FUEL TO BURN

THE CLIMATE AND PUBLIC HEALTH IMPLICATIONS OF OFF-ROAD VEHICLE POLLUTION IN CALIFORNIA

A CENTER FOR BIOLOGICAL DIVERSITY REPORT

Fuel to Burn:
The Climate and Public Health Implications of Off-road Vehicle Pollution in California

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Motorcycle in Jawbone Canyon, California
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The Center for Biological Diversity is a national nonprofit conservation organization with more than 40,000 members dedicated to the protection of endangered species and wild places. We work through science, law, and creative media to secure a future for all species, great or small, hovering on the brink of extinction.

The Clean Air Initiative, a project of the American Lung Association of San Diego & Imperial County, is dedicated to improving the air quality and health of residents in Imperial County and the Mexicali border region through education, advocacy, and support. The Clean Air Initiative coalition members include health care agencies, nonprofit organizations, environmental agencies, and Imperial Valley community members.

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Executive Summary

In 2006, California took a giant leap forward in addressing the threats posed by global climate change by passing landmark legislation, the Global Warming Solutions Act. Under this law, the state commits to reducing its emissions of greenhouse gases to 1990 levels by the year 2020 — a reduction of approximately 29 percent compared to the projected business-as-usual scenario. In addition, Governor Schwarzenegger's Executive Order S-3-05 commits the state to reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050. Currently, the California Air Resources Board is crafting rules to achieve the new greenhouse gas emission reductions targets.

As described below, because off-road vehicles produce significant greenhouse gases, California should ensure that emissions from this source are reduced at the same pace as other sources. At a minimum, emissions from off-road vehicles should be reduced to at least 1990 levels by 2020 with further reductions to 80 percent below 1990 levels by 2050.

The gas used annually by California off-road vehicles equals that used in 1.5 million car trips between San Francisco and Los Angeles.

The state has also made a commitment to protecting the quality of the air that California residents breathe. California has among the poorest air quality in the nation and is home to 13 of 20 counties nationwide most at risk to adverse health impacts from smog.

In addressing the twin goals of reducing greenhouse gas emissions and protecting public health from the adverse effects of poor air quality, California needs to immediately address the pollution and greenhouse gas emissions from off-road vehicles. These emissions, while a relatively small component of the overall transportation sector, are a significant and growing source of greenhouse gases. Due to the meteoric rise in the number of off-road vehicles, these emissions will climb significantly if steps are not taken to curb them.

Off-road vehicles in California currently emit more than 230,000 metric tons — or 500 million pounds — of carbon dioxide into the atmosphere each year. This is equivalent to the emissions created by burning 500,000 barrels of oil. The 26 million gallons of gasoline consumed by off-road vehicles each year in California is equivalent to the amount of gasoline used by 1.5 million car trips from San Francisco to Los Angeles.

Because of the significant pollution caused by off-road vehicles, a reduction in emissions will have important health benefits for Californians. Off-road vehicles emit considerably more pollution than automobiles. According to the California Air Resources Board, off-road motorcycles and all-terrain vehicles produce 118 times as much smog-forming pollutants as do modern automobiles on a per-mile basis.

In the past 15 years, pollution from off-road vehicle use has increased significantly. Emissions of total organic gases and reactive organic gases — which are important precursors to smog — have doubled. Carbon monoxide emissions have increased by 56 percent. Emissions from current off-road vehicle use statewide are equivalent to the carbon dioxide emissions from 42,000 passenger vehicles driven for an entire year or the electricity used to power 30,500 homes

for one year. If left unchecked, the emissions from off-road vehicles will continue to increase; as California addresses the difficult problems posed by global warming, emissions from off-road vehicles must be addressed.

This pollution is having a significant impact on the health of Californians. Imperial County, for example, is one of the most popular off-road vehicle recreation destinations in the state. It also has among the worst air quality in California. Childhood asthma rates in Imperial County are far higher than the statewide average. Air pollution is a contributor to the high rates of asthma, bronchitis, pneumonia, and allergies in this region, especially among children younger than 14 years old.

Despite these serious climate and health implications, the State of California has failed to seriously address the greenhouse gas emissions and pollution associated with off-road vehicle recreation. The California Air Resources Board currently allows the continued sale and use of polluting off-road vehicles that do not meet state emissions standards. And the Department of Parks and Recreation spends tens of millions of dollars each year promoting and supporting off-road vehicle use on state and federal public lands.

The significant reduction in greenhouse gas emissions mandated by the Global Warming Solutions Act applies to all greenhouse gas sources throughout the state. However, not all sources are able to realize reductions to the same degree at the same economic and societal costs. Because

Dusty trail in dirt-bike and all-terrain vehicle park. Dust, a component of particle air pollution, makes unpaved roads the largest single source of particulate matter.
Photo by Laurel Hagen

recreational off-road vehicle use is entirely discretionary, emissions reductions in this source to levels at or significantly below 1990 levels may be used to offset other sources that are less discretionary or that involve higher costs. For the policy recommendations below, we urge the Air Resources Board to assess the benefits of using each policy mechanism to achieve much greater reductions in this source. In all cases, a reduction to 1990 levels by 2020 should be considered only as the minimum reduction alternative.

Limiting overall off-road vehicle emissions will ensure that recreational polluters are reducing emissions at the same pace as other sectors of the population. Consistent with Assembly Bill 32 and the governor's executive order, emissions from off-road vehicles should be reduced to at least 1990 levels by 2020 with further reductions to 80 percent below 1990 levels by 2050. In order to meet this target, we offer the following recommendations:

• **The California Air Resources Board, in cooperation with the Department of Parks and Recreation, should limit greenhouse gas emissions from off-road vehicle use in state vehicular recreation areas and other state lands to at least 1990 levels.**

The Department of Parks and Recreation should develop a statewide plan to reduce statewide off-road vehicle emissions to the maximum extent possible. The plan should include options to reduce greenhouse gas emissions from discretionary recreational off-road vehicle use to at least 1990 levels by 2020. No new state off-road vehicle sites should be established unless they are consistent with such a plan. An initial analysis of the amount of greenhouse gases currently being emitted from off-road vehicle use within state vehicular recreation areas and other state lands is crucial in developing a statewide plan and individual management plans to reduce off-road vehicle emissions from these areas.

• **The State of California should ensure that federal agencies managing off road recreation in California are limiting greenhouse gas emissions from off-road vehicles to at least 1990 levels and should withhold financial support and permits from federal agencies that do not meet this target.**

Because significant greenhouse gas emissions arise from off-road vehicle use on federal lands, the State of California must ensure that those emissions are reduced along with emissions from other sources. This means that:

o *The California Air Resources Board should reject applications for continued or expanded off-road vehicle use by federal agencies that are not reducing emissions.*

The California Air Resources Board should adopt rules that require rejection of applications for new, continued, or expanded off-road vehicle recreation on federal lands from federal agencies or districts that do not have an adequate plan to reduce overall off-road vehicle emissions from their jurisdiction to at least 1990 levels.

Off-road motorcycle sending up a cloud of dust
Photo by George Wuerthner

o *The Department of Parks and Recreation should reject applications for funding from federal agencies that are not reducing emissions.*

The California Department of Parks and Recreation provides tens of millions of dollars to federal agencies to promote and manage off-road vehicle recreation. The Off-Highway Motor Vehicle Recreation Division should adopt rules that disallow applications for funding from federal agencies or districts that do not have a sufficient plan to reduce overall off-road vehicle emissions from their jurisdiction to at least 1990 levels.

o *The State of California should provide substantive comments on federal land-use plans and proposals that will result in increased greenhouse gas emissions.*

The State of California has several opportunities to significantly reduce greenhouse gas emissions from off-road vehicle use on federal lands. The California Air Resources Board, the state, and appropriate state agencies should participate in the public planning process for proposed federal land management plans, travel management plans, and individual projects to actively promote the position that each plan or project must be consistent with an overall plan by the federal land management agency to reduce off-road vehicle emissions to the maximum extent possible. Such plans should include options to reduce greenhouse gas emissions from discretionary recreational off-road vehicle use to, at a minimum, 1990 levels by 2020.

Off-road vehicle destruction in the Mojave Desert. Besides creating ugly tracks like these, California off-road vehicles together emit as much carbon dioxide as 42,000 passenger vehicles driven for a year.
Photo by Perry Hoffman

• The Department of Motor Vehicles should cap the number of registrations issued for off-road vehicles in California.

The Department of Motor Vehicles should cap the number of registrations issued for off-road vehicles in California. The cap should be scaled to achieve, at least, a reduction of emissions to 1990 levels by 2020. Because registration enforcement is currently lax, additional resources may be required for effective enforcement.

Also, the California Air Resources Board should immediately address the adverse public health effects and climate implications of non-conforming off-road vehicles.

• The California Air Resources Board should eliminate loopholes that allow continued use of polluting off-road vehicles that fail to meet state emission standards.

Just as California does not allow the continued use of automobiles that do not meet state emission standards, the state should not allow the use of off-road vehicles that do not comply with state standards. The California Air Resources Board should eliminate the "red-sticker" loophole that allows continued use of polluting off-road vehicles.

• The California Air Resources Board should disallow continued or expanded off-road vehicle use on federal lands in areas that do not meet air quality standards.

California must certify that proposed land uses on federal lands conform to the state's enforcement of the Clean Air Act. To date, the state regularly approves these uses — even in non-conforming areas like Imperial County — without significant evaluation. The California Air Resources Board should reject proposals to continue or expand off-road vehicle use on federal lands in areas that do not meet air quality standards.

Dust plume from off-road vehicle staging. Meeting California's ambitious goals of reducing greenhouse gas emissions means that *all* emissions sources must be addressed.

Photo courtesy Community ORV Watch

Global Climate Change: Overall Impacts and California's Response

In 2007, the Intergovernmental Panel on Climate Change once again warned that human-induced global warming is already causing physical and biological impacts worldwide.[1] Global temperatures have already risen by 0.74°C (1.3°F) over the past century, and the rate of warming in the last 50 years was nearly double the rate observed over the last 100 years.[2] Temperatures are certain to go up even further in the future, and the most recent scientific work demonstrates that climate changes are occurring earlier and more quickly than expected.

Fossil fuel combustion is producing a critical mass of greenhouse gases that has already shifted the planet's climate system into new and dangerous territory. The impacts of this shift are already apparent and are predicted to intensify.

