Beyond the birds and bees:

URBAN HABITATS FOR LARGE CARNIVORES

Jossie Ivanov

Image: Liviu Ivanov

ABSTRACT

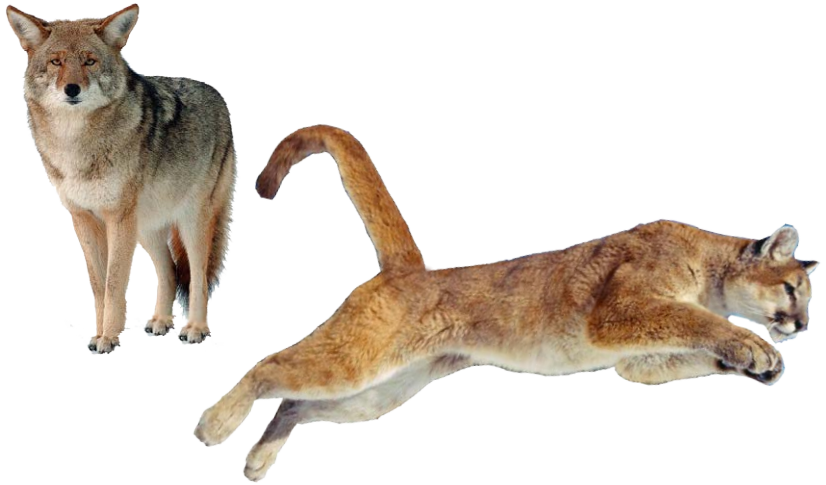
There has been growing recognition of the need to create habitat for birds and pollinators within urban centers, but more “threatening” large carnivores continue to be unplanned for. Due to human fear and a widespread belief in the fundamental difference between city and nature, most cities do not plan for intrusions by carnivores.

But carnivores have shown up anyway. As sprawl has decimated and fragmented habitats, more animals are pushed into urban and suburban areas. Without proactive management and education, negative or deadly human-carnivore encounters can push public opinion strongly against these animals. Planning for peaceful co-existence with animals that are crucial top links in food-chains becomes imperative.

Two California regions have shown especially interesting ways of accommodating carnivores. In San Francisco, native coyotes started to re-appear in the Presidio, a large urban park and former military base, in 2002. This tract of sparsely developed land has served as a denning ground and home base for many coyotes, which have been actively studied by the Presidio Trust. Shortly thereafter, other large pieces of disconnected habitat land throughout the city, including Golden Gate Park and Twin Peaks, have enabled coyotes to exist throughout the city. Signs throughout San Francisco warn of coyote presence, and literature on how to keep pets safe can be found on the Presidio’s website. This proactive management of coyotes has ensured a safe and thriving coyote population, and exciting exposure to urban wildlife for citydwellers.

Southern California’s relationship with mountain lions provides a different type of example: there, connective wildlife corridors, often fought for parcel-by-parcelhave enabled the carnivore population to continue to inhabit the mountains above Irvine, Riverside, and San Diego. A new planning method, called Natural Communities Conservation Planning (NCCP), has tried to proactively work with developers to conserve lands, with limited success.

Broadly defined, though, we can consider both cases successful, as populations of carnivores are able to subsist over time in traditionally unfriendly habitats. But while the Presidio Trust has actively managed and fostered coyote/human relationships, the Los Angeles success is tenuous as rampant development continues. Without regulatory teeth in the NCCP program, unsecured corridors could undergo conversion to development, putting in peril the informal corridors’ connections to wild areas. This case study will explore how these different approaches to carnivore populations can inform future urban habitat efforts.



Images: Yathin S Krishnappa, CC BY-SA 3.0; ctmountainlion.org.

INTRODUCTION

Across the United States, there is growing recognition of the overlap between human and animal habitat. From widely published guidelines for planting native species in gardens to attract pollinators like bees and butterflies, to new books like *Welcome to Subirdia: Sharing Our Neighborhoods With Wrens, Robins, Woodpeckers, and Other Wildlife*, the built environment has begun to be more hospitable to many animal species. But large, carnivorous, and generally scary animals continue to be marginalized and unplanned for. It's fairly easy to encourage suburbanites to welcome wrens and robins into their backyards, but a mountain lion is a different story. Due to growing metropolitan areas and increased habitat fragmentation, large carnivores are showing up whether they're invited or not. Drawn into urban cores by desire or necessity, looking for new food sources or trying to get to now-isolated habitat remnants, carnivores are increasingly coming into contact with humans.

This contact can be positive: the human and the animal view each other at a distance, stay out of each others' way, and both parties remain alive and unharmed. The human leaves with an experience, a story to tell, and perhaps with greater empathy. But too often, the contact is negative: there is too much interaction. Too much interaction takes many forms: property damage, road collisions, domestic pets as dinner, or animals attacking humans. These forms almost always end up with the animal dead. Road collisions are the number one killer of wildlife, but depredation kills, conducted by the United States Department of Agriculture (USDA), are also extremely common. Anyone who has experienced loss of property, livestock, or any threat of bodily harm may apply for a depredation permit, and the USDA will kill the animal in question. These criteria are extremely revealing in how humans often view wildlife: animals should eat certain things, stay in certain places, and behave in human-approved ways. When animals diverge from human-approved ideas of good behavior (which is often a result of learned behavior after a human intrusion), their lives lose their value and they are killed. For any type of sustained co-existence, then, contact must remain overwhelmingly positive.

Whether human/carnivore encounters have positive or negative outcomes depends largely on two factors: the character of the built environment in terms of its barriers, connectivity, and habitat patches; and human perception of the relative risk and value of these creatures. Two cases clearly illuminate these factors: the re-entry of coyotes in San Francisco and subsequent management by The Presidio Trust, and the gradual fragmentation of mountain lions' habitat in Southern California and the attempt to preserve connective corridors through the creation of Natural Community Conservation Planning (NCCP).

As cities, suburbs, and exurbs continue to expand, planners and designers have an ethical imperative to consider how the built environment impacts other species. The successes and drawbacks of these two cases can help to clarify future directions.

THE ANIMALS

Coyotes, native to North America, are pack canines that are classified as mesocarnivores: animals whose diets consist of 50-70% meat, with the rest from plants, including fruit and fungi.[1] They eat rodents, deer, rabbits, and domesticated pets and livestock when available. One biologist noted the impossibility of listing typical coyote foods, as they are regarded as some of the world's greatest generalists in their creative and industrious foraging skills.[2] Coyotes also have very unique reproductive characteristics. Female coyotes actually become more fertile when pack leaders are killed, breeding more often and having more pups per litter, leading to exponential population growth.[3] In rural environments, each coyote pack has a range of two to four square miles of territory. In urban environments, possibly due to higher density of potential food sources and greater difficulty of movement, packs are observed to take less space, as low as 0.4 square miles.[4] Both urban and rural coyotes require sheltered areas for denning with their young, such as forest shrubbery or rock outcroppings, but without pups, they can live in open grasslands. Coyotes tend to avoid humans with natural wariness, but can lose their fear of human contact if they are fed.

1 Mesocarnivores are situated between hypercarnivores, which eat more than 70% vertebrate meat, and hypocarnivores, which eat less than 70% vertebrate meat. Van Valkenburgh, Blaire. "Déjà vu: the evolution of feeding morphologies in the Carnivora." Oxford University Press on behalf of the Society for Integrative and Comparative Biology, Phoenix, Arizona, 2007.

2 Adams, et al. *Urban Wildlife Management.* Boca Raton: CRC Press, 2006.

3 Fimrite, Peter. "California bans wildlife killing contests." SFGate, December 5, 2014.

4 Adams, Lowell W. *Urban Wildlife Habitats: A Landscape Perspective.* Minneapolis: University of Minnesota Press, 1994.

Mountain lions, native to the Americas from Canada to the southernmost tip of South America, are also variously known as cougars and pumas: all names refer to the same animal. They are hypercarnivores who get most of their food from four-legged mammals like deer and livestock. Typically living in mountains and forests where they can pounce on prey from above, mountain lions require huge ranges of about one hundred square miles per male, making them particularly susceptible to habitat fragmentation. They also tend to avoid humans and remain unseen when possible. Since their typical food source is a four-legged mammal, some biologists speculate that humans don't register as a potential food source – unless someone bends down to tie a shoe.[5]

5 Haupt, Lyanda Lynn. The Urban Bestiary: Encountering the Everyday Wild. New York: Little, Brown and Company. 2013.

"The coyote is a long, slim, sick and sorry-looking skeleton, with a grey wolf-skin stretched over it, a tolerably bushy tail that forever sags down with a despairing expression of forsakenness and misery, a furtive and evil eye, and a long sharp face, with a slightly lifted lip and exposed teeth. He has a general slinking expression all over. The coyote is a living, breathing allegory of Want. He is always hungry. He is always poor, out of luck, and friendless. The meanest creatures despise him, and even the fleas would desert him for a velocipede. He is so spiritless and cowardly that even while his exposed teeth are pretending a threat, the rest of his face is apologizing for it."

