring all pets inside at night.

Minimize outdoor night lighting. Lighting should be the minimum needed for safety, restricted to within 50' of houses, point toward the structure or toward the ground, and use the lowest wattage possible.

Do not use pesticides. Pesticides can cause secondary poisoning in wildlife.

Timber harvesting should benefit wildlife corridor habitat. Timber harvesting should be very limited if not prohibited. Any timber harvesting should contribute to the structural diversity of the landscape and leave standing and downed dead trees.

8.5 Engage regional and state transportation agencies.

Arnold Drive and State Route 12 are under the jurisdiction of the Sonoma County Transportation Authority and Caltrans, respectively. Meeting with these agencies to present the undercrossing and road kill monitoring results and highlight the importance of the Corridor can lay the foundation for the inclusion of permeability enhancements in future road improvement projects. Caltrans provided the following guidance to facilitate a productive working relationship and successful outcome.

1. Be familiar with transportation planning documents.

a. Transportation Concept Reports are long-term strategies with a 25-year time frame.
b. A Project Initiation Document is developed at the start of each new project, approximately 4-6 years prior to implementation, and is the best stage to work with Caltrans to include a wildlife focus.
c. State Transportation Improvement Plan.
d. Regional Transportation Improvement Plan.

2. When proposing wildlife elements for a road project:

    a. Be sure the proposal addresses the interests of all of the Caltrans departments involved in the planning, e.g., esthetics, maintenance, engineers, etc.
    b. Justify the inclusion of wildlife elements into road improvement projects by using all available data including:

        - Hot Spot analysis using carcass removal data from Caltrans and Sonoma County Public Works, as well as TASUS data on vehicle collisions maintained by the California Highway Patrol.
        - Road kill data gathered by Corridor advocates.
        - Results of planning efforts demonstrating the need for improvement.

    c. Use the crossing and road kill data to illustrate the need for the proposal.
    d. The proposed structure or management methods should not be experimental and should have documented results.
    e. Keep the cost and maintenance of the proposed project as low as possible.
    f. Engage the California Department of Fish and Wildlife early in process. Caltrans looks to the Department for guidance on wildlife needs.

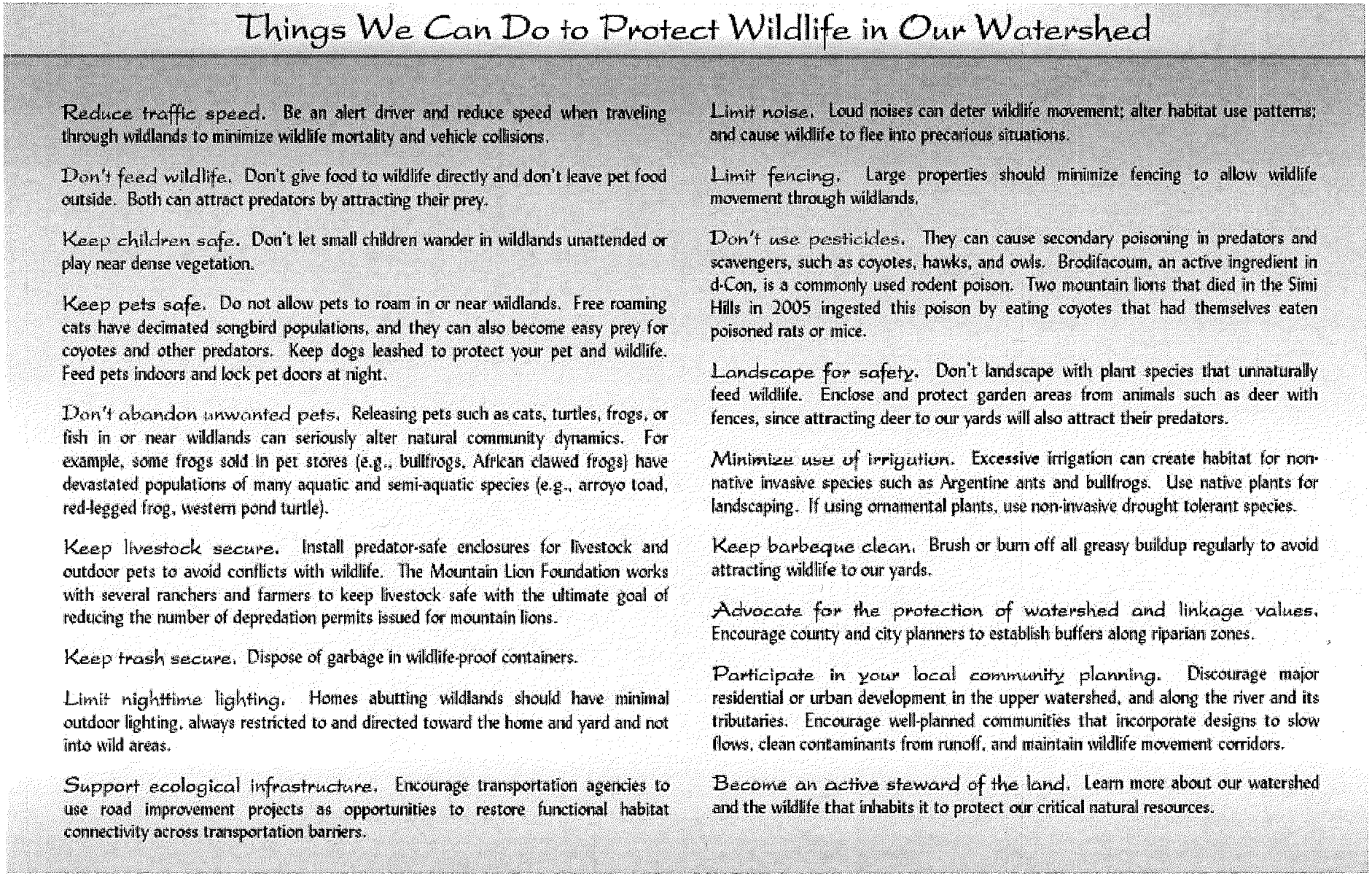
8.6 Meet with fire officials to address concerns regarding wildfire and the application of defensible space requirements.

CAL FIRE is the responsible agency for much of the Sonoma Valley Wildlife Corridor while the Sonoma Valley Fire Department has responsibility for the developed areas. Meeting with both of these agencies to communicate impacts to wildlife from both wildfire and excessive or inappropriate vegetation removal by landowners creating defensible space could advance the adaptation of fire and fuels goals that are wildlife friendly. Landowners would benefit from the same information. For example, Fire Safe Sonoma makes presentations to neighborhood groups that they call "The Wildlife Wise Acre." Corridor advocates should work with knowledgeable presenters to provide information about wildlife friendly fire and vegetation management in the Corridor to community and neighborhood groups.

8.7 Complete Permeability Evaluations for Bouverie Preserve, Sonoma Valley Regional Park and Sonoma Developmental Center.

Bouverie Preserve, Sonoma Valley Regional Park, and Sonoma Developmental Center are key properties in the heart of the Sonoma Valley Wildlife Corridor. More detailed permeability evaluations of these properties should be conducted to determine if there are opportunities to enhance conditions for successful wildlife passage.

Figure 38. Wildlife corridor information for homeowners from the Santa Clara River Watershed Plan.
Developed by Science and Collaboration for Connected Wildlands.



Things We Can Do to Protect Wildlife in Our Watershed

Reduce traffic speed. Be an alert driver and reduce speed when traveling through wildlands to minimize wildlife mortality and vehicle collisions.

Don't feed wildlife. Don't give food to wildlife directly and don't leave pet food outside. Both can attract predators by attracting their prey.

Keep children safe. Don't let small children wander in wildlands unattended or play near dense vegetation.

Keep pets safe. Do not allow pets to roam in or near wildlands. Free roaming cats have decimated songbird populations, and they can also become easy prey for coyotes and other predators. Keep dogs leashed to protect your pet and wildlife. Feed pets indoors and lock pet doors at night.

Don't abandon unwanted pets. Releasing pets such as cats, turtles, frogs, or fish in or near wildlands can seriously alter natural community dynamics. For example, some frogs sold in pet stores (e.g., bullfrogs, African clawed frogs) have devastated populations of many aquatic and semi-aquatic species (e.g., arroyo toad, red-legged frog, western pond turtle).

Keep livestock secure. Install predator-safe enclosures for livestock and outdoor pets to avoid conflicts with wildlife. The Mountain Lion Foundation works with several ranchers and farmers to keep livestock safe with the ultimate goal of reducing the number of depredation permits issued for mountain lions.

Keep trash secure. Dispose of garbage in wildlife-proof containers.

Limit nighttime lighting. Homes abutting wildlands should have minimal outdoor lighting, always restricted to and directed toward the home and yard and not into wild areas.

Support ecological infrastructure. Encourage transportation agencies to use road improvement projects as opportunities to restore functional habitat connectivity across transportation barriers.

Limit noise. Loud noises can deter wildlife movement; alter habitat use patterns; and cause wildlife to flee into precarious situations.

Limit fencing. Large properties should minimize fencing to allow wildlife movement through wildlands.

Don't use pesticides. They can cause secondary poisoning in predators and scavengers, such as coyotes, hawks, and owls. Brodifacoum, an active ingredient in d-Con, is a commonly used rodent poison. Two mountain lions that died in the Simi Hills in 2005 ingested this poison by eating coyotes that had themselves eaten poisoned rats or mice.

Landscape for safety. Don't landscape with plant species that unnaturally feed wildlife. Enclose and protect garden areas from animals such as deer with fences, since attracting deer to our yards will also attract their predators.

Minimize use of irrigation. Excessive irrigation can create habitat for non-native invasive species such as Argentine ants and bullfrogs. Use native plants for landscaping. If using ornamental plants, use non-invasive drought tolerant species.

Keep barbeque clean. Brush or burn off all greasy buildup regularly to avoid attracting wildlife to our yards.

Advocate for the protection of watershed and linkage values. Encourage county and city planners to establish buffers along riparian zones.

Participate in your local community planning. Discourage major residential or urban development in the upper watershed, and along the river and its tributaries. Encourage well-planned communities that incorporate designs to slow flows, clean contaminants from runoff, and maintain wildlife movement corridors.

Become an active steward of the land. Learn more about our watershed and the wildlife that inhabits it to protect our critical natural resources.