On a global level, we are seeing and will continue to see increases in average air and ocean temperatures, widespread melting of snow and ice, and rising mean sea levels. On continental, regional, and ocean-basin scales, numerous long-term changes in climate have also been observed. These include loss of Arctic ice and habitat, loss of Antarctic ice, melting of glaciers and related glacial-lake outburst flows, loss of snowpack in California and elsewhere, changes in precipitation patterns, increased hurricane intensity, sea-level rise and coastal flooding, public health harms such as increased heat-related illness and smog, harm to habitats, widespread species extinction, and the potential for substantial social upheaval resulting from significant environmental changes. Further, there will continue to be warming due to the amount of heat-trapping greenhouse gases already in the air, even if we completely stop new emissions immediately. [3]

Very few species will escape the burn of climate change. A landmark study surveying 20 percent of the Earth's land area offered a stark prediction: 35 percent of species will be committed to extinction by the year 2050 if greenhouse gas emission trends continue.*

What does this temperature change mean for California? The California Climate Change Center has evaluated the present and potential future impacts of climate change to the state and demonstrated that climate change poses enormous risks to California.[4] Predicted impacts to the Golden State include:

- A six- to 30-inch rise in sea level, leading to increased coastal flooding.
- A 200- to 400-percent increase in the number of heat-wave days in major urban centers.
- An increase of up to 53 percent in wildfire risk.
- An increase in storm intensity, precipitation, and the proportion of precipitation as rain versus snow.
- A 30- to 90-percent reduction of the Sierra snowpack during the next 100 years, as well as earlier melting and increased runoff.
- An increase in the number of days conducive to ozone (O_3) formation.
- Profound, and potentially catastrophic, impacts to ecosystems and species, including changes in the timing of life events, shifts in range, and community-abundance shifts.[5]

*C.D.C Thomas et al., "Extinction risk from climate change," *Nature* 427 (2004):145-148.

Curbing greenhouse gas emissions to limit the effects of climate change in California and the world is one of the most urgent challenges of our generation. Recent peer-reviewed works emphasize the urgent need to reduce greenhouse gas emissions immediately: Just ten more years of "business-as-usual" emissions may commit us to climate feedbacks and impacts that would entirely transform the planet as we now know it.[6] As noted in a report commissioned by the California Environmental Protection Agency:

Because most global warming emissions remain in the atmosphere for decades or centuries, the choices we make today will greatly influence the climate our children and grandchildren inherit. The quality of life they experience will depend on if and how rapidly California and the rest of the world reduce greenhouse gas emissions.[7]

In response to this monumental threat, in 2006, the California legislature passed the Global Warming Solutions Act, known as Assembly Bill 32, which requires the state air resources board to limit statewide greenhouse gas emissions by 2020 to 1990 levels.[8] Assembly Bill 32 recognizes California's leadership in furthering environmental protection. Despite leading the nation in energy efficiency, the state of California — compared to entire nations — remains the 12th-largest emitter of greenhouse gases worldwide.

Under Assembly Bill 32, the California Air Resources Board must establish rules and regulations to achieve the maximum technologically feasible and cost-effective greenhouse gas emission reductions from any "greenhouse gas emission source." This is defined in the statute as any "source, or category of sources, of greenhouse gas emissions whose emissions are at a level of significance, as determined by the state board, that its participation in the program established under this division will enable the state board to effectively reduce greenhouse gas emissions and monitor compliance with the statewide greenhouse gas emissions limit."[10]

The California Air Resources Board is currently in the process of crafting the rules and regulations in an effort to meet its goal of cutting greenhouse gas emissions to 1990 levels by 2020. This will require an approximately 29-percent reduction from a business-as-usual approach.

A primary focus of efforts to curb greenhouse gas emissions is likely to remain on passenger vehicles, which includes the sedans, trucks, sport utility vehicles, and mini-vans that most of us drive to work, school, or the grocery store every day. But while passenger vehicles contribute the majority of greenhouse gas emissions, off-road vehicles emit the same greenhouse gases as passenger vehicles and have even more detrimental impacts on human health. Limiting off-road vehicle emissions will help the state meet its goal of reducing greenhouse gas emissions while simultaneously protecting public health. Regulation of emissions from off-road vehicles must be a priority for the California Air Resources Board as it implements Assembly Bill 32.

Dust from off-road vehicles. Off-road vehicle dust can disperse harmful air contaminants well beyond a designated off-road vehicle-use area.

Photo by Kevin Emmerich

The Significant Greenhouse Gas Emissions of California Off-road Vehicles

In 2006, the Off-Highway Motor Vehicle Recreation Division of California's Department of Parks and Recreation commissioned a survey to estimate fuel usage by off-road recreation in California.[11] The survey concluded that overall use of off-road vehicles on public lands consumes more than 26 million gallons of gasoline each year in California (Figure 1).[12] This equates to more than 500,000 barrels of oil. The gasoline consumption from off-road vehicle use in California is equivalent to the gasoline consumed by more than 1.5 million passenger vehicles driving from San Francisco to Los Angeles.[13]

Figure 1. Estimated Gallons of Gasoline Used by Off-road Vehicles on Public Lands in California, April 2004 – March 2005

VEHICLE TYPE*	MEAN	LOWER BOUND	UPPER BOUND
Registered off-road vehicles	20,014,590	17,081,031	22,948,148
Illegal, unregistered off-road vehicles	6,207,327	4,186,151	8,218,148
Total	**26,221,917**	**21,267,182**	**31,166,650**

Source: California Department of Parks and Recreation, *Estimating the State Fuel Tax Paid on Gasoline Used in the Off-highway Operation of Vehicles for Recreation*, September 2006

***Registered off-road vehicles** include dirt bikes, all-terrain vehicles, snowmobiles, and dune buggies that have been legally registered with the state.

Illegal, unregistered off-road vehicles include dirt bikes, all-terrain vehicles, snowmobiles, and dune buggies that

The Environmental Protection Agency standard estimation is approximately 8,800 metric tons of carbon dioxide from each million gallons of gasoline burned.[14] By this estimate, annual emissions from California off-road vehicle use equal 230,000 metric tons of carbon dioxide. This equates to more than 500 million pounds of carbon dioxide emissions each year. Emissions from current off-road vehicle use statewide are equivalent to the carbon dioxide emissions from 42,000 passenger vehicles driven for an entire year or the electricity used to power 30,500 homes for one year.

Worse, the figure used here does not include emissions from travel to and from off-road vehicle recreation sites, which is likely substantial. According to a comprehensive survey of recreation in California, the mean travel time to a recreation area is 45 minutes.[15] Many off-road vehicle recreation sites are remote from urban population centers, leading to even longer travel times. Further, the trucks used to tow off-road vehicles often have very low fuel efficiency, leading to increased emissions. When emissions from travel to and from off-road vehicle recreation sites are considered, total greenhouse gas emissions from off-road recreation are likely to be much higher.

In addition, off-road vehicle recreation consumes 5.5 million gallons of diesel fuel each year,[16] and although diesel engines are generally more fuel efficient than gasoline

Figure 2. Annual Recreational Gasoline Usage by Vehicle Type

VEHICLE TYPE	GALLONS OF FUEL USED
Off-road motorcycles	10,003,506
Off-road all-terrain vehicles	12,013,896
Off-road four-wheel vehicles	2,658,841
Snowmobiles	1,444,087
Other off-road vehicles	101,585
Total gasoline usage	**26,221,915**

Source: California Department of Parks and Recreation, *Estimating the State Fuel Tax Paid on Gasoline Used in the Off-highway Operation of Vehicles for Recreation*, September 2006

engines, they emit 25 to 400 times the amount of particulate black carbon and organic matter (soot) than gas-burning vehicles.[17] The warming from soot may offset any benefits from reduced carbon dioxide emissions, and scientists have increasingly focused on the need to control black carbon in conjunction with carbon dioxide reductions in order to slow global warming.[18]

The Continued Growth of Off-road Vehicle Emissions in California

Transportation is the largest single contributor of greenhouse gases in California, accounting for 38 percent of the state's total greenhouse gas emissions.[19] Off-road vehicle emissions account for a small but significant fraction of the state's overall greenhouse gas emissions, and emissions from this sector, if left unchecked, will continue to grow.

Motorcycle ascending scarred hillside in Jawbone Canyon, California. California off-road motorcycles together release more emissions than all other types of off-road vehicles in the state.
Photo by Howard Wilshire

Because only a small fraction of the population — about 15 percent — participates in off-road vehicle recreation, reductions in use will have no impact on a majority of Californians.[20] And because recreational off-road vehicle use is entirely discretionary, reductions in this source to levels at or significantly below 1990 levels may be used to offset other sources that are less discretionary or that involve higher costs. In a survey of Californians, walking was the activity with the highest participation percentage (91 percent) and trail hiking ranked ninth out of 55 (69 percent), while driving four-wheel-drive vehicles ranked 31st (19 percent) and riding all-terrain vehicles and dirt bikes ranked 38th (17 percent).[21]

Finally, as described in greater detail below, reducing greenhouse gas emissions from off-road vehicles will have important public health benefits for all Californians. It is only fair that reductions in emissions associated with an optional recreational pursuit contribute towards meeting the state's greenhouse gas emissions reductions targets. Meeting the state's ambitious goals of reducing greenhouse gas emissions means that all emissions sources must be addressed, and the Air Resources Board must acknowledge this fact by addressing the emissions associated with off-road vehicles.

Motorcycle in dune recreation area. Off-road motorcycles released an astounding average of 143 tons of emissions per day in 2006. (California Air Resources Board, http://www.arb.ca.gov/app/emsinv/emssumcat.php.)

