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Photographs by Christopher Woodcock

Mirage in the Making

Mojave dreams

Energy is what makes a desert a desert. Sun and wind are the two universal, inescapable forces of every arid landscape. Together, they foster unique evolutionary adaptations and reveal the evidence of awesome geomorphic processes. But they also scour and desiccate the surface, while buffeting and irradiating its inhabitants. Energy is what makes deserts so majestic and intriguing; it is also what makes them so austere and forbidding. Excessive energy, in the form of sun and wind, has hindered the economic development of many arid regions. And the Mojave Desert, where both exist in extravagant abundance, is no exception.

Over the past decade, however, the idea that sun and wind are the scourges of the Mojave has given way to an ambitious new vision. Complex forces and diverse interests have converged to make the Mojave Desert—which extends from the leeward slopes of the Transverse Ranges in Southern California, east to the Colorado River

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Valley, and north to into southern Nevada, northwestern Arizona, and southwestern Utah—one of North America's most prized areas for energy development. Sun and wind have become the region's most valuable commodities, and the Mojave now constitutes a key site for the global boom in renewable energy. Dozens of bureaucratic assessments, academic studies, and media reports have chronicled the issues and controversies surrounding energy development in the Mojave. But a larger question remains: What do Californians want from the Mojave Desert? Answering requires an understanding of the region's history and geography; the key trends, events, and struggles that have shaped the contemporary landscape; the diversity of claims to the desert environment; and the distribution of political power at work in current decision-making processes. It also requires a sense of what is at stake.

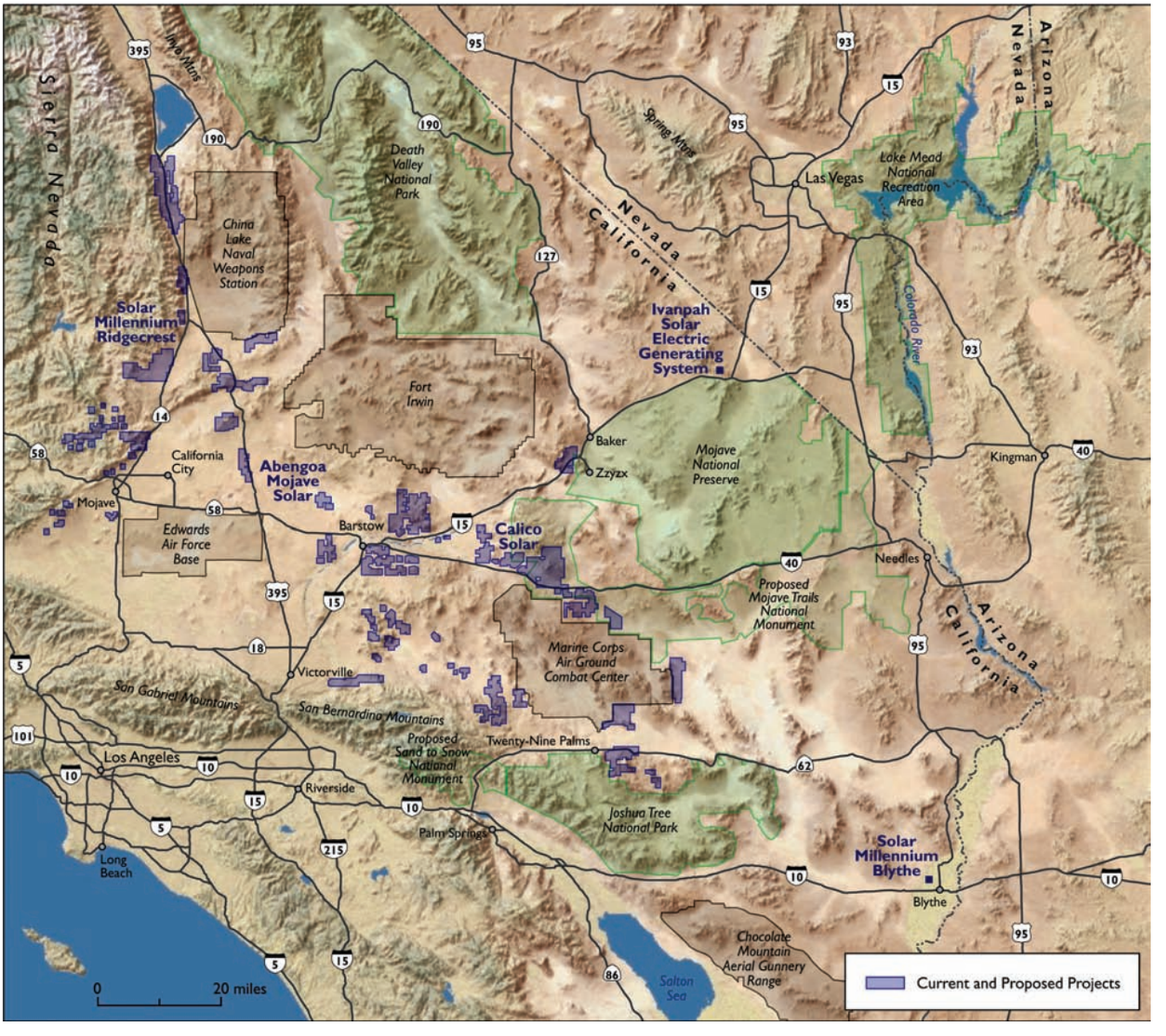

Figure 1. The Mojave Desert includes portions of California, Nevada, Arizona, and southwestern Utah. Renewable energy development is occurring mainly in the California portion of the Mojave. Map courtesy of Lohnes & Wright.

