Down the Drain:

The Impact of Sprawl on Colorado's Water Supply

A Report by the Colorado Public Interest Research Foundation:

Produced With the Generous Support of the Educational Foundation of America

October 2002

Table of Contents

Executive Summary……..1

Colorado's Water Shortage……..3

Sprawl and Water Quantity……..4

Water Waste and Increased Lot Sizes…….5

Case Study: Castle Pines Village and Castle Pines North……..5

Water-Wasting Covenants……6

Case Study: Xeriscape Hurdles at Highlands Ranch…….6

Case Study: Prohibition of Native Grasses at Wood Run III……7

Non-renewable Water Sources…….7

Case Study: South Metro Area Water Portfolios……...8

Sprawl and Water Quality……9

Impervious Surfaces…….9

Transportation Related Water Quality Impacts……..10

Case Study: Polluted Mountain Lakes Linked to Sprawl……11

Costs……..12

Infrastructure Costs……12

Case Study: Failing Drainage Infrastructure……13

Costs for Large Storage Projects……13

Case Study: $10 Billion for Dams Proposal……...14

Policy Recommendations…….15

Executive Summary

Sprawl results in the inefficient use of our water resources, decreased water quality, and higher costs for water and sewer needs. While there has been much discussion about the loss of open space, increased traffic congestion, and the air pollution resulting from sprawl, we have only recently begun to discuss sprawl's impact on our water supply. The fact is that we live in a semi-arid state with limited water resources and sprawl wastes those resources. Colorado's incredible population growth combined with the state's lack of growth management policies has affected both the quantity and quality of our state's limited water supplies, as well as the costs of providing water to residents.

This report shows the following:

1. Sprawl stresses our limited water supply. In fact, high-density planned development may use up to 35 percent less water than low-density sprawling development.[1]
2. Sprawling development patterns negatively impact water quality. A one-acre parking lot produces about 16 times the volume of runoff that comes from a one-acre meadow.[2] This runoff transports various pollutants into the water supply including: sediment, nitrogen, phosphorus, organic carbon, copper, zinc, lead, petroleum hydrocarbons, and pesticides.[3]
3. Poorly planned growth results in increased infrastructure costs for water and sewer needs. Low-density suburban development can cost two to three times more in infrastructure costs than a traditional community.[4]

Sprawl is:

- Low density and floor area ratio
- Unlimited outward expansion
- Leap frog development
- No attempt at clustering, mixing of uses, or establishment of city centers
- Resource-consumptive development
- Automobile-dominated transportation.

Our water supplies have been strained by sprawling development patterns resulting from a lack of long term water and land use planning. Colorado has been approving substantial numbers of large-lot subdivisions that require large amounts of water to sustain their lawns and water intensive landscaping. In fact, over half of the total residential water consumption in Colorado is due to outdoor uses. Additionally, numerous communities across the state are subject to covenants that require water intensive landscaping or create obstacles to the use of more water efficient alternatives. Finally, in many of our fastest growing communities, increased water supply demands are being met with nonrenewable groundwater sources. Integrated water and land use planning

[1] *The Costs of Sprawl,* Real Estate Research Corporation, U.S. Government Printing Office, 1974.
[2] *The Practice of Watershed Protection,* Schueler and Holland, 2000.
[3] *Id.*
[4] *Save Our Lands, Save Our Towns: A Plan for Pennsylvania*, Hylton, Urban Land Institute, 1995.

can help to alleviate the state's water quantity issues.

In addition to straining our available supply, sprawl is also affecting our water quality. Covering natural areas with impervious surfaces such as roads, parking lots, and rooftops causes runoff to reach our streams and rivers more quickly and in a more polluted condition. Many of the water quality problems associated with sprawl are a direct result of the increased reliance on the automobile that characterizes these sprawling development patterns by increasing the need for roads and parking lots. Roads and parking lots send polluted water directly into our streams and rivers and transportation-related air pollution can also finds its way into water bodies. Clustering development and providing buffer zones around water bodies can help reduce these impacts.

Sprawl results in increased costs for water-related infrastructure. As development spreads out and is covered with impervious surfaces, water and sewer costs skyrocket. The increased demand created by sprawl also results in efforts to push costly and environmentally destructive large storage and diversion projects on Colorado. Planning for water needs in relation to land use decisions can help reduce expenses for water and sewer systems as well as reduce the need for new storage projects by promoting more efficient use of the water resources we already have.

