

**From:** [McKinney, Matt](#)  
**To:** [Mohr, Jason](#)  
**Cc:** [Sarah Bates](#)  
**Subject:** Re: WPIC request for information  
**Date:** Wednesday, October 21, 2015 8:55:22 PM  
**Attachments:** [2003 Land Lines.pdf](#)  
[2011 Policy Report # 7 Water & Land 2011.pdf](#)

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Jason:

We have focused on this issue of linking land and water decisions since 2003. I am attaching most of our work on the topic.

Sarah, what I am missing?

Sarah and I are happy to provide additional information as time permits.

All the best,

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Matthew McKinney, Ph.D.  
406.459.5166  
[www.naturalresourcespolicy.org](http://www.naturalresourcespolicy.org)  
[cid:573686C4-B766-406D-8CEC-6BD2F96FC939]

From: Jason Mohr <[jmohr2@mt.gov](mailto:jmohr2@mt.gov)<<mailto:jmohr2@mt.gov>>>  
Date: Wednesday, October 21, 2015 at 3:52 PM  
To: Matt McKinney User <[matt@cnrep.org](mailto:matt@cnrep.org)<<mailto:matt@cnrep.org>>>  
Subject: WPIC request for information

All,

The Water Policy Interim Committee is seeking information for its interim study of Water Availability and Supply. Specifically, the committee seeks to evaluate four diverse cases of what you think works well and what doesn't related to supplying water for growing communities. For example, issues associated with the development of a subdivision next to city limits and the subsequent decision to use either individual groundwater wells or a municipal water supply.

Please tell the committee what you think works well, what doesn't, and what the issue is. Suggested, knowledgeable contacts with phone number and/or email address would be appreciated.

The WPIC hopes to use these case studies to explore how the Legislature might support successes and address issues, so feel free to provide suggestions, even if you don't have a specific case study.

The Water Policy Interim Committee is a bipartisan, eight-member committee that meets to discuss water issues and has oversight of state agencies where the primary concern is the quality and quantity of water. The committee's next meeting is Jan. 11-12.

To suggest a potential case study, please contact WPIC staffer Jason Mohr at [jasonmohr@mt.gov](mailto:jasonmohr@mt.gov)<<mailto:jasonmohr@mt.gov>> or 444-1640.

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# Linking Growth and Land Use to Water Supply

Over the past several years, the Lincoln Institute has sponsored executive courses for state planning directors in the Northeast and in the West. In October 2002, more than 25 planning officials from 14 western states met in Portland, Oregon, to compare their experiences, learn from each other's successes and failures, and receive briefings, lectures and case presentations. A featured panel discussion during that course addressed "The Role of Water in Managing Growth." This article provides a brief review of alternative policy options to link land use and water supply, and offers some suggestions for further research, education and policy development.

MATTHEW MCKINNEY

During the summer of 2002, many Colorado communities imposed watering restrictions as historic drought gripped the state. Along Colorado's Front Range, from Fort Collins to Colorado Springs, officials are now contemplating the possibility of adopting a coordinated program to help homeowners understand when they can, and cannot, water (Smith 2002). At the same time, Governor Bill Owens and other state officials hope to work with the Bush administration to harvest more trees in Colorado's high-country in hopes of increasing water supply (Stein 2002). The basic idea behind this proposal, based on decades of study of state forests in Colorado, is that by removing around 40 percent of all trees in an area, the runoff from spring snowmelt can be increased significantly (*Denver Post* 2003). Such a proposal could change the face of Colorado for decades to come.

The situation in Colorado is symptomatic of urban areas throughout the Rocky Mountain West, one of the fastest growing regions in the country, and one of the driest. Finding sufficient water to meet the demands of burgeoning urban areas while also providing water for agricultural, commercial, recreational and environmental uses is one of the region's most challenging land use issues.

But water is not a problem only in the West. Communities from Florida to Massachusetts experienced some form of water rationing during the summer

drought in 2002 (Snyder 2002). Frederick, Maryland, for example, has experienced a water supply crisis due to rapid growth and bad planning. After imposing a ban on new development, city officials approved an ordinance in September 2002 that will limit developers' access to water once Frederick moves beyond the immediate crisis and lifts the moratorium on construction. As further evidence of the growing need to link growth and land use with water supply, the Environmental Law Institute, the American Planning Association and other organizations cosponsored a conference in February 2003 titled *Wet Growth: Should Water Law Control Land Use?* It was cosponsored by and held at the Center for Land Resources at Chapman University School of Law in Orange, California.