Photo by George Wuerthner

Reducing Off-road Emissions by Reducing Overall Usage

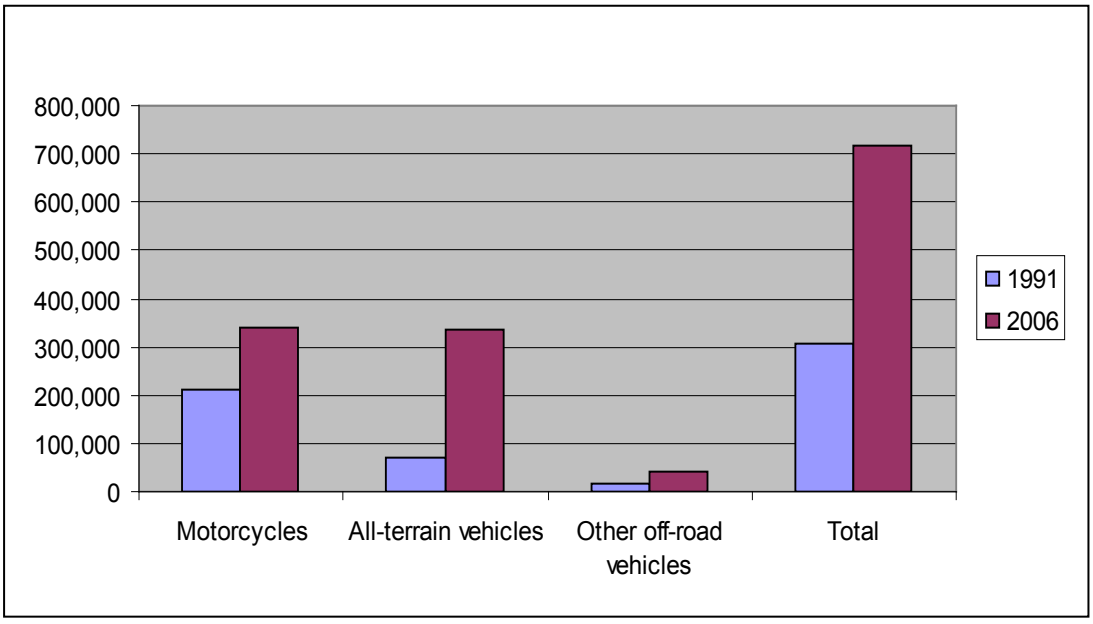
There are currently no regulations directly addressing the greenhouse gas emissions of off-road vehicles in California. In 2002, the United States Environmental Protection Agency issued final regulations setting new standards for emissions from off-road vehicles and snowmobiles.[22] However, this rule focused on carbon monoxide, nitrogen oxides, and volatile organic gases, and did not regulate greenhouse gas emissions. In 2004, the California Air Resources Board adopted regulations to comply with Assembly Bill 1493, California's Clean Vehicle Law, which commits the state to achieving the maximum feasible and cost-effective reduction of greenhouse gas emissions from passenger cars and light trucks sold in California. However, the Bush administration has so far blocked these regulations by refusing to provide Environmental Protection Agency approval. Most recently, the State of California petitioned the federal government for rule-making to address the greenhouse gas emissions from all non-road vehicles, including off-road vehicles,[23] but the Bush Administration is not expected to act on this petition.

Dust plume from off-road vehicle staging near public lands. Evidence shows that coarse particle pollution, most associated with off-road vehicles, is detrimental to human health.

Photo courtesy Community ORV Watch

While more efficient vehicles would produce less greenhouse gas per miles traveled, efforts to increase efficiency would generally apply only to new vehicles and would therefore fail to address the greenhouse gas emissions of all of the off-road vehicles already in use in California. At the same time, the use of off-road vehicles in California continues to increase. Registrations of all-terrain vehicles, snowmobiles, dune buggies, sand rails, and dirt bikes in California have more than doubled in the last 20 years.[24] In addition, there has been a 74-percent increase in street-licensed four-wheel-drive vehicles in California since 1994, and a more than 60-percent increase in the sale of sport-utility vehicles in the state from 1996 to 2002 (Figure 3).[25] Furthermore, California contains more than 1.1 million legally registered and illegal, unregistered off-road vehicles, and millions more sport-utility vehicles and motorcycles that are driven off road.[26]

Figure 3. Increase in Off-road Vehicle Registration, 1991-2006



Source: California Department of Parks and Recreation, *Estimating the State Fuel Tax Paid on Gasoline Used in the Off-Highway Operation of Vehicles for Recreation*, ICF International, September 2006, at 5-20; Memorandum from Department of Transportation to State Controller's Office, June 9, 1992

All told, the large number of off-road vehicles already in use in California, coupled with the expected increase in the number of users, makes it highly unlikely that higher efficiency requirements for new off-road vehicles alone could bring about a decrease in greenhouse gases. In addition, considering the ongoing political obstacles to regulations to increase vehicle efficiency, efforts to reduce greenhouse gas emissions from off-road vehicles as a group must focus on measures to limit their use and proliferation.

The Serious Public Health Effects of Off-road Vehicle Emissions

Off-road vehicles are typically powered by two-stroke engines that are highly inefficient and produce relatively high emissions of gases that harm the environment and can adversely affect human health.[27] The pollutants released in off-road vehicle exhaust include carbon monoxide, ozone, hydrocarbons, oxides of nitrogen and sulfur, and particulate matter.[28] Kasnitz and Maschke report: "One two-stroke off-road motorcycle or all-terrain vehicle emits as much hydrocarbon pollution per mile as 118 passenger cars, while relatively cleaner four-stroke engines still emit more than seven times the level of carbon monoxide as new cars."[29] Other studies report similar results.[30]

According to the Environmental Protection Agency, recreational vehicles account for nearly 10 percent of national mobile-source hydrocarbon emissions and about 3 percent of national mobile-source carbon monoxide emissions. If left uncontrolled, by 2020, these engines will contribute 33 percent of national mobile source hydrocarbon emissions, 9 percent of carbon monoxide emissions, 9 percent of oxides of nitrogen emissions, and 2 percent of particulate matter emissions.[31]

Dirt bike in all-terrain vehicle park. On an hour-by-hour basis, a motorcycle can emit as much pollution as more than 30 automobiles.

Photo by Laurel Hagen

On an individual basis, these vehicles have very high pollution rates. A two-stroke all-terrain vehicle or motorcycle can emit as much pollution (hydrocarbons, carbon monoxide, and nitrogen oxides) in one hour as more than 30 automobiles operating for one hour, and a snowmobile can emit as much as nearly 100 automobiles.[32] This pollution from emissions of hydrocarbons, carbon monoxide, and nitrogen oxides — as well as particulate matter — has been linked to respiratory disease, cancer, and premature death.[33] Pollution from off-road vehicles in California has continued to rise over the last several decades (Figure 4).

Ozone

Ground-level ozone, the primary and most health-damaging component of smog, is a toxic gas formed from ozone precursors including industrial emissions and gasoline vapors and can affect health even when found in small amounts. According to the California Air Resources Board, off-road motorcycles and all-terrain vehicles produce 118 times as much smog-forming pollution as modern automobiles on a per-mile basis.[34]

Figure 4. Increase in California Off-road Vehicle Pollution, 1990-2006

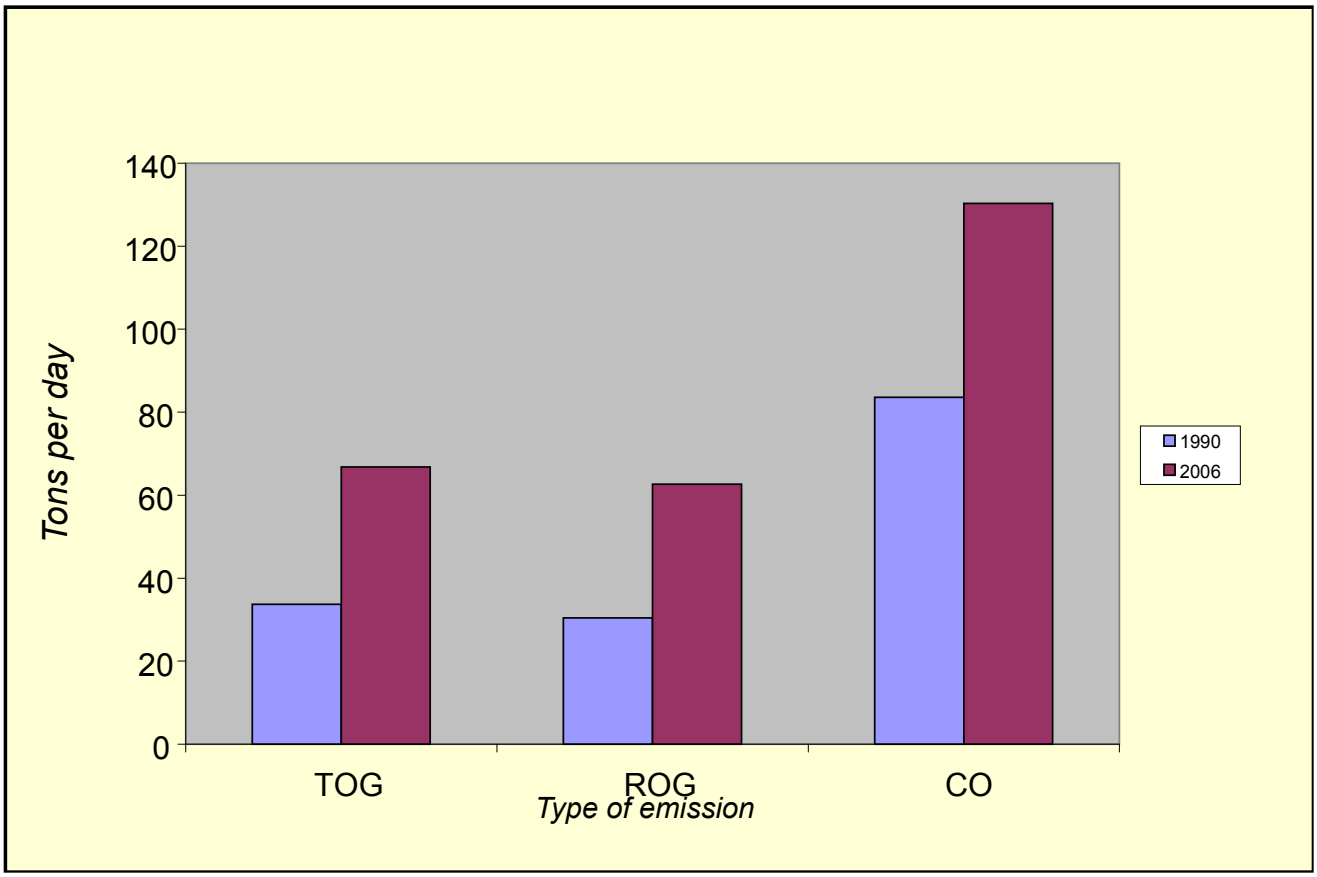


Figure 4: In California, emissions from off-road vehicles (all-terrain vehicles, dirt bikes and snowmobiles) of total organic gases (TOG) and reactive organic gases (ROG) have approximately doubled in the last 15 years while carbon monoxide (CO) emissions have shown a 56-percent increase.[43] Some of these pollutants are precursors to other pollutants. For example, oxides of nitrogen and reactive organic gases are precursors to ground level ozone and other greenhouse gases. Data from California Air Resources Board, http://www.arb.ca.gov/app/emsinv/emssumcat.php.