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EFFECTS OF STATE ROUTE 23 WIDENING PROJECT AND ACCOMPANYING MITIGATION MEASURES ON CULVERT USE AND ROAD MORTALITY OF WILDLIFE

FINAL REPORT

NATIONAL PARK SERVICE
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Executive Summary

This report summarizes a project conducted by the National Park Service in collaboration with the California Department of Transportation (Caltrans) to monitor wildlife movement across State Route 23 (SR 23) in Ventura County, California from January 2004 through August 2011. The objective of this project was to determine the effectiveness of three measures by Caltrans to reduce road impacts on wildlife, particularly medium-sized and large mammals, along SR 23 following a lane expansion. The mitigation efforts included clearing out underpasses that were filled with sediment and likely less usable by wildlife, constructing exclusion fences along both sides of the highway, and installing one-way gates that allow animals inside the fencing to escape. We measured the effectiveness of these efforts by monitoring culvert use and road mortality of wildlife both before and after the highway modifications and construction and by monitoring one-way gate use after they were installed. Our project is one of few that have studied wildlife road mortality and crossing use both before and after the installation of exclusion fencing and improvements to existing wildlife-crossing structures.

Before the construction of two additional lanes along SR 23, we conducted road mortality surveys for 34 months by driving the 3.2 km stretch of the highway in both directions three times a week to document animals killed by vehicle collisions. We used remote digital cameras to simultaneously monitor wildlife use of three culverts along the same stretch of highway, two of which were significantly obstructed by debris. During construction the two blocked culverts were cleared, and an entirely new right-of-way fence, including 12 one-way gates, was built along the highway. Highway mortality and culvert monitoring were performed in the same manner for 27 months post-construction. Remote digital cameras were used to monitor the 12 one-way gates after they were installed, during post-construction monitoring.

Mammals represented the highest percentage of road mortality during both pre-construction (63%) and post-construction (76%) surveys. After mammals, bird species represented 25% of pre-construction and 15% of post-construction roadkills. Reptiles and amphibians may have been underrepresented in our mortality counts, because they were difficult to detect from the vehicle due to their small size. Among mammals, rabbits (*Sylvilagus* spp.) represented the most roadkills both before (21%) and after (51%) the wildlife proof fence was constructed. For coyotes (*Canis latrans*), the largest mammal detected in the study area, road mortalities declined 88%, from 43 to 5, after the fence was built. However, there was no reduction in the frequency of road mortalities for all other detected species. Road mortalities actually increased slightly for medium-sized mammals excluding coyotes from 19 to 21, and for small mammals, after the fence was built, with rabbit roadkills increasing fourfold. The overall rate of road mortalities was 0.47 animals killed/km/week pre-construction and increased to 0.70 animals killed/km/week post-construction. Although the fence reduced road mortalities for coyotes, the lack of change in road mortality for other species suggests that smaller animals were finding ways through or around the fence.

Our monitoring data indicated that the one-way gates were used by both wildlife and humans in both directions. Human use damaged some of the gates allowing animals to pass through the gate the unintended direction more easily. Although we documented use of the gates in the wrong direction by all animal species detected in the study area, two-thirds of the one-way gate

uses were in the intended direction (i.e. away from the highway). We suspect animals could have entered the right-of-way by going around the fence ends or through holes along the fence line, but once inside they seemed to also use the one-way gates the intended way and avoided crossing the road.

The pre-construction culvert monitoring data showed extensive wildlife use of the open culvert, but the two blocked culverts received significantly less use. Wildlife use of the three culverts increased after the wildlife-proof fence was constructed and the two blocked culverts were cleared. Animal detections increased 2- and 3-fold at the two blocked culverts once cleared (from 0.32 to 0.72 detections/day at Culvert A, and from 0.32 to 0.92 detections/day at Culvert C). The culvert that required no modification also showed an increase in wildlife use (from 2.18 to 3.54 detections/day at Culvert B). We also documented confirmed crossings (defined as a picture of the same species, going the same direction, at both ends of the same culvert within 10 minutes) in the two cleared culverts for coyotes, raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), and opossums (*Didelphis virginiana*). For both of these culverts, there were no confirmed crossings by animals before they were cleared. Even the culvert that did not require modification received 6 times more crossings post-construction by coyotes, raccoons, and skunks, likely as a result of animals being funneled to the culvert entrances by the exclusion fencing. The lack of complete crossings by small mammals (rabbits, squirrels, mice) may be because the culverts were unsuitable for these species because of the lack of protective cover. Although we detected bobcats (*Lynx rufus*) at all 3 culverts post-construction, we did not confirm them going through the entire undercrossing. The culverts may be attractive to bobcats for resting, hunting, or even thermoregulation during hot days. Coyotes and skunks accounted for the most animal pictures and confirmed crossings throughout the study.

The goal of the mitigation was to reduce mortality of medium-sized and large mammals. Our results suggest that the mitigation efforts by Caltrans were effective in increasing culvert use for many medium-sized mammals and reducing road mortality of coyotes, the largest of the mammal species detected in our study area. An important consideration in the implementation of exclusion fencing, one-way gates, and culverts is their relevance to a range of species. Culverts that incorporate multiple mitigation design elements will be most effective in encouraging wildlife passage for a variety of species. Since no deer or large carnivores (e.g. mountain lions) were detected in our study area, it would be valuable if mitigation was also effective for smaller animals. We recommend creating smaller scale cover in the two drier culverts that may encourage use by small mammals, reptiles, and species associated with rocky habitats. The one-way gates show potential value for preventing road mortalities, if they can be modified to prevent people from damaging them and animals from going through the wrong way. We also noted several holes along the bottom of the fence line along both sides of the freeway, so we recommend regular inspection of the wildlife proof fence and maintenance to repair any damage to ensure that animals are not exploiting breaks in the fence. Further, we recommend that the culverts be monitored and maintained over time to ensure that they continue to function properly as both a wildlife passage and drainage system. These results have important implications for future efforts to mitigate the impacts of roads and vehicles on the movement and survival of wildlife.

INTRODUCTION

The impacts of highways on wildlife populations are of increasing concern for transportation and natural resource agencies. Roads and vehicles can affect wildlife populations in numerous ways, including through direct loss of habitat, fragmentation of remaining natural areas, disruption of animal movement, and by causing road mortality (Forman et al. 2003). Wildlife-vehicle collisions are also a major safety concern for motorists and can cause property damage, human injuries, and deaths (Conover et al. 1995). The barrier effects of roads on wildlife are considerable (Beier 1993, Forman & Alexander 1998, Riley 2006) and freeways have been shown to restrict gene flow even in wide-ranging species (e.g. Riley et al. 2006).

The effects of roads and freeways can be especially prevalent in urban landscapes such as those in Southern California, including around Los Angeles, the second most populous metropolitan area in the U.S. and the largest in geographical area. Given the negative effects of roads, wildlife may benefit from the use of underpasses along roadways. Previous studies conducted along the 101, 118, and 23 freeways north of Los Angeles documented wildlife use of beneath-highway passages (culverts, tunnels, underpasses) and wildlife mortality caused by vehicle collisions (Riley et al. 2003, Ng et al. 2004, LSA 2004). On all three highways, coyotes (*Canis latrans*) were the most common medium-sized mammal fatality; the greatest number of coyote roadkills occurred where traffic volume was lowest, on State Route 23, and the fewest took place where traffic volume was greatest, along U.S. Highway 101 (Ng 2000). Many types of undercrossings were utilized by a variety of different species, indicating that beneath-highway passages, even when not originally designed for wildlife, can provide important avenues for animals to cross roads and can increase connectivity in fragmented landscapes (Haas 2000, Clevenger et al. 2001*a*, Ng et al. 2004). Underpass variables, including length, width, and height and the presence of suitable habitat on either side of the passage are important predictors of underpass use for some species (Haas 2000, Forman et al. 2003, Ng et al. 2004). Land management agencies around the world have made efforts to mitigate the negative effects of roads on wildlife, with a focus on reducing road mortality (Forman et al. 2003, Ree et al. 2007, Glista et al. 2009). Where roads pass through natural habitat, wildlife can benefit from tall fences or similar barriers to prevent them from crossing the road and possibly funnel them towards undercrossings. Wildlife proof fences or barriers, underpasses, or combinations of these measures (Ward 1982, Foster & Humphrey 1995, Clevenger et al. 2001*b*, Cain et al. 2003, Dockstader & Southall 2003, Gordan & Anderson 2003, Taylor & Goldingay 2003, Dodd et al. 2004, Klar et al. 2009, McCollister & Van Manen 2010) have been found to effectively reduce highway mortality in a number of studies.

The objective of this project was to determine the effectiveness of three measures to reduce road impacts on wildlife by the California Department of Transportation (Caltrans) along State Route 23 (SR 23) following a lane expansion. Specifically, Caltrans added a lane on each side of the freeway, increasing both directions from two lanes to three. The lanes were added on the inside

of the freeway, in the median, so the total width of the roadway did not change, but the unpaved area of the median was significantly reduced. The mitigation efforts included clearing out underpasses under the highway, constructing exclusion fences along both sides of the highway, and installing one-way gates that allow animals inside the fencing to escape. We hypothesized that fencing and clearing out culverts would reduce wildlife-vehicle mortalities and increase culvert use, allowing safe passageways for wildlife under the highway. We measured the effectiveness of these efforts by monitoring culvert use and road mortality of wildlife before the highway modifications and construction and again after construction. One-way gate use was also monitored after construction. This study provides an excellent opportunity to evaluate the efficacy of mitigation efforts by measuring different aspects of wildlife movement and mortality before and after the highway modifications occurred.

STUDY AREA

The study area consisted of a 3.2 km (2.0 miles) section of SR 23 from post-mile (PM) 8.2 at the Olsen Road exit to PM 10.2 at the Tierra Rejada Road exit in Ventura County, California (Figure 1). The study area was approximately 5 km southeast of the City of Moorpark and approximately 8 km north of US Highway 101. Land use within the project area primarily consisted of agricultural areas and low-density residential areas. A network of unpaved roads occurs throughout the study area and is primarily used to support farming operations. On average, annual daily traffic volume (ADT) along SR 23 was 57,000 vehicles per day in 2007 with a posted speed limit of 105 km/hr (65 miles/hr) for its entire length. To reduce congestion, lanes were added to SR23, since it is a major commute route from Simi Valley and Moorpark to areas south.

