



NEGATIVE
POPULATION
GROWTH

THE NPG FORUM

You Can't Go West. Stress in the High Country

by Dennis Brownridge

This is the twelfth in a series of NPG FORUM papers exploring the idea of optimum population — what would be a desirable population size for the United States? Without any consensus even as to whether the population should be larger or smaller, the country presently creates its demographic future by inadvertence as it makes decisions on other issues that influence population change.

The approach we have adopted is the “foresight” process. We have asked specialists in various fields to examine the connection between alternative population futures and national or social objectives, and how policy may influence population change. In this issue of the FORUM, Dr. Brownridge refutes the view frequently expressed by urban Americans that the nation “has plenty of room; look at all that space out there.”

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Lindsey Grant, Editor

The West has long been the fastest growing part of the country. In 1900 it held 4 million people—5% of a nation of 75 million. Now, a lifetime later, it has 50 million—20% of a nation of 250 million.¹ It has the most populous state, California, and several of the biggest and fastest-growing metropolises. Nevertheless, much of the West remains thinly populated—the “wide open spaces” of lore. The phrase “rural West” is almost an oxymoron. The dense networks of rural farmsteads and villages typical of the East or Europe are rare in the West. The great majority of Westerners have always lived in cities and towns. So, to a New Yorker or Midwesterner, the non-metropolitan interior West must seem empty indeed.

But sheer living space doesn't limit population. All the cities and towns of America would fit into Utah with room to spare, but there would be nothing for people to do—no way to make a living. Most of the West is thinly populated for good reason: it has little or no economic use.

Geographic Constraints

There are three things, other than funny hats and pointy-toed boots, that distinguish the West from the rest of the country:

(1) Mountains. The shifting crustal plates have rippled it with range upon range of rugged mountains. From the Rocky Mountain front to the Pacific Coast, mountains are almost always in sight. There is lots of flat land between the mountains, of course—the land you see from the highways. But most of it is high plateau, averaging 1500 meters above sea level. High altitude means cold winters and short growing seasons.

(2) Aridity. Thanks in part to the rainshadow effect of the mountains, most of the West is also dry. It is either steppe (a semiarid climate that can support short grass) or full-fledged desert. With minor exceptions, it is too dry to farm without irrigation. A good many homesteaders discovered that the hard way. You can still see their decaying cabins dotting the landscape. Only a narrow coastal strip of the Pacific Northwest is both wet and warm enough to support Eastern-style farming. It is no coincidence that Oregon was the original destination of settlers trekking west in the 1840s.

In short, nine-tenths of the West is too dry, too cold, too steep, or too rocky for crop farming. And it is farming that sustains large rural populations.

(3) Public Land. Mainly because it is useless for farming, half the West was never claimed under the various 19th century land grant laws. Since the nation is now full, the land giveaway laws have been repealed (except for the controversial 1872 Mining Law). The land that no one wanted remains in public ownership, freely accessible to all, the last vestige of a public domain that once stretched from the Appalachians to the Pacific. The public lands include:

BLM land (Bureau of Land Management)	23% of the West
National Forests	18%
National Parks and Monuments	1.5%
National Wildlife Refuges	0.7%
National Recreation Areas (mainly reservoirs)	0.4%

Another 2% of the West is government land, used for bombing, war games, and weapons development. The military says it needs much more and is currently trying to appropriate another half percent (14000 km²) from the public lands. Several additional percent is owned by the states and might be considered public. Since the public lands have no permanent inhabitants, they appear empty on a population map. But they are by no means unused. Their resources are open to private commercial exploitation and they serve tens of millions of recreational visitors a year.

The Great Plains are sometimes included in the West, dividing the country in two at the 100th meridian. While the Plains lack the mountains and public land of the "real West", they satisfy the high-and-dry test. Figures in this essay are for the 11 western states, the West of the statisticians, which roughly splits the differences between these two geographic definitions.

Forests

The West has—or did have—the finest coniferous (softwood) forests in the world. They include the tallest trees (Redwoods), the most massive trees (Sequoias), and the oldest trees (Bristlecone pines) found anywhere on Earth. The Pacific Northwest (coastal Washington, Oregon, and northern California) supports magnificent rainforests rivalled in lushness and beauty only by the hardwood rainforests of the tropics.