-Mark Twain, *Roughing It*

PERCEPTIONS

Critical to any discussion of human/wildlife interactions is the capricious and constantly shifting nature of human perception of these animals over time. Both coyotes and mountain lions have been frequently considered pests and varmints, especially by ranchers on whose livestock they prey. Further, perception of the relative risk of attack often bears little relationship to reality. These two factors have huge consequences for carnivore populations.

COYOTES

Coyotes were listed as bountied predators in the first half of the 20th century. Recognition of their ecological benefits has grown, but they are still killed in huge numbers to protect livestock, now by the US Department of Agriculture. In 2001 alone, 90,000 coyotes were killed through depredation permits in United States,[6] and according to ecologycenter.org, around 400,000 total coyotes are killed every year through the combined efforts of government agencies and individuals.[7]

But urban and rural populations tend to have radically different attitudes about coyotes, exemplified through a recent conflict; annual "coyote drives," which offer prizes for the most animals killed, sparked huge outrage across California. The online arm of the San Francisco Chronicle, SFGate, reported on December 5, 2014, that "the California Fish and Game Commission has banned predator killing contests, ending a fierce debate over the rural tradition, which invariably ended with a pile of blood-soaked coyote carcasses and a smiling gun slinger with a new belt buckle."[8] Putting aside the urban news source's clear stereotyping of rural residents as belt-buckle-wearing gun-slinging hillbillies, the paper quoted coyote advocates accusing rural residents of ignorance about coyote reproduction, and general inhumane behavior. While rural residents often see coyotes as threats to their livelihoods, urban residents, with vastly different concerns, often like glimpses of nature, and tout the benefits of coyotes controlling feral cat and deer populations, which many view as pests.

MOUNTAIN LIONS

Biologists Stephan DeStefano and Robert D. Deblinger have chronicled changing perceptions of mountain lions over the past century.

"In the early parts of the 20th century, mountain lions were

6 Adams, et al. *Urban Wildlife Management.* Boca Raton: CRC Press, 2006.

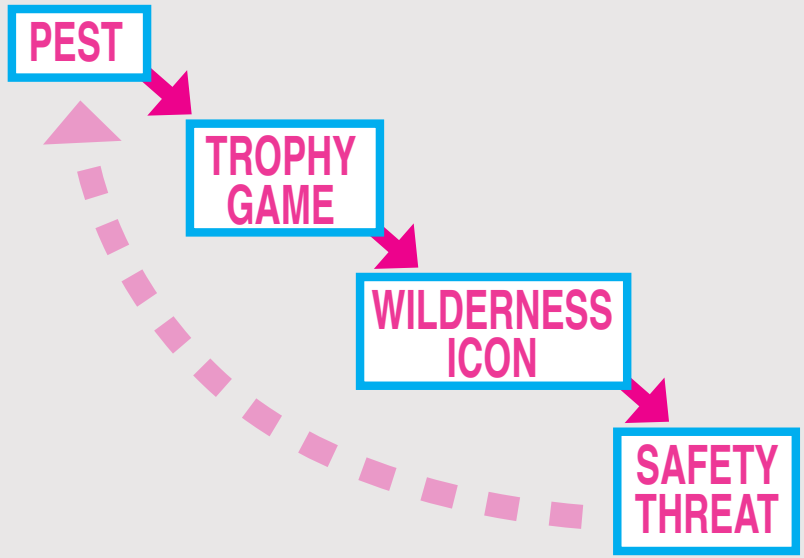
7 DeBarbieri, Lili. "Coyotes 'round the Town." www.ecologycenter.org, December 1, 2009.

8 Fimrite, Peter. "California bans wildlife killing contests." SFGate, December 5, 2014.

Coyote drives. Sources: AP Photo/Terry White, myoutdoorbuddy.com

Varmint hunting mountain lions. Source: mountainlion.org

MOUNTAIN LIONS IN POPULAR OPINION: 1940-2005



Adapted from DeStefano, "Wildlife as Valuable Natural Resources vs. Intolerable Pests," 2005.

> considered vermin and pursued and killed for bounty. This activity was not only rewarded with cash payments, but was encouraged by local communities…. The lion hunter was a person of notoriety and importance in the community in the middle part of the last century."[9]

DeStefano and Deblinger go on to describe further shifts, occurring on the decade scale. In the 1960s, an emerging understanding of predators as important players in ecosystems and a shift of mountain lions into trophy game animals put them under the protection of state and federal game laws, with permit requirements and the elimination of bounties. By the 1980's, attitudes had shifted again with growing urban and suburban populations, which, with no livestock to protect and very little actual exposure to predators, had unfavorable views of hunting for any purpose. (Like coyotes, mountain lions control deer populations, which many suburban residents view as pests, and the swinging cycles of what are viewed as pests may closely follow normal cycles of population growth and decline.) In 1990, Californians passed Proposition 117 in the primary elections, which prohibited sport hunting of the California Mountain Lion, and any "takings" unless for protection of life, livestock, or other property. The proposition also required that $30 million be spent every year on habitat conservation measures.

Tellingly, voting numbers for the measure reflect the urban/rural divide on how mountain lions should be treated. Statewide, 52.4% of voters approved the measure. San Francisco County approved the measure by 67.8%, and Los Angeles County approved it by 59.5%.

9 DeStefano, Stephen and Deblinger, Robert D. "Wildlife as valuable natural resources vs. intolerable pests: a suburban wildlife management model." Urban Ecosystems, 8: 179-190, 2005.

But just over the mountains from Los Angeles, in rural Kern County, residents voted against the measure by 63.3%, with just 36.7% of voters voting with the state majority.[10]

The rapid suburban growth of the 1990s and 2000s brought increasing habitat fragmentation, and with it, some increased negative encounters between humans and mountain lions. According to DeStefano and Deblinger, "Although the number of such incidents is small and much less than attacks by domestic dogs on people, the potential attack of a large wild predator is a very fearsome event, even if the chances of such an attack are remote…. Lions are now being viewed as a threat to human safety by many members of the public."[11] They fear that increased salience of mountain lion attacks and predation on beloved household pets could cause the lion to be re-labeled a pest, and could restart the opinion cycle.

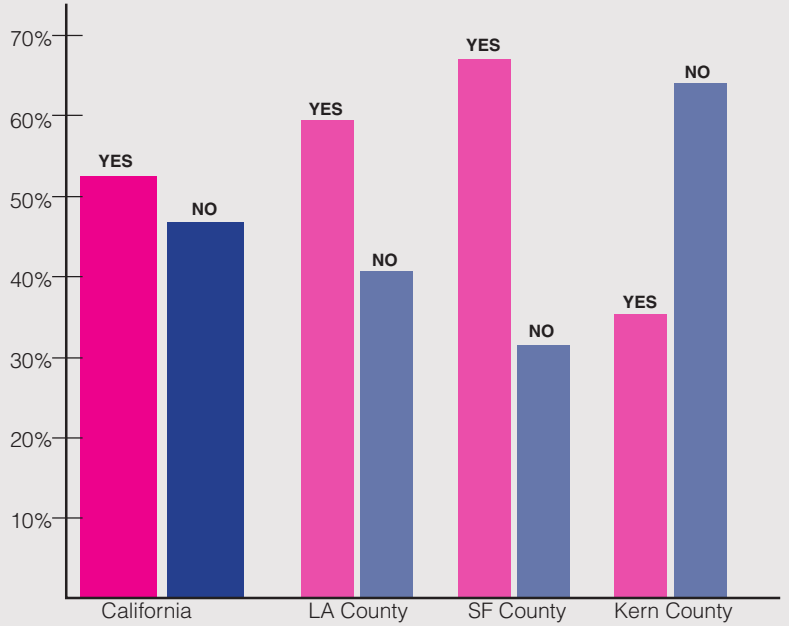
According to mountainlion.org, 149 mountain lions were legally killed through depredation permits in 2000 in the US, which is the leading cause of death for lions in California.[12] Interestingly, from 1907-1963, when the lions were listed as a bountied predator, about 215 were reported killed per year. This is a small difference, considering the legal shift from encouraged killing to protected from killing.

10 California Secretary of State website, "Supplement to the Statement of Vote – Results of the June Fifth Primary Election: Statewide Summary by County." Accessed December 7, 2014.

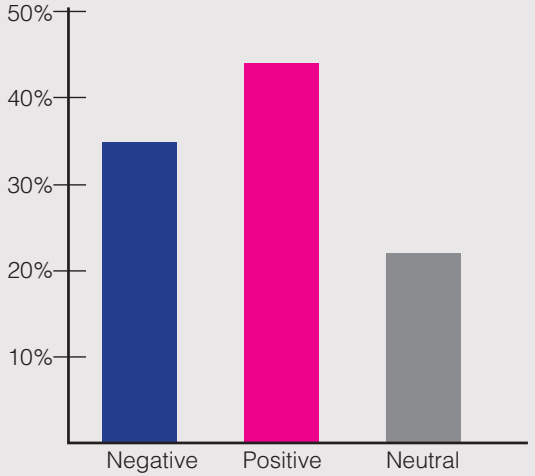
11 DeStefano, Stephen and Deblinger, Robert D. "Wildlife as valuable natural resources vs. intolerable pests: a suburban wildlife management model." Urban Ecosystems, 8: 179-190, 2005.