Throughout history, deserts have provided a sort of a blank canvas onto which people from various cultures, backgrounds, and political persuasions can project a seemingly endless succession of notions, visions, schemes, plans, and desires. Over the past 200 years, the Mojave has served as a homeland, a rangeland, a wasteland, a training ground, a battleground, and a playground. Today, it remains, to one degree or another, all of the above. It also remains the subject of competing historical and environmental narratives that seek to frame the current energy debate.

But deserts are not infinitely malleable. At each stage in the Mojave's history, the projects undertaken, whether in the name of progress or preservation, have left indelible marks on the landscape. In the process, the Mojave has become more divided, both spatially and politically. The current Mojave is not only a site of industrial energy development, but also one of the most "protected" regions, in terms of parks and wilderness areas, in the United States. These two identities exist in uneasy tension. Californians want many things from the Mojave, but it remains unclear whether the desert can continue to supply all of our increasing and competing demands. What is clear is that we all have much to gain, but also, potentially, much to lose, from once again transforming the Mojave.

The setting

The Mojave Desert is a rugged and topographically complex region of mountains, valleys, sinks, and plateaus. It ranges in elevation from –266 feet at Badwater in Death Valley to 11,331 feet on the summit of Telescope Peak in the Panamint Mountains. Botanists consider it a transitional ecosystem because it lies between the hotter, lower Colorado and Sonoran deserts to the south and east, and the colder, higher Great Basin Desert to the north. The Mojave's boundaries correspond roughly with the range of its iconic plant species, the Joshua Tree.[1]

The Mojave may seem timeless, but in climatic and geologic terms it is a youthful and dynamic landscape. Over the past few million years, the uplift of California's great mountain chains—the Sierra Nevada, Coast Ranges, and Transverse Ranges—cast a rain shadow over the American Southwest. In recent millennia, however, the Mojave has oscillated between a more and less arid climate. When the first humans arrived, more than 100 centuries ago, they found a landscape unlike the one that exists there today. The region experienced cooler temperatures and probably received at least double its current precipitation. Piñon-juniper woodlands, oak savannahs, and bunchgrass prairies thrived in many areas now dominated by thorny shrubs. Perennial streams carried runoff from snow-covered mountains to dozens of pluvial lakes fringed by wetlands and gallery forests. Vestiges of early human settlements can be found along these ancient shores, but the waters have long since evaporated, and today only rocky arroyos and dusty playas remain.[2]

Today, federal agencies manage about 80 percent of the Mojave's land area in California. The largest of these agencies, the Bureau of Land Management (BLM), administers about 8 million acres, or around 41 percent, of these federal lands. The National Park Service (NPS) manages around 26 percent, and Department of Defense lands encompass about 13 percent. Other federal lands amount to less than 1 percent. Only around 18 percent of the Mojave in California remains under private ownership.[3]

The Mojave's attractiveness for renewable energy development results partly from its physical geography. All deserts receive abundant energy, but even among arid regions the Mojave is unusually sunny. California's Mediterranean climate, with its lack of summertime cloud cover, combined with an average elevation of 2,500 to 5,000 feet above sea level, make the Mojave Desert the region with the highest average annual solar radiation in the United States. The Mojave's basin and range topography also helps concentrate and capture sun and wind energy. The mountain passes that separate the Mojave from coastal Southern California and the San Joaquin Valley act as bottlenecks for wind, and the region's broad valleys contain large areas of flat or gently sloping terrain ideal for solar panels.

The Mojave's human geography also makes it attractive for energy development. For most of the last two centuries, the Mojave was merely remote. Today, it is better described as "centrally isolated." It still contains some of the most inaccessible places in the contiguous United States, but after a century of population growth, it now lies within

The waters have long since evaporated.