METHODS

Wildlife Crossing Points and Mitigation Measures

The 3 underpasses (Figure 2) along the study area were drainage culverts that were originally placed there for hydrologic purposes. Culverts B and C were circular corrugated metal pipe culverts and culvert A was a concrete box culvert with two walls inside it running the length of the culvert and dividing it into 3 tunnels. Sediment filled approximately 75% of Culvert A prior to the Widening Project and was later cleared by Caltrans. Plant and sediment material filled approximately 85% of the western side of Culvert C prior to the Widening Project and clearing by Caltrans. Each of Culvert A's 3 tunnels was 83 m long, 3.2 m wide, and 0.6 m high pre-clearing and measured 3.2 m wide and 1.85 m high after being cleared with an openness ratio (ht x width/length, commonly used in relation to wildlife passages; Reed et al. 1975) of 0.07 m, and

remained dry most of the year. Culvert B required no modification and was 140 m long, 3.2 m wide, and 2.8 m high (openness ratio=0.06 m) and remained dry most of the year. Culvert C was 110 m long, 1.45 m wide, and 0.6 m high pre-clearing and measured 1.45 m wide and 1.9 m high (openness ratio= 0.03 m) after being cleared and had (generally shallow) running water throughout the year. Culvert A was the only underpass that had visibility through the entire length of the culvert, allowing an animal to see the other end. Culvert B was the only underpass that had a dirt substrate along its entire length. Culvert A's floor was covered with dirt for half its length and bare concrete the remaining half, and Culvert C had a constant flow of water running through it at an average height of 8 cm. Culvert C was the only culvert that had natural vegetated areas leading up to both entrances.

Caltrans removed the existing right-of-way fence along both sides of SR 23, which was damaged in many locations, and replaced it with a new fence line along the same footprint. The new chain-link wildlife fence was designed to prevent wildlife from entering the road; it had a mesh size of 7 x 8 cm and was buried 0.6 m (2 ft) into the ground with a total height above ground of 1.8 m (6 ft) or 2.4 m (8 ft) depending on the slope (Figure 3). On both sides of the highway, fences were located at least 7 m from the road and as far away as 100 m. The fences ran parallel to the highway and continued above each of the 3 culverts to funnel animals into the culvert opening. During construction, twelve one-way gates (Figure 4) were also installed (6 on each side) along the fence line to allow animals that do get inside the fencing to escape.

One-way gates were designed to allow easy passage from the road to outside areas, but little or no passage from the outside area to the road. Caltrans and the National Park Service (NPS) modified the one-way galvanized steel escape gate design commonly built for deer (Reed et al. 1974) to also apply to medium sized mammals, since no deer were detected in the study area during 3 years of pre-construction monitoring. Specifically, modifications included placing baler tines in the gates closer together at the bottom (bottom 61 cm spaced 8 cm apart; middle 31 cm spaced 10 cm apart; top 31 cm spaced 13 cm apart) and including 5 x 10 cm wire mesh that was secured on the tines nearest the gate ends extending out 31 cm to prevent flexibility that may allow animals to bend the tines and squeeze through (Figure 5). Tines were left open the remaining 5 cm to allow flexing at the point an animal would pass through the gate (Figure 6). The gate profile was lowered to ground level and chain link fence material was installed at the bottom of the gate and buried 0.6 m to prevent animals from digging under it. Gaps between the fence and gate frame were closed to no larger than 4 cm.

Highway Mortality Monitoring

Before highway construction began, we monitored highway mortality from January 7, 2004 to October 30, 2006 (34 months). Caltrans completed the culvert clearing, one-way gate installation, and 90% of the fence construction by March 12, 2009 (the last section of fence was installed on August 12, 2009). NPS began post-construction road mortality surveys on May 4,

2009 and finished them on August 12, 2011 (27 months). We monitored SR 23 from Tierra Rejada to Olsen Road by driving the 3.2 km stretch of the highway in both directions twice (four times total) to thoroughly observe both sides of the road from each direction for animals killed by vehicle collisions. Monitoring occurred after the morning rush hour three times per week, on Monday, Wednesday, and Friday. For each animal found dead on the road, we recorded species, sex, age (adult or juvenile), date, and exact location in UTM coordinates (Universal Transverse Mercator, datum NAD27) using a Global Positioning System (GPS) device. To prevent double counting, we either removed all animal carcasses from the highway or marked them with spray paint. We also collaborated with Caltrans field personnel in the event that they discovered additional wildlife mortalities on this stretch, so that we could record as many of the road mortalities as possible. The road mortality surveys occurred throughout (and beyond) the periods of culvert monitoring, and they were conducted throughout the year to collect data during different periods of wildlife reproduction and dispersal. The surveys were conducted in the same manner pre- and post-construction. We used a chi-square analysis (observed vs. expected) to test whether wildlife vehicle mortalities differed significantly between the pre-construction and post-construction surveys, with the expected condition that mortality rates were the same pre- and post-construction.

Culvert Monitoring

We monitored the use of the 3 culverts by wildlife from November 4, 2004 to October 30, 2006 (24 months) before construction and culvert clearing and then again from May 4, 2009 to August 12, 2011 (27 months) post-construction. We used remotely triggered infrared digital cameras (pre-construction monitoring: Digital CamTrakker; CamTrak South, Inc., 1050 Industrial Drive, Watkinsville, GA 30677, post-construction monitoring: Reconyx PC 90; Reconyx, Inc., 3828 Creekside Lane, Suite 2, Holmen, WI 54636) to monitor culvert use, with cameras secured in steel containers mounted to the culvert walls (Figure 7). One camera was placed at both entrances of each culvert 40 cm off the ground and positioned at an angle to cover the full width of the structure. Cameras were triggered to take a photograph anytime heat and motion interrupted the infrared beam. Photos were captured at 20 second intervals, and the date and time were recorded on each photo. Cameras operated 24 hours a day and were checked at least once a month to change media cards and batteries. Images from the media cards were downloaded to a computer and each photo was examined to identify species, number of individuals, and direction of travel. Images of the same species, going the same direction, at both cameras of the same culvert within 10 minutes were recorded as a "confirmed crossing" through the underpass. We used a chi-square analysis to test whether animal detections and confirmed crossings in the culverts differed significantly between the pre- and post-construction surveys, as with the mortality surveys.

Digital CamTrakker remote cameras were used in the culverts during our pre-construction monitoring. These cameras had a delay of approximately 2 seconds between the time an animal

broke the infrared heat-in-motion detector and the camera took a photo. This delay caused us to miss animals walking by at a fast pace and would result in a blank picture. When a picture was taken with nothing in it, we recorded this event as a "trip" event. All cameras were positioned in the culvert at an angle to minimize the number of recorded trips. All the CamTrakker remote cameras used during the pre-construction monitoring were damaged in some capacity and had to be repaired or replaced before the start of our post-construction monitoring. Remote digital camera technology improved considerably after the start of the pre-construction monitoring; the CamTrakker model we used was no longer available, so we purchased cameras from a different manufacturer (Reconyx, Inc.) for post-construction monitoring. The Reconyx PC 90 remote cameras used in the post-construction monitoring had a delay of < 1 second between an animal triggering the infrared detector and the camera taking a photo. This resulted in obtaining fewer "trip" events, or photos without an animal.

There were occasions during the study where the cameras were not active, specifically when culverts flooded, cameras were damaged, batteries were depleted, or memory cards were full. During the rainy season cameras had to be removed to prevent them from being damaged. When there was a constant rain, all three culverts filled with water above the camera line. Cameras were placed back in the culvert boxes when the water level declined. We measured the rate of culvert use by dividing the number of animal photos and trip events in the culverts by the number of nights the camera was active.

One-way Gate Monitoring

We monitored all 12 one-way gates for 1 year from August 12, 2010 to August 12, 2011 with Reconyx PC90 remotely triggered infrared digital cameras. Monitoring of the six gates on the east side of SR23 began six months prior to this time period, on February 17, 2010, resulting in a total monitoring time of 18 months for the east side gates. The fast camera speed of these cameras allowed us to detect animal behavior at each one-way gate. One camera was placed 1.5 m in front of and to the side of each one-way gate at a height of 45 cm from the ground to record any animal use (Figure 8). Cameras were located along the inside (freeway side) of the fence line, secured in steel containers that were fastened to a wooden stake driven into the ground, and locked with a 2 meter section of steel chain to a fence post. Media cards and batteries were changed at least every 2 months, with more frequent camera visits at sites that needed more maintenance. The only mammals recorded in our analysis were those that could not fit through the mesh size of the chain link fence (e.g. small mammals, such as mice were not monitored). Occasions occurred during the post-construction monitoring when the cameras were not activated because of depleted batteries and full memory cards. We measured one-way gate use by dividing the number of pictures taken of animals going through (in either direction) or walking by the gate by the number of nights the camera was active.

RESULTS

Highway Mortality Monitoring

Pre-construction surveys

We recorded 222 animal mortalities from vehicle collisions during the 34 months of pre-construction monitoring. Mammals represented the highest percentage of road mortality (63%), followed by birds (25%), reptiles (5%), and amphibians (3%); we detected 11 mammal species in total that were killed (Table 1). On average 69.4 animals were killed per km of highway surveyed during 34 months, and 1.5 animals were killed per week along the 3.2 km stretch, for an overall rate of 0.47 animals killed/km/week. Of the mammals, rabbits (47, 21%), and coyotes (43, 19%) accounted for the most road mortalities (Figure 9). Twenty-seven (63%) of the coyotes were hit near Culvert B (Figure 10), which is the culvert where we had the most photo-documented coyote activity. Coyotes were hit every month of the year, and 26 (76%) out of 34 months surveyed had ≥ 1 coyote killed with an overall average of 1.26 coyotes killed/month (Table 2). The rate of road mortalities/day was 0.14 for medium-sized mammals (0.04 excluding coyotes), 0.18 for smaller mammals, 0.13 for birds, and 0.04 for herpetofauna.

Post-construction surveys

We recorded 265 animal mortalities from vehicle collisions during the 27 months of post-construction monitoring after the mitigation measures were completed. Mammals represented the highest percentage of road mortality (76%), followed by birds (15%), and reptiles (5%); we detected 13 mammal species in total that were killed (Table 1). On average 82.8 animals were killed per km of highway surveyed, and 2.2 animals were killed per week for the whole stretch, for an overall rate of 0.70 animals killed/km/week. Of the mammal species, rabbits accounted for the most road mortalities (51%; Figure 11) followed by squirrels (8%). We recorded 5 coyotes, 1 bobcat (*Lynx rufus*), and 1 badger (*Taxidea taxus*) killed by vehicles post-construction. The rate of road mortalities/day was 0.10 for medium-sized mammals (0.08 excluding coyotes), 0.52 for smaller mammals, 0.12 for birds, and 0.04 for herpetofauna.