But some perspective is in order. Seventy per cent of the West is unforested. And half the nominal forestland is so dry or cold that it supports only brushy, stunted, or slow-growing trees with no commercial use—trees valuable only as watershed and wildlife habitat. Only 15% of the West is commercial forestland, capable of growing timber.³

Nevertheless, Western forests supply 50% of the nation's softwood (construction) lumber. Half of that comes from the great Douglas-fir, cedar, and Redwood forests of the Pacific states. Ponderosa pine, a large and beautiful tree of the drier interior, supplies another fifth. The trees of the high Rockies—lodgepole pine, spruces, true firs, and aspen—are relatively unimportant. The South produces three times as much lumber as all eight Rocky Mountain states put together.

For three centuries the U.S. was self-sufficient in wood. But since the 1940s we have been a net importer and the gap is widening rapidly. We export a large volume of irreplaceable old-growth timber, mostly to Japan, but we import much more. The U.S. cuts more wood than any other nation—half a cubic kilometer per year, a literal mountain of wood. We are cutting more than ever before. Yet we now consume 13% more wood—and 30% more lumber—than we produce.

Can we blame this on increasingly profligate consumption? Not at all. We use only half as much wood and lumber, per person, as Americans did in 1900. There has been an explosion in pulp products (paper and cardboard) but it has been offset by a corresponding decline in barrels and boxes and countless other products once made of wood. Many have been replaced by petroleum-based plastics, metals, and other nonrenewable materials. Lumber consumption has dropped, per capita, because we build smaller and plainer houses; because we use more stucco, concrete, and aluminum; because we use trees more efficiently; and because we get along with inferior products like particleboard (a miserable, ersatz wood made of glued sawdust).

But if we use much less wood per person and are cutting more from our forests, then how did we go from being a net exporter to the world's biggest importer? The answer is simple: U.S. population has more than tripled since 1900. In a single lifetime, we have added 175 million people.

Almost all of our wood shortfall is imported from Canada. Canada's forests aren't as fine as our own. She has a vast taiga forest in her subarctic North, but it is a stunted, slow growing spruce/fir forest with little value other than for pulp. Canada cuts only 40% as much wood as we do. Canadians use wood the same way we do. Yet Canada is the world's greatest *exporter* (44% of world lumber exports) while we are the biggest *importer*. How is this possible? Again the answer is simple: the U.S. has ten times more people than Canada.

Much western timber is still cut from virgin forest. The trees are often hundreds and sometimes thousands of years old. In little more than a lifetime, 90% of the virgin, old-growth forest in the Pacific Northwest has been destroyed.⁴ Only small patches remain and they are currently being logged at 250 square kilometers a year. At that rate all that is not protected in parks or Wilderness Areas will be gone in a decade or so. In the interior, the great stands of old-growth Ponderosa pine are also virtually gone. Somewhat more virgin forest survives in the Rockies, but it contains only small pockets of old-growth, since most Rocky Mountain species are small and shortlived.

Of course trees grow back. In fact we are growing wood at a faster rate than in the past, simply because small, immature trees grow faster than big old ones. However, while we may appear to be getting more "interest" out of the forest, the wood is of much lower quality and our "capital" is rapidly being eroded. Since 1952 the net volume of softwood sawtimber standing in Western forests has declined 17%.

This represents a per capita decline of 48% (since U.S. population has mushroomed during the same time). For each American, there is only half as much sawtimber standing in the Western forests as there was a generation and a half ago. The decline is obvious to anyone who drives the backroads of the Pacific Northwest. Clearcuts—large, completely deforested patches—are everywhere to be seen. Huge stumps remind you of the forest that once was, like the ruins of a great civilization.

Large virgin trees bring high prices because the wood is superior and because more of the tree is useable as lumber. When a tree matures, its lower limbs drop off and growth slows, producing a stronger, finer-grained, straighter-grained, and knot free “clear” wood. The deep, rich colors that give Redwood and yellow (Ponderosa) pine their names also develop only in old trees.

Aesthetically, there is no comparison between diverse old-growth forests and the dreary tree farms that replace them. Old-growth forests are verdant, multi-canopied, cathedral-like places with huge trees and an astonishing complexity of life. Managed forests are monotonous, even-aged monocultures of uniform small trees, their interiors tangled with dead lower branches. There is no match for old-growth timber, alive or dead. But once these ancient forests are gone, they and whatever organisms depend on them are gone forever.