Colorado can protect our water in terms of quantity and quality and reduce water related infrastructure costs by managing growth (see Policy Recommendations at page 15). A statewide water plan that links water quantity and quality planning to land use planning would ensure that sprawl-related water impacts are addressed before new development is put in place. Reducing lot sizes, utilizing climate appropriate landscaping, promoting compact development patterns, and reducing impervious surface ratios can help protect the quantity and quality of our water supply as well as reduce infrastructure costs.

In Los Angeles, the saying "If you build it, they will come" might well have been followed by "and if they come, the water, somehow, will always be available."

No longer. The problems associated with the L.A. equation of water and sprawl are beginning to emerge in places that never thought they had a sprawl problem, let alone a water problem.

Philadelphia Inquirer. Robert Gottlieb, Professor of Urban and Environmental Policy at Occidental College and a former representative to the board of directors of the Metropolitan Water District of Southern California, July28, 2002.

Colorado's Water Shortage

Colorado's water supplies are severely strained as a result of decades of rapid sprawl and now a drought, which is aggravating the underlying problem.[5] The last two decades, the time when so much of the state's growth occurred, was a relatively wet period for Colorado.[6] New residents installed lush landscapes on large lots requiring large amounts of water and new developments were built far from existing services and without the framework of long-term land use and water planning. Additionally, our state is currently facing record low snow pack and below average reservoir levels. It is becoming clear that we can no longer afford to continue to sprawl and fail to create long term integrated land use and water planning.

Colorado's surface water supply is highly dependent on snow pack which provides 80 percent of the total supply.[7] By June of this year, Colorado's mountain snow pack had melted completely in several river basins. In the South Platte, North Platte, and the Yampa/White river basins snow pack was at 2, 8, and 7 percent of historic averages respectively.[8] As a result, throughout the state, local governments are implementing water-use restrictions in an attempt to make their communities' water supply last until next spring. Better planning and more efficient use of existing water supplies could have minimized the need for water-use restrictions.

Colorado's rapid growth combined with sprawling development patterns has strained our water supply. The Metropolitan Water Supply Investigation for the Denver region projects a shortage of about 100,000 acre-feet of water (enough to cover the city of Denver in one foot of water) for the projected population in 2020 if we continue our current rates of consumption.[9] This is due to the fact that we have a rapidly growing population that uses water in an inefficient manner. Water use in the Denver metro area exceeds 200 gallons per capita per day (GPCD)[10]—this is high compared to many other western cities. For example, in Tucson, Arizona, residents use about 160 GPCD[11] and in San Antonio, Texas they use about 143 GPCD.[12]

Colorado must begin to address the failures of sprawling development patterns in terms of our water quantity, quality, and infrastructure costs. We must begin to create integrated land use and water planning measures that are appropriate for our semi-arid climate—measures that allow us to maintain our quality of life while living in a sustainable manner.

---

[5] About 85% of Colorado's surface water supply is currently dedicated to agricultural uses. Developed and developing areas compete for the remaining portion and agricultural water rights that are subject to purchase.

[6] Joe Garner, *Drought in Colorado is Foreign to New Residents*, Rocky Mountain News, May 3, 2002.

[7] Joe Garner, *Drought's Deadly Grip*, Rocky Mountain News, May 4, 2002.

[8] *Feds: Colorado Snowpack Nearly Gone*, Rocky Mountain News, June 2, 2002.

[9] Metropolitan Water Supply Investigation, Colorado Water Conservation Board, 1999.

[10] Maddeus et. al., *Qualitative Review of Water Conservation Program*, May 2001.

[11] Craig O'Hare, *City of Santa Fe Per Capita Water Demands: Comparison with Other Cities,* August 27, 2001.

[12] Maddeus et. al., *Qualitative Review of Water Conservation Program*, May 2001.

Sprawl and Water Quantity

Sprawl has a direct impact on water consumption. Minimum lot sizes, required by local governments, increase the landscaped areas of individual homes. Some development in Colorado has proceeded with less than adequate water supply plans and conservation measures. Other areas have been developed with a large dependence on non-renewable sources--water supply plans that are only adequate for a finite amount of time.

