419 Acres

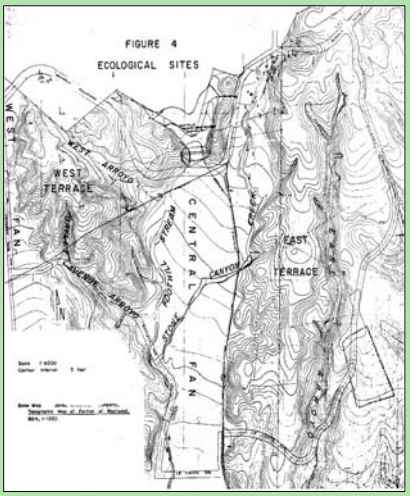
UCLA's Natural History

1. Land Use

The 419 acres of UCLA's campus, nestled in the hills of Westwood, provide a vivid example of the loss of nature in an urbanizing world. The natural history of the campus has been documented by generations of scholars who have worked here. Among the most outstanding was Loye Miller, Professor of Biology, who moved to the Westwood campus when it opened in 1929 and kept detailed records of the comings and goings of what he termed its "wild folk." His observations, combined with a thesis on the history of the campus environment written by Mary Vogel in 1962, and more recent natural surveys by Geography undergraduates, allow the reconstruction of the effects of changing land use on biodiversity from the 1920s to the present.

Burrowing Owls once reared their young in abandoned ground squirrel holes on the ridges that are now covered by the medical center.

Before the 75 years of modification as a university campus, UCLA's topography was much different. There were two terraces bisected by arroyos – the eastern would become the site of the central campus, the western eventually student housing. A central fan of alluvial sand deposited by Stone Canyon Creek separated the two terraces, and a second alluvial fan formed the western border of the campus. These features supported at least four distinct vegetation types. The arroyos and terraces were covered with fragrant coastal sage scrub and chaparral, interspersed with native grassland. Along Stone Canyon Creek and Foothill Stream were sand bars with rushes and willows, lined by grand sycamores. The upper banks of Stone Canyon Creek were covered with an oak woodland. While some of the native habitats had been disturbed when construction began on the campus in 1927, there remained examples of these vegetation types and their rich diversity of plants and animals.

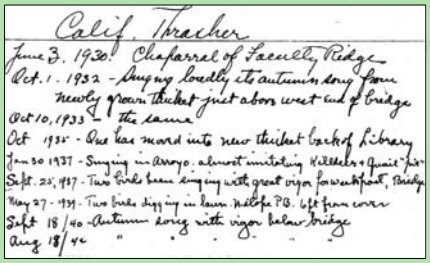


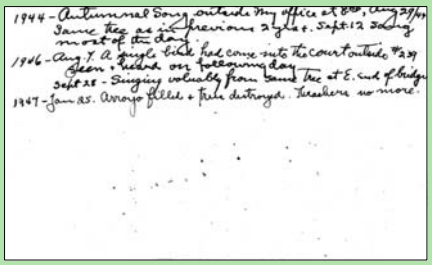
This 1924 map illustrates the geomorphological features of the UCLA campus site and is reproduced from Mary Vogel's thesis on the history of human effects on the campus.

This 1932 aerial photograph shows the eastern arroyo in the foreground, with western arroyo and Faculty Ridge in the upper left. The eastern arroyo was filled in 1947, while the western arroyo (Sunset Canyon) remained native habitat until the 1980s.

All creatures require a place to live that provides shelter and sustenance – a habitat. If the habitat is destroyed the species is lost as well. First to be displaced at UCLA were those species that require wide open spaces. The Horned Lark, a mid–sized grassland bird, was displaced with the first construction on the campus. Same with the Prairie Falcon, which flew over the dedication ceremonies in 1926, but was only seen once since, in 1931.

When the rushes and willows of lower Stone Canyon Creek were removed and the stream was channeled into an underground pipe in the 1940s, the birds that had frequented that riparian area were found no longer on campus. Gone with the tules were the Green Heron, Common Yellowthroat, Belted Kingfisher, Least Bell's Vireo, and Common Snipe. Also gone were the California Red–legged Frog, the Pacific Treefrog, and the salamanders.





Loye Miller's note cards record his observations of California Thrashers from 1930 until their habitat was destroyed by campus development on January 25, 1947.

In 1947 the eastern arroyo was filled to provide more building area for the central campus. The arroyo had been alive with birds, attracted to the coastal sage scrub and chaparral on its banks. One such chaparral bird was the California Thrasher, which Loye Miller heard from his office each year. When the arroyo was filled Miller recorded the event and poignantly noted, "Thrashers no more."