But haven't we saved a lot of old-growth in national parks and wilderness areas? Unfortunately not. Reserves where logging is prohibited are mostly rock, ice, desert, or non-commercial forest. Productive timberlands were usually excluded when boundaries were set. National parks are often confused with the much larger national forests that surround them. National forests did function as preserves for half a century, but when private timberlands were exhausted in the 1940s the national forests were attacked with vigor. Today they are managed primarily for timber production. However, the Forest Service is very good at public relations (witness Smokey the Bear). Since the 1960s, the agency has left thin screens of trees along major highways—like stage sets or Potemkin villages—to give motorists the illusion of driving through primeval forest. But step off the road for a stroll in the woods and you're surrounded by stumps and rusting logging cables.

As I write this, environmental groups are engaged in a last-ditch battle to save as much of the remaining old-growth as possible. Daring activists are dangling from ropes high in the treetops or chaining themselves to trunks in a desperate attempt to forestall the loggers and convince Congress to protect what little is left. There are no really big chunks; it is all bits and pieces.

It is clear that Western forests will supply a declining fraction of our wood. In 1970, they held almost 90% of the country's standing softwood sawtimber. Now only 75% is in the

West, partly because old-growth is disappearing and partly because the pine forests of the South have come back after generations of abuse. It is also clear that the annual cut from Western forests will have to be reduced. It will have to be reduced substantially if we want to save what little virgin forest remains and if we want to manage the rest in a genuinely sustainable way that doesn't diminish fish, wildlife, water quality, biodiversity, or other resources.

What about conservation? We do consume an astounding amount of wood: 2.2 cubic meters per person, per year—a ton and a half for every American. Half of that is lumber, the most critical use because it requires quality wood and mature trees (you can't make 12-inch boards out of 10-inch trees). Most lumber goes for housing. We could use more substitute materials, but they have many drawbacks (expensive, not renewable, take a lot of energy to manufacture, hard to work, poor insulators, unsafe in earthquakes, toxic, ugly, etc.). A much simpler way to reduce per capita lumber consumption is to have a stable population. Lumber is not “consumed” in the usual sense, since buildings don't wear out. A well maintained wooden house can last for centuries. But a growing population means that new housing is constantly needed just to maintain the status quo. More subtly, it means that many buildings are razed unnecessarily, long before their time. In a growing city, rising land values mandate that buildings be replaced with higher density structures. The condition of the buildings doesn't matter; even the finest structures are destroyed. But in a city with a stable population, buildings last much longer and there is much less waste. Indeed, one can usually reconstruct the population history of a place just by looking at its architecture. Curiously, Western cities and towns that were stable or lost population in the past are among the most prosperous and desirable today, because they have retained the ambience of fine old buildings (Portland, San Francisco, Santa Fe, Aspen, and Telluride, to name some well known examples).

More than a quarter of our wood is pulped for paper and cardboard. Much of that is undeniably wasted, since paper makes up 40% of the mass in our landfills.⁵ Newspapers and magazines are two-thirds advertisements. If we could finance them some other way, we might reduce paper consumption significantly (but how can we do that without making reading matter prohibitively expensive?). An easier target is overpackaging, especially the absurd American habit of giving out paper bags with every purchase. Recycling should also be stepped up, of course. But even if we slashed paper consumption in half, we couldn't be self sufficient and maintain healthy forests, given our present population. Nor would paper conservation necessarily help the lumber shortage.

A fifth of our wood is burned as fuel, for heat and some electricity. A generation ago, use of fuelwood was almost negligible, but since the oil crises of the 1970s it has jumped six-fold. We now burn almost as much wood as we did at the turn of the century, when wood and coal supplied nearly

all of our energy. Per person, we burn only a quarter as much, but the population is so much bigger that total consumption is back at historical levels. Even so, wood supplies only a tiny fraction of the nation's energy.

Most fuelwood comes from logging culls, mill waste, thinning projects, and non-commercial forest. Supply is not yet a problem, although firewood cutting has decimated rare mesquite bosques and some ancient juniper/pinyon stands in the Southwest. But commercial energy projects using forest biomass would run into supply problems and conflicts with other uses. Today the limiting factor on wood fuel seems to be air pollution. Many Western towns have had to restrict wood stoves because of severe winter pollution problems.