Further, many developers and homeowners' associations are implementing inefficient water-use practices such as mandating yards that are water-intensive. These requirements are often found in covenants that bind homeowners. A significant amount of the development in the state takes the form of covenant-controlled communities with homeowners' associations. In fact, there was a 1400% increase in the number of homeowners' associations across the country between 1970 and 1992—up to 150,000 from 10,000.[13] The increased consumptive needs resulting from sprawl are straining the state's water supplies.

After a number of years of below average snow pack and now a drought, it is more essential than ever that decision makers and citizens begin to make significant changes in planning for water in relation to land use in order to use water more efficiently. In Colorado, 85 percent of the state's water is used for agricultural purposes.[14] The remaining fifteen percent of the state's water serves all the other water needs in the state. Some of the most significant non-agricultural water users are single-family residences—a chief component of sprawl. In the arid West, approximately 50 percent of the average household's water is used outdoors, primarily for turf irrigation.[15] Preventing sprawl and implementing water efficiency measures will help to alleviate Colorado's water shortages.

Aerial view of water intensive sprawling development at Highlands Ranch.

[13] Renate Robey, *Covenants' Promise: Not in Your Backyard*, Denver Post, Oct. 18, 1998.
[14] Joe Garner, *Drought's Deadly Grip*, Rocky Mountain News, May 4, 2002.

[15] Richard L. Duble, *Water Management on Turfgrasses*, available at http://aggie-horticulture.tamu.edu/plantanswers/turf/publications/water.html.

Water Waste and Increased Lot Sizes

Every day Colorado has more residents using more water. Colorado's population is projected to continue to grow rapidly for the foreseeable future. In fact, the population is expected to grow by 50 percent by 2025.[16] While population growth alone increases demands on our water supply, it is the sprawling pattern of development through which we are absorbing this growth that is particularly problematic. The average rate of land consumption is increasing at two to four times the rate of population growth. This means that we are watering larger and larger lots with each new increment of population growth.

Over 50 percent of the average household's water consumption is related to outdoor use. The amount of water consumed by outdoor watering is evident when comparing the winter and summer waster usage of Denver Water customers. In the winter, customers use 120 million gallons per day, while in the summer daily consumption can peak above 500 million gallons per day.[17]

Reducing the water demands for outdoor watering of large lots can provide significant water savings. Denver Water estimates that 80 percent of potential future water savings, achieved through conservation measures, will come from the water used for outdoor watering.[18] If the Denver area maximized its Xeriscape potential it could save up to 160,000 acre feet of water annually—more than the 100,000 acre feet shortfall anticipated by Denver Water by 2020. Reducing outdoor watering demands frees existing water supplies for other uses and reduces the need to expand infrastructure or finance expensive storage projects.

Large Lot Sizes and Water Consumption (Castle Pine Village and Castle Pines North)

Like many towns and cities across Colorado, Castle Pines Village and Castle Pines North in unincorporated Douglas County experienced tremendous growth in the last decade. By 2000, the neighboring towns combined population had increased to more than three times their population in 1990. More importantly, their average density decreased by over 25 percent during this same time period. As a result of these land use patterns bluegrass lawns in the towns range from _ acre to 8 acres. Residents of the towns use an average of over 150,000 gallons per person annually—more than twice the metro area average and the highest in the region.

Source: DRCOG Figures and Denver Area Guzzles Water, Jerd Smith, Rocky Mountain News, Sept. 14, 2002

[16] Department of Local Affairs population projections.
[17] *Water For Tomorrow*, Denver Water, February 2002.
[18] *Id* at 59.

Water-Wasting Covenants

Many of the homes in Colorado are in covenant-controlled communities and many of these covenants impose wasteful water practices on residents. These covenants range from those that require water-intensive lawns to those that restrict water efficient landscaping. Establishing legal requirements that force residents to use more water wastes Colorado's valuable water resources and denies homeowners the freedom to choose how they want to landscape around their houses.

Water efficient landscaping improvement achieved through the use of Xeriscape.

Restrictive covenants should not be an obstacle to the use of climate appropriate vegetation. Colorado does not have adequate water supplies to sustain Kentucky bluegrass lawns and other water intensive landscapes. Fortunately, other reasonable alternatives exist. For instance, Xeriscape can have a considerable impact on water use —experts estimate a 30 to 40 percent reduction in water consumption with Xeriscape practices.[19] In the last 20 years, the Denver-based concept of Xeriscaping has gradually gained recognition as an aesthetically-pleasing, water efficient alternative to the blanket use of traditional turf grass and water-intensive vegetation.