12 Morrison, Scott A. and Walter M. Boyce. "Conserving Connectivity: Some Lessons from Mountain Lions in Southern California." Conservation Biology, Volume 23, No. 2 (2008): 275–285

PROPOSITION 117 VOTES:



LA TIMES MOUNTAIN LION COVERAGE 1985-1995:



Ten years of newspaper coverage of mountain lions reveals a fairly even split between positive and negative portrayals.
Source: Wolch, "Changing Attitudes Toward California's Cougars," 1997.

SAN FRANCISCO COYOTES

REINTRODUCTION

After a decades-long absence, coyotes were first re-spotted in San Francisco in 2001. Blood samples proved that the animals were related to a pack living to the north in Marin County, meaning they had crossed the Golden Gate Bridge (essentially a highway) to get to the city.[13] San Francisco, formerly a hilly sand-dune peninsula, has several large urban parks within its 49-square mile boundaries. The coyotes were first seen in the Presidio, a 2.3-square mile former naval base at the northern tip of the city, adjacent to Golden Gate Bridge. Now mostly forested, it also has a golf course, dispersed housing, and a few small museums. City residents soon began reporting sightings in all of the other large urban parks within the city, such as Golden Gate Park, Twin Peaks, Land's End, Glen Canyon, and Stern Grove, each of which has a mixture of human-centered park amenities with lands that are unmanicured and suitable for animal habitat. Coyotes were also seen in the tiny parks that top most of the city's hills within dense neighborhoods, including Washington Park, Russian Hill, and Telegraph Hill, many of which have gardens and lawns, with little secluded "habitat."

San Francisco's urban fabric and geography may be key ingredients in coyote success within the city. The high frequency of parks within a well-connected grid layout provides denning opportunities and multiple paths between safe habitats. There are relatively few highways, which create some of the worst habitat fragmentation and disconnectivity. There are some wide, high-speed streets, however, where some coyotes have been documented being hit and killed. These barriers reduce habitat connectivity, and car hits may be fatal or injurious to humans as well. But the overall urban connectivity, and

13 DeBarbieri, Lili. "Coyotes 'round the Town." www.ecologycenter.org, December 1, 2009.

Images: Yathin S Krishnappa, CC BY-SA 3.0; Google: Data SIO, US Navy, NGA, GEBCO, Image Landsat

"It seems that every nook and cranny of San Francisco's parks and greenbelts has a coyote or two hiding in it."
Tom Stienstra, SFGate

low-speed nature of many streets, seems to be a fairly hospitable coyote habitat.

PLAN:

In 2003, the Presidio Trust, a federal agency in charge of managing the Presidio, began active management of the coyotes. Working with the National Park Service, Department of Fish and Game, and Animal Care and Control, their goal was, "to ensure that our coyote population remains healthy and wild (i.e. posing no threat to public safety)."[14] Coyotes' health and wildness, here in an urban setting, is based explicitly on their relationship to humans. As we have seen,

14 www.presidio.gov

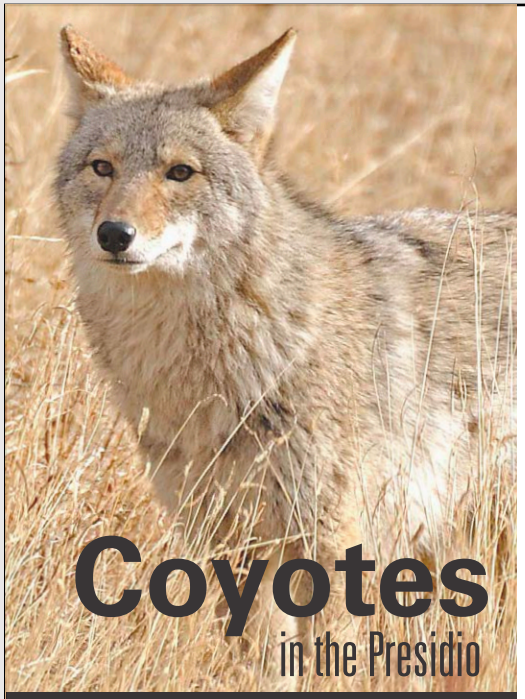
Images: Google, Data SIO, US Navy, NGA, GEBCO, Image Landsat

these animals must avoid being deemed public nuisances in order to stay alive. But the Presidio Trust takes proactive steps to manage humans as much as it manages the coyotes, in what it rightly sees as the path to peaceful co-existence. One of the main features of the Presidio Trust website is the section on coyotes, with links to an information brochure, a form to report sightings and incidents, and details on community outreach:

- "Offering a wildlife hotline and keeping a record of all reported coyote observations in the Presidio (and adjacent areas to park)
- Educating park residents, employees, and visitors through materials and presentations
- Installing temporary and permanent signage (with a focus on coyotes) in targeted areas of the Presidio"[15]

Their brochures and informational signs advise residents to keep dogs leashed, keep cats indoors at all times, and to keep pet food indoors and garbage cans secured. The brochure also makes a sympathetic case for the animals, including details about coyote life such as the fact that they typically mate for life (an animal fact often used to draw connections between humans and animals, and to compel humans to imagine animals as having relationships and emotions). In the event that human education doesn't work

15 www.presidio.gov



About Coyotes in the Presidio

Why are they here?

Coyotes are adaptable and often live in or near urban areas. They are seen throughout San Francisco and live in most large city parks. The Presidio offers good habitat for coyotes due to its wild food sources, water sources, and green open space. Coyotes feed primarily on rodents and are considered a valuable part of the park's diverse ecosystem.

What is the park doing about them?

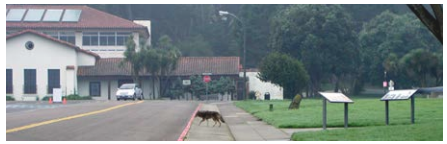
After coyotes reappeared in San Francisco in 2002, the Presidio Trust – working with park and wildlife officials throughout the Bay Area – developed a management protocol to promote harmonious coexistence with coyotes. Trust staff, with help from park residents and the public, monitor the movement and behavior of coyotes in and near the park. Our goal is to ensure the safety of people, coyotes, and pets. The Trust has created a hotline for community members to report wildlife observations (see back page). It also conducts outreach to park residents, visitors, and employees.

What do they look like?

- large erect ears, narrow muzzles, and golden brown eyes
- bushy tails held down when the animal is in motion
- reddish-yellow, tan, brown, or grey coloring
- bib-like patch of white fur around lower jaw and neck
- darker grey and black hairs on upper body and lighter cream-colored undersides
- between 20-40 lbs, but often appear heavier due to a thick, double coat of fur

What is their normal behavior?

Coyotes will usually avoid close human contact. Typically they are timid animals with a natural fear of humans. Coyotes can be active at any time of the day or night. They are most visible and vocal during breeding and pupping season, which is January through May. In urban areas coyotes may not be as quick to run in the presence of people, but they are likely to keep their distance in a human encounter. Coyotes are members of the canine family and can be reactive in different ways to the presence of dogs.



What do they eat?

Coyotes are opportunistic omnivores who rely on natural sources of food, but they will scavenge from trash or composting bins if the cans are not secure. In the Presidio, the coyote's primary natural food sources are gophers and other rodents. They also eat fruit and vegetation.

What should I do if a coyote approaches me?

There are occasions when coyotes need to be reminded that they should keep their distance from people. In the unlikely event that a coyote approaches you (or if you have an encounter within 50 feet and the coyote does not move away on its own accord) here are some things you can do:

- Be as big and loud as possible; shout in a deep, loud, and aggressive voice
- Wave your arms and throw small objects (to scare, not injure)

If the coyote continues to approach, do not run or turn your back on the coyote but continue to exaggerate the above gestures.

How can I protect my dog?

The best way to reduce the likelihood of interacting with coyotes is to keep your dog on a short leash and avoid extension leashes.

How do I discourage coyotes from visiting my neighborhood?

- tightly secure garbage and compost bins
- refrain from leaving pet food and water outdoors
- never leave pets unattended outdoors

How can I protect my cat?

The only way to guarantee your cat's safety is to keep it indoors.

Did You Know?

- The name "Coyote" (*Canis latrans*) is derived from the Aztec word "*coyotl*." They are found in every state except Hawaii.
- Coyotes are found in a wide variety of habitats, ranging from deserts to mountains to urban environments.
- Coyotes typically mate with the same partner for life.
- Coyotes are the most vocal of all land mammals. Their vocalizations are designed to bring individuals together or let other coyotes know their location.

Report a Coyote Sighting in the Presidio

Sightings from the public help us understand the behavior and movements of animals in and near the park so we can improve our management strategies.