Ozone is a respiratory irritant and increased concentrations have been associated with reduced lung function and increased hospitalizations for asthma, especially for children or those with compromised respiratory systems.[35] Ozone can also have detrimental impacts on healthy populations. Studies of two healthy groups, outdoor postal workers in Taiwan and college freshmen who were lifelong residents of Los Angeles or the San Francisco Bay area, found that exposure to elevated ozone decreases lung function,[36] and chronic exposure may cause permanent lung damage.[37] Ozone has been linked to increased hospital admissions for respiratory conditions including respiratory infection, asthma, chest pain, cough, and significant decreases in lung function.[38]

Elevated ozone concentrations pose a serious health concern. The American Lung Association reports that one-third of the U.S. population lives in areas with unhealthy levels of ozone nationwide.[39] One in three Americans lives in a county where the monitored air quality places them at risk for decreased lung function, respiratory infection, and lung inflammation.[40] California is home to 13 of 20 counties nationwide where residents are at the greatest risk from ozone pollution.[41] This includes the six counties most at risk nationwide from ozone pollution: San Bernardino, Kern, Riverside, Los Angeles, Tulare, and Fresno.[42] Many of these counties contain popular off-road vehicle areas like San Bernardino County's Johnson and Stoddard valleys and Dumont Dunes (among many others).

According to the California Air Resources Board, dirt bikes and all-terrain vehicles produce 118 times as much smog-forming pollutants as cars.

Particulate Matter

The subset of particulate matter known as PM_{10} consists of fine particulate matter of 10 microns or less that is a mixture of airborne solid particles and liquid droplets from both man-made and natural sources. It is generally caused by wind-blown sources of dust or the interaction of sulfur oxides, nitrous oxides, and volatile organic compounds. Particle air pollution is the biggest and most pervasive air pollution risk humans face.[43] Particulate matter can be emitted directly into the atmosphere by combustion sources, including off-road vehicles, or it can be created by the combination of gases such as nitrous oxide and sulfur dioxide, both of which are also released by off-road vehicles. Like ozone and carbon monoxide, nitrogen oxides and sulfur dioxide are associated with decreased lung function.[44] When inhaled, particulate matter irritates the respiratory tract.[45] Due to the small size of some particles, they are easily inhaled and can lodge in the lungs, causing respiratory and cardiovascular health consequences, as well as increased hospital admissions of the elderly and children when particulate-matter levels increase. [46, 47]

Dust is also a component of particle pollution, making unpaved roads the largest single source of particulate matter.[48] Off-road vehicles disturb soil crusts, crush soil, and generate wind that results in the creation and release of dust into the air. Because wind can disperse suspended particulates over long distances, dust raised by off-road vehicle traffic can disperse contaminants carried by dust well beyond a given off-road vehicle-use area. In 1973, for example, satellite photos detected six dust plumes in the Mojave Desert covering

more than 656 square miles, all attributable to off-road vehicle activities.[49]

Particle pollution is a significant threat nationwide. The American Lung Association reports that one in three people in the United States lives in an area where they are subject to short-term exposure to particle pollution, while one in five people lives in an area where they are subject to exposure to unhealthy year-round levels of particle pollution.[50] Even at low levels, exposure to particles over time can increase risk of hospitalization for asthma, damage to the lungs, and — most significantly —the risk of premature death.[51]

Particle pollution is particularly serious in California when compared to other states. According to the Environmental Protection Agency, 16 California counties exceed accepted levels of particulate matter.[52] In fact, the state is home to four of the five most polluted counties nationwide for both short-term and year-round particle pollution.[53]

While the health affects associated with particulate matter are especially severe for fine particles ($PM_{2.5}$), there is evidence that coarse particle pollution (PM_{10}), most often associated with off-road vehicles, is also detrimental to health. Studies have found that for each 10 microgram-per-cubic-meter increase in PM_{10}, there was a 1-percent increase in hospital admissions for cardiovascular disease, and about a 2-percent increase in admissions for pneumonia and chronic obstructive pulmonary disease. Investigators concluded that their analysis provided "new and strong evidence" linking PM_{10} air pollution to adverse health effects.[54]

Another study reported that deaths from respiratory diseases were associated with PM_{10} and total suspended particulates. They found that relative risks for coarse particles were similar to those for fine particles and even higher in the case of ischemic heart disease and stroke. The authors concluded that "the finding of elevated and significant effects for $PM_{10-2.5}$ suggests that there may still be a rationale to consider the health effects of the coarse fraction as well as the fine fraction of particulate matter."[55]

Other studies support the idea that coarse particles contribute to respiratory diseases and cardiovascular hospitalizations.[56]

Although many peer-reviewed studies have examined the effects of particulate matter on health, relatively few have specifically addressed coarse particles, and those that have often focus on short-term exposures. The impacts of long-term exposure to coarse particles is an area in which more research is likely needed.

Carbon Monoxide and Oxides of Nitrogen

In addition to its serious impacts on the environment, carbon monoxide poses serious health risks because it strongly binds to hemoglobin in the blood, thereby reducing the amount of oxygen that reaches the organs. Exposures to low levels affect the most oxygen-sensitive organs of the body — the heart and the brain — and can result in fatigue, angina, reduced visual perception and dexterity, and even death. Further, though not a greenhouse gas itself, carbon monoxide can increase the lifespan of greenhouse gases, increase the production of ground-level ozone, and worsen climate change.[57] Transportation accounts for the majority of carbon monoxide released nationwide and in 2000, the Environmental Protection Agency determined that recreational vehicles cause or contribute to ambient carbon monoxide in more than one nonattainment area, including Los Angeles.[58]

In 2001, the Environmental Protection Agency found that all-terrain vehicles, a subset of off-road vehicles, emit more than 381,000 tons of hydrocarbons, 1,860,000 tons of carbon monoxide, and 11,000 tons of oxides of nitrogen each year across the country.[59] The emissions of oxides of nitrogen alone

are equivalent to the annual greenhouse gas emissions from 566,575 passenger vehicles.[60] The Environmental Protection Agency has adopted National Ambient Air Quality Standards for some air pollutants that are of particular concern from a health perspective — including particulate matter, nitrogen oxide, carbon monoxide, sulfur dioxide, and ozone — which define maximum concentrations of these substances that are allowed in the air. However, many areas in California are not yet in compliance with these standards.[61]

The Environmental Protection Agency estimated that its 2002 rules regulating emissions from off-road vehicles and snowmobiles would avoid 1,000 premature deaths, prevent 1,000 hospital admissions, reduce 23,400 cases of asthma attacks, and reduce 200,000 days of lost work.[62] It is estimated that these health benefits will equal a total of $8 billion in 2030.[63]

Still, even with the new regulations, unhealthy emissions from all types of recreational vehicles continue to increase in California (Figure 6). By regulating emissions from these vehicles, California will help protect the health of its residents.