## Policy Options

Water and land are inseparable, yet the need to link growth with water supply in the process of making land use decisions appears to be a relatively recent phenomenon. A preliminary review suggests four prominent policy options to achieve this linkage.

## Water Markets

In their 2001 report, *Water and Growth in Colorado*, researchers at the University of Colorado's Natural Resources Law Center write, "... managing growth through water policy ... is probably not an option worth considering." Their conclusion is based, at least in part, on two observations: abundant water supplies in the city of Pueblo have not spurred growth there, and

a lack of water has not restricted development in the nation's fastest-growing region, Douglas County. The authors explain that a more compelling set of issues revolve around the impact of land use and growth on water resources. The increasing demand for municipal water use tends to deplete stream-flows and thereby degrade fisheries, recreational opportunities and other environmental values; increase water pollution; foster inter-state disputes; and increase the price of water. While these impacts are undeniable and create their own set of problems, they distract us from the question of whether, and to what degree, water supply can or should direct growth.

In the West, water is considered a private property right (Getches 1984). It can be separated from the land and may be bought and sold in the free market like any other commodity. In Colorado and other western states, it is common to hear people say, "water flows uphill toward money." This means that water is reallocated to where it is most highly valued (or to those who can pay the most), as illustrated by the trans-boundary system that diverts water from the western slope of Colorado across the Continental Divide to the metropolitan areas along the eastern slope. Under this legal and institutional system, it is quite common to transfer water rights from agriculture, which accounts for about 75 percent of water use in the West, to ever-expanding urban areas.

Water markets thus facilitate growth by acquiring the water necessary for land use and urban development (Anderson and Leal 2001). But what if a community or

region is interested in managing growth to sustain some open space, wildlife corridors, and sufficient water flows for fish, recreational and other environmental values? How can water availability, or more accurately the lack of water, direct growth and land use into more desirable areas, thereby reducing conflicts with other community goals?

### *Public Trust Doctrine*

One way is to establish priorities for water use through the political process. Article II, Section 1, of Hawaii's constitution states, "All public natural resources are held in trust by the State for the benefit of the people." Article II, Section 7, says, "The State has an obligation to protect, control, and regulate the use of Hawaii's water resources for the benefit of its people." Section 7 goes on to say that the state's water resources agency shall "establish criteria for water use priorities while assuring appurtenant rights and existing correlative and riparian uses ..." Interpreting these constitutional provisions, the Hawaii State Water Code clarifies that the state has both the authority and duty to preserve the rights of present and future generations in the waters of the state, and the state has a duty to take the public trust into account in the planning and allocation of water resources.

Hawaii's public trust doctrine is not uncommon; most western states have similar language in their constitutions (Sax 1993). Hawaii appears to be unique, however, in the degree to which it allocates water on the basis of the public trust doctrine. The state's water code declares that water should not only be allocated to domestic, agricultural, commercial and industrial uses, but also to protect traditional and customary Hawaiian rights, maintain ecological balance and scenic beauty, provide for fish and wildlife, and offer opportunities for public recreation. To achieve these purposes, the Commission on Water Resource Management is responsible for developing a water plan that allocates water on the basis of "reasonable beneficial use," and for regulating water development and use (Derrickson et al. 2002).

In 1997, the Commission issued water use permits for agricultural and other out-of-stream uses on the Waiahole Ditch water system. The decision was appealed to the Hawaii Supreme Court, which overturned the Commission decision and ruled that the public trust doctrine and the state's water code provide that, at least in this case, in-stream public uses of water receive special consideration over off-stream private uses. This and similar applications of the public trust doctrine suggest that it is possible for appropriate jurisdictions to establish priorities for water use, and then

**Arizona's five active management areas were created in response to the 1980 Groundwater Management Act. Map reprinted from December 2001 Final Report of the Governor's Water Management Commission, Arizona Department of Water Resources.**