Two significant natural areas remaining on campus are the oak grove around the University Residence (A), and the 4 acres of coastal sage and oaks between the Child Care Center and Hitch Residential Suites (B).

Many of the species that were displaced by the central campus were still found on the western terrace, known as "Faculty Ridge." But as this area too was developed for student housing the species were eliminated. Greater Roadrunner. Blue–gray Gnatcatcher. Black–headed Grosbeak. Pacific Rattlesnake. The California Quail hung on until the construction of the Sunset Recreation Center.

The loss of biological diversity at UCLA is similar to that which has occurred throughout California. Changes in land use, from natural to agricultural to urban, eliminate habitats and diminish the range of species. Eventually the species have barely enough habitat to support themselves and are declared "endangered," at risk of extinction. At least three species once common at UCLA are now endangered – the Least Bell's Vireo, the Quino Checkerspot Butterfly, and the California Red–legged Frog.

Today there remain two areas of remnant vegetation on the campus: a hillside of coastal sage scrub of approximately four acres by the Child Care Center near the intersection of Sunset Boulevard and Veteran Avenue, and an oak grove on the grounds of the University Residence above Stone Canyon Creek. These small reminders of the rich natural history of the campus provide unique teaching and research opportunties.

Written and designed by Travis Longcore and Catherine Rich. Presented at *California's Biodiversity Crisis: The Loss of Nature in an Urbanizing World*, UCLA Institute of the Environment, October 24–25, 1998.

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2. Biological Homogenization

Diversity Lost

These native butterfly species have been displaced by urban–tolerant, weedy species.

The land use changes associated with urbanization do more than elminate native species from the environment through habitat loss. Urban environments provide good habitats for a subset of species, both native and exotic, that can thrive in close proximity to human habitation. We understand native species to be those that were found in an area prior to human modification, while exotic species are those that were brought to an area, either intentionally or by accident, through human activity.

Urbanization of the natural landscape is a process of biological homogenization. The species that are displaced tend to be specialized to particular habitat requirements, while those that thrive tend to be generalists. The diverse native communities are replaced by depauperate generalist communities made up of tolerant natives and invasive exotics.

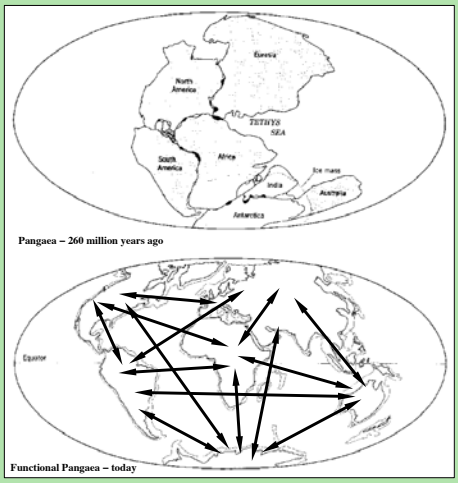
During the development of the UCLA campus some native species have prospered, while others have been eliminated. For the period from about 1930–1950, the increased water from irrigation promoted some native species. Loye Miller noted that California Quail, Greater Roadrunner, deer and other wildlife seemed to increase in response to the water sources made available by campus development. He recorded the increase of Brewer's Blackbirds in response to the lawns where they rooted for worms. Robins grew in number as they could stay year round with a water source. But further removal of native vegetation sounded the death knell for the roadrunner and quail, while European Starlings and other Old World invaders, the House Sparrow and Rock Dove (pigeon), multiplied.

Butterflies illustrate the process of biological homogenization well. Historically there were likely 42 native butterflies resident on the campus. Each butterfly has its own special requirements. For some, the caterpillar can eat only one plant species or plants from one closely related group. Lorquin's Admiral caterpillars fed only on willows along Stone Canyon Creek; California Dogface caterpillars ate false indigo under oak trees; Quino Checkerspot Butterfly caterpillars were found only on a small annual plantain in open spaces in the scrub.