Figure 6. Increase in Pollution by Vehicle Type in California, 1990-2006

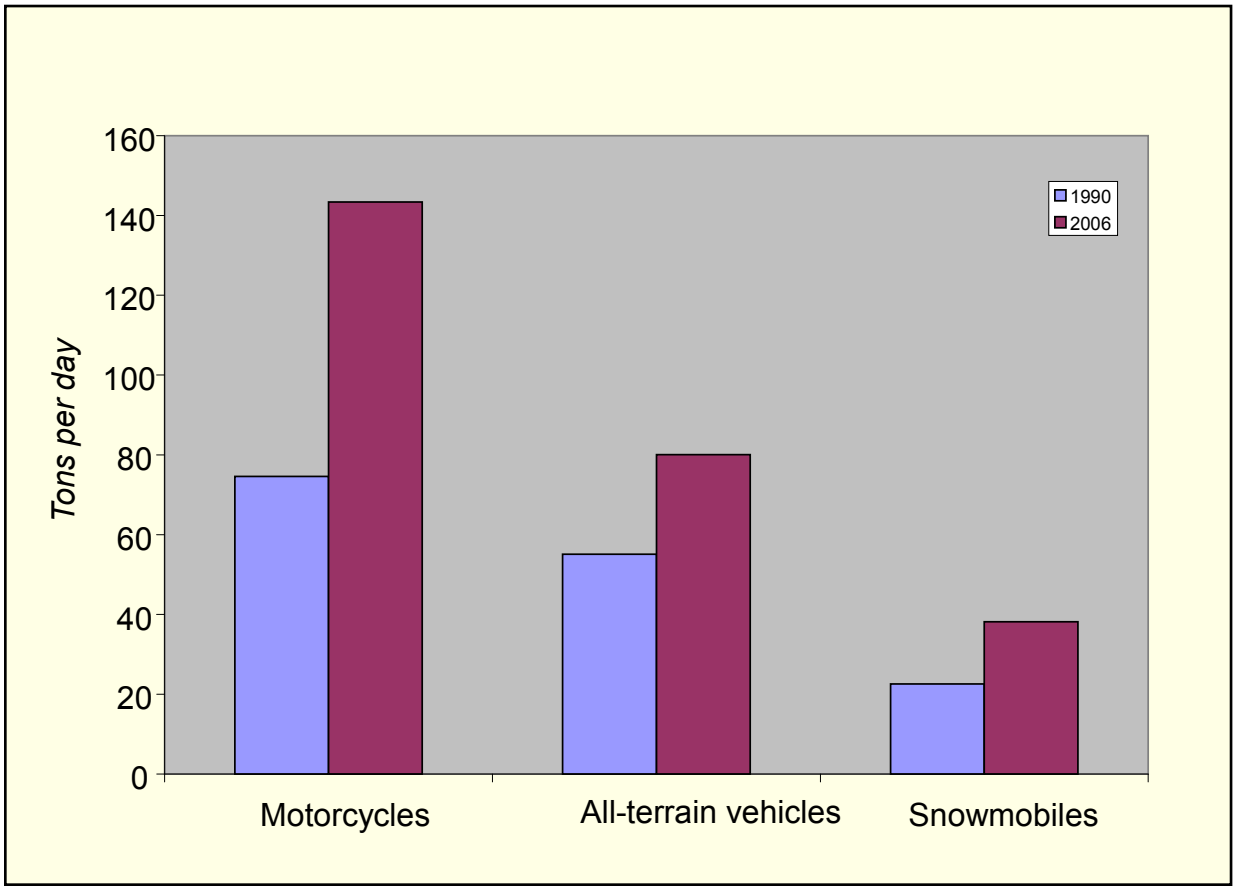


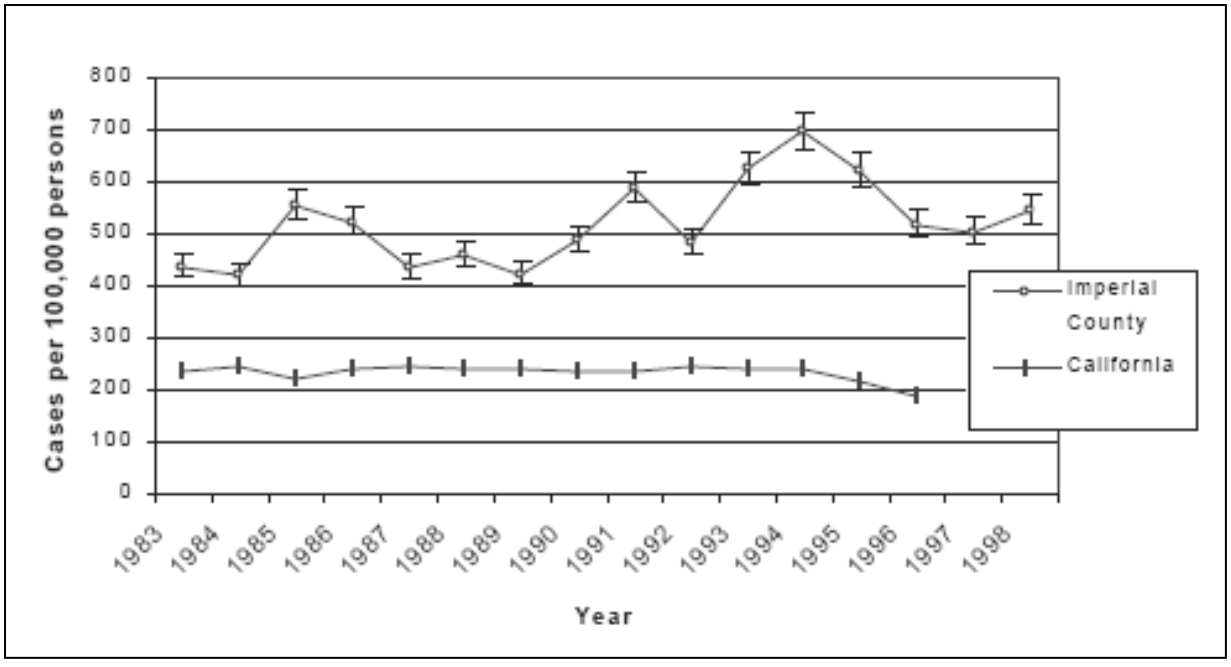
Figure 6: Each type of off-road vehicle showed an increase in total emissions (ROG, TOG, CO, NOx and SOx) over the past 15 years. Off-road motorcycles (dirt bikes) release the most, averaging about 143 tons (equivalent to the weight of 103 Toyota Priuses) of emissions per day in 2006. This was nearly double the average emissions (an increase of 95 percent) from dirt bikes in 1990. Over the same time period, all-terrain vehicles had an approximately 45-percent increase in total emissions, while snowmobiles had a 72-percent increase. Regulations require that the state of California cut overall greenhouse gas emissions to return to 1990 levels by the year 2020. Data from California Air Resources Board, http://www.arb.ca.gov/app/emsinv/emssumcat.php.

Case Study: Imperial County

Imperial County in southern California covers more than 4,597 square miles, bordering on Mexico to the south, Riverside County to the north, San Diego County on the west, and the state of Arizona to the east. The region currently exceeds federal standards for the particulate matter PM_{10} and both federal and state standards for ozone, and it has exceeded federal and state standards for both pollutants since 1996.[64,65,66] Local surveys report that some locations measure more than 10 times the maximum allowable federal standard for particulate matter and that Imperial County suffers from the worst particulate air pollution in California.[67] In fact, particulate matter concentrations in Imperial Valley have been measured at double the level deemed by the Environmental Protection Agency to cause significant harm to health.[68] The American Lung Association gave Imperial County an "F" for its failure to meet ozone standards and a "D" for its performance in terms of particle pollution.[69]

As described above, the adverse health effects from particulate matter and ozone pollution are severe — and their impacts on Imperial County's residents are readily apparent. Asthma is a serious problem, and Imperial has the highest child asthma rate of any county in California (Figure 7).[70] Asthma rates in Imperial County increased by 59 percent from 1983 to 1994. The county's maximum ozone levels increased by 64 percent, and particulate-matter

Figure 7. Age-adjusted Childhood Asthma Hospitalization Rates and 95-percent Confidence Intervals for Imperial County and California, 1983-1998



This graph shows the childhood asthma rate intervals for Imperial County and California from 1983 to 1998. Overall, the state's rate is fairly constant and is much lower than Imperial County's, which shows much more fluctuation and an overall upward trend. The statewide rate is decreasing; however, the county's rate is once again on the rise at the end of this study period and to the present.

Source: Imperial County Public Health Services

levels are four times higher in Imperial than in neighboring San Diego County.[71]

The California Department of Public Health Services recently found that Imperial County has the highest asthma hospitalization rates in the state for all race/ethnicity groups among all ages and for most race/ethnicity groups among children.[72] Rates of respiratory diseases continue to worsen.[73] Air pollution is blamed as a contributor to the high rates of asthma, bronchitis, pneumonia, and allergies in this region, especially among children between the ages of one and 14 years.[74] Children are especially at risk, as are the elderly, asthmatics, and those with chronic pulmonary disease or heart disease (Figure 7).

Off-road vehicle use on public lands in Imperial County is a major contributor to the county's air quality problems. In fact, the federal Bureau of Land Management has stated that off-road vehicles are one of the county's most significant sources of the harmful pollutants ozone, oxides of nitrogen, carbon monoxide, and particulate matter.[75] Off-road vehicle emissions also contribute to the county's increased levels of reactive organic gases.

Figure 7. Imperial County Public Health Statistics

CONDITION	NUMBER OF CASES
Pediatric asthma	4,201
Adult asthma	7,813
Chronic bronchitis	4,335
Emphysema	1,731
Cardiovascular disease	31,151
Diabetes	7,437
Total population with any of above conditions	**155,823**
Population younger than 18	47,199
Population 65 and older	**16,035**

Source: American Lung Association, *State of the Air: 2007*

Still, federal and state agencies continue to encourage off-road vehicle use throughout Imperial County. On holiday weekends, the Imperial Sand Dunes Recreation Area, run by the federal Bureau of Land Management, can be used by hundreds of thousands of off-road vehicle users. Other popular federal off-road vehicle areas include Superstition, Plaster City, Heber Dunes, and parts of the California Desert Conservation Area. State-run areas allowing off-road vehicle use include the Ocotillo Wells State Vehicular Recreation Area on the border of San Diego and Imperial counties, Desert Cahuilla, and portions of Anza-Borrego Desert State Park.

The high concentration of off-road vehicle use in Imperial County, coupled with the poor public health of its residents — which studies partially correlate to air pollution — implies that there is a need for further research. This research should focus on the contribution of off-road vehicles to pollution in the county and should seek to parse out the impacts that off-road vehicle pollution is having on poor public health. In the meantime, considering Imperial County's record-high childhood-asthma rates together with its massive off-road vehicle use — and the severe health implications of its violation of federal and state air-pollution standards — isn't it time for the state and federal governments to rein in anything that may be contributing to these increased levels, including off-road vehicle pollution?

Off-road Vehicles' Exemption From California Emission Standards

In the 1990s, the California Air Resources Board attempted to address the air-quality impacts of recreational pollution by adopting emission-control regulations for new off-road recreational vehicles, including off-road motorcycles (dirt bikes) and all-terrain vehicles.[76] The regulations require that all off-road recreational vehicles sold in California, model year 1998 and later, are certified by the Board to meet state emissions standards.[77] But manufacturers and off-road vehicle groups, while initially supportive, soon balked at the new regulations, claiming that the requirements decrease off-road vehicle sales.[78] Off-road vehicle user groups and industry representatives mounted an intense lobbying campaign urging the Board to weaken the new regulations.

Red stickers allow off-road vehicles that do not meet state emission standards to be used throughout much of California for most of the year.

In 1998, the California Air Resources Board succumbed to industry pressure and approved amendments to the new emission regulations that allow the continued operation of especially polluting off-road vehicles.[79] This clause distinguished types of off-road vehicle registration based on compliance (or noncompliance) with California's exhaust emission standards. Emission-compliant dirt bikes and all-terrain vehicles were (and still are) eligible for a "green-sticker" registration that allows them to be operated year round. Noncompliant dirt bikes and all-terrain vehicles were (and still are) eligible for a "red-sticker" registration and are subject to usage restrictions

Despite violating emissions standards, polluting "red-sticker" vehicles may still be ridden in many places during many months of the year (Appendix A).[80] A red sticker merely limits recreational use in certain places to those months of the year determined by the California Air Resources Board to have the lowest levels of ozone pollution — mainly, the months of fall, winter, and spring. To make matters worse, the California Air Resources Board grandfathered in all off-road vehicles manufactured before 2003. A press release from California State Parks explains: "Because of the confusion as to which vehicles required which stickers … to start with a clean slate, the DMV will provide Green Stickers to all 2002 model year and older OHVs, regardless of emission standards."[81]

Instead of re-evaluating each vehicle to ensure compliance, the Board revised its regulations once again so that all 2002 model year and older off-road vehicles would receive green stickers, even if these same vehicles had previously been certified as noncompliant based on their emissions.