Wood is one of our few genuinely renewable raw materials. As petroleum runs out, wood could supply more of our needs, as it did in the past. But it certainly can't do so with our present population, much less an expanding one. Nor can we expect Canada to supply us with unlimited wood, since the Canadians are increasingly concerned about the destruction of their own forests.

Water

Humans use far more water than all other resources combined. Water is the lifeblood of the West—the limiting factor for almost every activity. Land without access to water is virtually worthless. Western history is filled with political and legal battles, and even shooting wars, over water.

Since the turn of the century, the federal government has been subsidizing massive water projects in the West with the express purpose of increasing population—agricultural population at first, later urban populations as well. Water development has followed a familiar pattern: First, population grows where there is a good natural supply. Eventually population growth outstrips the supply, but by then the place has enough political and economic clout to import water from afar. The infusion of new water stimulates rapid new growth as worthless land becomes valuable overnight. In two or three decades, population growth again precipitates a crisis and another heroic project is conceived to bring water from still more distant sources. In some areas this vicious circle has repeated itself several times. Many Western politicians have built their entire careers around water.

Modern water engineering was invented in the West, where the world's first big dams were built. Aqueducts hundreds of kilometers long carry water across deserts and mountains. Vast quantities of energy are consumed to pump water out of the ground and over mountains. But the limits are being reached. Virtually every river has been dammed. Some are little more than a chain of reservoirs, stretching for hundreds of kilometers (like the Columbia and lower Colorado). Others have been literally sucked dry (like the Owens in California, the Gila and Santa Cruz in Arizona, and the

Arkansas). The once mighty Colorado which carved the Grand Canyon and drains a quarter of the West no longer reaches the sea. On a typical day, every drop is diverted for human use before it reaches the Gulf of California. Indeed the Colorado is oversubscribed. Because hydrologists overestimated its flow, more water was allocated in law than exists in the river.

A quarter of the West's supply is groundwater, much of which is non-renewable or "fossil" water stored during the Ice Age when the climate was wetter. In many places, groundwater is being "mined"—pumped much faster than nature can recharge it. In southern Arizona, for example, water tables are dropping one to two meters a year.⁶

The combination of diverted rivers and falling water tables is drying up the wetlands even where they are not being deliberately drained for agriculture. This was prime waterfowl and wildlife habitat, and their populations are crashing.

In recent years, water quality has proved to be as serious a problem as water quantity. Western surface and ground waters are being polluted by a variety of non-point sources: heavy metals leached from old mine tunnels and tailings; logging sediments; sediments and nutrients from livestock grazing; nutrients and pesticides from agriculture; and oils, metals, and solvents in the cities. But paradoxically, the most widespread cause of water pollution seems to be water development itself. Salts are concentrated when water evaporates from reservoirs, canals, and irrigated fields and can reach toxic levels. Irrigation also leaches salts from the ground. Most irrigated land in the West is underlain by sediments with high concentrations of toxic salts, left there when ancient seas and Ice Age lakes dried up. Long term irrigation dissolves out these salts, which either percolate down and contaminate the groundwater or are carried off by field drains and end up in a river or in the sump lakes and marshes that occupy many of the closed basins in the West. Most of these lakes and marshes are wildlife refuges—critical habitat for migratory birds and endangered fish—but they are rapidly becoming cesspools of poison. Of greatest concern is selenium, which deforms and kills fish and waterfowl at very low concentrations, and may be passed up the food chain to humans as well. In California's Kesterson National Wildlife Refuge, selenium poisoning has caused the greatest incidence of wildlife deformity ever recorded. Similar disasters are occurring in at least three other refuges and high levels of selenium have been discovered in dozens of other refuges throughout the West—all associated with large irrigation projects.

A related problem is salinity in irrigation water, which can stunt or even kill crops if concentrations are high enough. salinity is an acute problem in the Colorado River and in California's rich San Joaquin Valley.