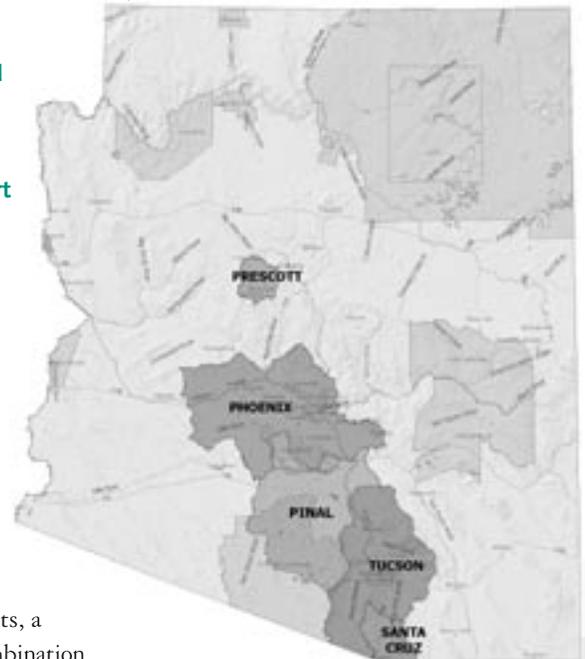
to allow the market to reallocate water rights from one use to another consistent with the priorities established by law and the political process (Sax 1993).

### *"Prove-it" Policies*

Rather than rely on water markets, a public trust doctrine, or some combination of the two, several jurisdictions around the country have crafted policies that specifically require a link between water availability and development. According to the ordinance adopted in Frederick, Maryland, city officials will review every proposed development and decide whether the city can provide the necessary water. Under the ordinance, 45 percent of surplus water will be allocated for new residential developments, 30 percent for commercial and industrial projects, and 25 percent for other uses, including government buildings and hospitals.

Other states have adopted similar policies that require developers to prove that they have adequate water supplies prior to approving development proposals. According to Charles Unseld, the director

of Colorado's Office of Smart Growth, several communities along Colorado's Front Range are imposing such restrictions, at least on an ad hoc basis. In October 2001, California Governor Gray Davis signed Senate Bill 221, which requires developers of proposals for subdivisions of 500 units or more to prove they have water rights before they can receive final approval. While this requirement can be avoided by building smaller developments, it nevertheless represents an incremental step in directing growth according to the availability of water.



Perhaps the most sweeping policy framework linking water supply to growth is Arizona's Groundwater Management Act. Groundwater sources supply roughly one-half of the total annual demand for water in Arizona (Jacobs and Holway, undated). Like most western states, agriculture accounts for about 70 percent of water use in Arizona, although this percent is slowly decreasing as municipal demand increases and the agricultural economy declines. In response to a growing concern over groundwater mining (that is, pumping and using groundwater at a rate faster than it can naturally replenish itself), the legislature passed the Groundwater Management Act (GMA) in 1980, and it was signed by then-Governor Bruce Babbitt.

The GMA created four "active manage-

ment areas” (AMAs) around the state’s most populous areas: Phoenix, Pinal, Prescott and Tucson; a fifth AMA was created in Santa Cruz in 1993. The primary intent of the GMA is to sustain a long-term balance between the amount of groundwater withdrawn in each management area and the amount of natural and artificial recharge. This is accomplished through a combination of mandatory water conservation requirements and incentives to augment existing supplies. To help achieve the goal of “safe yield,” the GMA prevents new subdivisions from being approved in AMAs unless developers can prove that renewable water supplies are available for 100 years.

During a recent review of the GMA by a Governor’s Commission, water managers in Arizona concluded that the “assured water supply” program is responsible for much of the substantial progress that has been made in fast-growing municipalities to move away from groundwater overdraft toward renewable water supplies, including water from the Colorado River and reuse of effluent.

Another potential policy mechanism to link growth and land use to water supply is the use of urban growth boundaries (UGBs). The statutes that authorize UGBs in Oregon do not currently single out water availability as a variable for determining where the boundary should be located. However, Ethan Seltzer, director of the Institute of Portland Metropolitan Studies at Portland State University, has commented that it is not inconceivable to create a UGB within which developers would be required to prove that water is available for proposed growth.

### Water and Land Management Strategies

In addition to asserting policies that explicitly link the availability of water supply to proposed development, there are other ways to meet the demand for more water to support development. Using existing water supplies more efficiently through conservation, xeriscaping and other water-saving measures can free up some water. Drought planning, water harvesting and the use of on-site gray-water systems can

also help manage supply to meet demand. Groundwater development and the conjunctive use of surface water and groundwater may be appropriate for some communities. Small-scale and off-stream water storage, while potentially expensive and environmentally controversial, also could help some communities satisfy their thirst for growth.