A survey by Denver Water found that 26 percent of the people surveyed had Xeriscaped at least part of their yard, up from 21 percent in 1995.[20] It is important that we remove barriers that prevent residents from transforming their lawns into landscapes that are more compatible with Colorado's semi-arid climate.

Xeriscape Hurdles (Highlands Ranch)

Highlands Ranch requires all homeowners to seek prior approval before Xeriscaping a lawn. Highlands Ranch, developed by SheaHomes, is home to more than 73,000 people. The relevant covenant states that "Using drought tolerant plantings and other water conservation methods of landscaping is encouraged, however, the design must be approved." Pre-approval creates an obstacle to using water more efficiently or appropriately. This provision has not been changed despite the current drought.
Source: www.hrcaonline.org and Jim Hughes, Do You Xeriscape?, Denver Post, June 3, 2002.

[19] Jim Hughes, *Do You Xeriscape?*, Denver Post, June 3, 2002.
[20] *Water For Tomorrow*, Denver Water, February 2002.

Denver Water provides examples of climate appropriate vegetation for interested residents.

Wood Run III: Prohibition of Native Grasses (Arvada)

Some restrictive covenants prohibit lawns consisting of native grasses, and establish lawn and turf requirements that require non-native, water-intensive types of turf such as Kentucky bluegrass. In Arvada, the Wood Run III subdivision's covenant regarding landscaping states: "No native grasses are allowed on any portion of any Property."

Like Kentucky bluegrass, native buffalograss can go dormant when water supplies are short. However, the recommended water applications are dramatically different. Buffalograss needs approximately one inch of water *per month* while Kentucky bluegrass needs approximately one to one and half inches of water *per week*. Buffalograss is not the only alternative to bluegrass that is precluded by covenants that prohibit native grasses. Another example is blue grama. Blue grama is the "state grass" and also a warm-season native grass. It is drought tolerant, and requires little fertilizer.
Source: www.woodrun3.com and www.gardeningcolorado.com .

Non-renewable Water Sources:

Sprawl can affect both the quantity and quality of our groundwater supplies. Land use planning should protect this valuable resource. The majority of Colorado's most valuable renewable surface water rights are held by agricultural interests and older cities. As a result, many of the fastest growing communities in the state are relying heavily on groundwater for their water supplies. While shallow aquifers are able to recharge fairly easily, deep or bedrock aquifers take much longer to recharge. As a result, many of Colorado's deeper aquifers are being rapidly depleted. For instance, between 1991 and 2000, some wells in the bedrock aquifers in the Denver Basin recorded drawdowns of over 250 feet.[21] Further, since even under ideal conditions these deep aquifers could take thousands of years to recharge, they are, in effect, nonrenewable.[22] Relying on renewable sources as the primary source of water supply can help ensure that the deep aquifers are allowed to recharge and available to supplement the water supply in times of drought. However, they will always remain a finite resource.

Areas that have absorbed much of the state's recent growth, like Parker and Castle Rock, do not have the water portfolio that older, more established cities on the Front Range have. To date, cities like Denver have largely used renewable surface water resources.

---

[21] *Planning for the Conservation and Development of Infrastructure Resources in Urban Areas—Colorado Front Range Urban Corridor*, U.S. Geological Survey Circular 1219, 2002.
[22] *Id.*

Explosive growth in Douglas County has resulted in mining the groundwater. Groundwater systems are a valuable resource to the state; they are also finite and largely non-renewable. With a number of metro areas planning to drill into the deep aquifer, we may soon see some severe water supply issues for those areas relying heavily on this non-renewable source. Cities should rely on renewable supplies and not on finite supplies of groundwater.

Bedrock aquifers are particularly sensitive to development containing impervious surfaces because they are less permeable than shallow aquifers and are thus, by and large, recharged through limited outcrop areas.[23] Land use planning should account for these outcrop areas in order to maximize the recharge rates of these valuable resources. While they have a much faster recharge rate, shallow aquifers are more susceptible to contamination by pollutants. Contamination of shallow aquifers is affected by land use and the rate and direction of ground-water movement.[24] These aquifers may become contaminated through a variety of means including fertilizers and pesticides, landfills, and underground fuel storage tanks. In light of the impacts development has on both shallow and deep aquifers, land use planning should be more protective of our groundwater supplies.