Road mortality comparison pre- and post-construction

The total number of animal (mammals, birds, reptiles, and amphibians combined) road mortalities was significantly higher during the post-construction surveys than during the pre-construction surveys ($\chi^2 = 20.34$, d.f.= 1, $P<0.001$). The total number of coyotes killed by vehicle collisions was significantly lower during the post-construction surveys than during the pre-construction surveys ($\chi^2 = 22.30$, d.f.= 1, $P<0.001$), but there was no significant difference in the total number of roadkills of all other medium sized mammals (skunk, raccoon, opossum, bobcat, and badger) during the two survey periods (19 total pre-construction vs. 21 post-construction;

$\chi^2 = 2.36$, d.f.= 1, $P>0.10$). There were significantly more rabbit road mortalities post-construction than pre-construction ($\chi^2 = 67.0$, d.f.= 1, $P<0.001$).

Culvert Monitoring

Pre-construction monitoring

Remote cameras recorded 2509 photos during pre-construction monitoring, including 1432 photos of various species and 1077 "trip" events where nothing was captured in the picture (Table 3). Coyotes (67%) and striped skunks (*Mephitis mephitis*; 17%) accounted for most of the animal pictures. The highest percentage of animal pictures taken were of rabbits (42%) and birds (19%) in Culvert A, of coyotes (74%) in Culvert B, and of raccoons (*Procyon lotor*; 41%) in Culvert C. A variety of animals were detected at the culvert entrances; coyotes, raccoons, skunks, squirrels, and rabbits, were detected at all three culverts, and bobcats and opossums (*Didelphis virginianus*) were detected at two of the three culverts. Culvert B had the highest wildlife use with the cameras taking 2.18 photos/monitoring day, while 0.32 photos/monitoring day were taken in both Culverts A and C (Table 3). Coyotes were detected using culvert B nearly every day with 0.9 coyote photos/monitoring day. Remote cameras recorded 43 (86 photos) confirmed crossings by coyotes and skunks with all of these occurring in Culvert B (Table 4). No confirmed crossings were recorded in Culverts A or C pre-construction.

Post-construction monitoring

After the construction period and the mitigation measures were completed (the wildlife proof fence was built and Culverts A and C were cleared, Figure 12), remote cameras recorded 5820 photos, of which 5110 were animals and 710 were "trip" events (Table 3). Skunks (30%) and coyotes (21%) accounted for most of the animal pictures (Figure 13); other species recorded in all three culverts were bobcat, raccoon, opossum, rabbit, and ground squirrel (Otospermophilus beecheyi). The highest percentage of animal pictures taken were of rabbits (35%) and coyotes (12%) in Culvert A, of skunks (51%) and coyotes (23%) in Culvert B, and of raccoons (33%) and skunks (16%) in Culvert C. Culvert B had the highest wildlife use with cameras taking 3.54 photos/monitoring day, while 0.72 photos/monitoring day were taken in Culvert A and 0.92 photos/monitoring day were taken in Culvert C (Table 3). Coyotes also used Culvert B nearly every day with 0.8 coyote photos/monitoring day. Remote cameras recorded 321 (642 photos) confirmed crossings by coyotes, raccoons, skunks, and opossums (Table 4), with coyotes and raccoons passing through all 3 culverts. Coyotes accounted for most (61%) of these crossings. Mammals were photographed at all times throughout the 24 hour period, however 188 (52%) of the confirmed crossings occurred between the hours of 5am and 9pm (i.e. during the day).

Culvert Monitoring comparison pre and post-construction

Confirmed crossings by coyotes, skunks, and raccoons in Culvert B were significantly higher post-construction than during the pre-construction surveys (χ^2= 142.76, d.f.= 1, P<0.001), and Culverts A and C had confirmed crossings (Culvert A= 10, Culvert C=60) of coyotes, raccoons, opossums, and skunks (only in Culvert C) post-construction and none during the pre-construction monitoring surveys. Each culvert had significantly more animal detections post-construction compared to pre-construction (Culvert A, χ^2= 73.32, d.f.= 1, P<0.001; Culvert B, χ^2= 346.66, d.f.= 1, P<0.001; Culvert C, χ^2= 126.31, d.f.= 1, P<0.001).

One-Way Gate Monitoring

Remote cameras recorded 4748 photos of a variety of animals using or passing by the 12 one-way gates. Most of these pictures (2990 or 63%) were of rabbits going through the gate in either direction. The 6 east side gates had more rabbit detections (1.15 rabbit pictures/day) compared to the 6 west gates (0.10 rabbit pictures/day). Excluding rabbits and people, cameras recorded 1097 passages through the one-way gates by medium sized mammals; 67% of these passages were through the gate the intended way (from inside the fenced freeway to the outside). All animals (excluding rabbits) were detected going through the gate the intended way at a rate of 0.18 animal detections/day. Animals were detected going through the gate the wrong way (entering the freeway side of the fence) at a rate of 0.09 animal detections/day. Remote cameras recorded animals walking by the gate inside the fence at a rate of 0.08 detections/day, and walking by the gate on the outside of the fence at 0.06 detections/day (Table 5). Medium- sized animals were detected more frequently at the western gates (0.59 detections/day) than the eastern gates (0.29 animal detections/day). Medium-sized animals were detected using 11 of the 12 one-way gates in both directions, with coyotes, house cats, and skunks being detected the most frequently. People were recorded 58 times using 6 of the gates, and in most of these cases the metal tines were bent, decreasing effectiveness. The 6 gates used by people showed more animal use than the 6 gates not used by people (Table 6). Five of the 6 gates modified and used by people had photo documentation of animals going through the gate the wrong way. All animals detected using the one-way gates (coyote, bobcat, raccoon, badger, skunk, opossum, domestic dog and domestic cat) demonstrated the ability to go through the gates in both directions, including the gates that were not used and bent by people.

DISCUSSION

Highway Mortality Monitoring

The total number of animals found dead on the road remained high, even after the wildlife proof fence was constructed. Yet, we found that wildlife road mortality was significantly reduced for coyotes, the largest mammal detected in the study area, after the fence was completed. Coyote deaths declined 88% after the fence was built. However, there was no reduction in the frequency

of road mortalities for all other detected species. Medium-sized mammals, excluding coyotes, (bobcat, badger, raccoon, skunk, opossum, and domestic dog and cat) and small mammals (rabbit, squirrel, and rodent) road mortalities stayed the same or actually increased after the fence was built. Rabbit road mortalities increased fourfold, there was no apparent change in the frequency of herpetofauna road mortalities, and bird mortalities decreased slightly. Although the fence reduced road mortalities for coyotes, the lack of change in road mortality for other species suggests that most animals were finding ways through or around the fence. Cameras indicated that the one-way gates were frequently used in both directions by all wildlife detected in the study area, and we suspect that many of the animals found on the freeway side of the fence entered by passing through these gates the wrong way.

Animals face substantial consequences from attempting to cross a highway. Ford and Fahrig (2007) examined published data on mammalian roadkill surveys conducted in North America and found that carnivores had a lower roadkill frequency than herbivores or omnivores. They also found a significant relationship between body size and roadkill frequency, with roadkill frequency increasing with body size up to 1.06kg, and then decreasing as body size increased past this point. Out of the 38 species used in the authors' analyses, herbivores (64%) and specifically different rabbit species (50%) accounted for the most roadkills. Our findings of wildlife road mortality support this finding, as rabbits represented the most mammal roadkills both before (21%) and after (51%) the wildlife proof fence was constructed. The highest non-mammalian mortalities were bird species representing 25% of roadkills pre-construction and 15% post-construction. Such species may have been struck while flying across the road, foraging near the road, or scavenging on other roadkill. In studies addressing multispecies road mortalities, birds are most often listed as killed more frequently than mammals, with reptiles and amphibians appearing even less often as roadkill (Clevenger et al. 2003, Forman et al. 2003). This was not the case in our study, as mammals were killed more often than bird species both pre-construction (63%) and post-construction (76%). Reptiles and amphibians may be underrepresented in our mortality counts because they are frequently removed by scavengers and it is difficult to detect them from the vehicle due to their small size.

Culvert Monitoring

The pre-construction culvert monitoring data showed extensive wildlife use of the open culvert (B), but the two blocked culverts (A and C) received significantly less use. Culvert A was difficult to monitor because it had two walls inside it running the length of the culvert dividing it into 3 tunnels. As a result both cameras had to be placed on the outside of the culvert so that an animal walking through any of the 3 tunnels would intersect the infrared beam when it entered or exited. Camera 1 (West) had to be removed regularly and was activated only 30 days pre-construction because the adjacent agricultural field would flood resulting in deep sediment and a pool of water above the camera line. We believe wildlife activity was low in Culvert A because of the constant muddy sediment at the western end. On three occasions we noted tracks from

coyotes attempting to enter the culvert and sinking up to their chest in mud and then turning around and exiting without going through the culvert. Culvert C was also difficult to monitor before it was cleared. Camera 6 (East) was only activated 124 days because of the constant flow of water flooding occasionally above the camera line; the western entrance was also 85% filled with sediment. For both of these culverts, there were no confirmed crossings by animals before they were cleared. Pictures showed coyotes approaching both of these culverts and bobcats (Figure 14) approaching Culvert C, looking in the culvert and not entering it.

Wildlife use of the three culverts increased after the wildlife proof fence was constructed and the two blocked culverts (A and C) were cleared. Animal detections increased 2-fold at Culvert A and 3-fold at Culvert C. Cameras also recorded confirmed crossings in Culverts A and C of coyotes, raccoons, skunks, and opossums. Coyotes, raccoons, and skunks used Culvert B to cross 6 times more often post-construction. This culvert did not require any modification and wildlife use still increased. This may be explained by more animals being funneled towards the culverts and away from the road by the new fence. Although we had a total of 15 bobcat detections at all three culverts and two badger detections at two of the culverts post-construction, we did not observe these animals going through the entire undercrossing. Most of these detections showed bobcats traveling in and out of the culvert entrance. The culverts seem to not be effective for bobcat crossings, but may be attractive to them for resting, hunting, or even thermoregulation during hot days. We also found 1 bobcat road mortality just above Culvert C. This culvert recorded the highest detection (11 of 15) of individual bobcats approaching the culvert entrance, but not continuing through. Coyotes were shown using Culverts A and B the most, while raccoons were detected using Culvert C most frequently. This is likely attributed to the location of Culverts A and B adjacent to orchards and agricultural crops (which offers habitat value for coyotes); additionally, both culverts remained dry most of the year. Culvert C had a constant flow of shallow water running through it, making it good habitat for raccoons to hunt and travel along. Raccoons were repeatedly photographed foraging (Figure 15) in the pools of water inside Culvert C. This culvert provided a natural drainage system and riparian habitat leading up to both entrances of the culvert. We recognize that confirmed crossings and detections at the culvert entrances and the one-way gates were undoubtedly by some individuals repeatedly using the same culvert or gate.