Ninety per cent of the West's developed water is used for irrigation. Western farms tend to be very large and productive. They also tend to be very profitable, thanks to numerous subsidies—cheap water, cheap power to pump the water, and price supports. Yet only 11% of the West is farmed since there is far too little water to irrigate it all. In many areas, further population growth can only occur at the expense of farming. "Water ranching"—buying up distant farms and abandoning them for the water rights—is increasingly popular. Since the 1930s, thousands of square kilometers of productive farm land have been abandoned to tumbleweed and sagebrush as the water has been carried off to distant cities. Owens Lake, one of the largest and most picturesque lakes in California, has been reduced to a salt flat—the victim of population growth in Los Angeles. Mono Lake, equally large and beautiful, is now meeting the same fate. Current efforts by Phoenix, Denver, and Las Vegas to secure distant water rights are precipitating bitter struggles between urban and rural communities. Cities don't waste water; they use much less, per hectare, than farming. And cities as well as farms in the arid West are making strenuous efforts to conserve water and recycle sewage effluent. In Tucson, Arizona, per capita use has declined sharply as lawns and shade trees have given way to cactus and rock gardens. But population growth inevitably wipes out any conservation gains.

Many Western dams were built for hydroelectric power, not water supply. In fact, excessive damming reduces water yield because so much is evaporated from the surface of the reservoirs. For example, Utah's Lake Powell wastes enough water by evaporation to supply a million people. Yet the reservoir supplies no water; its only function is to generate power to finance other water projects. And in the process, it has destroyed Glen Canyon, one of the world's most beautiful canyons.

Dams produce half the West's electricity—almost an exajoule per year—although they pale in comparison to the total U.S. energy consumption of 90 EJ.⁷ If the West had 20 million people (as it did in 1950) it could presumably generate all of its electricity with existing dams. Hydropower is clean and renewable, at least until the reservoirs silt up, which can take centuries. Theoretically, we could double Western hydropower but it would mean the utter destruction of remaining rivers and would further reduce the water supply because of evaporation. The best sites have long since been dammed. There were plans at one time to dam the Grand Canyon at both ends and divert the rest of the river through a tunnel, but an outraged public quashed the idea. A battle is now raging to reduce generation at Glen Canyon Dam (at the head of the Grand Canyon) because the fluctuating flows are devastating the park's beaches and fish. Fish, incidentally, are the most endangered class of native animals in the West, thanks to massive water engineering.

Proposals have been made to transport water from the Columbia River (the only drainage with a significant surplus)

or even from the Yukon in Canada. While technically possible, these projects would be astronomically expensive and would require equally astronomical amounts of energy to pump the water over mountains. They would also be enormously destructive of the natural environment. And to get the Yukon water we would probably have to conquer Canada. Desalinization of seawater is another possibility, but again expense and energy are limiting factors.

Grazing

Almost all of the land in the West that can possibly support a cow or sheep and is not otherwise developed is used for commercial grazing. Even wilderness areas, wildlife refuges, military reservations, and some national parks are open to commercial grazing. Yet western rangelands produce an almost insignificant fraction of our meat. The public lands (the bulk of the range) grow less than 2% of the nation's beef. Their main function is producing calves, although only a tenth of the country's cattle are born there.⁸

Most of our beef is grown in the East, on irrigated pasture, or in feedlots. Although beef consumption per capita has declined, we are no longer self sufficient, consuming 3% more than we produce. In fact, the U.S. is the world's largest net importer of beef. Again, it is instructive to compare Canada, which has the same beef eating habits we do and much less pasture land. Canada is a net exporter, simply because it has a tenth as many mouths to feed.

Despite the cowboy mythology ingrained in our culture, the Western range is not a very good place to raise livestock. Forage is produced at a slow rate. Animals can only be grazed part of the year. In drier regions it may take a square kilometer to support a single cow (compared to 500 cows per square kilometer in Missouri). All of the public lands—half the West—support only 30,000 ranchers. For most of them ranching is a part-time occupation, pursued more as a lifestyle than as a livelihood. Although public lands ranchers are heavily subsidized, paying grazing fees far below market value, it is not a lucrative business for most of them.