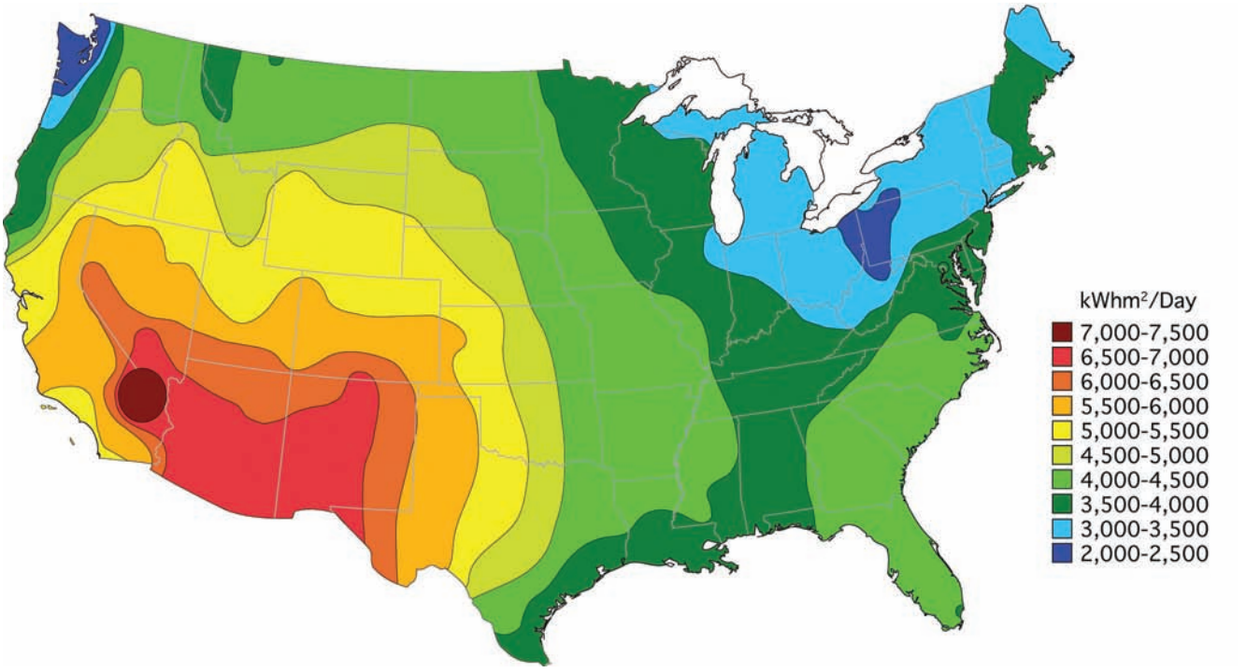

Figure 2. Average daily solar radiation in the contiguous United States for a surface facing directly toward the sun. The eastern Mojave Desert contains some of the best solar energy resources in the United States. MAP DRAWN BY PETER ALAGONA.

a day's drive of more than fifty million people. This combination of seclusion and proximity has made the Mojave an in-between space in the economic geography of California and the American Southwest. It has also made the region the crossroads of a vast water, power, and transportation infrastructure. The Mojave has long served as a space of transmission: a flyover, drive-by, or pump-through landscape. Now, though, it is ideally situated to suit the needs of industrial energy production.

These physical and human geographies may make an energy boom seem inevitable. The politicians, bureaucrats, and industrialists who regard the Mojave's energy as an untapped resource certainly have made it seem so. They have portrayed development as crucial and unavoidable, and in the process they have acquired tremendous momentum. But as with other booms, this one was not preordained, and the outcome remains far from certain. Even at a time of widespread concern about the risks associated with traditional forms of energy production, proposals for new facilities in the Mojave have met with a mix of exuberance, acceptance, resistance, and dread.

To most Californians, for whom the Mojave is little more than a blank spot on the map, it might seem odd that renewable energy development there would cause so much controversy. In the words of former California Governor Arnold Schwarzenegger, "If we can't put solar power plants in the Mojave Desert, I don't know where the hell we can put them."[4] For those who have experienced the Mojave only through the windshield of an air-conditioned car or the window of a pressurized cabin, it can seem like an empty space awaiting some form of beneficial future use. Yet the Mojave is far from vacant. It has a rich natural and cultural landscape, and a complex, contested, and contingent history.

The land of lost borders

The development of the modern Mojave began after the California Gold Rush of 1849, when a series of processes transformed the desert in two crucial ways. First, the Mojave attracted a legion of prospectors. By the 1880s hundreds of gold, silver, and other mines perforated the desert. Bustling towns emerged around some of these sites, but there were no great bonanzas and the settlements rarely lasted more than a few years before the deposits diminished, the residents fled, and structures burned to the ground.

Although brief, these operations altered the landscape by causing erosion, introducing nonnative plants, increasing fire frequency, and enabling access along roads, many of which remain passable to the present day.[5]

Grazing also began in the Mojave during the mid-nineteenth century. Sheep and goats can subsist on the woodier, nutrient-poor plants typical of desert rangelands, but the Mojave hardly ever produced enough forage to support a vigorous livestock industry. Cows require between 100 and 1,000 times more grazing land in the desert than they do in wetter and more productive subtropical regions. Yet optimistic ranchers disregarded the warnings of skeptics, such as John Wesley Powell, who argued that overgrazing would destroy the rangelands of the intermountain West.[6] Instead, they regarded sporadic wet years as "normal" and common dry years as "droughts." Their way of thinking courted disasters. When the rains failed to come, as in the decade from 1893 to 1904, livestock compacted the soil, eroded the riverbanks, and denuded the vegetation in their search for food and water. Grazing peaked in the Mojave around 1920, before another cyclical dry period decimated the herds and devastated the industry.[7]

By the beginning of the twentieth century, the growth of conservation and outdoor recreation, along with new thinking about landscape aesthetics, gave rise to novel ideas about desert environments in California and the American West. Three well-known authors exemplify popular ideas about the Mojave during this period.

Figure 3. Saline Valley and Inyo Mountains, Death Valley National Park.
PHOTOGRAPH BY CHRISTOPHER WOODCOCK.

Figure 4. Californians have often understood the Mojave as a blank canvass awaiting some form of future beneficial use. Yet many of the region's most ambitious development projects have failed. PHOTOGRAPH BY CHRISTOPHER WOODCOCK.

In his 1900 book, *Forest and Water*, Abbot Kinney argued for conservation to prevent desertification. Kinney was a colorful figure: a self-styled Renaissance man, world traveler, tobacco magnate, entrepreneur, and visionary real estate developer of "Venice-By-the-Sea," now known as Venice Beach. He also served as the first chairman of the California Board of Forestry and the president of the Southern California Academy of Sciences, and he advocated for the creation of federal lands to promote forest and water conservation. Kinney was not, however, a fan of the desert, which he viewed as an imminent threat to Southern California's fragile climatic balance. "The desert is at our door today," he wrote. "It is pushing up against the mountain barrier that divides us. It is creeping up on the passes . . . and even has footings on and inside our mountain wall."[8] Referring to the torrid Santa Anna winds that periodically rake the Los Angeles Basin, he warned his readers that "The deserts even now come into our valleys for a few days with their fire and furnace breath to look at the rich booty they may someday hold."

John C. Van Dyke, a Rutgers University art historian, articulated a different view two years later, with the publication of *The Desert: Further Studies in Natural Appearances*.[9] Van Dyke delighted in scenery for its own sake, and he marveled at the light, texture, depth, and diversity of the desert's landscapes. His work drew from a fusion of late, romantic nature writing and a Modernist appreciation for hygienic spaces and minimalistic forms. For Van Dyke, deserts were "an acquired taste." In a pithy, personalized summary of the history of landscape art, he wrote that "One begins by admiring the Hudson-River landscape and ends by loving the desolation of the Sahara."