Heavy Reliance on Non-Renewable Water Sources (South Metro Areas)

Douglas County tops the United States Census as the fasting growing county. As a result, there is a substantial need for new water resources all of the time. Much of this need is being met with groundwater sources. For example, in 2001, Castle Rock used 96.8 percent non-tributary water, and only 3.2 percent tributary. Parker used about 85 percent non-renewable groundwater. In Douglas County, where both Castle Rock and Parker are located, well levels have been dropping about 30 feet a year for about 10 years. The explosive growth in the last five years is tapping out the wells faster. As water levels drop so, often, does water quality. Further, it becomes more and more expensive to pump as water levels drop.

Both cities are currently in the process of expanding their water portfolios to include renewable sources.
Source: Deborah Frazier, Water Going Up For Bids in Elbert County, Rocky Mountain News, May 7, 2002; Castle Rock Utilities; and Parker Water and Sanitation District.

[23] *Id.*
[24] *Id.*

Sprawl and Water Quality

Sprawling development patterns dramatically impact an area's water quality. Streams, rivers, lakes, and reservoirs absorb the increased runoff when natural areas are paved over. Not only does runoff in sprawling areas contain greater concentrations of certain pollutants, but the runoff reaches water bodies in less time and is subject to less filtration than in other areas. As a result pollutants reach our streams, rivers, lakes, and even our shallow aquifers. Focusing development in areas with less sensitivity to water pollution can protect our water quality.

Impervious Surfaces

We can protect our water quality by directing development to areas that are less sensitive to water pollution. Natural areas contain soils that allow water to permeate, which both slows and filters runoff. Development entails covering over natural soils with structures that allow almost no absorption of water. These impervious surfaces include roads, parking lots, rooftops, sidewalks, and other structures. Studies across the nation have found that once a given land area is developed with 10 percent impervious surface ratio (the amount of a given area that is covered with impervious surfaces) water quality quickly and significantly declines. On average development covering 25 percent of a land area is equivalent to 10 percent impervious surface ratio—this is a housing density of only one unit per two to three acres. This is much lower than the average density of urban or suburban areas.

> *A variety of studies during the past decade converge on a central point: When more than ten percent of the acreage of a watershed is covered in roads, parking lots, rooftops, and other impervious surfaces, the rivers and streams within the watershed become seriously degraded.*
>
> *Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States, Pew Oceans Commission, 2002.*

Impervious surfaces allow more runoff from precipitation to reach streams and other water bodies. This creates flooding issues as well as water quality issues because the runoff reaches streams in greater volumes and carrying more pollutants. A one-acre parking lot produces about 16 times the volume of runoff that comes from a one-acre meadow.[25] As a result, the runoff from a one-inch rainstorm would fill a standard-sized office to a depth of two feet if the runoff came across a one-acre meadow, but if the runoff came across a parking lot it would completely fill three offices.[26] Thus, the release of pollutants in a developed area has a much more significant impact on water quality than the release in an area with more permeable surfaces. Urban runoff transports various pollutants into the water supply including: sediment, nitrogen, phosphorus, organic carbon, copper, zinc, lead, petroleum hydrocarbons, and pesticides.[27]

---

[25] *The Practice of Watershed Protection,* Schueler and Holland, 2000.
[26] *Site Planning for Urban Stream Protection,* Center for Watershed Protection, 1995.
[27] *The Practice of Watershed Protection,* Schueler and Holland, 2000.

Impervious surface ratio affects water bodies in a multitude of ways. Streams and rivers in areas with a greater than ten percent impervious surface ratio contain higher levels of pollutants, are affected in their physical structure, and are able to support less wildlife.[28] Further, as impervious surfaces cover a watershed the water temperature increases, which is often detrimental to fish and other aquatic life.[29]

Reducing the amount of impervious cover can benefit developers and local governments economically. On average, roads, sidewalks, driveways, and parking spaces account for about half of the cost of residential subdivision construction.[30] Reducing impervious surfaces can provide major savings in terms of roadbuilding, storm drainage, and water and sewer service.[31] For example, clustering units can create a 50 percent to 75 percent reduction in road length.[32]

We can protect our water resources by utilizing more compact development patterns that are concentrated in areas with less sensitivity to runoff related water pollution issues. We can protect watersheds and streams that have not reached the 10 percent impervious surface ratio threshold from development. In developed areas we can mitigate the impact of development on water quality by creating buffer zones between impervious surfaces and water bodies, utilizing on-site stormwater practices and new paving techniques, reducing dependency on the automobile, and implementing other land use planning tools.[33]

Transportation-related Water Quality Impacts

The increased driving distances and reliance on the automobile associated with sprawl also impact water quality. Transportation-related facilities like roads and parking lots are constructed in conjunction with sprawling developments and contribute heavily to an area's impervious surface ratio. Further, airborne pollutants from automobiles reach water supplies, as do toxic particles released from tires and brakes.