Another option, mentioned earlier, is to increase water supply through timber harvesting and vegetation management. While some people debate the technical merits of this option, nearly everyone must question its political feasibility. During the past decade, conservation and environmental groups have consistently challenged timber harvesting practices on federal lands throughout the West, often tying-up much needed salvage logging and restoration projects for years in the courts.

### The Search for a Land and Water Ethic

A recent issue of *National Geographic* reports, “Among the environmental specters confronting humanity in the 21st century—global warming, the destruction of rain forests, over-fishing of the oceans—a shortage of fresh water is at the top of the list ...” (Montaigne 2002). In the face of what the World Bank refers to as the “grim arithmetic of water,” the author concludes that people around the world seem to emphasize two common approaches to this problem: efficient use of available water supplies, and a belief in using local solutions and free market incentives to emphasize conservation.

The relationship among water, growth and land use is a global problem that will be resolved most effectively at the local and regional level. While this article has reviewed several policy options, it is clear that there is much to be learned from other countries. More research, documentation and analysis of the effectiveness of alternative policies and practices are surely needed if the *National Geographic* story is correct: that limited water supplies are or will be the number-one environmental issue facing communities.

As we search for effective ways to integrate water, growth and land use, it is

instructive to keep in mind the “land ethic” articulated by conservationist Aldo Leopold (1949, 224-225): “A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.” The land ethic, according to Leopold, is based on the premise that the individual is a member of a community of interdependent parts. It provides moral direction on relationships between individuals and society and between humans and the biotic community, which includes soil, plants and animals, or collectively, land and water. This principle should inspire and guide us as we develop effective public policies to sustain communities and landscapes. **L**

**MATTHEW MCKINNEY** is director of the *Montana Consensus Council*, which is housed in the Office of the Governor in Helena, Montana. He is also a faculty associate of the *Lincoln Institute*, where he teaches courses on resolving land use disputes and regional collaboration, and coordinates the annual course for state planning directors in the West. Contact: [mmckinney@state.mt.us](mailto:mmckinney@state.mt.us) or [www.mcc.state.mt.us](http://www.mcc.state.mt.us).

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# BRIDGING THE GOVERNANCE GAP



# STRATEGIES TO INTEGRATE WATER AND LAND USE PLANNING



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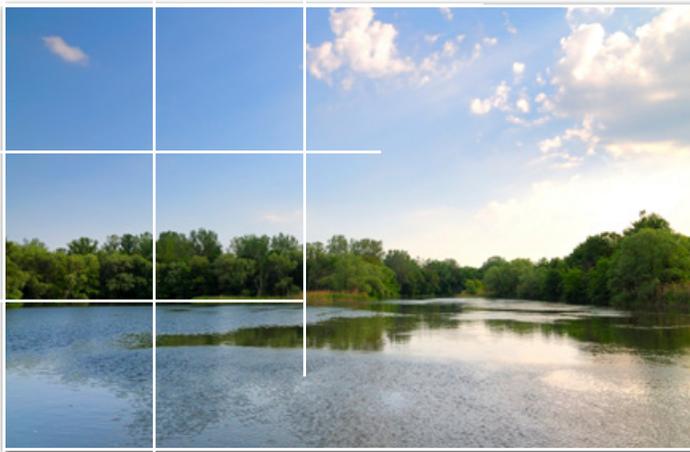
Center for Natural Resources  
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**Policy Report No. 7**

*The Center for Natural Resources and Environmental Policy is an applied research and education center at The University of Montana. The Center's goal is to shape policy for people and places, including urban, rural, working, and wild landscapes. The Center operates on the principle that the best way to do this is through public processes that are well informed and provide meaningful opportunities for all interested citizens, stakeholders, and decision makers to participate. To help achieve this mission, the Center produces Policy Reports to build and share knowledge on options to prevent and resolve natural resources conflicts. To ensure the reports are relevant, the Center partners with appropriate organizations involved in formulating and influencing public policy. While not representing the official policy of any of these organizations, our publications benefit a great deal from this input and review.*