In 1903 Mary Hunter Austin published her classic book, *The Land of Little Rain*, a meditation on the natural and cultural history of the vast expanse between the Sierra Crest and Colorado River.[10] Austin was a prolific author in several genres, as well as a feminist and indigenous rights advocate, but she is best known for her celebration of the Mojave Desert, which she also called "the land of lost borders." Unlike Kinney and Van Dyke, Austin did not view the desert as hazardous or austere. She celebrated the possibilities it afforded to "live with great zest, to have red blood and delicate joys, to pass and repass about one's daily performance an area that would make an Atlantic seaboard state," and to do so with "no peril . . . no particular difficulty." For Mary Austin, the desert was a place to be studied, experienced, cherished, and, most of all, enjoyed.

Austin's view was slow to catch on among those who, like Kinney, continued to view the desert less as a *place* to be appreciated than as a *process* to be prevented. One such person was ecologist Paul Sears of the University of Oklahoma. His 1935 book, *Deserts on the March*, further popularized and dramatized the idea of desertification as a destructive process. The economic devastation of the Great Depression seemed to take physical form in the darkened skies of Oklahoma, and Sears warned that without swift action other regions could meet a similar fate. They, too, could become wastelands.[11] Sears advocated for rational management of lands and natural resources by trained ecologists who could help restore balance to disturbed and degraded landscapes.

Yet, during the mid-1930s, the Mojave Desert, unlike the southern Great Plains that Sears described, was transitioning into a time of relatively plentiful precipitation.[12] Winter rains and spring wildflowers returned to the Mojave at the same time that New Deal recovery funds enabled state and federal agencies, including the National Park Service and California State Park Commission, to build the roads, campgrounds, and other visitor facilities that would supply Southern California's growing populace with new recreational opportunities. Ironically, Californians began to appreciate the splendid desolation of their state's arid landscapes at the same time that most other Americans were becoming more fearful of the desert as an abstract idea.

By the late 1930s, large numbers of tourists were encountering the Mojave for the first time, and to the astonishment of many a leathery old-timer, they fell in love with the place. The region's great distances and harsh weather ruled out travel by foot or horseback for most visitors, so desert sightseeing required automobiles and a transportation infrastructure. Motorists who traveled freshly graded byways discovered geological marvels, historical relics, and biological curiosities.[13] They started to experience the Mojave not as a godless wasteland or impending threat, but as a space of natural beauty. By the time road crews finished paving Route 66, in 1938, activists in California had completed successful campaigns to establish the state's three original desert parks: Death Valley, Joshua Tree, and Anza Borrego.

Dividing the desert

A new chapter of the Mojave's environmental history began in the 1940s, when diverse groups began to lay claim to the region's lands and natural resources. During World War II, the Mojave became a major staging ground for military training operations in preparation for General George S. Patton's North African Campaign. For the Second Armored Division, it was the closest thing we had to the Sahara. Later military commanders would praise the Mojave for its likeness to the Middle East, including Iraq and Afghanistan, and for its relative isolation from large population centers. The Department of Defense now operates nine bases in the Mojave, which it uses for training exercises and bombing ranges.

After the war the Mojave became a magnet for speculative real estate schemes. The most famous was California City, the brainchild of Nathan Mendelsohn, a Columbia University sociologist who in 1958 purchased 82,000 acres about 100 miles north of Los Angeles. Mendelsohn promoted his project as California's next great suburban metropolis, and he laid out a vast network of roads to nowhere with names like Forest Boulevard and Biscayne Avenue. Radio advertisements enticed listeners to "Buy a piece of the Golden State—you'll be sitting pretty when you come to California City." Mendelsohn's project attracted hundreds of investors but few residents. Today, California City is the state's third largest municipality by land area, after Los Angeles and San Diego, but it is home to only about 14,000 people.[14]

Mining and grazing were still the most important economic activities on the Mojave's federal lands. By the

late 1960s, major mining operations had affected only about 50 square miles, but a network of roads and other infrastructure enabled access to each of these sites. Grazing never completely rebounded from its crash in the 1920s, but in 1968 there were still 25,000 cattle and 138,000 sheep grazing on public lands in California's deserts.[15] Federal lands also served as pathways for the thousands of miles of highways and other linear corridors that crisscrossed the desert. By 1980 BLM lands alone contained 3,500 miles of power transmission lines, 12,000 miles of pipelines, 15,000 miles of maintained roads, and tens of thousands of miles of off-road tracks.

Recreational off-roading started as hobby in the 1950s, and then expanded during the 1960s with the introduction of light, inexpensive motorcycles imported from Japan. By 1968 Californians owned nearly two million off-road vehicles,

Figure 5. Saltdale Dry Lake, near California City. PHOTOGRAPH BY CHRISTOPHER WOODCOCK.

including at least a million motorcycles and 200,000 dune buggies. Over the next five years, recreational use of California desert BLM lands tripled, with almost two-thirds of the increase attributed to off-road motorized recreation. Long-distance competitions, such as the infamous "Barstow to Vegas" race, attracted thousands of riders. What was once a hobby became a community, a culture, even a way of life. For rider-activists, such as Bob Perkins, the desert was a tremendous playground—"a place of beauty and joy where you could have thrills that most people only dream about."[16]

One person's dream is another's nightmare. In 1974 the *Los Angeles Times* announced that a battle had begun over the future of the Mojave. "The bikers, seeing more fences, freeways and No Trespassing signs each time they ride the desert, are mindful of days when they could unload their machines and ride in any direction as long as their fuel

Figure 6. The ruins of Rhyolite, Nevada, just east of Death Valley National Park. PHOTOGRAPH BY CHRISTOPHER WOODCOCK.