Report coyote sightings of concern to:

nature@presidiotrust.gov

(415) 561-4449

10

Source: Presidio Trust website

ANIMAL CARE AND CONTROL
1200 15TH STREET ~ SAN FRANCISCO, CA 94103 ~ FAX TO: 415-864-2866
COYOTE ENCOUNTER OBSERVATION REPORT

Date Reported: _____ Staff: _____ Field/Office/Other

Nature of Call: _____

_____

_____

Nature of Reporting Person: _____

_____

_____

Reporting Person's phone number: _____

Reporting Person's address: _____

Date of Coyote encounter: _____

Location of Coyote encounter: _____

Description of encounter: _____

_____

_____

Coyote markings/distinguishing features: _____

_____

_____

Did R/P request Coyote information? _____ Date sent: _____

Other comments: _____

_____

to facilitate peaceful co-existence, the Trust follows a Wildlife Incident Response Protocol (WIRP) they developed in 2004 with the Department of Fish and Game and the National Park Service. According to an article on ecologycenter.org,

> "the WIRP identifies unacceptable behavior as: the animal repeatedly disturbs, raids, or investigates human or high-use areas; the animal displays unprovoked aggression; and the animal does not retreat when a human takes aggressive action to drive it off. In June of 2008, a coyote displayed these behaviors towards a Presidio resident and visitors. Presidio Trust natural resources staff first contacted wildlife rescue organizations and zoos to see if any would accept a coyote for relocation. When none would, the Trust contacted California Wildlife Services to humanely dispatch the animal."[16]

The Trust treats killing as an absolute last resort – and their primary policy of human education seems to make it a last resort that is rarely needed.

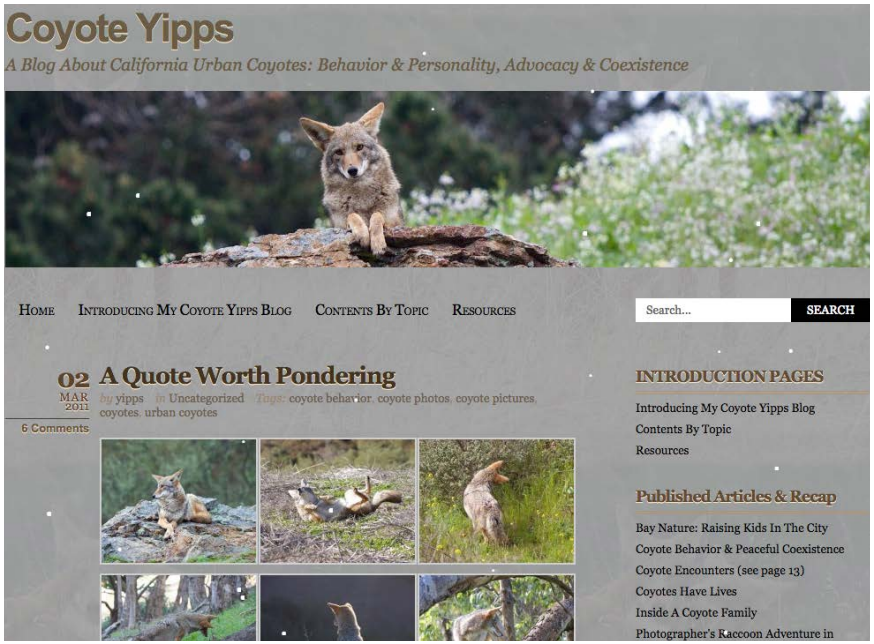
OUTCOMES:

The Presidio Trust's policies of treating killing as a last resort, using education to facilitate co-existence, and promoting coyotes as valuable resources has led to very successful outcomes so far for coyotes in San Francisco, especially considering
the close urban proximity between humans and coyotes and high

[16] DeBarbieri, Lili. "Coyotes 'round the Town." www.ecologycenter.org, December 1, 2009.

potential for negative encounters. Tom Stienstra, the outdoors journalist for the San Francisco Chronicle, estimates that there are currently up to 100 coyotes within San Francisco, stating, “it seems that every nook and cranny of San Francisco’s parks and greenbelts has a coyote or two hiding in it.”[17] However, just last year, there were only fifteen total coyotes estimated to be within the city. The huge increase could be a biological response to a pack leader killed, or it could be that coyote populations have a larger niche to fill within the city.

Current public opinion seems to favor coyotes. Blogs like coyoteyipps.com document coyotes’ activities with stories and photos, and residents seem to mostly enjoy their exposure to the animals. Articles are filled with stories about how they control feral cats and skunks, and there are few documented clashes with pets. But as populations have risen, there is potential for public opinion to go sour. The sweet spot for co-existence may be tenuous. So far, though, the Presidio Trust’s goal of “ensur[ing] that our coyote population remains healthy and wild (i.e. posing no threat to public safety),”[18] appears to be successfully met.



Blogs such as coyoteyipps.com and baynature.org feature photos of and stories about urban coyotes. Images: coyoteyipps.com, Janet Kessler / baynature.org

17 Stienstra, Tom. “Coyotes seemingly thrive in San Francisco.” SFGate, published March 27, 2014.

18 www.presidio.gov

LOS ANGELES MOUNTAIN LIONS

GRADUAL FRAGMENTATION:

Southern California's mountain ranges, an ideal habitat for mountain lions, tower above valleys and flat lands. Dense development has tended to stay away from mountains due to high building costs, so the valleys have filled up with Los Angeles and San Diego metropolitan areas. But these areas are largely full, and rampant suburban and exurban development of the 1990s and 2000s crept up the hills. While many of the mountains are protected parks and public lands, many of the connections between them remained unconverted ranches and open space, vulnerable to development and resulting habitat fragmentation.[19]

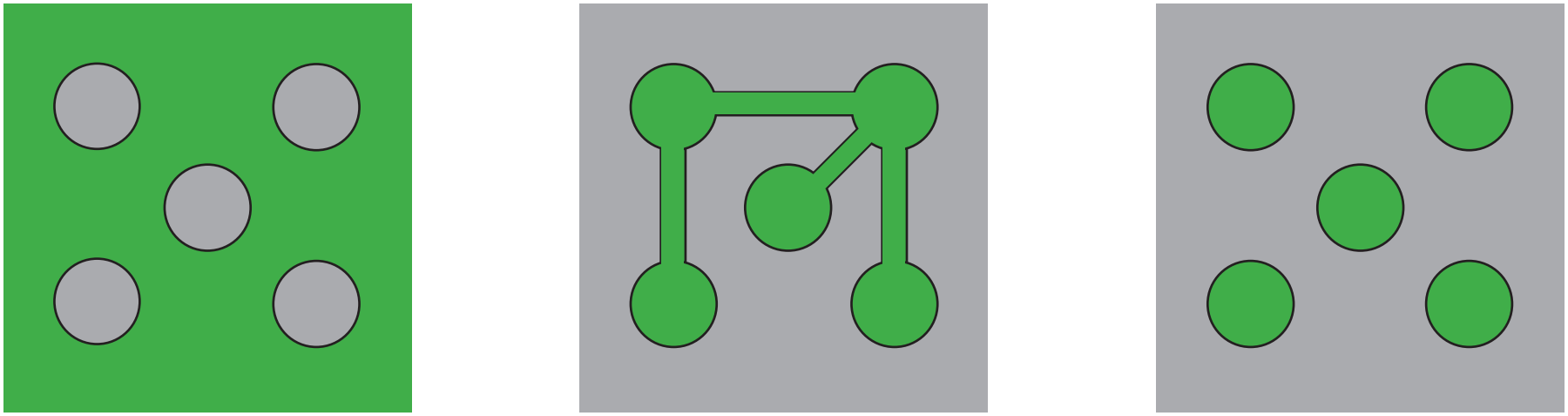
PLAN BACKGROUND:

In 1973, Congress passed the Federal Endangered Species Act (FESA), which prohibits that "taking" (harming, harassing, trapping, killing, and any habitat destruction that would inevitably lead to these outcomes) of any listed species, essentially outlawing development within endangered species' habitats. To provide more flexibility, the Act was amended in 1982, creating "incidental take permits," permitting habitat takings in exchange for a habitat conservation plan (HCP).[20] But Habitat Conservation Plans, and the legal mechanisms of FESA and its California counterpart, the California Endangered

Source: Google Earth imagery

19 Morrison, Scott A. and Walter M. Boyce. "Conserving Connectivity: Some Lessons from Mountain Lions in Southern California." Conservation Biology, Volume 23, No. 2 (2008): 275–285

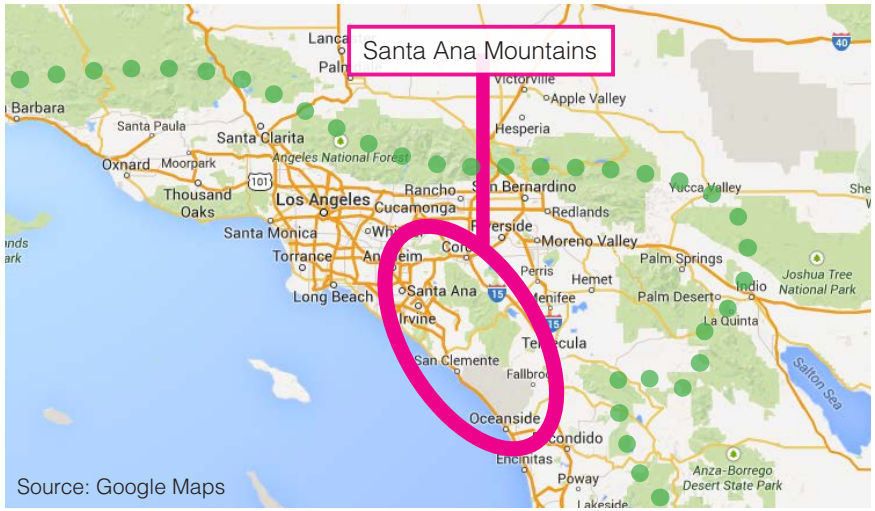
20 Beatley, Timothy. "Use of Habitat Conservation Plans Under the Federal Endangered Species Act." Published in Adams, Lowell W. and Leedy, Daniel L. *Wildlife Conservation in Metropolitan Environments: Proceedings of a National Symposium on Urban Wildlife*. Columbia, Maryland: National Institute for Urban Wildlife, 1990.