*This report, **Bridging the Governance Gap: Strategies to Integrate Water and Land Use Planning**, builds on work done in partnership with a number of organizations and individuals involved in water policy and land use planning. The first edition, published in 2007, received wide distribution. We shared its findings in meetings convened by the American Planning Association (national and state chapters), the Lincoln Institute of Land Policy, the Council of State Governments-WEST, the Rocky Mountain Land Use Institute, the Oregon Association of Counties, statewide watershed coordinating councils in Montana and Colorado, the U.S. Environmental Protection Agency, and the Universities of Colorado, Montana, and Wyoming; discussions with leaders of the Western Governors' Association, the Western Planning Association, and the Western Interstate Region of the National Association of Counties; and in publications such as Headwaters News, Environmental Law Reporter, Water Report, Public Land & Resources Law Review, and Planning & Environmental Law.*

*This extensive and informative dialogue highlighted the need to update and expand the 2007 report to reflect many emerging strategies to link land use and water throughout the country. With the generous support of the Bullitt Foundation, we launched this revision in 2010. This second edition reflects additional input from scholars and practitioners throughout the country, whose published work is listed at the end of the report. We are grateful for the perceptive, forward-looking observations of Douglas Kenney, Dan Tarlock, Lora Lucero, Conci Bokum, Scott Coulsen, Peter Pollock, Kimery Wiltshire, Jim Holway, Michael Campana, Brianna Randall, Barbara Hall, Mary Sexton, and Michelle Bryan Mudd, as well as the many organizations whose invitations to share this scholarship have enriched its content and reach.*



*Bridging the Governance Gap: Strategies to Integrate Water and Land Use Planning, Second Edition*  
By Sarah Bates

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## HIGHLIGHTS OF THIS REPORT

Despite the obvious relationship between where and how people live and the water they need to do so, our institutions have been slow to encourage decision makers to think about land and water use together and to engage in a dialogue with affected publics about the consequences of those decisions. The dual pressures of population growth and climate change (along with impacts of energy production) are prompting a more urgent look at this connection.

A variety of strategies to integrate land use and water are arising throughout the country. In the arid western states, these tend to focus on making sure that adequate water is available to meet the demands of growing populations. And, while water shortages are not unknown in the East, land-water connections in that part of the country focus more on making sure that development does not compromise the quality of drinking water or the integrity of aquatic ecosystems.

We frame this discussion around two broad visions of integrated land use and water planning. Within each, we provide examples of emerging initiatives:

**Water-Conscious Land Use Planning:** *Land use decisions take into account where the necessary water will come from, and at what cost (economic, environmental, and social). Land use decisions are coordinated on a large-landscape scale across jurisdictional boundaries. Land use planning is mindful of water supply constraints, and prioritizes development that is most consistent with maintaining water quality and ensuring sustainable supplies.*

Examples:

- Conditioning development approval on sustainable water supplies
- Limiting and directing growth to match water availability
- Protecting and restoring watersheds and aquifers
- Reducing our water footprint through development design and building choices



**Community-Conscious Water Planning:** *Water planning and development decisions acknowledge that infrastructure availability often sparks growth (“build it and they will come”), and thus incorporate deliberative public dialogue about long-term land use priorities. Water suppliers seek to make the best use of limited resources, minimizing demands, and ensuring that the impacts of water development on highly valued landscapes are acknowledged and taken into account before final decisions are made. Residents are aware of the source of their water and the benefits of conservation and efficient use.*

Examples:

- Coordinated planning across jurisdictional lines
- Projecting water needs based on more than simple population estimates
- Limiting and mitigating for water use
- Encouraging voluntary transfers of developed water to meet new needs

Based on our experience and discussions with the people on the front lines of this work, a few key policy options would encourage better overall integration of water and land use planning:

- Evaluate broad questions related to water supplies and quality early in the planning process (e.g. comprehensive plan), and require a hard look at the sustainability of anticipated water sources for proposed new development prior to approval;
- Tighten the exempt-wells loophole to discourage its use in subdivision development, and implement appropriate measures to mitigate for the impacts of groundwater pumping on streams and aquifers;
- Value and protect the ecosystem services of key watershed lands, source aquifers, and other landscape components that enhance water supplies and quality;
- Evaluate development implications of alternative water supply scenarios, and ensure consistency with land use priorities; and
- Reduce overall demands and stretch existing supplies by mandating and providing incentives for conservation and efficiency throughout the water and energy sectors.

Facing the consequences of well-established growth patterns is not an easy proposition, but it is a necessary step in moving toward a sustainable future. We can no longer be indifferent to the environmental and other costs of our land use and water management practices. In taking the first step and thinking more deliberately about the consequences of growth, communities facing water security concerns will alter our course toward a more sustainable way to live in and with this landscape.