Figure 7. Many Californians know the Mojave only as a drive-by or fly-over landscape. PHOTOGRAPH BY CHRISTOPHER WOODCOCK.

would last."[17] The conservationists, "seeing marks lacing the desert and dust plumes on the horizon, hearing the annoying whine of engines, remember when only the wind moved the sand and the only sounds were of birds and of small animals scurrying." The two sides seemed irreconcilable, but in fact they had much in common. Both sides wanted to "keep the wide open spaces open," and both sides wanted save the Mojave, in their own way, from destruction.

The partitioned landscape

The Bureau of Land Management remains the largest land manager in the Mojave Desert, yet it has played an ambiguous role. It was not until the 1976 passage of the Federal Land Policy and Management Act (FLPMA) that Congress provided the Bureau with the statutory authority to manage the lands under its jurisdiction. Even then, Congress did not define what it meant by "management," but it singled out the California Desert as a special administrative zone and required BLM officials to develop a conservation plan covering more than 25 million acres. In 1980 the Bureau's state director, James B. Rush, struck a conciliatory, almost apologetic, tone in announcing the completion of the California Desert Conservation Area Plan: "Perhaps, as individuals, we may say, 'This is not exactly the plan I would like,' but together we can say, 'This is a plan we can agree on, it is fair, and it is possible.'"[18]

In the years that followed, the BLM became a lightning rod for controversy. Its regulations for off-road vehicle use met with resistance from riders. Its efforts to make grazing more ecologically benign and economically rational met with outrage from ranchers. And its attempts to protect endangered species met with lawsuits from environmentalists who charged that the Bureau had not

done enough. With FLPMA, Congress had given the BLM a sweeping mandate. But legislators failed to address the Bureau's organizational weakness, and they provided few resources for it to fulfill its new responsibilities. Some BLM officials also found creative ways to make their bureau's predicament even worse, including antagonizing potential allies, ignoring legal mandates, and appearing in court unprepared to answer challenging but legitimate questions.[19]

Environmentalists, always suspicious of the BLM's intentions and emboldened by a slate of new environmental laws, set out to slash the Bureau's authority and remove key lands from its jurisdiction. In 1994 they succeeded in passing the California Desert Protection Act, which expanded Death Valley and Joshua Tree national parks, transferred the East Mojave Scenic Area from the BLM to the National Park Service and renamed it the Mojave National Preserve, and set aside seventy-one new wilderness areas encompassing 3.75 million acres.[20]

By the early 2000s, Mary Hunter Austin's "land of lost borders," once a place of open ranges and weak governance, had become an intricately partitioned landscape. These divisions took many forms and drew from many justifications. One rationale cited the decline of the desert tortoise, which the US Fish and Wildlife Service listed in 1989 as threatened in the Mojave under the federal Endangered Species Act. The tortoise's listing proved important in catalyzing efforts to establish new nature preserves, desert wildlife management areas, and habitat conservation plans. Today, the desert tortoise remains the "flagship species" for wildlife conservation in the Mojave Desert.

Land partitioning also resulted from real estate sales, swaps, and purchases. In Nevada, federal legislation authorized the BLM to sell its remaining land in and around the Las Vegas metropolitan area, and then use the proceeds ($3.3 billion between 1998 and 2008) to fund conservation and community development projects in the area. In 2001 Congress authorized an expansion of the Fort Irwin Army base, which included $75 million for land and wildlife conservation projects. This was in addition to funds allocated for the purchase of 257,000 acres of Mojave land between 1994 and 2000. By 2009 the federal government had purchased another 600,000 acres in the Mojave for conservation and recreation.[21]

These purchases had direct effects on land use. Consider the example of grazing. During the 1970s, the number of cattle and sheep grazing on the BLM's fifty-four California desert allotments declined by more than half. The election of Ronald Regan, a self-proclaimed sagebrush rebel, gave ranchers renewed clout, but the reversal was short-lived. In 1992 the General Accounting Office recommended a full review of grazing on the BLM's hot climate desert allotments. By 2005 only two large operations remained on BLM lands in the California portion of the Mojave, and the purchase of lands and retirement of grazing permits had all but ended grazing in southern Nevada. Some ranchers gave up and left the business, while others moved to different states. Tom Wetterman, whose herd of 200 to 400 cows occupied 350,000 acres near Barstow, decided it was time to leave when the Department of Defense offered to purchase his allotment as part of its Fort Irwin expansion. At the time, the Army was considering using Wetterman's home as a field station for desert tortoise research.[22]

By the middle of the last decade, the Mojave had been transformed from a space of dispersed resource extraction to one dominated by conservation and recreation. It had become one of the most conserved regions, in terms of parks and wilderness areas, in the contiguous United States, and a desert traveler was more likely to encounter a conservation biologist than a cattleman on the open range. Bedroom communities had exploded during the housing boom, but they still occupied little of the Mojave's total area. And although off-road vehicle recreation remained popular, it had become more regulated and more concentrated. In the words of Jim Andre, director of the University of California's Sweeney Granite Mountains Desert Research Center, located in the Mojave National Preserve, the Mojave offered "a rare example of how conservation can work on a regional scale."[23]

Energy development comes to the Mojave

In November 2008, citing California's traditional leadership in renewable energy and describing its importance for fostering economic development and reducing greenhouse gas emissions, Governor Schwarzenegger issued Executive Order S-14-08. The Governor noted the state's goal of supplying 20 percent of its energy needs through renewable sources by 2010, and then set the even more ambitious target of 33 percent renewable power by 2020.