Adapted from a diagram from "Ecological Corridors in Urban Southern California" by Lyle and Quinn, in Wildlife Conservation in Metropolitan Environments: Proceedings of a National Symposium on Urban Wildlife.

Species Act (CESA), were criticized as being overly focused on one species, too late. By the time a species was listed as threatened or endangered, its ecosystem was often degraded beyond repair. And focusing on one species' habitat often ignored the wider habitat needs of the other creatures the endangered animal relied upon, leading to insufficient conservation, cascading endangerment listings, and huge conflict with developers and landowners.[21] Mountain lions are not threatened or endangered across the country, making them ineligible for protection under FESA or CESA. This left the job of conservation to either existing public wild lands, or to private groups focused on protecting additional land.

The Nature Conservancy, in particular, took up the mantle for trying to preserve connectivity corridors for the mountain lions and other species. One of the main threatened habitats they focused on was the Santa Ana Mountain megafragment, an area split between Orange, Riverside, and San Diego Counties. Over 20 years ago, biologist Paul Brier warned that the Santa Ana Mountains were tenuously connected to other protected mountain zones, and that if the connection wasn't improved and conserved in perpetuity, the



21 Beatley, Timothy. "Use of Habitat Conservation Plans Under the Federal Endangered Species Act." Published in Adams, Lowell W. and Leedy, Daniel L. *Wildlife Conservation in Metropolitan Environments: Proceedings of a National Symposium on Urban Wildlife*. Columbia, Maryland: National Institute for Urban Wildlife, 1990.

REMAINING PATCHES

15 miles

BARRIERS

Highways: "the most efficient wildlife slaughtering mechanisms ever devised."

-Haupt, The Urban Bestiary

15 miles

CORRIDORS

Tenaja Corridor

Palomar Linkage

15 miles

Images: Google: Data SIO, US Navy, NGA, GEBCO, Image Landsat

BUILT FABRIC

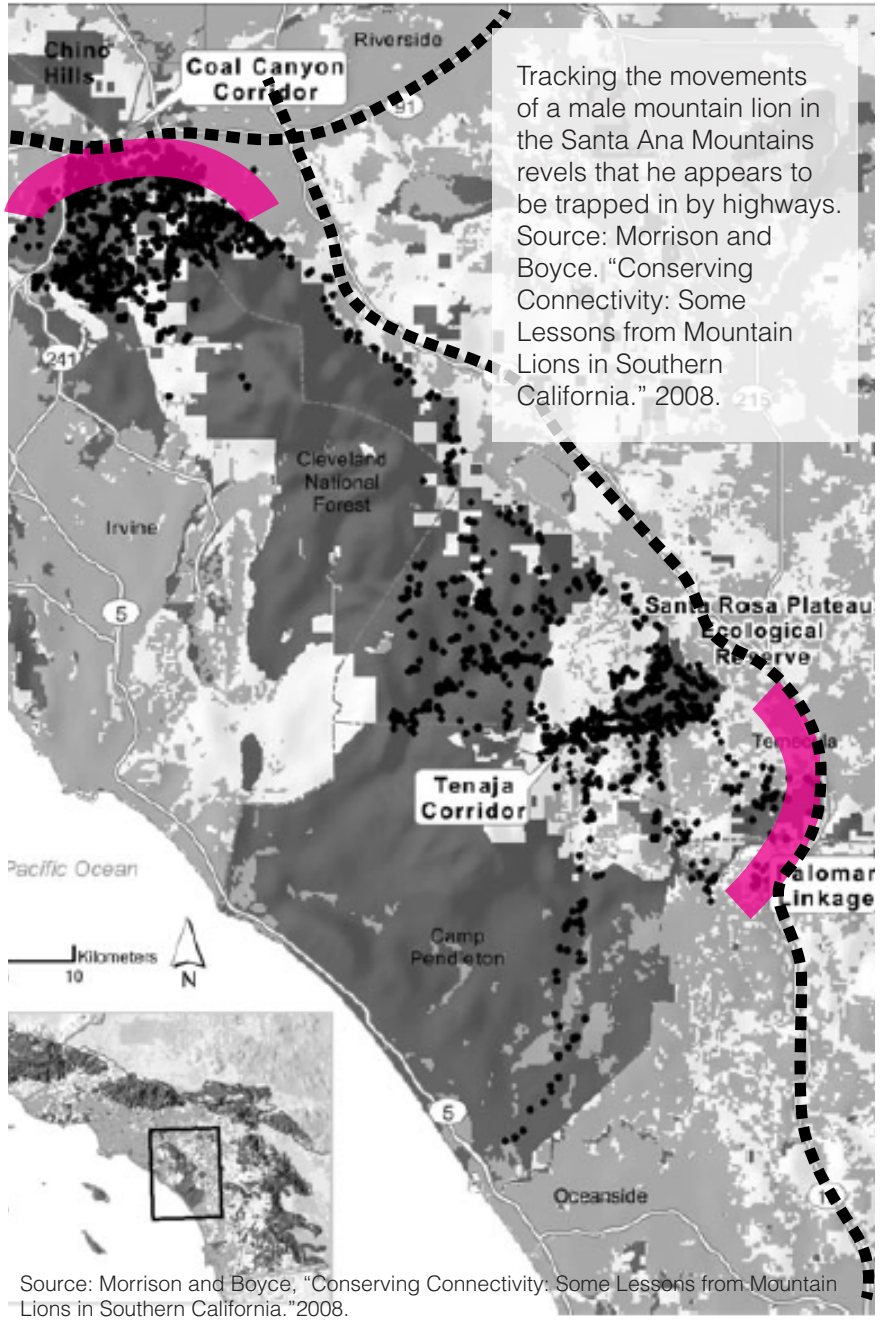
15 miles

mountains lion would be extirpated in these mountains within 100 years, leading to cascading environmental degradation without the keystone species. (The ability to connect to other habitat patches is particularly critical for mountain lions due to the huge size of their required ranges.) Referred to as the Palomar Linkage, as it connects the Santa Ana range to the Palomar Mountains, which link up to Southern California's other major conserved lands, this critical passage is severed by the I-15 highway and has been the target of major new development in the past 20 years.[22]

The Nature Conservancy and its partner organizations focused on the Palomar Linkage and two smaller corridors, the Coal Canyon and Tenaja, which connect smaller conserved lands within the Santa Ana Mountains. Through parcel-by-parcel acquisition, they slowly acquired lands, but because of rising land costs and continued parcel subdivision, it seemed unlikely that they would ever complete the linkages despite huge sunk costs. Scott Morrison and Walter Boyce, scientists for The Nature Conservancy, reflect on the problems of parcel-by-parcel acquisition in their paper, "Connectivity Conservation in Urbanizing Landscapes:"

> "Some properties protected early in implementation have become ecological dead ends due to adjacent conversion… Given the intensity of conversion and the real estate market, it is increasingly uncertain whether connectivity will be secured…. The number [or parcels] required to secure the Tenaja corridor is in the hundreds. The number of parcels needing protection in the Palomar Linkage may be in the