# INTRODUCTION

Historically, land use and water planning have occurred separately from one another. In most states, land use planning and decision making is the responsibility of local officials, while water allocation happens through the cumulative decisions of many individuals who develop water based on their immediate and projected needs. State officials exert control over water use indirectly, through their administration of water rights; federal agencies play a role through their management of large water storage and delivery projects and through implementation of federal environmental laws.

With few exceptions, land use planners have addressed water in a fairly cursory fashion, if at all. Planners safely assumed that water would be available for all projected growth and would not be a limiting factor. Increasingly, however, local land use decisions run headlong into concerns about the sustainability of water supplies and the impacts of withdrawals on aquatic ecosystems, recreational resources, and other important public values.

In some cases, existing uses are depleting finite water supplies, raising questions about their future reliability. For example, in some fast-growing rural areas of Arizona, homeowners draw their water from wells that, prior to construction, the state engineer's office declared "not reliable" due to insufficient underground supplies. Some homeowners did not realize the tenuous nature of their water supplies and have been forced to construct cisterns and pay for trucked-in water for their domestic use.

Elsewhere, officials are beginning to face the high social, environmental, and economic costs of obtaining water to meet rising urban demands. Urban growth around Phoenix, Denver, and Boise has been fueled by voluntary, market-based reallocation of water from farms to cities, which will continue in the future. But public outcry over Las Vegas' long reach into rural Nevada signals renewed concerns over the impacts of large-scale water transfers, both on the rural communities from which the water is taken and on the pocketbooks of the consumers receiving it.

Water security issues are more visible in the arid western states, but they are emerging throughout the country. For example, fast-growing Atlanta, Georgia, ran into conflicts with neighboring states in the 1990s when its diversions from Lake Lanier threatened the downstream states' ability to receive the hydroelectric and water supply benefits they counted on. In a 2009 ruling, federal Judge Paul Magnuson ruled against Atlanta and the U.S. Army Corps of Engineers (which operates the dam and reservoir from which Atlanta draws its water), but stayed his



ruling for three years to allow the parties to work out their differences.<sup>1</sup> They have failed to do so, and thus the conflict is likely to flare again soon. The judge noted in his opinion that local governments, motivated by the promise of increased tax revenues, encourage unchecked growth but “do not sufficiently plan for the resources such unchecked growth will require. Nor do individual citizens consider frequently enough their consumption of our scarce resources” unless faced with an imminent loss of water as was the case in Atlanta in 2007.

Although absolute water shortages may provide a hard barrier to growth only in isolated places, the failure to connect land use and water planning will have far-reaching and increasingly unacceptable consequences throughout the country. This report describes the problem as a “governance gap”—a lack of integration in planning processes and a failure to examine and communicate the consequences of both land use and water choices at various levels of government.

*Sustainability offers a long view that attempts to balance—and synthesize—economic development, environmental protection, and equity. Sustainability holds the promise of more complete governance.*

Lincoln Davies, “Assured Water Supply Laws in the Sustainability Context” (2010).

An earlier version of this report, published in 2007<sup>2</sup> provided background on the governance gap between water and land use planning, summarized emerging strategies to better integrate the two, and suggested options to improve land use and water governance to address the pressures of growth while ensuring sustainable water supplies for the future.

This report updates and expands upon that material, providing more concrete examples of emerging strategies and policy options. It also includes more information about the projected impacts of climate change on water supply reliability, the role of public lands in meeting urban water needs, and the implications of the economic downturn on water demand projections. In the three years since the first report was published, there has been widespread recognition of the need to integrate land use and water decisions, but progress toward that important goal remains sporadic.

A California water law symposium convened in 2010 provided an excellent overview of the accomplishments and challenges of that state’s ambitious effort to link land use and water through a combination of development approval and environmental review processes.<sup>3</sup> The symposium organizers noted that various “wet growth” initiatives have emerged throughout the country, but there is little agreement about what we are trying to achieve with these efforts. Are we seeking to minimize water depletions and thus protect and restore functioning aquatic ecosystems, or is the emphasis on achieving water security for a growing population in the face of climate uncertainty? This important question—toward what end?—is useful to keep in mind in evaluating the emerging strategies and policy options highlighted in this report.

<sup>1</sup> *In re Tri States Water Rights Litigation*, 639 F. Supp. 2d 1308, 1355 (M.D. Fla. July 17, 2009).