A century of commercial grazing has taken a heavy toll on the land. Large cattle-like animals are not native to most of the West, so the vegetation is not adapted to them. Bison (buffalo) were mainly a plains animal and generally didn't range west of the Rockies. The Bureau of Land Management (BLM) estimates that 68% of its rangeland is in "unsatisfactory" condition ("poor" or "fair"). Only 2% is rated in "excellent" condition.⁹ The virgin steppes of a century ago supported far more livestock than they do today. In an effort to increase grass and water for livestock, thousands of square kilometers of juniper/pinyon woodland have also been deforested.

Commercial grazing competes directly with wildlife. At the behest of ranchers, the government spends millions of

dollars a year to poison and trap wildlife deemed a threat to livestock. Grizzly bears, wolves, and jaguars have been all but eliminated. Ranchers generally oppose attempts to reintroduce native carnivores or build up herds of native herbivores. In my own county, for example, a rancher was recently convicted of slaughtering a large number of elk, out of fear that his grazing allotment would be reduced if elk numbers grew. Drinking water, not forage, is often the limiting factor for livestock as well as wildlife. While wells and catchment basins developed for livestock can benefit wildlife, livestock have a serious impact on riparian (stream-side) environments. In the arid West, riparian habitat is of critical importance, harboring most of the rare and endangered species of plants, fish, and wildlife.

One might argue that grazing is the best use for land with no other commercial value. Growing cattle feed is certainly an inefficient use of prime Eastern farmland, which might better be employed growing human food for a hungry world. With careful management, Western rangelands could probably support some commercial grazing without diminishing other resources. But current livestock numbers will certainly have to be reduced and the rangelands—the least productive lands in the West—will never support significant numbers of people.

Amenities

For many people, the West's most valuable resources are open space, natural beauty, wildlife, and the physical freedom offered by the public lands. This is not just a value judgment; tourism is the biggest industry in many Western states. Chambers of commerce invariably list the natural environment as a major asset. But amenities and freedoms diminish in direct relation to the number of people trying to enjoy them. It is clear, for example, that most national park visitors today are cheated of the natural experience they presumably came to find. They spend most of their time jostled by crowds, fighting traffic, or struggling to find a place to stay. It has become fashionable to blame the problem on cars, but shuttlebuses, bicycle paths, raftable rivers, and foot trails are often crowded too. It is hard to escape the conclusion (though managers try) that there are just too many people in the parks. Nor is the problem much better in national forest campgrounds. Even the open desert is becoming crowded. In the winter months, tens of thousands of sun-seeking retirees from colder states camp on the public lands of the Southwest. Whole cities of trailers and motor homes spring up, stretching as far as the eye can see across the fragile desert plains. It is still easy to car-camp in solitude, at least if you don't mind cowburnt rangeland or cutover forest. But overuse—too many people—is certainly the number one problem threatening the natural areas of the West.

Earlier in this century, human activity had decimated most large native animals. Several were on the verge of extinction. Since then wildlife agencies have brought many of them back, at great expense and with much artificial

manipulation. But would-be hunters and fishermen outnumber the game and fish, so increasingly complex restrictions are necessary. On many streams, fish must be released after they are caught. Hunting permits are often rationed, using lotteries and auctions. In my own state of Arizona, a hunter recently paid \$60,000 for a permit to shoot a bighorn. He missed.

The greatest freedom of all is found in wilderness—a place to experience the world without being manipulated by other humans. The idea of preserving land in its natural state is an American invention which author Wallace Stegner has rightly called “the best idea we ever had.” It is an idea which has been admired and copied by more than 120 nations around the world. The modern wilderness movement, which culminated in the landmark 1964 Wilderness Act, began in the 1920s after the national parks had been opened to automobiles and the national forests were earmarked for logging. Its aim was to keep small parts of the country free of the sights and sounds of man and his machines—places big enough to assure solitude and absorb a two week trip on horse or foot. But wilderness is rapidly disappearing as logging, grazing, mining, oil and gas development, off-highway vehicles, resort development and urbanization saturate the land with roads. Only 4% of the West is protected as designated Wilderness.¹⁰ At this writing, another 9% or so survives as *de facto* wilderness. Environmental organizations are engaged in prolonged political battles to save as much of it as they can. They won't be able to save it all, since competition for other uses is intense.