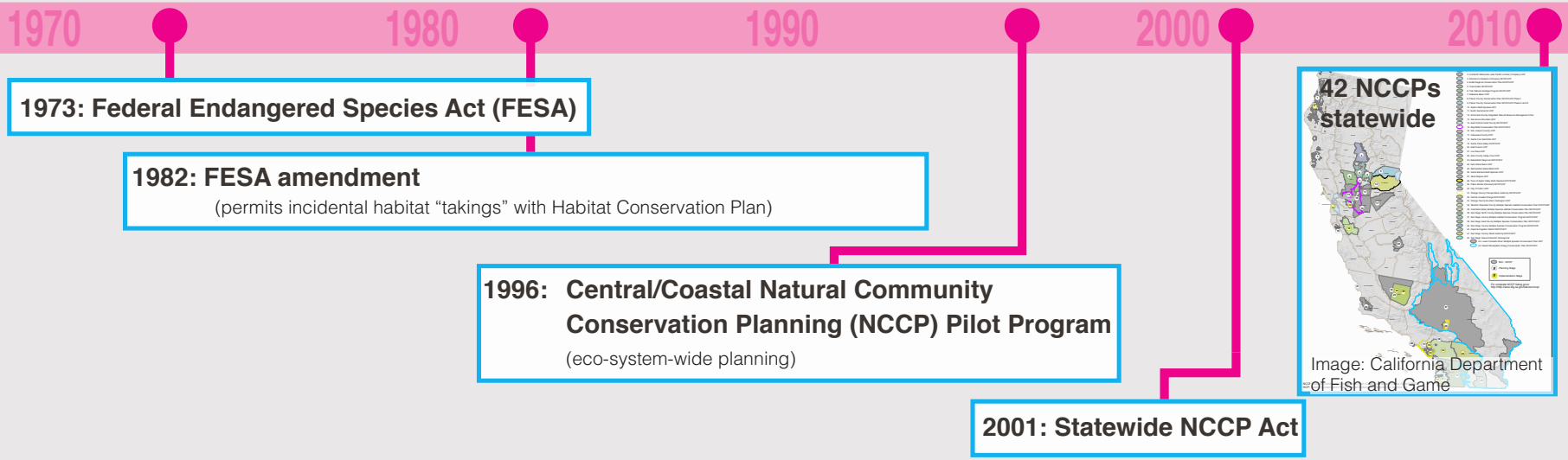
22 Morrison, Scott A. and Walter M. Boyce. "Conserving Connectivity: Some Lessons from Mountain Lions in Southern California." Conservation Biology, Volume 23, No. 2 (2008): 275–285



Tracking the movements of a male mountain lion in the Santa Ana Mountains revels that he appears to be trapped in by highways. Source: Morrison and Boyce. "Conserving Connectivity: Some Lessons from Mountain Lions in Southern California." 2008.

Source: Morrison and Boyce, "Conserving Connectivity: Some Lessons from Mountain Lions in Southern California."2008.

TIMELINE



thousands."

Corridor conservation is a tricky topic. Even defining required widths is problematic. A ten-foot corridor may be wide enough for small, sedentary species, but may be unusable by larger or shyer species. Lyle and Quinn define ideal corridors as those that, "knit together all [habitat patches] so that inhabitants of any part of the system are members of unified populations. Members of these populations can move freely from one patch to another and are afforded the full range of social and genetic interactions that characterize natural populations living in continuous habitat."[23] A continuous habitat allows infinite connections, whereas corridors create only one or two connections. Additionally, according to Morrison and Boyce, "the functionality of a corridor depends on the behavior of humans living in the vicinity. Land protection alone does not a corridor make. Left unmanaged, the high proportion of edge-exposed habitat in corridors and the prevalence of roads, pets, livestock, and even pesticides can create a gauntlet for wildlife."[24] Early Nature Conservancy plans hoped for multiple connections between patches to provide different options for species, but as land prices rose and development ramped up, they were forced to massively scale back their expectations, and hoped to complete a single corridor.

Parcel-by-parcel corridor conservation is clearly a daunting task with high probability of ultimate failure. But in the same paper, published in 2007, the two scientists wrote excitedly of a new direction: the Natural Communities Conservation Planning program.

23 Lyle, John, and Quinn, Ronald D. "Ecological Corridors in Urban Southern California." Published in Adams, Lowell W. and Leedy, Daniel L. *Wildlife Conservation in Metropolitan Environments: Proceedings of a National Symposium on Urban Wildlife*. Columbia, Maryland: National Institute for Urban Wildlife, 1990.

24 Morrison, Scott A. and Walter M. Boyce. "Conserving Connectivity: Some Lessons from Mountain Lions in Southern California." Conservation Biology, Volume 23, No. 2 (2008): 275–285

NATURAL COMMUNITY CONSERVATION PLANNING

- **"conserve natural communities at the ecosystem level while accommodating compatible land use."**
- **"anticipate and prevent the controversies and gridlock...[by] including key interests in the process."**

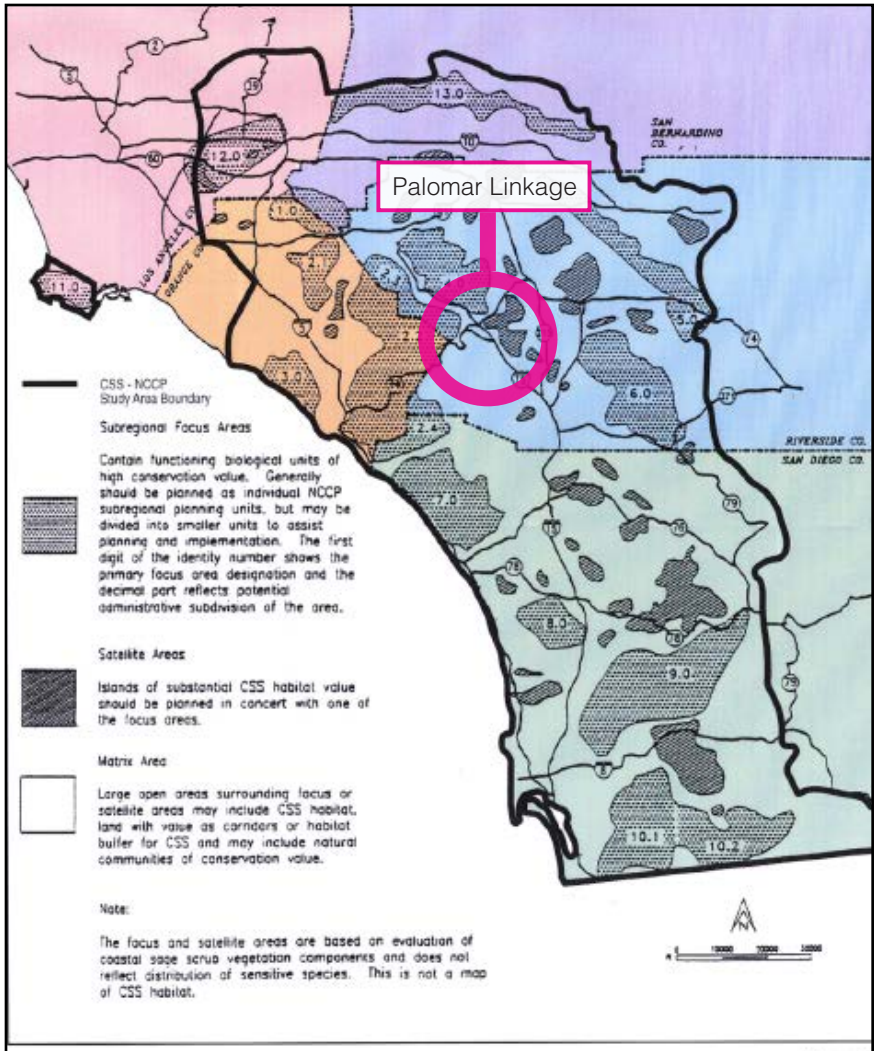
(non-threatening species in logo)

Image: California Department of Fish and Game

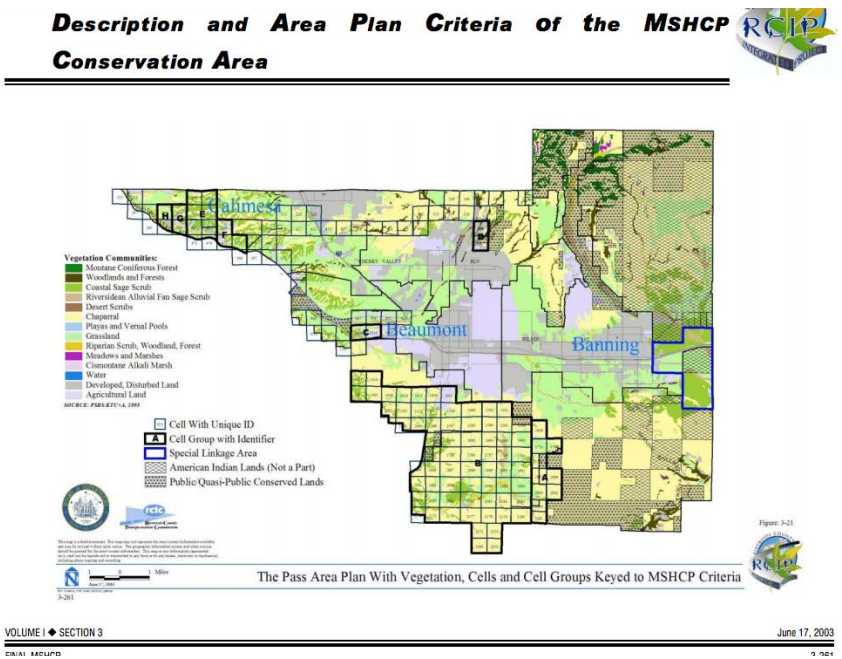
PLAN:

In 1996, a pilot study began in Southern California. The Central/ Coastal Natural Community Conservation Planning (NCCP) Pilot Program was an experimental plan to find a more flexible, responsive, proactive way to address the difficulties of combining development with conservation. Followed in 2001 by a statewide NCCP Act, the stated goals of the NCCP program were to, "conserve natural communities at the ecosystem level while accommodating compatible land use," and "anticipate and prevent the controversies and gridlock...[by] including key interests in the process."[25] A new iteration of the old HCP planning established under the FESA amendment, "the NCCP Act was intended to be broader and

[25] California Department of Fish and Game. "NCCP." https://www.wildlife.ca.gov/Conservation/Planning/NCCP. Accessed December 7, 2014.