<sup>2</sup> See [http://cnrep.org/documents/collaborative\\_governance\\_reports/bridging\\_the\\_gap.pdf](http://cnrep.org/documents/collaborative_governance_reports/bridging_the_gap.pdf)

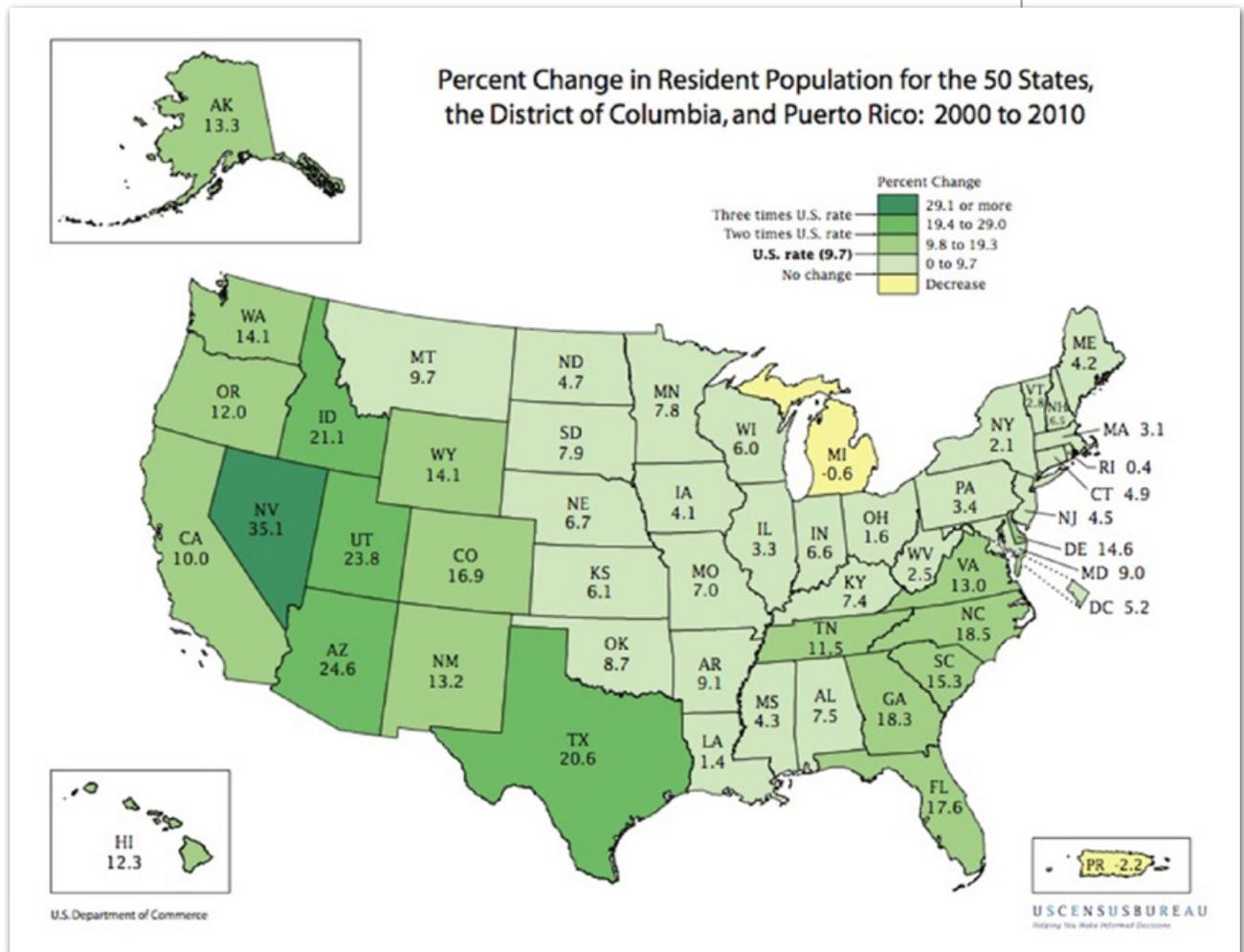
<sup>3</sup> See Golden Gate Univ. Environmental L.J., 4, no. 1 (2010): *Symposium Edition: Real Water: California’s Land Use-Water Law Turns Ten*. Specific articles from that issue are referenced here and cited in full in the Resources section at the end of this report.