Culvert A documented the least number of animal detections and use. Culvert A's entrances (east and west side) were located closer to the highway than the other two culverts. In addition to poor wildlife cover and habitat next to this culvert, traffic noise and light disturbance from passing vehicles might have discouraged animals from approaching the culvert. The entrances to Culverts B and C were located lower (below grade) and further away from the highway where traffic noise and light disturbance were notably reduced. Culverts B and C also had vegetative cover around the culvert entrances.

One-Way Gate Monitoring

Our monitoring data indicate that the one-way gates were repeatedly used by both wildlife and humans in both directions. Soon after the gates were installed, farm workers (Figure 16) began to use them and bend the tines to pass through in both directions. In most instances, the tines were not bent back to their original shape after the person passed through the gate. Additionally, human use has broken some of the tines completely off the gate, allowing animals to pass through the gate in both directions more easily. The 6 gates used by people also showed the most use by wildlife, and the highest frequency of animals going through the gate in the wrong direction. However, all animals detected showed the ability to pass through the gates in both directions (Figure 17), even those not used by people. Only one gate did not have evidence of animal passage the wrong way, but that gate also had only four animal detections, which was the fewest of any of the gates. Although the gates were often used the wrong way, they seemed to be effective for some individuals, as cameras detected coyotes (Figure 18) and bobcats approaching the gate from outside the freeway, attempting to pass through, and then turning around and leaving. Some coyotes were even photographed biting on the metal tines, possibly in an attempt to bend them to make passage easier (Figure 19). We suspect that many of the passages were from the same individuals that learned how to pass through the gate the wrong way and would continue to do this at other gates. For example, we identified one individual coyote by its extreme case of hair loss (Figure 20), which is commonly associated with mange, using 3 gates on each side of the freeway in both directions over a period of at least 4 months. This individual was also photographed using Culvert B.

Wildlife proof fencing along roads can result in greater amounts of forage and cover for small mammals on the highway side of the fence. The dense herbaceous cover of roadsides can be attractive to many small mammal species (Downes et al. 1997). An early study along highways in the US found a higher presence and density of small mammal species in the right-of-way habitat than in adjacent habitat (Adams et al. 1983). In our study, rabbits had the highest frequency of gate usage in both directions, and we suspect they accessed the right-of-way to forage. Groot Bruinderink and Hazebroek (1996) found that fenced rights-of-way are attractive to herbivores and predators, because there is more forage for grazing and higher densities of small mammals and carrion. Once wildlife enters the fenced right-of-way, they can become trapped and are more likely to get struck by a vehicle unless they pass through the gate again. Coyotes may have been attracted to the roadside edge habitat for hunting. Eleven of the twelve one-way gates detected coyotes inside the right-of-way. All one-way gates had double the amount of passages through the gate the intended way (0.18 passages/day) than the wrong way (0.08 passages/day). It appeared animals were getting into the right-of-way by other means besides going through the one-way gate the unintended direction. We suspect animals could have entered from going around the fence ends or holes along the fence line, but once inside they seemed to also use the one-way gates the intended way and avoid crossing the road. Ludwig and

Bremicker (1983) reported 69% of all passages through one-way gates by mule deer were in a positive direction (from inside the highway to the outside). We found similar results in our study area, as 67% of all passages by medium-sized mammals through one-way gates were from inside the fenced highway section to the outside.

The addition of a lane in both directions along SR23 and the reduction in size of the median could affect wildlife mortality rates. Studies have found that mid-sized and large mammals are particularly vulnerable to vehicle collisions along two-lane, high-speed roads, and birds and small mammals on wider, high-speed highways (Forman and Alexander 1998). Even though coyotes were found inside the right-of-way, few deaths were recorded on the road during our post-construction monitoring. In addition to the exclusion fencing and culvert clearing, an added lane (from two to three) on both sides of the median strip could have made crossing attempts less attractive to coyotes. Likewise, rabbits and other small mammals had a greater distance to travel to reach the safety of the median strip and were more likely to get hit on the road.

The one-way gate cameras provided information on what animals were present in the study area, including rare or more secretive carnivores, such as long-tailed weasels (*Mustela frenata*), bobcats, and badgers (Figure 21). Rabbits (63%) were the most common animal detected near the gates followed by coyotes (13%) and skunks (12%). All species identified near the one-way gates have also been detected in the culverts. Bobcats, badgers, and weasels were detected twice as often near the gates than in the culverts, and rabbits were detected 5 times more often near the gates than in the culverts. Coyotes were detected twice as often in the culverts as at the gates, and skunks were detected 3 times more often in the culverts than near the gates. This suggests that coyotes and skunks used the culverts more than the gates, but rabbits, bobcats, badgers, and weasels used the gates and surrounding habitat more often than the culverts.

We had some knowledge of wildlife movement along SR 23 before our study began. In the local hills south of the study area, NPS studied bobcats and coyotes with radio-collars from 1996-2003. Some individuals moved north and used the area between Olsen and Tierra Rejada Roads adjacent to SR 23. NPS studied 1 radio-collared bobcat and 4 radio-collared coyotes that used the immediate area on both sides of SR 23, demonstrating that these individuals were successfully crossing the highway (Figure 22). The one bobcat we followed mostly used the area west of the highway near Culverts B and C, but we located him once (1 of 42 locations in the study area) just east of the highway north of Culvert A, indicating he made at least two successful crossings. We followed 1 coyote for a month east of SR 23 near Culvert C; he did not cross the highway to our knowledge but was later hit and killed on Olsen Road by a vehicle. Following these individuals with radio-collars provided important information about how these animals were moving along this fragmented landscape. Although we located animals on both sides of the highway, we were uncertain of how they crossed SR 23.

CONCLUSIONS AND RECOMMENDATIONS

Our results suggest that the mitigation efforts by Caltrans were effective in increasing culvert use for many medium-sized mammals and reducing road mortality of coyotes, the largest of the mammal species detected in our study area. Clearing the two heavily silted culverts proved to be a particularly valuable mitigation, as these culverts received significantly more use once cleared. Even the culvert that did not require modification received more wildlife use, likely as a result of animals being funneled to the culvert entrances by the exclusion fencing. Our findings indicate that, for some mammalian carnivores, the culverts appear to be important for maintaining habitat connectivity across a busy highway. The lack of complete crossings by small mammals (rabbit, squirrel, mice) may be because the culverts were too formidable for these prey species, perhaps creating a preference for crossing on the road. The one-way gates show potential value if they can be modified to prevent people from damaging them and animals from going through the wrong way. Although our results measuring culvert use and road mortality before and after the highway modifications are compelling, it is important to recognize that we were not able to monitor presence of activity of wildlife in adjacent habitat during this study (we attempted to, but all adjacent land was private , and we were not granted access). However, we believe the coyote population has not changed significantly between our pre and post-construction monitoring. NPS (in a separate study) has been doing scat transects for coyotes during the course of the SR23 project in lands surrounding the study area in Los Angeles and Ventura counties and has not detected significant changes in coyote numbers.

The majority of published studies involving exclusion fencing and one-way gates along highways show the benefits for ungulates and large carnivores. To our knowledge, few studies have determined the effectiveness of one-way gates for small and medium-sized animals. Since no deer and large carnivores were detected in our study area, it would be valuable if mitigation was also effective for smaller animals as well. An important consideration in the implementation of exclusion fencing, one-way gates, and culverts is their relevance to a range of species. Based on our 5 years of pre- and post-construction monitoring data, the following recommendations have been developed:

A. The wildlife proof fence requires regular inspection and repair to ensure that animals are not exploiting breaks in the fence. Fence maintenance is usually neglected after construction, yet it is important to conduct even with budgets and priorities of transportation agencies changing over time (Forman et al. 2003). Fences are not permanent structures and can fail from improper construction, soil erosion, vandalism, falling trees, vehicular accidents, and animals digging holes under the fence. We have already documented locations along the fence line where water has eroded soil creating gaps under the fence (Figure 23). Caltrans walked the entire fence line in March 2012 and identified 15 of these locations (Figure 24) where animals can fit under the fence and access the right-of-way. The entire fence line should be walked every 6 months to identify and repair any holes and breaks.

Caltrans should consider moving the wildlife proof fence as close to the road as possible in future highway mitigation projects. This will reduce the amount of roadside vegetation and cover along the highway side of the fence and may help reduce the attractiveness of roadsides to a variety of species. Leaving less room between the fence and road may reduce wildlife vehicle collisions.

B. Consider improving the one-way gate design to be more effective in keeping animals and people from entering the right-of-way through it. Our modified one-way gate design resulted in animals passing through the gate the intended way two-thirds of the time. However, we believe the design can be improved by extending the 5 x 10 cm wire mesh out to the end of the tines (Figure 25). A gap of 5 cm between the tine ends should still be kept in place. This should prevent animals from passing through the gate the wrong way between the tines (Figure 26), and should strengthen the tines and prevent them from bending and breaking off (Figure 27). Even with the wire mesh extended to the tine ends, there should still be enough flexing to allow animals to push through. All wildlife species showed the ability to pass through the small gap between the tine ends and flex the gate open (Figure 28). If the tines appear not to flex enough after extending the wire mesh to the tine ends, then a thinner gauge wire mesh could be used. Testing and monitoring of the updated gate design would be required to evaluate its effectiveness. Some of the gates, especially the ones used by people, need repair by replacing bent tines and adding tines that have been broken off. Spring-loaded swing gates (Clevenger and Huijser 2010) should also be added in the fence next to the one-way gates to allow passage for people and prevent them from going through the one-way gates. This should help reduce human damage to the one-way gates and tines. To keep costs down, the spring-loaded gates (Figure 29) can be placed at the 6 gates (3 on each side of freeway) that showed use by people (Gates 1W, 2W, 4E, 4W, 5E, 6E). Gates 4E and 5E showed the most use (76%) by people. Signs in English and Spanish should be placed at each gate directing them to use the spring-loaded swing gate and not the wildlife one-way gate. All one-way and spring-loaded swing-gates should be checked every 6 months to ensure they are functioning properly and identify and repair any broken parts.