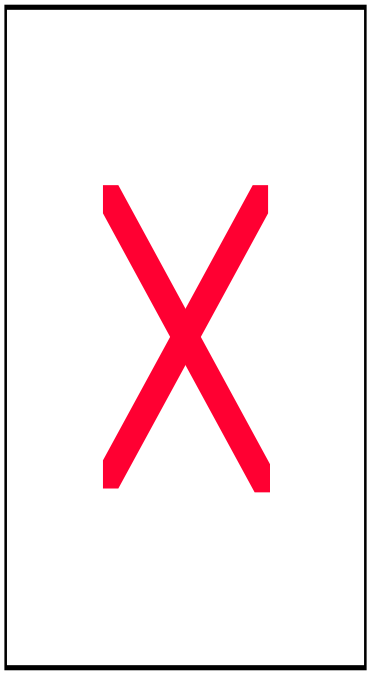
Sprawling subdivisions contribute to the impervious surface area in a variety of ways. However, their most significant contribution comes in the form of wide streets and parking areas. For example, transportation-related imperviousness accounted for 63 percent to 70 percent of the impervious surface area in a variety of residential, multifamily, and commercial areas surveyed in Olympia, WA.[34] The fact that transportation-related impervious surfaces are often continuous surfaces that are directly connected to storm drainage systems further aggravates the problem. While rooftops often release contaminated water into lawns or other permeable surfaces that can filter pollutants, streets and parking lots often direct runoff straight into drainage systems.[35]

A study of the San Francisco Bay found that cars and trucks were one of the

[28] *Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States*, Pew Oceans Commission, 2002.
[29] *Id.*
[30] *Site Planning for Urban Stream Protection*.
[31] *Id.*
[32] *Id.*
[33] *Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States*.
[34] *Site Planning for Urban Stream Protection.*
[35] *Id.*

largest sources of pollutants in the bay. Of the toxic metals found in the bay, half of the cadmium and zinc came from tire wear, half the copper came from brake pad wear, and an additional 25 percent of the copper originated as air pollution from cars only to be deposited in the bay, and lead came mainly from diesel powered vehicles.[36]

By utilizing compact development patterns, we can slow the development of natural areas and provide transportation benefits that can help protect both air and water quality. Infill development and redevelopment of older suburbs could reduce vehicle miles traveled per capita by 39 to 52 percent compared to sprawling patterns of development.[37] Currently, due to sprawling development patterns and a resulting lack of transit options, almost 90 percent of workers drive to work.[38] Providing transit alternatives can have a major impact on transportation choices. This has proven true in Colorado—in 2000 the Denver Regional Transportation District completed the Southwest light rail line on time and under budget; use of the line has held steady at 30% above projections. By promoting development along transit corridors and adequately funding transit alternatives we can protect our air and water quality.



Polluted Mountain Lakes Linked to Sprawl

The City of Boulder gets almost half of its drinking water supply from alpine lakes located just east of the Continental Divide two miles from the nearest road. Less than 50 people visit Green Lakes each year, yet it was recently discovered that the lakes doubled their nitrogen content between 1984 and 1994. Despite the fact that the Green Lakes are protected and located in an isolated location, the nitrogen level increases have been linked to human activities. In fact, the most likely culprits are air pollution from cars and airborne fertilizer from home lawns, farms, and feedlots. Lakes in Rocky Mountain National Park have suffered this same chemical shift on the Eastern Slope, but not on the Western Slope, which is more protected from Front Range pollution. This discovery indicates that the effects of sprawl on water quality are both far-reaching and not yet fully understood.

Source: Winds Carry Pollution to Alpine Lakes, Scientist Says, Mark Obmascik, Denver Post, May 30, 2002.

---

[36] *Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States.*

[37] *Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality*, EPA, 2001.

[38] *Easing the Burden: A Companion Analysis of the Texas Transportation Institute's Congestion Study*, Surface Transportation Policy Project, 2002.