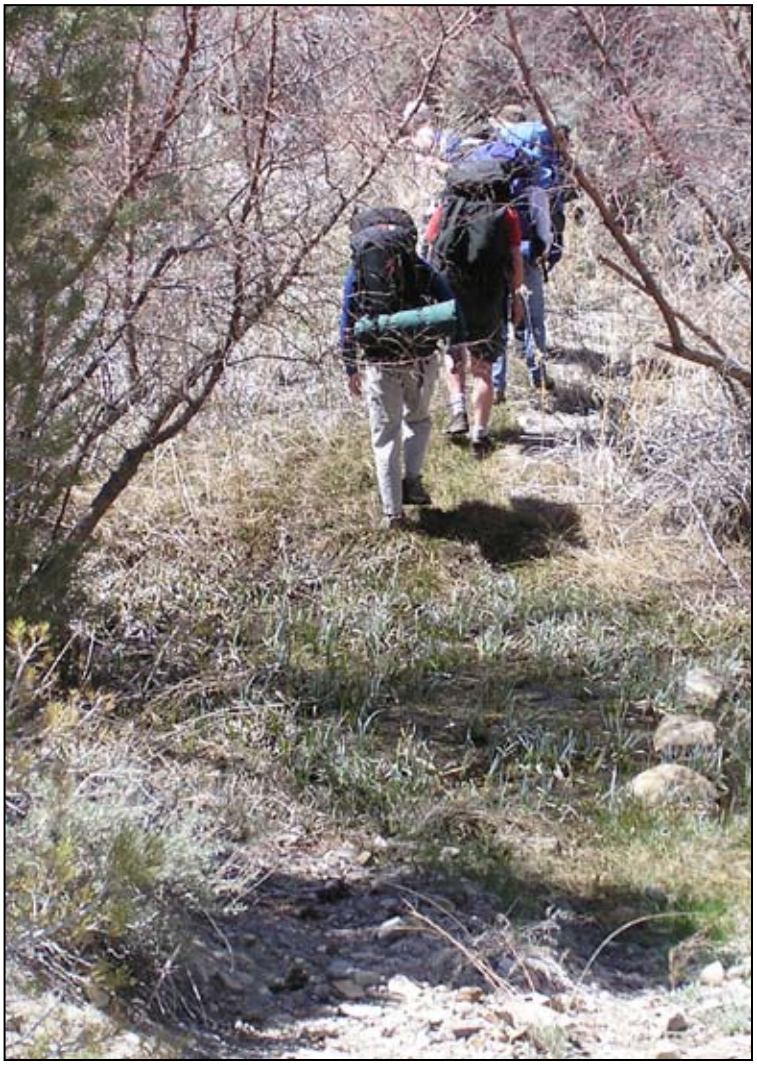
To date, off-road vehicles that do not comply with state emission standards may still be sold in the state and used throughout much of the year in California, creating a loophole in the state's emissions regulations that undermines its commitment to protecting the public health of its residents.

Biological and Cultural Benefits of Limiting Off-road Vehicle Use

The impacts of off-road vehicles on the environment have been well documented. Off-road vehicle use impairs water quality, degrades wildlife habitat, threatens California's archeological heritage, and destroys the peace and quiet that Californians want and expect from the great outdoors.[82]

Encouraging Quiet Outdoor Recreation

Most people visit the outdoors seeking peace and quiet, wanting to recharge their batteries by taking a break from the ever-increasing pace of modern life. Walking, hiking, wildlife viewing, camping, and picnicking are among the most popular outdoor recreation activities of Californians,[83] while off-road vehicle use, riding dirt bikes, and snowmobiling are among the least popular.[84] Muscle-powered recreationists, including hunters, anglers, bird watchers, cross-country skiers, and hikers — which make up the largest user group on public lands and overall in California — are losing access to places where ecological integrity is intact and quiet prevails. Reducing off-road vehicle traffic would mean more opportunities for quiet recreationists to enjoy peaceful and undisturbed experiences in nature.



Hikers near Furnace Creek. Hiking ranked ninth out of 55 in a study of the most popular outdoor activities in California. Off-road vehicle use ranked 38th.
Photo by Daniel Patterson

Improving Water Quality

Off-road vehicle use near streams, rivers, and lakes can degrade water quality, both negatively impacting the creatures who live there and creating a serious threat to the quality of our drinking water.[85]

Off-road vehicles expel 20 to 30 percent of their oil and gasoline unburned, releasing it into air and water.[86] With off-road vehicle use exceeding 80 million visitor days in national forests alone, tens of millions of gallons of gasoline and motor oil likely enter the soils and waters of our public lands each year as a result of inefficient combustion and emissions.[87] This is significant because national

forests are the largest and most important water source in the United States: more than 60 million Americans in 3,400 communities from 33 states get their drinking water from watersheds that originate on our national forests and grasslands.[88]

Areas on the Inyo National Forest and surrounding lands managed by the Bureau of Land Management show evidence of degraded water quality and habitat due to off-road vehicles. The Bureau of Land Management found that Furnace Creek in the White Mountains does not meet the Bureau of Land Management's standards for a properly functioning riparian system. They report:

Presently, portions of the Furnace Creek drainage are considered ''functional-at risk.''

Riparian-wetland areas are considered ''functional-at risk'' when an existing soil, water, or vegetation condition makes them susceptible to degradation. Presently, there are seven locations in Furnace Creek where the existing vehicle route crosses the stream. Significant erosion and sedimentation of the stream are occurring at two stream crossings. Erosion in both locations is contributing excessive sediment to the adjacent riparian area. Moreover, headcutting is forming at both locations. Headcuts are a fluvial geomorphic feature indicative of unstable conditions. The proposed closure order is consistent with protecting and restoring Furnace Creek to a "properly functioning" riparian system.[89]

Although Furnace Creek is not a key source of drinking water, it is a good example of what recreational off-road vehicle use can do to a stream and surrounding habitat. Both air and water pollutants have been shown to have measurable impacts to stream environments.[90] In addition to releasing pollutants, off-road vehicles cause erosion and sedimentation that pours dirt directly into streams and rivers, also degrading water quality and habitat for animals that are key to functioning riparian ecosystems.[91]

Another example of a degraded waterway is the Pajaro River, listed as an "impaired water body"

Mud pit created by off-road vehicles near Furnace Creek.
Besides emitting greenhouse gases, off-road vehicles can do tremendous damage to public lands.
Photo by Paul McFarland

under the federal Clean Water Act, which flows into the protected Monterey Bay National Marine Sanctuary and which faces a number of problems including erosion, sedimentation, and pollution.[92] Off-road vehicle activity has directly impacted water quality in this watershed and has exacerbated sediment migration and degraded habitat along riparian corridors and in the Clear Creek area.[93] Reducing off-road vehicle use in California has the potential to increase the quality of drinking water for Californians and the creatures that need this habitat for survival.

Reducing Wildlife Habitat Degradation

Off-road vehicle recreation has severe impacts on wildlife and habitat. It is the third-leading cause of species endangerment — behind only direct habitat destruction and invasive species — and 43 percent of California's threatened and endangered species are declining in whole or in part because of off-road vehicles, including the Peninsular bighorn sheep, Mojave fringe-toed lizard, snowy plover, and Peirson's milk-vetch.[94] A reduced number of off-road vehicles would provide these and other species an opportunity to survive, thus preserving an important part of California's natural legacy. On a larger scale, the greatest impacts of off-road vehicles to species and habitats may be the greenhouse gases that contribute to global warming.

Helping Preserve Archeological Sites

California's lands are rich with cultural and archeological resources that also can be destroyed by off-road vehicles. According to the Bureau of Land Management, prehistoric sites in the California desert have been "run over and ridden through, and tires have been spun on them," leading to the degradation or complete destruction of archeological sites thousands of years old.[95] For example, "donuts" or off-road vehicle tracks, were recently found through ancient sleeping circles in the Desert Cahuilla area adjacent to Anza Borrego State Park. Not only would reducing off-road vehicle use help protect California's land, air, and water — it would also contribute to the preservation of the state's cultural heritage for future generations to enjoy.

Peirson's milk-vetch in flower. Off-road vehicle use is one of the biggest obstacles to the recovery of the threatened Peirson's milk-vetch.
Photo by Andreas Chavez

California's Continued Support for Off-road Vehicle Use — Despite the Consequences

Currently, more than 200 private, county, state, and federal sites in California are open to off-road vehicle use, and regardless of these vehicles' significant impacts to public health, the global climate, and local ecosystems, the state continues to encourage expanded off-road vehicle recreation on public lands.

Off-road Vehicle Use on State Lands

The Off-Highway Motor Vehicle Recreation Division of California's Department of Parks and Recreation manages six state vehicular recreation areas to provide off-road vehicle opportunities.[96] Attendance at these areas increased by 52 percent between 1985 and 2000 — with a corresponding increase in greenhouse gas emissions.[97] Still, the Off-Highway Motor Vehicle Recreation Division is calling for an increase in new off-road vehicle facilities in the coming years.[98]

Sport utility vehicles churning up dust
Photo by Larry Hogue

Other state lands also allow off-road vehicle use. Anza Borrego Desert State Park, for example, contains more than 500 miles of roads for four-wheel-drive and all-terrain vehicles and dirt bikes. Overall, the state of California provides thousands of miles of routes for off-road vehicle use throughout its state parks and more than 105,000 acres in state vehicular recreation areas. The use in state vehicular recreation areas shows an overall increase from 1992 to 2001 with estimated visitors in 2001 reaching more than 2.3 million (see Appendix B).[99]

Despite this, there has been little effort to consider the impacts of this growth on global climate change and emissions by the Department of Parks and Recreation. The Department's two-page "Response to Climate Change" devotes only a single paragraph to the Off-Highway Motor Vehicle Recreation Division, stating simply that the agency will take actions consistent with the Department's direction and will retrofit its trucks to comply with new California Air Resources Board standards.[100] There is virtually no mention of the significant climate and health effects of continued and expanded off-road vehicle use and no evidence of effort to avoid or mitigate greenhouse gas emissions associated with state-supported off-road vehicle use.

Off-road Vehicle Use on Federal Lands

California's federal lands offer millions of very accessible acres and thousands of miles of trails

for off-road vehicle use. According to the Government Accounting Office, California boasts twice as many areas offering off-road vehicle recreation opportunities than in any other state[101] — and the state itself is the primary supporter of off-road vehicle recreation on these lands. (See Appendix C for a breakdown of federal lands open to off-road vehicle use.)