Caltrans should consider earthen escape ramps (or jump-outs) to allow wildlife, especially deer, to safely exit the right-of-way in place of one-way gates in future highway mitigation projects (Forman et al. 2003). Earthen escape ramps are an alternative to one-way steel gates and have been shown to be 6 to 12 times more effective than gates in allowing deer to escape the right-of-way (Bissonette and Hammer 2000). Earthen escape ramps are mounds of dirt placed against a backing material constructed on the right-of-way side of the fence that allow animals to jump down to the non-highway side of the fence (Figure 30). The outside walls of the escape ramp must be high enough to discourage animals from jumping onto the ramp and entering the right-of-way. To prevent injury to the jumping animal, the landing spot should consist of loose soil and be free of vegetation. Deer and elk have been found to be the most common users, but bighorn sheep, bears, moose, and cougars have been documented to use the ramps as well

(Clevenger and Huijser 2010). Escape structures need to be carefully planned in future mitigation projects for the wildlife they are targeting. For small-sized mammals such as badgers, small hinged doors at ground level (Figure 31) can allow safe escape of the right-of-way (Clevenger and Huijser 2010).

C. Culverts should be monitored and maintained over time to ensure that they continue to function properly as both a wildlife passage and drainage system. There is a continent-wide trend of neglect of scheduled maintenance of passage structures (Cramer and Bissonette 2005). Culverts need to be continually maintained in order to ensure their continued use by wildlife. Once a year after the rainy season, all 3 culverts should be checked to remove any silt or debris that has accumulated and ensure that water is draining properly. Our results clearly show that wildlife prefer culverts that are not heavily silted in with debris.

D. Add continuous cover throughout Culverts A and B to ensure their use by smaller mammal species. We did not record any complete crossings by small mammals, indicating that the culverts are not effective for passage by these species. Smaller sized mammals, particularly prey species, tend to use passages of a size that allow for their movement, but restricts the movement of their larger predators. In the drier culverts, the cover requirements of smaller mammals may be met by placing pipes or tubes of varying diameter (Figure 32) in the culverts along one side that span the entire length. Cover within the culvert can also be in the form of logs, rock piles, and bushes (Cavallaro et al. 2005, Cramer and Bissonette 2005, Clevenger and Huijser 2010). Modifications creating smaller scale cover in Culverts A and B may encourage use by small mammals, reptiles, and species associated with rocky habitats. Mitigation measures that accommodate the needs of small-sized mammal species will require further monitoring to determine effectiveness. A culvert that incorporates multiple mitigation design elements will be most effective in encouraging wildlife passage for a variety of species.

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Tables and Figures

Table 1. Number of road mortalities along SR 23 survey route, January 7, 2004-October 30, 2006 (pre-construction phase/ 432 survey days) and May 4, 2009-August 12, 2011 (post-construction phase/ 337 survey days).

SPECIES	Number of Road Mortalities Pre-Construction	Number of Road Mortalities Post-Construction
Medium Sized Mammals		
Coyote	43	5
Striped Skunk	11	12
Raccoon	2	2
Opossum	2	4
Bobcat	0	1
Badger	0	1
Domestic Dog	1	1
Domestic Cat	3	2
Small Mammals		
Rabbit	47	136
Ground Squirrel	22	22
Wood Rat	5	11
Mouse	1	3
Gopher	2	2
Birds		
Barn Owl	16	5
Red-tailed Hawk	1	1
Unknown Bird	11	11
Crow	2	7
Raven	2	1
Roadrunner	1	0
Duck	1	3
Dove	19	10
House Finch	1	0
Seagull	1	3
Reptiles and Amphibians		
Misc. Snakes	11	13
Bull Frog	3	0
Western Toad	4	0
Lizard	0	1
Unknown Animal	10	8
Total # of Species	**222**	**265**

Table 2. Total number of coyotes killed each month by vehicles along SR 23 survey route January 7, 2004-October 30, 2006 (pre-construction phase).

MONTH	2004	2005	2006	*Month Totals*
January	2	1	0	*3*
February	2	2	1	*5*
March	3	1	1	*5*
April	3	1	1	*5*
May	3	2	1	*6*
June	2	0	3	*5*
July	0	1	1	*2*
August	1	1	0	*2*
September	2	1	0	*3*
October	3	0	2	*5*
November	0	1	**X**	*1*
December	1	0	**X**	*1*
Yearly Totals:	*22*	*11*	*10*	*43*

Table 3. Total number of species identified with remote cameras at 3 culverts under SR 23 survey route, November 4, 2004 – October 30, 2006 (pre-construction phase) and May 4, 2009 – August 12, 2011 (post-construction phase).

Species	Camera Number											
	1A		2A		3B		4B		5C		6C	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Coyote	1	63	18	38	342	484	588	378	7	30	-	93
Striped Skunk	-	6	4	17	74	629	173	1318	3	126	-	67
Raccoon	-	18	6	25	7	21	22	26	27	192	2	196
Bobcat	-	-	-	2	-	-	7	2	3	5	5	6
Badger	-	-	-	1	-	1	-	-	-	-	-	-
Opposum	-	28	2	18	-	1	1	66	-	2	-	-
Domestic Dog	-	5	-	-	-	1	-	5	-	-	-	-
Rabbit	-	70	48	214	-	43	3	138	8	32	-	40
Squirrel	-	9	7	61	2	1	4	152	1	11	-	13
Weasel	-	-	-	-	-	-	-	1	-	-	-	-
Wood Rat	-	13	-	-	-	5	-	-	2	34	-	16
Mouse	-	2	-	-	-	-	-	-	-	-	-	-
Duck	-	-	3	-	-	-	-	-	-	-	-	-
Bird	-	51	21	2	3	1	6	10	5	43	1	21
People	-	41	3	36	12	2	9	1	2	8	-	-
Trips	4	37	50	53	346	183	634	355	39	221	4	29
Days in Field	29	387	487	733	498	520	526	561	223	561	122	726
Total Number of Photos	5	344	162	467	786	1372	1447	2452	97	704	12	481
No. of Photos Taken/ Day/ Camera	0.17	0.89	0.33	0.64	1.58	2.64	2.75	4.37	0.43	1.25	0.10	0.66
No. of Photos Taken/Day/ Culvert	Culvert A Pre = 0.32 Post = 0.72				Culvert B Pre = 2.18 Post = 3.54				Culvert C Pre = 0.32 Post = 0.92			

Table 4. Total number of confirmed crossings by wildlife in 3 culverts under SR 23, November 4, 2004 – October 30, 2006 (pre-construction phase) and May 4, 2009 – August 12, 2011 (post-construction phase).

	CULVERT					
	A		B		C	
Species	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Coyote	-	6	39	183	-	6
Striped Skunk	-	-	4	65	-	48
Raccoon	-	3	-	3	-	6
Opossum	-	1	-	-	-	-
Total Detections (*n*)	0	10	43	251	0	60
Total Survey Days	30	387	509	520	124	561
Crossing rate (*n*/survey days)	**0**	**0.03**	**0.08**	**0.48**	**0**	**0.11**

Table 5. Total number of individuals for each species (excluding rabbits) detected by remote cameras inside the fence and walking through the one-way gate (IT), outside the fence and walking through the one-way gate (OT), inside the fence and walking by the one-way gate (IB), and outside the fence and walking by the one-way gate (OB) along SR 23 survey route, February 17, 2010 – August 12, 2011 (6 east gates monitored for 2440 survey days) and August 25, 2010 – August 12, 2011 (6 west gates monitored for 1718 survey days).

Species	**IT**	**OT**	**IB**	**OB**
Coyote	214	157	72	171
Striped Skunk	392	145	178	44
Raccoon	6	10	5	-
Bobcat	17	8	3	2
Badger	1	1	2	1
Opossum	45	15	10	3
Weasel	2	1	4	-
Domestic Dog	2	1	3	4
Domestic Cat	57	23	48	23
People	30	28	-	-
Total detections (*n*)	766	389	325	248
Detection rate (*n*/survey days)	**0.18**	**0.09**	**0.08**	**0.06**

Table 6. Total wildlife detections/day (excluding rabbits) going through (inside the fence and through = IT; outside the fence and through = OT) and walking by (inside the fence and walk by = IB; outside the fence and walk by = OB) the 6 one-way gates used by people (2054 survey days) and the 6 one-way gates not used by people (2104 survey days).

	Gates Used by People		Gates Not Used by People	
Detection Direction	**Detection rate (*n*/survey days)**	***n***	**Detection rate (*n*/survey days)**	***n***
IT	0.22	441	0.14	294
OT	0.12	236	0.06	125
IB	0.08	170	0.07	151
OB	0.10	203	0.02	46

Figure 1. Study area showing location of culverts and one-way gates.