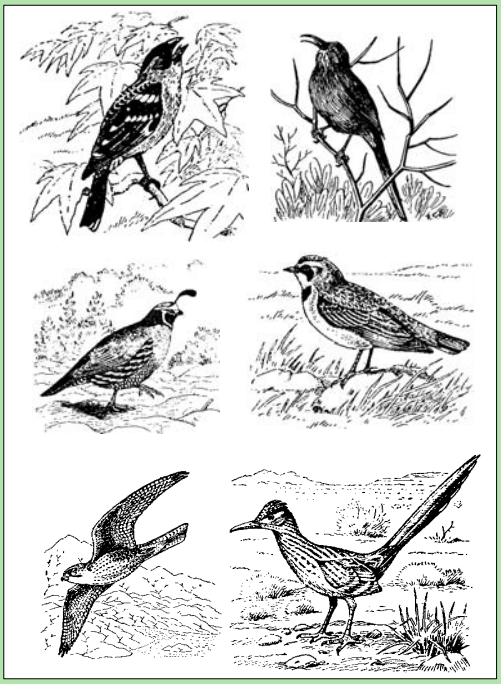
These specialized butterfly species are gone, and the butterflies left on campus are a handful of "urban" butterfly species, the larvae of which will eat many different plants, or will eat common landscape plants, and the adults of which are able to disperse well. The 20 or so butterflies remaining on campus are the same butterflies that can be found in an urban area anywhere in southern California. A unique and diverse local flora and fauna has been replaced by a suite of plants and animals found in association with urban development virtually around the globe.

We are becoming, as author David Quammen recently wrote, the "Planet of the Weeds." In many respects, the biological homogenization of the natural world is the logical consequence of the network of global transportation that humans have created. Through the regular and universal transport of creatures to all corners of the Earth, either as cargo or as stowaways, humans have accomplished the biological equivalent of reuniting the continents into one large land mass. The last time the continents formed a single land mass was 260 million years ago. Paleontological records show that the coalesence of continents into Pangaea resulted in a mass extinction event, as species exploiting similar sets of resources came into contact and eliminated one another in a Darwinian struggle for survival. Similarly, creation of a "Functional Pangaea" through human transportation is contributing to a mass extinction event as well.

Extinctions spread out from human introductions; they are not only restricted to urban areas. Many plants introduced from other parts of the world invade quickly into native ecosystems. They act as biological *conquistadors*, rapidly colonizing new territory and eliminating native diversity as they go. Examples of this have been the utter decimation of native wildflower populations as Mediterranean grasses were introduced to California, the obliteration of native dune communities by ice plant from South Africa, and the constant spread of fennel, acacia, and gazanias – not to mention the grasses – into the native grasslands, coastal sage scrub, and chaparral. The ultimate results are species–poor communities. The lack of diversity in species–poor communities makes them less likely to have the adaptive capability to respond to unexpected environmental stressors such as climate change and disease. So while humans will likely survive – we are the ultimate weedy species – the world that we are creating will continue to become more homogeneous and depauperate, less interesting, and increasingly less likely to continue to provide the ecosystem amenities that make life livable.



Human creation of a "Functional Pangaea" is contributing to an extinction spasm like that following the formation of Pangaea 260 million years ago.



Only certain species can tolerate the constant disturbance of urban habitats. The Black–headed Grosbeak, California Thrasher, California Quail, Horned Lark, Prairie Falcon, and Greater Roadrunner find no home in such places. In addition, urban species, like starlings, crows, mockingbirds, and rats invade the remaining native habitats and usurp resources from the native community.

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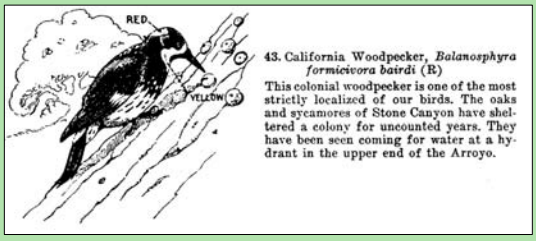
3. Island Biogeography

One of the great advances in our understanding of the distribution of species across the Earth's surface derived from the study of islands. In 1967, E. O. Wilson – the most visible and eloquent advocate for biodiversity today – and mathematician/ecologist Robert MacArthur published "The Theory of Island Biogeography." At its simplest, they quantified the relationship between an island's area and the number of species on the island. Islands of greater areas support more species. This number of species was hypothesized to be a balance between the rate of immigration to an island and the rate of species extinction on the island. Immigration rates were attributed to the distance to the nearest source of species, while extinction rates were shown to vary inversely with island area. Species go extinct faster on smaller islands because they have smaller populations and less area to retreat from environmental stresses.

The clown–faced Acorn Woodpecker lived colonially in the oaks surrounding the University Residence above Stone Canyon Creek until the 1950s.