The Angeles National Forest in southern California, for example, is within an hour's drive of Los Angeles and currently provides 364 miles of designated off-road vehicle routes and more than 10,000 acres for open off-road vehicle use. Off-road vehicles contribute to poor air quality in Los Angeles, a non-attainment area, by releasing carbon monoxide and other contaminants into the air.[102] Still, the State of California spent $5.6 million between 1983 and 1998 to support off-road vehicle recreation on the Forest, including $401,720 to construct 36 miles of off-road vehicle trails in 1983 and $361,000 to develop another 58 miles of off-road vehicle routes in 1988. [103]

All told, the state provided the U.S. Forest Service with more than $58 million to support off-road vehicle recreation between 1983 and 1999.[104] Funding has continued for the past 25 years and in fact has expanded in recent years. For example, in 2006 and 2007, California sent the federal government more than $25 million to support off-road vehicle recreation and management on federal lands in the state.[105] Despite California's goals of reducing greenhouse gas emissions and protecting public health, its support for off-road vehicle recreation on federal lands continues.

Currently, all California national forests are undergoing travel-management planning to designate roads, trails, and areas where off-road vehicles are specifically allowed. [106] The Bureau of Land Management occasionally revises management guidelines for its lands open to off-road vehicles. But to date, the State of California has taken no substantive position regarding the climate change and public health implications of state-supported off-road vehicle recreation on public lands.

Tracks near Anza-Borrego Desert State Park. The California Department of Parks and Recreation has done little to address the climate change implications of off-road vehicles' increasing greenhouse gas emissions.
Photo by Larry Hogue

Recommendations

In order to prevent needless off-road vehicle pollution from further imperiling the global climate and public health, the California Air Resources Board must limit overall greenhouse gas emissions from off road vehicles to the maximum extent possible. Consistent with Assembly Bill 32 and the governor's executive order, a reduction to 1990 levels by 2020 should be considered only as the minimum reduction alternative. Such a limitation will ensure that recreational off-road vehicles are reducing emissions at the same pace as are other sectors of the population and will have important health benefits for Californians.

Off-road motorcycle in dune recreation area. No new state off-road vehicle sites should be established unless they fit an overall scheme to reduce off-road vehicle emissions to 1990 levels.
Photo by George Wuerthner

There are two ways to effectively limit greenhouse gas emissions from off-road vehicles: capping the number of vehicles registered and limiting their use. The surest way to limit overall off-road recreation emissions is to reduce the amount of off-road recreation allowed on both state and federal public lands throughout California. Specifically, the following should be achieved:

- **Reduction of greenhouse gas emissions from off-road vehicle use in state vehicular recreation areas and other state lands to at least 1990 levels**

The California Air Resources Board must analyze the amount of greenhouse gases being emitted from off-road vehicle use within state vehicular recreation areas and other state lands, while the Department of Parks and Recreation ensures that, at a minimum, off-road vehicle emissions from these areas are reduced to 1990 levels. Further emission reductions may be required if federal agencies do not reduce emissions from off-road vehicles on federal lands.

No new state off-road vehicle sites should be established unless they are consistent with an overall

scheme to reduce total off-road vehicle emissions to 1990 levels.

Hillside scarred by off-road vehicle use. The California Department of Parks and Recreation now provides tens of millions of dollars to federal agencies to promote and manage polluting and damaging off-road vehicles. Photo by Chris Kassar

• **Enforced federal management of California off-road recreation limiting off-road vehicle emissions to, at a minimum, 1990 levels**

Because significant greenhouse gas emissions arise from off-road vehicle use on federal lands, the State of California must ensure that those emissions are reduced along with emissions from other sources. The state should ensure that federal agencies managing off road vehicles in California are limiting greenhouse gas emissions from discretionary recreational off-road vehicle use; a reduction in this source to 1990 levels by 2020 should be considered as the minimum reduction alternative. The state should also deny financial support and permits to federal agencies that do not meet this target.

First, this requires that the California Air Resources Board adopt rules that call for the rejection of applications for new, continued, or expanded off-road vehicle use on federal lands from federal agencies or districts that do not have an adequate plan to reduce overall off-road vehicle emissions from their jurisdiction to, at a minimum, 1990 levels.

Second, this means that the Off-Highway Motor Vehicle Recreation Division should adopt rules requiring the rejection of applications for funding from federal agencies or districts that do not have a sufficient plan to reduce overall off-road vehicle emissions from their jurisdiction to the maximum extent possible — at a minimum, to 1990 levels by 2020. Currently, the California Department of Parks and Recreation provides tens of millions of dollars to federal agencies to promote and manage off-road vehicles.

Finally, the State of California should provide substantive comments on federal land-use plans and proposals that will result in increased greenhouse gas emissions. The California Air Resources Board and other state agencies should take substantive positions on proposed federal land management plans — including pending travel-management plans — and projects that urge federal land management agencies to ensure that each plan or project is consistent with an overall plan to reduce off-road vehicle emissions to at least 1990 levels. The state should encourage a cap on off-road vehicle use on federal lands that is scaled to achieve maximum emission reductions.. To date, California has not offered consistent substantive comments on federal land-use proposals that will impact global climate change.

• A cap on the number of registrations issued for off-road vehicles in California.

The Department of Motor Vehicles should cap off-road vehicle registrations to achieve an emission reduction to, at a minimum, 1990 levels, which should be adjusted depending on the effectiveness of limitations on use described above. Because registration enforcement is lax, additional resources will be required for effective enforcement. Additionally, the California Air Resources Board should immediately address the adverse public health effects and climate implications of non-conforming off-road vehicles.

• Elimination of loopholes that allow continued use of polluting off-road vehicles that fail to meet state emission standards.

Just as California does not allow the continued use of automobiles that do not meet state emission standards, the state should not allow use of off-road vehicles that fail to comply with state standards. The California Air Resources Board should eliminate the "red-sticker" loophole that allows continued use of polluting off-road vehicles that do not meet state emission standards.

• Rejection of continued or expanded off-road vehicle use on federal lands in areas that do not meet air quality standards.

California must certify that proposed land uses on federal lands conform with the state's enforcement of the Clean Air Act. To date, the state regularly approves these uses — even in non-conforming areas like Imperial County — without significant evaluation. The California Air Resources Board should reject proposals to continue or expand off-road vehicle recreation on federal lands in areas that do not meet air quality standards.

Off-road vehicle tracks with run-over sign. Enforcement of rules is lax on public lands. The Department of Motor Vehicles will need more resources to institute and enforce a cap on off-road vehicle registrations.
Photo by Larry Hogue

Conclusion

The State of California has developed laudable goals to reduce greenhouse gas emissions and protect the health of California residents. Exhaust from off-road vehicles contains the same greenhouse gases as emissions from cars — and significantly more pollution. In addition, just as the number of cars on the road has increased, off-road vehicle use has skyrocketed in the last 20 years. The continued rise of off-road vehicle recreation — and the pollution and greenhouse gas emissions associated with it — threaten to undermine the state's goals for reversing climate change and improving public health.

The California Air Resources Board must place recreational off-road vehicle pollution on the table with emissions from automobiles, smokestacks, and other polluters. The state must take immediate action to prevent off-road vehicle pollution from continuing to jeopardize the public health of California residents, contributing to disastrous changes in climate, and otherwise harming California's natural and cultural heritage.

Dust plume from off-road vehicle staging near public lands
Photo courtesy Community ORV Watch

Appendix A: Off-road Vehicle Riding Areas Open to Non-compliant Vehicles

California Air Resources Board (CARB) Non-compliant OHV (Red Sticker) Riding Season Schedule		Map Area ID	Red Sticker Riding Season	
			Riding Starts	Riding Ends
State Vehicular Recreation Areas (SVRA)				
SVRA	Clay Pit	38	1-Sep	30-Jun
State Recreation Area (SRA)	Mammoth Bar	40	Year round	
SVRA	Prairie City	53	1-Oct	30-Apr
SVRA	Carnegie	65	1-Oct	30-Apr
SVRA	Hollister Hills	75	1-Oct	31-May
SVRA	Oceano Dunes	87	Year round	
SVRA	Hungry Valley	102	1-Oct	30-Apr
SVRA	Ocotillo Wells	124	1-Oct	31-May
SVRA	Heber Dunes	128	Year Round	
Bureau of Land Management (BLM)				
Northern California				
BLM Arcata Field Office	Samoa Dunes	6	Year round	
BLM Redding Field Office	Chappie-Shasta ORV Area	8	1-Oct	30-June
BLM Eagle Lake Field Office	Fort Sage OHV Area	16	Year round	
BLM Ukiah Field Office	South Cow Mountain Recreation Area	36	Year round	
BLM Ukiah Field Office	Knoxville Recreation Area	37	Year round	
Bakersfield District				
BLM Hollister Field Office	Clear Creek Management. Area	76	1-Oct	31-May
BLM Bishop Field Office	Bishop Resource Area	82	Year round	
California Desert District				
BLM Ridgecrest Field Office	Olancha Dunes	96	Year round	
BLM Ridgecrest Field Office	Jawbone Canyon, Dove Springs	103	1- Sep	31-May
BLM Ridgecrest Field Office	Spangler Hills	104	1 Sep	31-May
BLM Barstow Field Office	Dumont Dunes	105	Year round	
BLM Barstow Field Office	El Mirage	109	1-Oct	30-Apr
BLM Barstow Field Office	Stoddard Valley	110	1-Sep	31-May
BLM Barstow Field Office	Rasor	111	1-Sep	31-May
BLM Barstow Field Office	Johnson Valley	115	1-Sep	31-May
BLM Needles Field Office	Eastern Mojave Desert Areas	118	Year round	
BLM Lake Havasu Field Office	Parker Strip	120	Year round	
BLM Palm Springs Field Office	Colorado Desert Areas	122	1-Oct	30-Apr
BLM El Centro Field Office	Lark Canyon	127	1-Oct	30-Apr
BLM El Centro Field Office	Arroyo Salado	125	1-Oct	31-May
BLM El Centro Field Office	Superstition Mountain	129	1-Oct	31-May
BLM El Centro Field Office	Plaster City	130	1-Oct	31-May
BLM El Centro Field Office	Imperial Dunes-Mammoth Wash	131	Year round	
BLM El Centro Field Office	Imperial Dunes-Glamis/Gecko	132	Year round	
BLM El Centro Field Office	Imperial Dunes-Buttercup Valley	133	Year round	