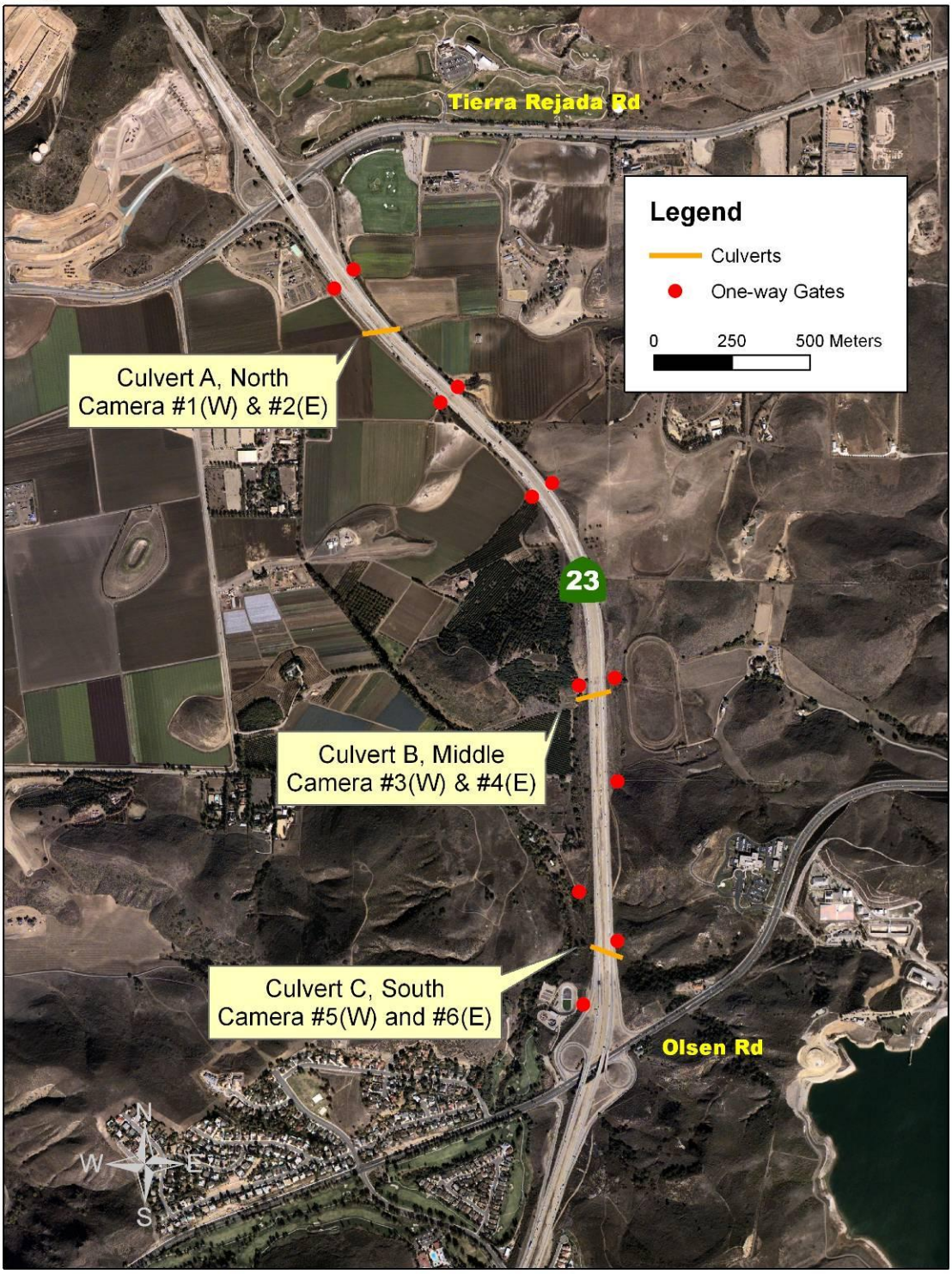

Figure 2. Three culverts along SR 23 study area.

Culvert A

Culvert B

Culvert C

Figure 3. Chain-link wildlife exclusion fence buried 2 feet into the ground with a total height above ground of 6 or 8 feet.

Figure 4. One-way gate designed to allow animals that are trapped inside the right-of-way to safely exit.

Figure 5. Wire mesh secured on the one-way gate tines to prevent flexibility that may allow animals to bend the tines and squeeze through.

Figure 6. Gap between tine ends to allow flexing at the point an animal would pass through.

Figure 7. Digital remote camera secured in steel container used to monitor culvert use.

Figure 8. Digital remote camera used to monitor one-way gate use.

Figure 9. Locations of animals hit on the road during pre-construction monitoring, November 4, 2004 to October 30, 2006.

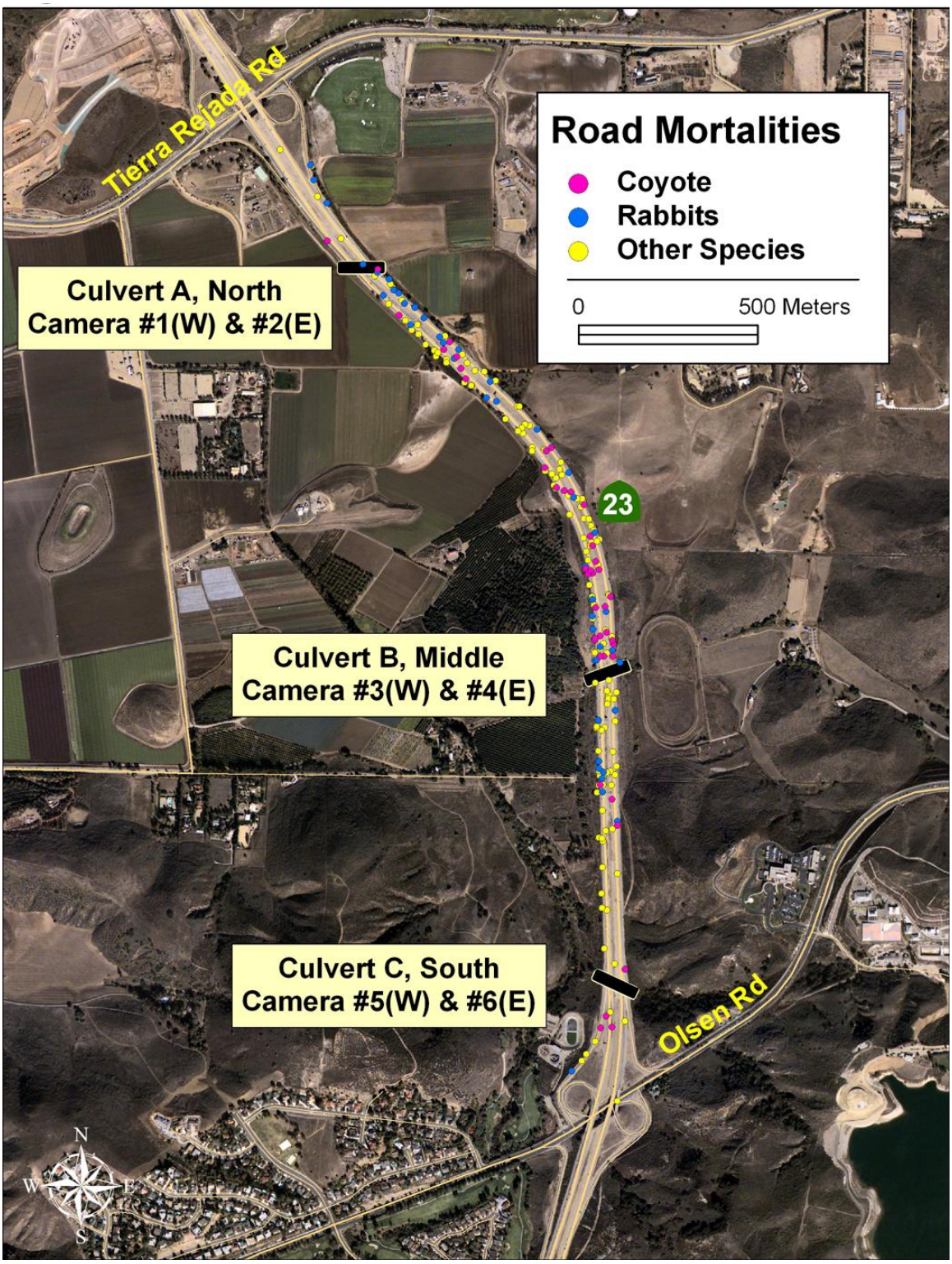

Figure 10. Coyote hit by vehicle along SR 23.

Figure 11. Locations of animals hit on the road during post-construction monitoring (May 4, 2009 to August 12, 2011) and locations of 12 one-way gates.

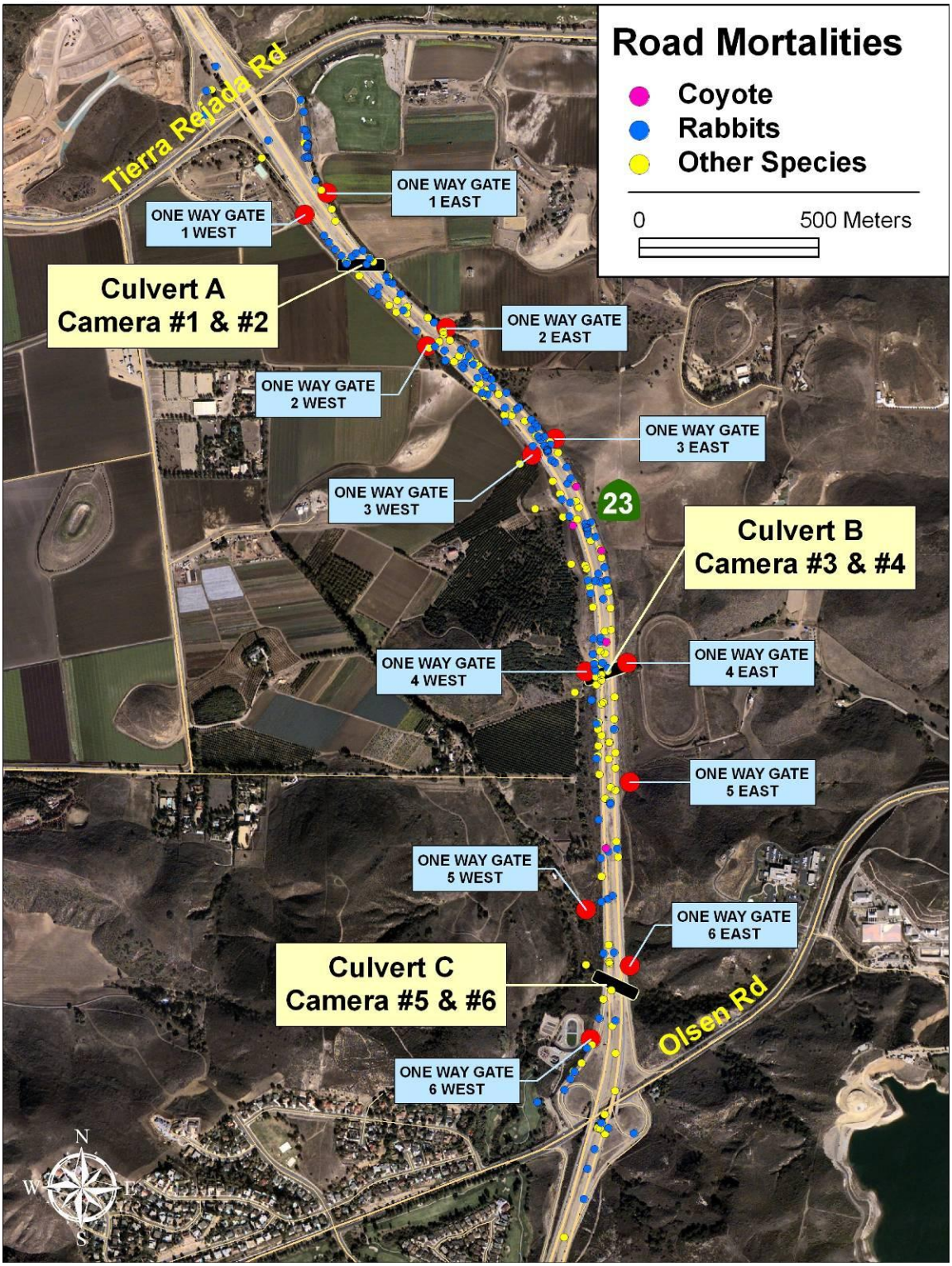

Figure 12. Culverts A and C before and after being cleared.