In March 2009, the Obama administration's new Interior Secretary, Ken Salazar, produced a similar order, stating that "the production, development, and delivery of renewable energy is one of the Department's highest priorities." Seven months later, Schwarzenegger and Salazar signed an agreement that directed state and federal agencies to promote renewable energy development by dedicating additional resources and coordinating their efforts. One of their main objectives was to facilitate the approval of utility-scale projects on federal lands in the California desert. Renewable energy thus joined the many other claims to land use in the Mojave Desert.[24]

This was not the first attempt to develop renewable energy in the region. In the late 1980s and early 1990s, for example, the Luz International Corporation launched an ambitious project to develop solar energy facilities in San Bernardino County. By 1991 the projects were producing 354 megawatts (MW) and were well on their way to the company's goal of 594 MW. The completed installations represented more than 90 percent of global solar energy production, but they amounted to only about 0.8 percent of California's total energy-generating capacity. Before the end of that year, Luz International filed for bankruptcy and abandoned the project.[25]

By 2009 California was still by far the country's largest solar power producer, with 768 megawatts of grid-connected photovoltaic installations, or 61 percent of the national capacity. The runner-up, New Jersey, had just 128 MW, or 10 percent of the national capacity. Yet California was still generating less than 12 percent of its retail electric load through renewable sources, well short of its 2010 target. The federal government also remained behind schedule in its effort to approve 10,000 MW of nonhydropower renewable energy facilities on public lands by 2015. The slow pace of progress was particularly frustrating because increased supplies of solar equipment, from Germany and China, had reduced the start-up cost for new installations.[26]

Schwarzenegger and Salazar identified two main problems. Despite a decade of efforts to designate energy transmission corridors, California still lacked adequate infrastructure for moving power from the sites of production to the sites of consumption. And although regulatory agencies were reviewing new project applications, red tape had slowed the permitting process. State and federal officials concluded that California needed a "streamlined," one-stop permitting process that would include all of the relevant agencies. Industry leaders could not have agreed more.

An alliance was developing among politicians, bureaucrats, and industrialists who had come to see renewable energy as a win-win proposition. Elected officials emerged as passionate advocates for projects that appeared to represent both pro-environment and pro-growth agendas and present little political risk. The leaders of renewable energy firms appreciated the moral support, but what they really needed was access to more public land and water for production and transmission. The

Figure 8. Thousands of miles of transmission lines and access roads crisscross the Mojave Desert. PHOTOGRAPH BY CHRISTOPHER WOODCOCK.

federal government had already initiated a Programmatic Environmental Impact Statement (PEIS), in June 2008, to assess the potential impacts on BLM public lands. It also partnered with California by uniting the four key state and federal agencies—the California Energy Commission, California Department of Fish and Game, Bureau of Land Management, and US Fish and Wildlife Service—into a Renewable Energy Action Team (REAT).

The REAT agencies have different missions, cultures, and agendas. But a rare convergence of public-private consensus, top-down direction, and political pressure has forced them to work together toward a common goal. For the California Energy Commission, which is eager to meet its emissions and renewable energy targets, cooperation remains essential. The BLM faces a more complicated situation because its multiple-use mandate requires it to promote efficient use while conserving natural and cultural resources. BLM officials seem to view renewable energy as a way to maintain their agency's traditional emphasis on resource extraction, while bolstering its portfolio of "environmentally friendly" projects. The California Department of Fish and Game is responsible for conserving biological resources under public trust, and the US Fish and Wildlife Service enforces key laws such as the Endangered Species Act. Both wildlife agencies have the statutory responsibility to scrutinize new projects with potentially significant biological impacts, and they have the most to lose, in terms of power and autonomy, from procedural streamlining.

The wildlife agencies are not unique in their concerns about streamlining, or in their efforts to maintain their autonomy and authority. Agencies that regulate the environment and administer natural resources often resist expedited or bundled permitting processes, and even under the most favorable conditions bureaucratic coordination can prove extraordinarily challenging. It is useful, therefore, to reflect on the broader historical moment in which this unusual collaborative effort emerged.[27]

The politics of consent

In July 2008, the price of crude oil reached $147 a barrel, the highest ever recorded, due in part to diplomatic tensions between the United States and Iran and concerns about potential disruptions of supply from Nigeria and Brazil. Four months later, Barack Obama captured the White House, promising to reinvigorate the US economy by investing in infrastructure and "green jobs." The $787 billion American Recovery and Reinvestment Act, passed in September 2009, used the phrase "renewable energy" twenty-nine times and launched a national race to acquire federal funding for "shovel ready" projects. In April 2010, the Deepwater Horizon drilling platform exploded and sank off the coast of Louisiana, killing eleven men, spilling 4.9 million barrels of oil, and renewing public concern about the risks of offshore drilling. The following March, an 9.0-magnitude earthquake centered off the east coast of Japan generated a 50-foot tsunami that disabled the

Figures 9 and 10. Two views of BrightSource Energy's Ivanpah Solar Electric Generating System, which began construction in October 2010.

PHOTOGRAPH COURTESY OF BRIGHTSOURCE ENERGY.

The summer of 2011 once again provided a stark reminder.

Fukushima Daiichi Nuclear Power Plant and resulted in the world's worst nuclear accident since the Chernobyl disaster of 1986. In the summer of 2011, a controversy emerged in the American heartland about the proposed Keystone XL Pipeline, which would carry heavy crude from the tar sands of Alberta, across the Ogallala Aquifer, to refineries on the Gulf Coast.