Costs

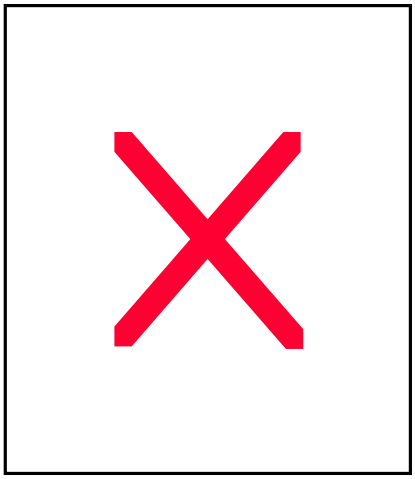
Sprawling development patterns result in increased costs to residents and public entities. Low-density suburban development can cost two to three times more in infrastructure costs than a traditional community.[39] Infrastructure costs for water and sewer services increase as development spreads out across the land. These costs, borne by residents, can be greatly reduced by limiting sprawl and planning for water-related costs in conjunction with land use planning. The increased water demands associated with sprawl have also resulted in reactionary measures pushing for costly water storage projects.

Infrastructure Costs

Sprawl is characterized by low density and leapfrog patterns of development; these patterns require that infrastructure extend further out than is required by more traditional and compact forms of development. The result is increased costs for water and sewer services, and other infrastructure. In fact, an examination of the average annual municipal and school district operating costs across the nation indicates that residential uses pay only a quarter to a half of the cost of public services.[40]

Water and sewer services comprise a large portion of the operating costs of communities. Water and sewer systems are necessary for growth, but it is estimated that sprawl can inflate water and sewer infrastructure costs by 20 to 40 percent.[41] For example, Denver Water is projected to need over $31 million by 2005 in order to address capital improvement needs; this figure does not include costs absorbed by other entities for necessary improvements.[42] Clearly, planning for water needs in conjunction with land use decisions can dramatically impact the infrastructure costs associated with water and sewer needs.

Sprawling development patterns can also affect the layout of water and sewer systems in negative ways. For instance, water systems are typically arranged in a grid or loop system, which this allows for greater circulation of water and connectivity between lines. However, cul de sac development, a hallmark of sprawl, often results in "dead ends" that reduce circulation, may cause water quality problems, and require the water provider to flush the system, which incurs greater costs and wastes more water.[43]



Cul de sac development in Lakewood.

[39] *Save Our Lands, Save Our Towns: A Plan for Pennsylvania*, Hylton, Urban Land Institute, 1995.
[40] Presentation by Robert Burchell, Ph.D., Rutgers University, December 2001.
[41] *Building Livable Communities*, Clinton-Gore Administration, 2000.
[42] *Water For Tomorrow*, Denver Water, February 2002.
[43] *Id.*

Failing Drainage Infrastructure (El Paso County and Colorado Springs)

Between 1990 and 2000, El Paso County's population increased 30.2 percent while Colorado Springs' population increased 28.3 percent. This dramatic growth has further burdened the area's already overtaxed stormwater drainage system. In 1999, a series of heavy spring rains and flooding had a devastating impact on the area. Many homes experienced sewage backups and roads and bridges were damaged. The total damage in the area was estimated at about $40 million.

Growth in the area has created a demand for increased infrastructure. Current drainage fees are meant to pay for new infrastructure. However, the existing infrastructure is in need of improvement and maintenance. While drainage fees have increased (based on location and impervious surface ratio) for newly developed areas it is clear that the needs of the existing infrastructure are not being met. In fact, according to the Colorado Springs Area Infrastructure Study, approximately 95 percent of identified drainage needs are unfunded.

Source: Ed Sealover, A Flood of Buyers, Colorado Springs Gazette, January 21, 2001; Pam Zubeck, Two Sue Over Flood/'99 Damage Blamed on Lack of City, County Drainage, Colorado Springs Gazette, May 1, 2001; KPMG Consulting, Colorado Springs Area Infrastructure Study.

Sprawl takes a serious toll on California's water supply. Forty of the state's 350 groundwater basins are seriously over drafted, and water planners predict that by 2020 the state will face a water supply deficit of between 2 million and 8 million acre-feet. Though not the sole cause, fringe development does make the water issue more expensive and complicated to manage.

Greenbelt Alliance. Beyond Sprawl: New Patterns of Growth to Fit the New California, 1995.