Figure 13. Coyote and Skunk in Culvert B

Figure 14. Remote camera picture showing bobcat jumping out of the western side of Culvert C before it was cleared.

Figure 15. Raccoons foraging in Culvert C.

Figure 16. People using one-way gates.

Figure 17. Animals passing through the one-way gates in both directions.

Series of 3 pictures showing coyote passing through the one-way gate the intended direction (from inside the fenced freeway to the outside).

Series of 3 pictures showing coyote passing through the one-way gate the wrong way (entering the freeway side of the fence).

Series of 3 pictures showing bobcat passing through the one-way gate the wrong way.

Series of 3 pictures showing raccoon passing through the one-way gate the wrong way.

Figure 18. Coyote approaching the one-way gate from outside the freeway, turning around and leaving.

Figure 19. Coyote biting on metal one-way gate tine from outside the freeway side of the fence.

Figure 20. Coyote with mange identified using 3 one-way gates on each side of the freeway in both directions.

Figure 21. Long-tailed weasel, badger, and bobcat photographed using one-way gates.

Figure 22. Locations of 1 bobcat and 4 radio-collared coyotes studied by NPS from 1996-2003. All individuals were located on both sides of the freeway.

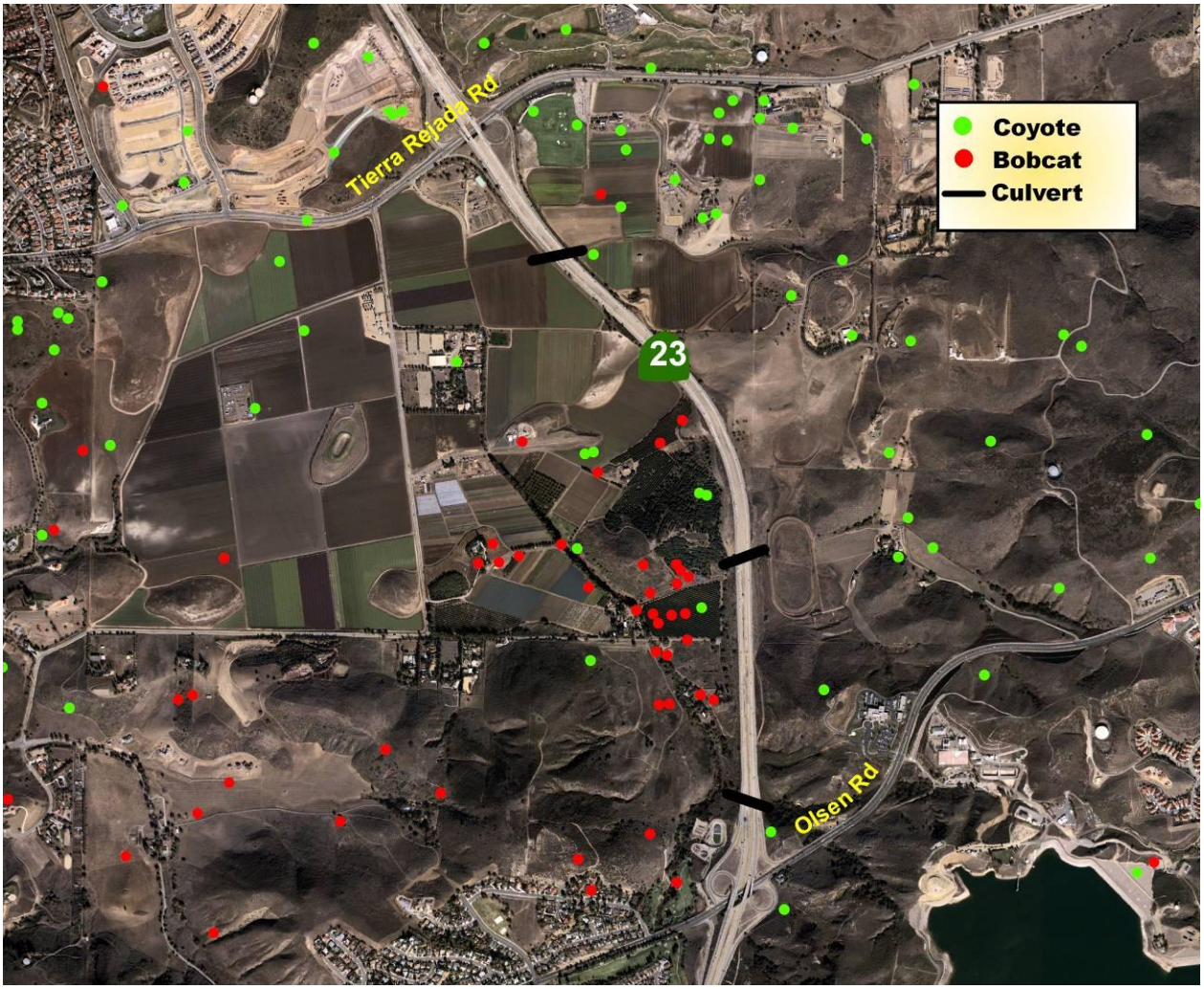

Figure 23. 23cm gap under the wildlife exclusion fence. Tracks of coyote and raccoon have been found at this location going under the fence and accessing the right-of-way.

Figure 24. Locations of 15 holes identified in March 2012 along the wildlife proof fence.

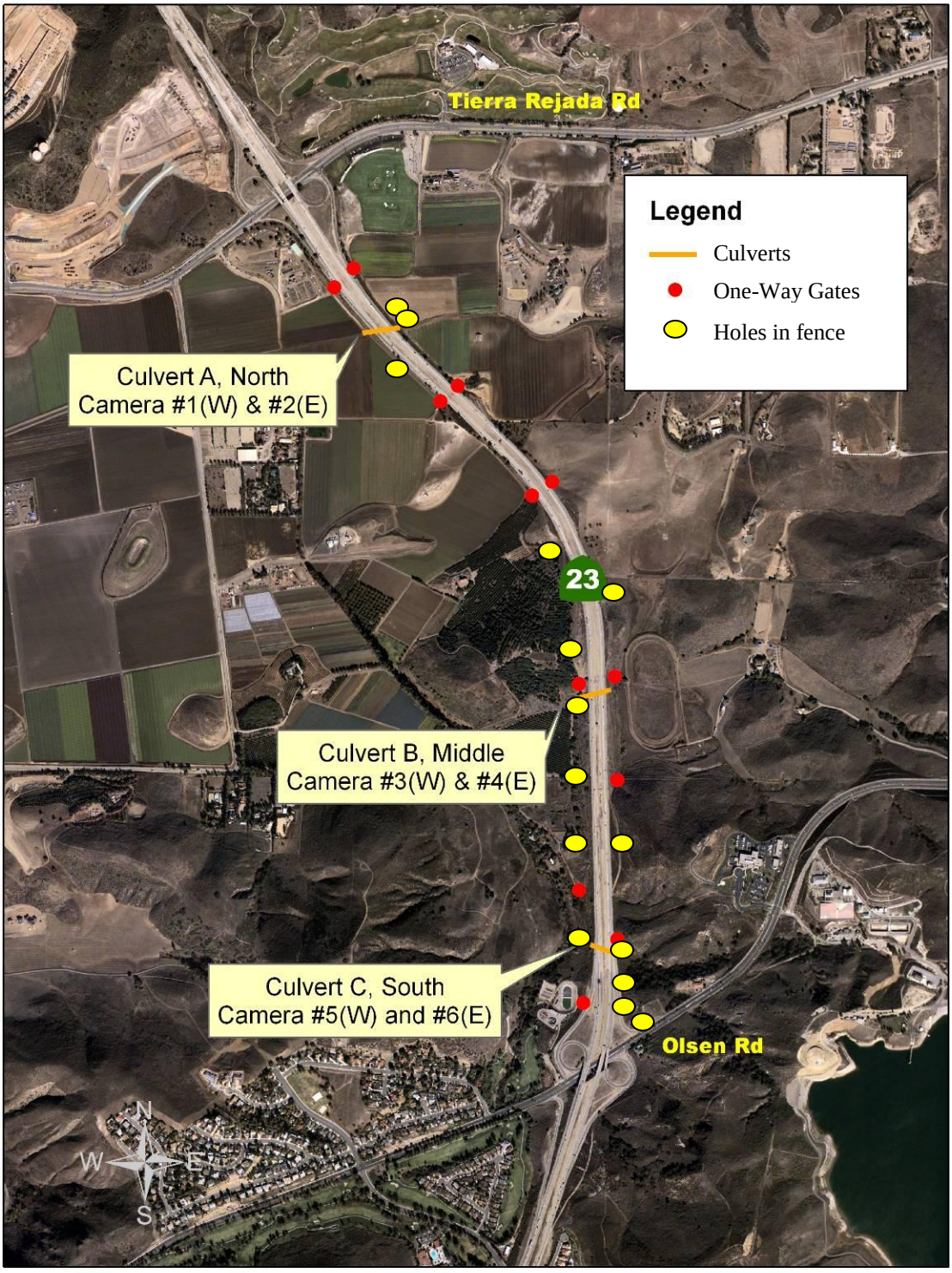

Figure 25. The wire mesh should extend out to the tine ends to improve the one-way gates so animals cannot pass through the wrong way.

Figure 26. Bobcat and coyote passing through the one-way gate between the tines.

Figure 27. Tines bent and broken off from people using the one-way gate.

Figure 28. Coyote and skunk passing through the one-way gate the intended way.

Figure 29. Spring-loaded swing gate in wildlife exclusion fence (Credit: Tony Clevenger).

Figure 30. Examples of escape ramp (jump-out) for wildlife trapped inside the fenced highway right-of-way (Credit: Tony Clevenger).

Figure 31. Small hinged door in wildlife exclusion fence for escape of medium-sized mammals (Credit: Tony Clevenger).

Figure 32. Example of pipes placed in culvert to provide cover for small mammal passage (Credit: Tony Clevenger).