Popular concern about climate change in the United States waned during economic malaise that followed the financial crisis of 2008—witness the Obama administration's weak showing at the United Nations Climate Change Conference in Copenhagen in 2009 and its retreat from a strong green-jobs agenda during its first term. But the summer of 2011 once again provided a stark reminder. It was the second warmest season on record in the United States, after the grim Dust Bowl summer of 1936, and Texas had the hottest summer of all-time for any state. Given this dizzying sequence of events, since 2008, it is no wonder that, back in California, solar and wind energy seemed like such innocuous and indispensable alternatives.

From 2001 until 2011, firms in California completed some forty-eight utility-scale renewable energy installations, representing 16,635 MW of potential power. Fifty-eight percent of these projects were built in or near California deserts. Beginning in 2008, the pace of new proposals accelerated. By 2010 the BLM was reviewing at least 150 applications for renewable energy projects on more than 1.3 million acres in California. This included fifty-four applications for solar projects in the state's desert regions covering half a million acres.

As of November 2011, twenty-six projects, projected to produce 10,000 MW of power, had received approval and were in the preconstruction or construction phases, including at least seventeen located in desert areas. One of these, the Blythe Solar Millennium project, was slated to become the world's largest solar power plant, with a projected capacity of 1,000 MW. Fourteen additional projects, including twelve on desert lands, were either under review or would soon begin the review process.[28]

The REAT agencies often emphasize that expedited permitting does not mean a lack of oversight. Their policies aim to "encourage timely and responsible development of . . . renewable energy resources while minimizing environmental impacts and protecting and enhancing water, wildlife, and other natural resources."[29] REAT documents describe the need for thorough applications, comprehensive resource surveys, detailed project plans, and agency supervision. The REAT agencies have taken proactive measures to avoid or mitigate project impacts, and all relevant state and federal laws still apply.

Two major political initiatives promise to increase conservation efforts even as development continues. The first is the stakeholder-based process to create a Desert Renewable Energy Conservation Plan. Habitat and natural community conservation planning processes emerged in California, during the 1980s and 1990s, as mechanisms to comply with the state and federal endangered species acts, usually by setting aside habitat reserves while enabling development to continue in other areas.[30] They have become popular among business groups seeking regulatory assurance, and many conservationists value them as the best available opportunities to implement proactive, regional biodiversity conservation programs. Critics consider such plans end-runs around the federal Endangered Species Act, and point out that they do little to recover listed species and may even hinder other recovery efforts. Either way, the stakes are high. When completed, the plan will provide a framework for wildlife mitigation projects associated with renewable energy development throughout the 22,587,000-acre California desert planning area.

A legislative effort is also underway in the US Senate. Senator Diane Feinstein (D-CA), who sponsored the California Desert Protection Act of 1994, has introduced new legislation. Feinstein's bill has something in it for everyone. It would facilitate energy development on certain public and private lands, promote the construction of transmission lines to remote areas, and allocate other sites for motorized recreation. It would also close development on 1.2 million acres by transferring additional lands from

Renewable energy development in the Mojave has also caused consternation among environmentalists.

the BLM to the National Park Service and by creating two new national monuments and one special management area. The bill has garnered the support of at least 118 local governments, elected officials, chambers of commerce, civic groups, energy companies, businesses, and activist organizations—including groups as disparate as the Off-Road Business Association, the Los Angeles Department of Water and Power, and The Wilderness Society.[31]

Risks and impacts

Despite these efforts, much concern remains. American Indian groups have held protests to raise awareness about threats to archeological and religious sites.[32] Public safety concerns have emerged in communities near proposed energy installations that contain hazardous materials. Military officials have expressed security worries about energy developments near their bases. Long-distance transmission lines convey electricity inefficiently and can pose severe wildfire hazards during Santa Anna wind events.[33] Wind turbines inflict substantial damage on migratory bird populations. And many desert residents and tourists alike consider wind and solar projects blights on the landscape.[34]

Renewable energy development in the Mojave has also caused consternation among environmentalists. National environmental groups—such as the Sierra Club, Defenders of Wildlife, and Natural Resources Defense Council—have sought to promote "responsible" renewable energy development, while opposing projects they view as unnecessarily harmful. What qualifies as too damaging, however, remains an open question, and inevitably depends on a given project's design, goals, and landscape context. As a result, such groups have often switched positions on particular projects. This has enabled them to sit on both sides of the table at planning meetings and court proceedings, but it has also generated confusion and dissent among their members, especially those who live in communities near proposed projects. Representatives of the leading environmental organizations have yet to figure out how to measure the trade-offs of renewable energy development versus land conservation.[35]

One way to measure these trade-offs is in terms of badly needed jobs and the many economic benefits those jobs provide. Workers at the remote Ivanpah Valley Solar Electric Generating System will be required to drive up to an hour each way to work every day, burning gasoline to make electricity. Yet the carbon footprint of this long-distance commuting will be relatively minor, because after construction the Ivanpah plant, like other solar installations, will require only a small crew of permanent employees—probably under 100—to the chagrin of its nearest communities.

One of the most important problems for utility-scale solar power plants is that they work best in arid environments but require tremendous volumes of water. In their 2009 project applications, the Genesis Solar Energy Project, west of Blythe, projected that it would use 536 million gallons per year, while the Abengoa Mojave Solar Project Power Plant, near Barstow, would require 705 million gallons.[36] To put these figures in perspective, California's yearly per capita water consumption is about 14,000 gallons, not including agriculture. Together, these two proposed 250 MW facilities would produce enough energy to power around 180,000 homes. But they would also consume enough water to supply about 90,000 people, the population of a city the size of Santa Barbara. In 2010 California became the first state to require air-cooling technologies in new thermal solar plants. Such systems would increase electricity cost by around 10 percent, but could reduce water use by 80 to 90 percent. Other Western states do not require air-cooling systems, and the federal government has issued only voluntary guidelines outside California.[37]

Some projects propose to move an astonishing amount of earth to create flat fields for solar installations, provide level areas for staging, and enable access by large vehicles

along graded roads.[38] Six projects analyzed by a team of researchers from the University of Michigan each required the removal of between 1.7 and 8.3 million cubic yards of soil. If piled on top of a football field, 8.3 million cubic yards of dirt would create a rectangular mountain more than a mile high. In addition to the obliteration of local habitats and hydrologic patterns, the dust released can exacerbate air regional pollution.