Few wilderness areas remain that are big enough for a two week trip. There are so many people and so little wilderness that visits are often rationed with computerized permits. It is ironic that wilderness—which survives mainly because no one wanted it in the past—is the only place where the government has tried to determine an optimum population and enforce it with fines. In some areas you must reserve space months in advance. To raft some rivers you must apply years in advance. Because of overuse, onerous restrictions have become necessary. Campfires are often prohibited. Lakes and streams are often polluted. Solitude is difficult to find. And it is almost impossible to escape the noise of aircraft. Many wilderness areas, national parks, and wildlife refuges have been designated Military Operating Areas (MOAs), used for aerial war games. Others are deluged by tourist planes, helicopters, and commercial jets. It might be honest to say that there is no real wilderness left in the West, as the authors of the Wilderness Act envisioned the concept.

It is important to distinguish sustainable population from optimum population. Optimum population is reached when adding more people does not improve the quality of life. Of course, what you regard as optimum population density depends on your background, age, and many other personal factors. Residents of Wyoming, our least populous state save Alaska, like to say that “Wyoming has more antelope than people and that's the way it should be.” But many people

are content to spend their entire lives in teeming cities. So I suggest that an optimum population would offer the greatest freedom of choice—the greatest diversity of experiences. It is clear that the West has long since passed that point. There is no shortage of high-density experiences, but low-density experiences are increasingly at a premium. The Rural Renaissance which began in the late 1960s is hard evidence that we have passed what people regard as the optimum population. For the first time in history, the flow of people from rural to metropolitan areas has reversed. Western cities are still growing rapidly, partly by natural increase and partly by immigration from other regions or countries. But at the same time, waves of urban refugees are filling up the hinterlands.

I should point out that the energy schemes discussed in other essays in this series—coal, natural gas, oil shale, nuclear, direct solar, wind, and biomass—would all have devastating effects on the natural environment of the West. Vast expanses of land would have to be sacrificed. We saw a small example of this devastation during the Rocky Mountain energy boom of the late 1970s and early 80s. Other areas will be affected a well. For example, tapping our uranium reserves will wreak havoc on the scenic Colorado Plateau. Grand Canyon National Park is already

ringed by tens of thousands of uranium claims, waiting for the price to rise. In the fragile Western environment where the tracks of a single vehicle can last a generation, the scars left by mining usually last forever. And renewable energy sources can destroy even more land than mining because the energy density is so low. For example, the wind farms in California's San Geronio Pass have blighted San Jacinto Peak, one of the most dramatic mountainscapes in the nation, while generating only a minuscule fraction of our energy.

Conclusion

In the American West, the limiting factors for sustainable population are water (both quantity and quality), altitude and topography, and energy. The 50 million people now in the West certainly exceed these limits. But sustainable population is not the same as optimum population. Optimum population allows the highest quality of life, provides the greatest diversity of experiences, and permits the greatest freedom of living styles. Optimum population for the West has also long since been exceeded, perhaps by a factor of two or three. Forests, rivers, grasslands, wildlife, scenic beauty, quiet, solitude, and freedom have been drastically diminished by the impact of too many people.

NOTES

1. Unless otherwise noted figures in this essay are from the following sources:
Statistical Abstract of the United States, 1989. (U.S. Bureau of the Census, Washington, DC)
Historical Statistics of the United States, Colonial Times to 1970. (U.S. Bureau of the Census, Washington, DC)
Goode's World Atlas, 1990 edition. (Rand McNally, Chicago)
2. *High Country News* (Paonia, CO). February 12, 1990. p.1
3. Commercial forest is defined as capable of growing at least 1.4 m³/ha per year of commercially useful species.
4. Old growth forest is defined, in part, as containing at least twenty 200-year-old trees per hectare. See *National Geographic* 178:3 (September 1990) pp. 106-136.
5. U.S. Environmental Protection Agency. *The Solid Waste Dilemma: An Agenda for Action.* Draft Report, September 1988.
6. Arizona Republic (Phoenix, AZ). October 14, 1990. p.1
7. exa = 10¹⁰. The joule is the international unit of energy, defined as a newton meter of work.
8. *High Country News* (Paonia, CO). March 12, 1990. pp.6-8
9. National Wildlife Federation. *Our Ailing Public Lands: Condition Report 1989.* (Washington, DC)
10. The Wilderness Society. *1989 National Wilderness Preservation System* (map). (Washington, DC). Defacto wilderness is defined as roadless areas of 20 km² or larger.

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