Costs for Large Storage Projects:

Colorado has an extensive system of water storage facilities and infrastructure systems. However, increased population and sprawl have resulted in higher water demand. Between 1990 and 2000, Colorado has seen its population increase 30.6 percent.[44] Coupled with rapid population growth, Denver area water users consume significantly more water per day than other cities in the West. Supplying a limited amount of water to growing numbers of people along the Front Range is becoming increasingly difficult. Implementing water conservation measures and integrating land use and water planning can help Colorado to use its water resources more efficiently.

The increased water demands associated with sprawl combined with a failure to conserve water supplies has resulted in extreme water shortages across Colorado. One reaction to this crisis has been a renewed interest in large, expensive storage projects. However,

[44] http://www.quickfacts.census.gov.

these projects can take decades to complete, are enormously expensive, and environmentally harmful. Rather than promoting these problematic projects, Colorado needs to look seriously at conservation measures and the relationship between sprawl and water consumption. Denver Water has begun to follow this track by looking to conservation, reuse, and small-scale system refinements in order to minimize the need for new storage projects.[45] These initial efforts are expected to free enough water that demand will not exceed supply until at least 2035. Other water providers in Colorado should follow Denver's lead. Expanding existing reservoirs and repairing existing facilities should be prioritized over large, new storage projects. Statewide planning for water supplies must also be implemented.

While the environmental and fiscal impacts of dams are extensive, conservation efforts can extend the existing supply at much lower costs. For instance, the Union Park Project was estimated to cost about $800 million dollars in the early 1990s and would provide about 100,000 acre feet per year. Denver Water, in contrast, has projected that it can save 29,000 acre feet per year at a cost of just over a $1.5 million per year.[46] That amounts to a cost of $8,000 per acre foot of water out of Union Park versus just over $471 per acre foot of water saved by conservation measures. Further, continued failure to address the relationship between sprawl and water supply issues will keep Colorado in a never ending cycle of water shortfalls and promotion of unsustainable growth and expensive water storage and diversion projects.

$10 Billion Dam Proposal

A lack of serious conservation measures to reduce demand, combined with a drought, has prompted new calls for water storage projects. Recently, the State Legislature considered a $10 billion water storage infrastructure bill that would have significantly increased money available for the creation of water storage projects without requiring land use planning that considers water quantity and quality, efficiency measures, least cost alternative analysis, environmental protections, or even basic direction as to how the money should be spent. While this particular proposal did not pass, many similar proposals are expected to emerge in the near future.

Blue Mesa Reservoir.

[45] *Water For Tomorrow.*
[46] *Id.*

Policy Recommendations:

CoPIRG endorses the following policies to alleviate the growth-related water issues facing Colorado:

1. Integrate land use planning with a statewide plan for sustainable water supplies that promotes conservation, protects the environment, is cost effective, and treats all geographic areas of the state equitably.
    - Limit approval of development projects to those that can be accommodated by the available water supply.
    - Promote development of smaller lot sizes that require less outdoor watering. Compact planned development may use up to 35 percent less water than low-density sprawling development—this is mainly due to lot sizes.
    - Utilize compact development patterns and transit alternatives to reduce reliance on the automobile and prevent the proliferation of associated impervious surfaces and their associated pollution problems.
    - Reduce impervious surface area ratios in undeveloped areas through land use planning.Utilize tools that protect water resources in developed areas. For example, buffer zones between impermeable surfaces and water bodies and technical solutions such as permeable surfaces.
    - Reduce water and sewer infrastructure demands by linking land use and water planning. Utilizing compact development patterns can save 20 to 40 percent in infrastructure costs.
    - Explore flexible, market-based approaches to water supply management such as dry year leasing, water banking, and interruptible water contracts.
    - Future water projects must be designed so that they have minimal economic, environmental, and social impacts.

2. Implement conservation measures that can save significant amounts of water at relatively low costs and do not have the environmental and fiscal impacts of large storage and diversion projects.
    - Prior to approving new transbasin diversions existing water supplies should be utilized to their full potential. This includes implementing measures such as conservation, reuse, and conjunctive use of groundwater.
    - Enact ordinances that prohibit restrictive covenants regarding turf grass. (For example, Denver City Ordinance Section 57-100.)
    - Encourage and educate people about more water efficient landscaping methods such as Xeriscaping. It is estimated that utilizing Xeriscape can reduce water consumption by 30 to 40 percent.
    - Require permanent water saving measures including watering every third day and watering only at night or in the early morning.