And then there are the critters. In 2010 a board of independent science advisors submitted its recommendations to the Desert Renewable Energy Conservation Plan stakeholders and officials. The board commended California for seeking to reduce its reliance on fossil fuels. But it also stressed the unique challenges and perils of bringing industrial energy production to a fragile, stressed, and poorly understood ecosystem. The science advisors implored planners and managers to minimize water use and surface disturbance, locate new installations on previously degraded sites, and refrain from harassing wildlife whenever possible. The report concluded that regulators and developers should use extreme caution because damage to the desert environment would require centuries to heal.[39]

Some impacts are preventable or can be mitigated, but others are unavoidable and will only exacerbate the desert's ecological problems. Consider the Mojave's flagship wildlife species, the desert tortoise, which will almost certainly be a big loser in this process.[40] Renewable energy poses a direct threat to tortoises that lose habitat or seek shade under heavy machinery. It also poses an indirect threat because human developments of all kinds enable tortoise predators from other regions, such as ravens and coyotes, to colonize and multiply. It would seem simple just to move the vulnerable animals, but translocation of tortoises from areas slated for development can do more harm than good because tortoises carry fatal communicable diseases, and because wild animals in general tend to fare poorly when moved to new locations.[41]

The DCREP promises to address these problems by creating new nature reserves and supporting research, monitoring, and restoration. But problems persist. Stories of bungled biological surveys, incomplete resource assessments, and unforeseen impacts continue to emerge from sites throughout the region, and project monitors have failed to prevent accidental wildlife deaths on construction sites.[42] Collateral damage is an important problem, but a bigger concern is that habitat conservation planning remains a grand experiment with uncertain long-term costs and benefits. Future land managers will not have the capacity to fully mitigate for the spread of epidemic diseases or the proliferation of aggressive, intelligent predators. One can imagine a future when tortoise ranching will replace cattle ranching as an organizing principle for range management in the Mojave. It is equally easy, however, to picture a bleaker scenario—a desert with vast nature reserves devoid of the very species those reserves were created to protect.

Narratives of power and place

The story unfolding in the Mojave Desert today is actually two stories, depending on how you see it. The common narrative, championed by proponents of large-scale solar and wind development, is a story about energy—about how the shift from a hard path to a soft path will usher California into a cleaner, greener, more prosperous era. The alternative narrative, which we have adopted in this essay, focuses on the Mojave itself—about how people have understood, experienced, exploited, and attempted to conserve this distinctive place. We embraced this alternative approach because we remain concerned that if the story about *power* eclipses the story about *place* then Californians may lose a treasured aspect of their natural heritage.

We also have more specific concerns. The emergence of a consensus among politicians, bureaucrats, and industrialists has enabled some of California's most powerful people to push renewable energy projects in the Mojave forward at an unprecedented rate. We see evidence of this consensus in executive orders and bureaucratic reorganizations, in the dispensation of public funds and the allocation of federal lands to private interests. The rush to harness renewable energy in the Mojave is new, but the broader pattern of energy industry patronage is not. The Obama administration's aggressive promotion of energy development in the Mojave focuses on solar and wind projects, but in other ways it resembles the George W. Bush administration's similarly ambitious plans to open federal lands elsewhere in the American West for fossil fuel extraction. Both administrations have advocated streamlined environmental reviews and permitting processes, and both have proposed voluntary mitigation

What do we want our desert to produce?

strategies designed as much to capture the support of reluctant stakeholders as to safeguard natural resources and environmental quality. Fast-tracking industrial energy projects benefits private corporations, but it tends to reduce public participation, promote ineffectual oversight, and invite unintended consequences.

Focusing on utility-scale projects also can also obscure other equally urgent discussions about energy in California. Opportunities for improvements in conservation and efficiency have grown in recent years due to the availability of "smart" technologies. With increased incentive programs, the state could also spark a boom in distributed renewable energy production, such as rooftop solar panels, which have the added advantage of avoiding the efficiency problems and hazards associated with long-distance transmission. Conservation, efficiency, and distributed production might not completely replace the generating capacity of utility-scale desert installations, but they would increase local control, reduce the number of installations needed, and enable planners to avoid particularly sensitive areas.

What do Californians want from the Mojave Desert? The answer is many things. We want it to provide solitude and beauty, freedom and adventure, wildlife and wilderness, industry and infrastructure—and now we want energy, too. California needs more renewable energy, and the Mojave can certainly provide much of it. After all, energy is what makes a desert a desert. No one is seriously considering "sacrificing the desert to save the Earth," as a recent *Los Angeles Times* headline proclaimed.[43] But the decisions we are making today will shape the desert we pass down to subsequent generations. Before we proceed, therefore, we need a broader discussion about the questions that really matter: What kind of desert do we want in the future? What do we want our desert to produce? And what level of use can we reasonably expect our desert to sustain?

These questions about energy development will shape the next chapter of the Mojave's political, economic, and environmental history. Our challenge now is to determine how much of this energy we can harvest without diminishing, or destroying, the Mojave's ability to provide the many other things Californians still desire from this special place. **B**

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