The Palomar Linkage lies within Riverside County, so is now administered by the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Image: http://www.naturereserveoc.org/, Central/Coastal NCCP, 1996



The Western Riverside Multiple Species Habitat Conservation Plan defines habitat types and calls for certain percentages of landscape conservation. Source: http://www.wrc-rca.org/

more flexible. Like the HCP law, the NCCP Act would encourage voluntary participation by allowing the regulators to enter into planning agreements and issue incidental take authorizations. A key difference with the HCP (Habitat Conservation Plan, created under [Federal] Endangered Species Act (FESA) Section 10(a)) process was that these NCCP take authorizations could cover any species, including unlisted species that might become listed."[26] Whereas before, only listed species could be explicitly protected and planned for by regional planning efforts, NCCP tried to look at the ecosystem scale and create stakeholder agreement over conservation corridors.

The Central/Coastal NCCP Pilot Program spanned several counties, which attempted to work together to establish overall goals, and then split up the areas by county. The Palomar Linkage is in Riverside County, so it ended up falling under the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). After years of delay, the MSHCP was completed in 2003. The basic format of the plan is that it identifies different habitat types (chaparral, coastal sage scrub, etc), and creates a grid matrix overlay of as-yet-undeveloped lands. The plan then specifies guidelines for how much land within each matrix component can be developed (i.e. 30%). This was seen as a way to circumvent the need for parcel-by-parcel acquisition, and a way to create ecosystem corridors with all abutting projects working together.

But the plan, and the NCCP program in general, has been heavily criticized. Compliance with the plan is voluntary, and, according to a report by the California Research Bureau, "some suspected the NCCP program was simply a means of circumventing CESA and facilitating development."[27] In 1990, Timothy Beatley argued that Habitat Conservation Plans, "have resulted in significant loss of species and habitat, and in this sense are contrary to the otherwise stringent provisions of the federal ESA. The preparation of HCPs will likely continue to open up significant amounts of habitat for development that would otherwise have been off-limits under ESA."[28] Today, the same could be said of NCCP. Without regulatory

26 Pollak, Daniel. "Natural Community Conservation Planning (NCCP): The Origins of an Ambitious Experiment to Protect Ecosystems." California Research Bureau, California State Library, 2001.

27 Pollak, Daniel. "Natural Community Conservation Planning (NCCP): The Origins of an Ambitious Experiment to Protect Ecosystems." California Research Bureau, California State Library, 2001.

28 Beatley, Timothy. "Use of Habitat Conservation Plans Under the Federal Endangered Species Act." Published in Adams, Lowell W. and Leedy, Daniel L. *Wildlife Conservation in Metropolitan Environments:*

teeth and full legal protection, developers have little incentive to fully comply with County planning efforts, and local governments may have funding incentives to allow more development.

Additionally, the plans are vague and non-specific. According to Morrison and Boyce in 2007, "one area of perhaps the greatest uncertainty is where Interstate 15 crosses the Palomar Linkage. The Riverside plan designates this a 'Special Linkage Area,' but no percentage conservation criteria have been assigned. It is unclear how this classification translates into implementation language."[29] Seven years later, a wildlife over- or underpass still has not been built in the "Special Linkage Area," effectively trapping the mountain lions within the Santa Ana Mountains.

OUTCOMES:

After all these years and great expectations, the NCCP plan for Southern California does not appear to be a panacea for preserving human/mountain lion co-existence. Orange County's 2013 Annual Report on the NCCP reads like a document written twenty years ago – the same problems remain unsolved.

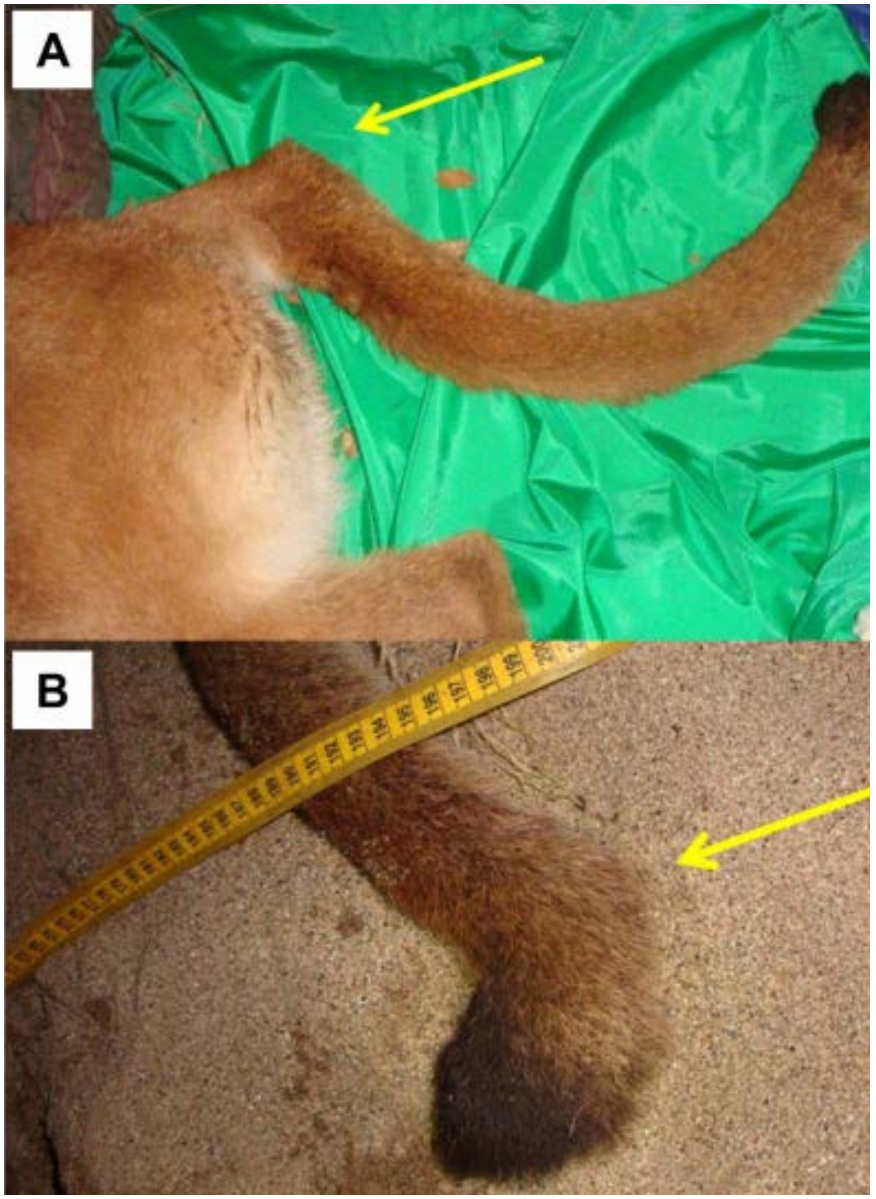
> "The mortality data collected during the study suggests that cougars throughout southern California face significant, and likely increasing, threats [from] to habitat loss and fragmentation, continued expansion of the human population, roads, and development. Some sources of mortality for cougars may be mitigated through education, investment in proper road crossings and fencing, habitat conservation, prevention of habitat fragmentation, and proper domestic animal husbandry. The research team is actively pursuing a number of these mitigation measures in collaboration with partnering organizations throughout the study area."[30]

Most tellingly, Scott Morrison has come out with a new paper on the Santa Ana Mountain Lions. Using blood samples and tagging, his research team mapped genetic connectivity among area mountain lions. Those within the Santa Ana Mountains are genetically isolated and disconnected from their brethren across Interstate 15. The scientists observed only one "outsider" lion making it into the habitat patch, and other lions displayed high rates of inter-family mating due to lack of suitable non-family partners. The research team believes that this isolation has led to kinked tails and other signs of inbreeding and genetic fragility (see next page).

Proceedings of a National Symposium on Urban Wildlife. Columbia, Maryland: National Institute for Urban Wildlife, 1990.

[29] Morrison, Scott A. and Walter M. Boyce. "Conserving Connectivity: Some Lessons from Mountain Lions in Southern California." Conservation Biology, Volume 23, No. 2 (2008): 275–285

[30] Nature Reserve of Orange County, County of Orange. Central/Coastal NCCP/HCP, 2013 Annual Report.



Two genetic groups, represented in green and red icons in the map above, show how Santa Ana mountain lion population has become increasingly isolated, and have high rates of inbreeding as a result. The research team believes that the kinked tails they've begun observing in the Santa Ana lions are a sign of inbreeding. Images: Scott Morrison, "Fractured Genetic Connectivity Threatens a Southern California Puma," 2014.