43. California Woodpecker, *Balanosphyra formicivora bairdi* (R)
This colonial woodpecker is one of the most strictly localized of our birds. The oaks and sycamores of Stone Canyon have sheltered a colony for uncounted years. They have been seen coming for water at a hydrant in the upper end of the Arroyo.

In a short work on the birds of the UCLA campus, Loye Miller documented the long–term persistence of a colony of Acorn Woodpeckers, then called California Woodpeckers, near the University Residence.

The insights about species incidence and abundance on islands were then applied to patches of habitat surrounded by urban development or other hostile environments. As native habitats are cut off into discrete patches by human modification of the environment they begin to function as islands. Like islands, patches that are smaller support fewer species than do larger patches. Habitat patches lose species diversity when their area decreases.

The loss of species following the decrease in habitat is traditionally referred to as "relaxation." A better term would be "diversity decay," analagous to radioactive decay. Habitat fragments, like radioactive isotopes, randomly and inexorably lose their component parts (species, nuclear particles) until they reach a stable point. For fragments this stable point is a species number commensurate with the fragment's area.

Colonies of Acorn Woodpeckers carefully cache acorns in precisely sized holes dug into trees. While the photo shows a pine tree, the UCLA colony likely used sycamores and oaks as granary trees.

The Acorn Woodpecker aptly illustrates the effects of habitat fragmentation. Acorn Woodpeckers live in complex, extended family units with acorns as one of their staple foods. A colony will store thousands of acorns in small holes in the bark of a tree – called a granary tree – to be consumed later. Granary trees represent thousands of hours of work by generations of woodpeckers. For countless years, a colony of Acorn Woodpeckers lived on the northern reaches of the UCLA campus near the site of the University Residence. While there were then and remain today Coast Live Oaks on the upper banks of Stone Canyon Creek, the range of this colony likely encompassed the many oak groves on streams in the lower hills of Bel Air and Beverly Hills. At some point since 1950 the raucous call of the Acorn Woodpecker disappeared from the UCLA campus. But why? The oak trees remained. There were still acorns to cache.

The answer lies in the insularization of the UCLA campus by urbanization. More and more over the years the oak grove at UCLA became isolated from other oaks, surrounded by the lush exotic landscaping of the growing campus and the mansions of Bel Air. Eventually the area of appropriate woodpecker habitat was simply too small to support the needs of the colony. Once the colony died out, perhaps after a poor acorn crop, no other colonies were close enough to provide young birds to reinhabit the area. The inevitable result of fragmentation came to pass. The smaller area supported fewer species and the Acorn Woodpecker was one of the casualties. Island biogeography researchers have derived a rule of thumb: if the area of an island (or habitat fragment) is decreased by a factor of ten, the number of species is halved. A greater number of species may hang on for a generation or two, but they will eventually be lost.

A second example of the effects of fragmentation on species is the extirpation of the Quino Checkerspot Butterfly. Not so long ago, this small orange, white, and black butterfly flew abundantly during the spring. Quino was so common that many lepidopterists did not even bother collecting specimens. The larvae fed mainly on a small annual plantain that grows in open areas in many different habitats, including coastal sage scrub, chaparral, and grassland.

Fragmentation of its extensive range resulted in the precipitous decline of the now–endangered Quino Checkerspot Butterfly.

Researchers hypothesize that Quino existed in a dynamic patchwork of interconnected populations, which would shift geographically as habitat conditions changed. The first blow to this abundant insect was the conversion of major portions of its habitat to urban and agricultural uses. UCLA's population fell victim to this fate. Populations throughout the species' range from the Santa Monica Mountains to Baja California suffered similar losses in habitat area. Many remaining areas of good habitat in Riverside and San Diego counties no longer support Quino either. The likely culprit is the isolation of adequate habitat patches and a resultant population crash. Any reduction in habitat area causes the loss of species and the Quino shows that even common, widespread species are vulnerable to habitat loss and fragmentation.

A generous estimate of the remaining native habitat area at UCLA would be about 12 acres in two different patches of the 419–acre campus. Accordingly the number of native species supported would be estimated to be under half of the original number. Such is the case for those taxonomic groups for which there are historical records (plants, resident birds, butterflies, reptiles and amphibians, and mammals). For the northwest portion of campus formerly known as Faculty Ridge, just over half of the native plant species remain in a four–acre fragment. Without management to protect against the effects of invasive species and to maintain the integrity of the remaining native habitat fragments, more species will be lost. As native patches are isolated and degraded the opportunity to teach about and research in them is lost as well.