United States Forest Service (USFS)				
Shasta-Trinity National Forest				
Mc Cloud Ranger District	McCloud Area	5	Year round	
Hayfork Ranger District	Hayfork Area	7	Year round	
Plumas National Forest				
Mt. Hough Ranger District	Deadman Springs, Snake Lake	18	Year round	
Mt. Hough Ranger District	Big Creek, Four Trees, French Creek	20	Year round	
Feather River Ranger District	Cleghorn Bar, Poker Flat	22	Year round	
Beckworth Ranger District	Gold Lake	25	Year round	
Beckworth Ranger District	Dixie Mountain	27	Year round	
Mendocino National Forest				
Upper Lake Ranger District	Lake Pillsbury	33	Year round	
Upper Lake Ranger District	Elk Mountain Area	34	Year round	
Grindstone Ranger District	Davis Flat	35	Year round	
Tahoe National Forest				
Downieville Ranger District	Downieville Area	23	Year round	
Foresthill Ranger District	Foresthill OHV Area	49	Year round	
Foresthill Ranger District	China Wall	50	Year round	
Nevada City Ranger District	Nevada City District Areas	41	Year round	
Nevada City Ranger District	Fordyce	42	Year round	
Sierraville Ranger District	Sierraville Area	30	Year round	
Truckee Ranger District	Truckee District Area	43	Year round	
Truckee Ranger District	Prosser Hills Area	44	Year round	
Lake Tahoe Basin Management Unit	Kings Beach	47	Year round	
Eldorado National Forest				
Georgetown Ranger District	Mace Mill, Rock Creek	51	Year round	
Pacific Ranger District	Barrett Lake	52	Year round	
Stanislaus National Forest				
Calaveras Ranger District	Corral Hollow, Spicer	58	Year round	
Summit Ranger District	Niagara Ridge Area	60	Year round	
Mi-Wuk Ranger District	Crandall Peek, Deer Creek Area	62	1-Oct	31-May
Mi-Wuk Ranger District	Hunter Creek	63	1-Oct	31-May
Mi-Wuk Ranger District	Hull/Trout Creek	64	1-Oct	31-May
Groveland Ranger District	Date Flat, Moore Creek Area	69	1-Oct	31-May
Sierra National Forest				
Mariposa/Minarets Ranger District	Hites Cove	70	1-Oct	31-May
Mariposa/Minarets Ranger District	Miami Motorcycle Trails	71	1-Oct	31-May
Kings River-Pineridge Ranger District	Huntington Lake	77	1-Oct	31-May
Kings River-Pineridge Ranger District	Eastwood	78	1-Oct	31-May
Kings River-Pineridge Ranger District	Shaver Lake Area	79	1-Oct	31-May
Kings River-Pineridge Ranger District	Kings River, Pineridge	81	1-Oct	31-May
Hume Lake Ranger District	Quail Flat	83	1-Oct	31-May

Sequoia National Forest				
Greenhorn Ranger District	Frog Meadow Area	90	1-Oct	31-May
Tule River Ranger District	Tule River Area	93	1-Oct	31-May
Cannell Ranger District	Kennedy Meadows	95	Year round	
Inyo National Forest				
White Mountain Ranger District	Poleta	97	Year round	
Los Padres National Forest				
Santa Lucia Ranger District	Black Mountain	88	Year round	
Mt. Pinos Ranger District	Ballinger Canyon	98	1-Oct	30-Apr
Mt. Pinos Ranger District	Alamo Mountain	99	1-Oct	30-Apr
Santa Barbara Ranger District	Santa Barbara	100	1-Oct	30-Apr
Ojai Ranger District	Ortega Trail	101	1-Oct	30-Apr
Angeles National Forest				
Santa Clara/Mojave Rivers Ranger District	Drinkwater Flats	106	1-Oct	30-Apr
Santa Clara /Mojave Rivers Ranger District	Rowher Flat	107	1-Oct	30-Apr
Santa Clara/Mojave Rivers Ranger District	Littlerock	108	1-Oct	30-Apr
San Gabriel River Ranger District	San Gabriel	112	1-Oct	30-Apr
San Bernardino National Forest				
Front Country Ranger District	Lytle Creek Area	113	1-Oct	30-Apr
Mountain Top Ranger District	Lake Arrowhead Area	116	1-Oct	30-Apr
Mountain Top Ranger District	Big Bear Lake Area	117	1-Oct	30-Apr
San Jacinto Ranger District	San Jacinto Area	121	1-Oct	31-May
Cleveland National Forest				
Trabuco Ranger District	Wildomar	123	1-Oct	30-Apr
Descanso Ranger District	Corral Canyon	126	1-Oct	30-Apr
Other Jurisdictions				
Army Corps of Engineers	Black Butte Lake	32	Year round	
City of Marysville (Riverfront)	Eugene Chappie OHV Park	39	Year round	
Santa Clara County	Metcalf Motorcycle Park	66	1-Oct	30-Apr
Stanislaus County	Frank Raines-OHV Park	67	1-Oct	30-Apr
Stanislaus County	La Grange	68	1-Oct	30-Apr
San Bernardino County	Park Moabi	119	Year round	

This list was provided by the California Air Resources Board (CARB). It will be updated periodically and you may contact CARB at (800) 242-4450 for more information.

Map available from California State Parks OHMVR Division that corresponds to Map Area ID.

Appendix B: State Vehicular Recreation Area Visitation, 1992-2006

This chart shows the number of visitors to state vehicular recreation areas. Data results from a combination of estimates based on field observations and paid entrance fees and conversion factors. Data includes both paid and free entries.

SVRA	1992	1993	1994	1995	1996	1997	1998
Carnegie	46,986	45,547	48,740	38,446	35,302	41,976	69,918
Heber Dunes	---	---	---	---	---	---	---
Hollister Hills	92,098	93,180	86,460	81,235	89,464	99,757	109,694
Hungry Valley	113,157	112,827	93,477	152,075	143,889	96,492	107,988
Oceano Dunes	1,173,019	1,090,522	925,131	1,106,221	1,090,223	1,075,621	1,013,728
Ocotillo Wells	288,800	301,092	298,418	306,874	323,414	302,607	236,722
Prairie City	43,730	36,278	42,349	44,800	56,802	56,926	55,652
Total visitation	1,757,790	1,679,446	1,494,575	1,729,651	1,739,094	1,673,379	1,593,702

SVRA	1999	2000	2001	2002	2003	2004	2005	2006
Carnegie	102,488	118,687	124,332	137,547	135,941	127,135	120,215	128,056
Heber Dunes	---	26,505	26,704	32,459	30,249	45,056	48,605	49,123
Hollister Hills	125,800	153,003	143,473	158,785	186,771	177,714	165,104	187,004
Hungry Valley	128,419	352,760	382,225	450,737	536,591	544,322	357,634	237,347
Oceano Dunes	1,093,647	1,243,445	1,204,541	1,364,397	1,428,472	1,809,469	2,055,631	1,991,445
Ocotillo Wells	281,751	365,933	325,056	495,786	609,762	816,450	938,554	1,324,389
Prairie City	77,413	93,720	121,271	140,344	149,446	193,330	188,368	168,941
Total visitation	1,809,518	2,354,053	2,327,602	2,780,055	3,077,232	3,713,476	3,874,111	4,086,305

Source: California State Parks, Off-highway Motor Vehicle Division

Appendix C: Public Lands in California Open to Off-road Vehicles[106]

State Lands

State Vehicle Recreation Areas:

Carnegie: 1500 acres
Hollister Hills: 3200 acres
Hungry Valley: 19,000 acres
Oceano Dunes: Approximately 3,800 acres
Ocotillo Wells: More than 80,000 acres
Prairie City: 836 acres

Federal Lands

National Forests:

Angeles: 364 miles of designated off-highway vehicle routes and more than 10,000 acres of open areas
Cleveland: More than 600 miles of roads and trails; more than 400,000 acres of open areas
Eldorado: 2200 miles of roads
Humboldt-Toiyabe: More than1500 miles of roads and trails; more than 800,000 acres open to cross-country travel (California portion of the forest)
Inyo: More than 3,000 miles of roads and trails; more than1 million acres of open areas
Klamath: More than 5,000 miles of roads and trails; more than 1 million acres of open areas
Lake Tahoe: More than 4,000 miles of roads and trails; more than 900,000 acres of open areas
Lassen: More than 4,000 miles of roads and trails; more than 1 million acres of open areas
Los Padres: More than 1,500 miles of roads and trails
Mendocino: More than 800 miles of roads and trails
Modoc: More than 1 million acres of open areas
Plumas: More than 1 million acres of open areas
San Bernardino: 42 miles of 24- to 50-foot trails; 166 miles for green-sticker/red-sticker use; 903 miles of road open to sport utility vehicles and four-wheel-drive vehicles
Sequoia: 1,267 miles of roads and trails, including trails open to off-road vehicle use within the Giant Sequoia National Monument; 10,000 acres of open areas
Shasta-Trinity: More than 6,000 miles of roads and trails; more than 200,000 acres of open areas
Sierra: More than 2,000 miles of roads and trails; more than 500,000 acres of open areas
Six Rivers: more than3,000 miles of roads and trails
Stanislaus: more than 3,000 miles of roads and trails; more than 500,000 acres of open areas
Tahoe: More than 4,000 miles of trails and roads; more than 900,000 acres of open areas

Bureau of Land Management Lands

Within the Bureau of Land Management's field offices, there are 11 million acres of agency land in California available for open and limited off-road vehicle recreation. The following is not a comprehensive list of all areas managed by the Bureau of Land Management in which off-road vehicles are allowed, but it lists some of the more well-known open off-road vehicle areas managed by the agency in California.[107]

Chappie-Shasta: 200 miles of trail, Shasta County
Cow Mountain: 52,000 acres, Lake and Mendocino Counties
Clear Creek Management Area: 76,000 acres, San Benito and Fresno Counties
Dove Springs: 5,000 acres, Kern County
Dumont Dunes: 8,150 acres, San Bernardino County
El Mirage Dry Lake Off-highway Vehicle Area; 24,000 acres, San Bernardino County
Fort Sage: 22,000 acres, Lassen County
Jawbone Canyon: 7,000 acres, Kern County
Johnson Valley: 140,000 acres, San Bernardino County
Imperial Sand Dunes: 150,000 open acres; Imperial County
Knoxville: 17,700 acres, Lake and Napa Counties
Lark Canyon: 1200 acres; 31 miles of trails, San Diego County
Plaster City: 41,000 acres, Imperial County
Rasor: 22,,500 acres, San Bernardino County
Samoa Dunes; 300 acres, Humboldt County
Spangler Hills; 57,000 acres, Kern County
Stoddard Valley; 50,000 acres, San Bernardino County

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Pristine area in the Trinity Alps, California
Photo by Chris Kassar