LESSONS

INFRASTRUCTURAL:

The cases of San Francisco's coyotes and Southern California's mountain lions demonstrate the importance of urban fabric typologies and the relationship between patches and connectors. Existing habitat parcels within San Francisco, unthreatened by future development, can be homes for coyotes because they can travel between them on relatively safe, low speed roads and through neighborhoods. However, the highway nature of the Golden Gate Bridge means that although a few animals made it across for their first re-introduction, it is unlikely that there will be any more mixing between the two populations, potentially suggesting future genetic isolation for the San Francisco population. But generalist coyotes, resourceful and easy to please, may prove to be highly suited to contemporary urban environments.

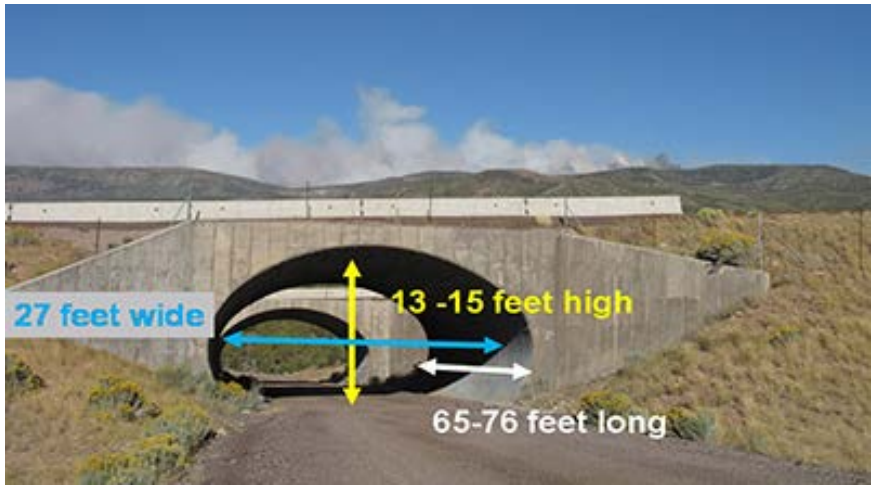
Mountain lions' needs are more specific and more difficult to accommodate, but there is evidence that highways are one of the biggest infrastructural obstacles. Some states have built wildlife over- or underpasses across highways – the trick is to make them sufficiently wide and vegetated to seem safe to the animals. A designated wildlife overpass, converted from a former highway interchange, seems to remain mostly unused by Southern California mountain lions. Morrison and Boyce speculate that it may present a "stark movement option" for a lion, since it has not been revegetated.[31] Better design, cover, and connectivity to patches could make it a more viable wildlife option.

The US Department of Transportation has begun implementing wildlife passages under highways, and has guidelines for how large culverts should be.[32] Further, it may be that waterways double as effective wildlife corridors in many places. The 1930 Olmsted brothers' plan for Los Angeles called for continuous waterways, and some biologists believe that while the designers weren't thinking about wildlife, these would have been the perfect corridors.[33] An urbanism approach that plans for continuous healthy waterways,

31 Morrison, Scott A. and Walter M. Boyce. "Conserving Connectivity: Some Lessons from Mountain Lions in Southern California." Conservation Biology, Volume 23, No. 2 (2008): 275–285

32 Cramer, Patricia. "Collaborative Research Effort Identifies Effective Wildlife Crossing Practices in Utah." Success in Stewardship newsletter, Federal Highway Administration, January, 2014.

33 Lyle, John, and Quinn, Ronald D. "Ecological Corridors in Urban Southern California." Published in Adams, Lowell W. and Leedy, Daniel L. *Wildlife Conservation in Metropolitan Environments: Proceedings of a National Symposium on Urban Wildlife*. Columbia, Maryland: National Institute for Urban Wildlife, 1990.



According to the Utah Department of Transportation, this culvert drastically reduced wildlife-vehicle collisions. Image by Patricia Cramer.

and allows for larger culverts and bridges at water-crossings, could double as an effective wildlife corridor.

In terms of planning, the NCCP programs seems to be too weak to effectively conserve the corridors mountain lions need. Stronger regulatory teeth, provided by legal frameworks similar to the strength of the Endangered Species Act, could remove the voluntary nature and could require habitat corridors and crossings be created by developers.

EDUCATIONAL:

Across the Golden Gate Bridge, Marin County has enacted stringent fines for feeding coyotes, with a large subsequent reduction in coyote problems.[34] The Presidio Trust's signs, brochures, and general public relations campaign for coyotes have most likely led to much greater public acceptance of the animals. These fairly simple measures can go a long way towards allowing animal life to thrive. In the case of the mountain lions, work to educate communities about keeping pets leashed and indoors, staying with children in mountain lion ranges, and about their role in the ecosystems as top predators could continue to keep them on the right side of public opinion.

DISCUSSION

With proper infrastructural protection and solid human education, urban life may even be safer for wild animals. As we have seen, negative attitudes towards predators in rural populations dependent on livestock leads to high rates of depredation permits – almost as

Coyote alert signs posted in San Francisco Parks.
Image by Steven Walling, CC BY-SA 3.0

high as straight-out bounty hunting. But urbanites often thrill at a glimpse of nature. In the book Uncommon Ground, William Cronon asserted that, "only people whose relation to the land was already alienated could hold up wilderness as a model for human life in nature."[35] As long as encounters remain mostly positive, urban wildlife could be seen as a sought-after amenity, as a recent New York Times article on zoos reflected that, "the wilderness had become the next tailored and tended diorama."[36] In a world of predictable shopping malls and mixed-use developments, wildlife could actually be part of

34 DeBarbieri, Lili. "Coyotes 'round the Town." www.ecologycenter.org, December 1, 2009.

35 Cronon, William. *Uncommon Ground.* New York: WW Norton & Company, 1996.

36 Siebert, Charles. "The Dark Side of Zootopia." The New York Times, November 18, 2014.

designing for uniqueness and sense of place.

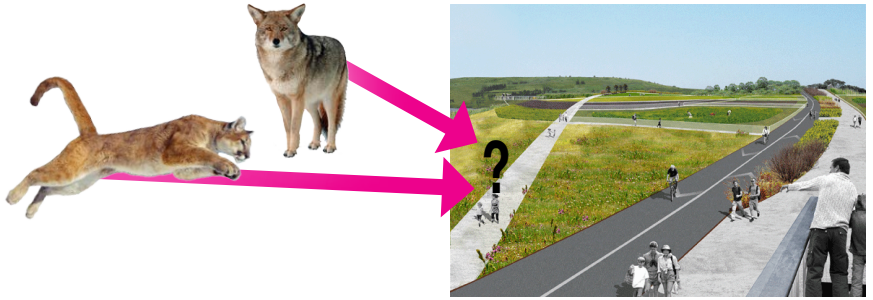
These cases illustrate, however, that carnivores in metropolitan areas are dependent on human kindness for continued survival. As one Eureka rancher put it, "the only thing that is going to turn [them] around is when there won't be any deer left and the lion starts coming into the city and going after children."[37] While in the near-term, there appear to be plenty of deer and feral cats to go around, if there is an increase in negative encounters, human opinion can quickly sour. The distance created by a combination of education and infrastructure is critical for continued co-existence.

Sometimes, the idea of urban carnivores raises questions such as, "do they belong here?" People wonder whether it is safe for humans to live near these animals, and whether they should be removed or eliminated in certain human-settled areas and allowed to continue living in the country or in nature preserves. In the past 28 years, there have been fifteen mountain lion attacks on humans, three fatal. In that time, there have been about 160 coyote attacks on humans, two of them fatal. These are extremely low risks, especially considering the 2,857 traffic fatalities in California in 2012 alone.[38] Further, it is not really our choice. As we have seen, animals fill niches and fight for their own survival. Where there is need or opportunity, animals will show up, and as humans, we have three options: to try to extirminate them near us, to ignore them, or to try to foster peaceful co-existence.

37 Gullo, Andrea, Unna Lassiter, and Wolch, Jennifer "Changing Attitudes Toward California's Cougars," Society and Animals 5 (2):95-116, 1997.

38 http://www.ots.ca.gov/OTS_and_Traffic_Safety/Score_Card.asp

Ultimately, one of the biggest threats to peaceful urban human/carnivore coexistence is the human perception that the planet exists primarily for our own use. Planners and designers tout the benefit of wildlife conservation areas in their human terms, and renderings of future nature-oriented projects almost always include humans enjoying the outdoors. Community use paths and bike trails are increasingly popular, but without enough width to give undisturbed space to other species, they may be ineffective in doubling as habitat corridors. According to Lyle and Quinn, "wildlife corridors in urban areas, if not planned and managed carefully, may lose their effectiveness if they attract heavy use by humans, feral cats, or unleashed dogs."[39] A combination of built and policy interventions – width and placement of trails within the larger section and dog-leash laws – could enable peaceful co-use.



Rendering of New York's under-construction Freshkills Park, touted as a huge ecological restoration project but fully populated with humans in renderings, implying that the land will be largely unusable by large wildlife. Image by Field Operations.

39 Lyle, John, and Quinn, Ronald D. "Ecological Corridors in Urban Southern California." Published in Adams, Lowell W. and Leedy, Daniel L. *Wildlife Conservation in Metropolitan Environments: Proceedings of a National Symposium on Urban Wildlife*. Columbia, Maryland: National Institute for Urban Wildlife, 1990.

Image: Liviu Ivanov

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