# A SHIFTING LANDSCAPE

Water and land use decisions take place within the context of a landscape that is dynamic in every sense. Dramatic changes in population growth patterns and lifestyle choices bring new and different demands for (and impacts on) land and water. Moreover, heightened public concerns about the consequences of land and water decisions have resulted in new laws that require additional disclosure and protective measures. Understanding these factors is an important first step in appreciating governance challenges and the need for more integrated land and water strategies in the future.

## Where the People Are

People are drawn to scenic, warm parts of the country. As demonstrated by information gathered in the U.S. Census (see map), much of the fastest growth is occurring in areas with the most limited water supplies. Initial figures released from the 2010 Census revealed that the United States population continues to



grow and migrate from the Northeast and Midwest to the South and West. The West experienced a 13.8 percent growth rate between 2000-2010, making it the second fastest growing region behind the South, which grew at a rate of 14.3 percent. All five of the states with the highest growth rates are located in the West: Arizona (24.6 percent), Idaho (21.1 percent), Nevada (35.1 percent), Texas (20.6 percent), and Utah (23.8 percent).

Growth patterns are at least as important as absolute numbers of people, and the trend is toward larger houses spread farther apart from one another. A U.S. Department of Agriculture analysis concluded that developed land in the contiguous United States increased 34 percent between 1982 and 1997. During the same 15-year period, population grew by about 15 percent. Thus, our footprint is getting bigger: land consumption occurred at more than twice the rate of population growth. And, as the U.S. Environmental Protection Agency noted in presenting this information, more than a quarter of all the land conversion from rural to urban and suburban uses since European settlement occurred in this same 15-year time period.<sup>4</sup>

The development slowdown that accompanied the Great Recession dampened the rate of growth but not the overall trends. Thus, we can expect to see continued migration of people to the warmer, drier parts of the country in coming decades.

## *Water Demand Forecasts*

So far, lack of water has not prevented urban areas from expanding, but cities such as Las Vegas face formidable physical and political obstacles in their continuing efforts to meet future demands. Part of the challenge is accurately forecasting these demands, which are not linked as tightly as one might expect to population and economic growth figures.

According to the U.S. Geological Survey, the United States as a whole currently uses less water now than it did in 1975, largely because of more efficient agricultural and industrial practices.

Indeed, as a 2009 interpretation of the USGS data put it, “the U.S. now produces far more wealth, with far less water, than at any time in the past.”<sup>5</sup> Researchers analyzing the “economic productivity” of water (dollars of Gross Domestic Product per unit of water used), concluded that this metric has nearly tripled since the 1970s, to \$8.45 of GDP produced per hundred gallons used from only \$3.18 in 1975 (in 2005 dollars).

*People from wetter regions are not taking their water with them when they head to drier areas.*

Heather Cooley, Pacific Institute (2009)

<sup>4</sup> EPA Watershed Academy Web, <http://cfpub.epa.gov/watertrain/index.cfm>

<sup>5</sup> These and the following data are from the Pacific Institute’s Fact Sheet (2009).

About 86 percent of Americans depend on public supplies for their domestic water; most of the others rely on private wells. The USGS found that the total amount of water withdrawn for public water supplies increased by just 2 percent between 2000 and 2005, during which our national population expanded by 5 percent, reflecting gains in urban conservation and efficiency.

Per-capita water use varies tremendously, however, with the highest rates occurring in the dry western states where more than half of each household's water is used to water lawns and gardens. Thus, to a large extent, efficiency gains in individual households will be offset by the ongoing migration of people to drier states and the trend toward larger houses on bigger (landscaped and irrigated) lots. A 2005 study of water and growth in California concluded that growth trends in that state indicate an increase in water demand by 40 percent between 2000 and 2030 if per capita use remains constant. Even if per capita use is reduced aggressively, urban water demand will increase by 1.5 million acre-feet, requiring water suppliers to look to a wide range of options: groundwater banking, recycling, conservation measures, and water transfers.<sup>6</sup>

Indeed, water suppliers increasingly turn to the market to purchase water already developed for agricultural irrigation, or invest in conservation and wastewater re-use technology. Some cities in coastal areas are exploring options for desalting ocean water or treating brackish groundwater. The search for "new" water is no longer limited to looking upstream for a suitable dam site, or drilling a deeper well.

### *Climate Change as the Wild Card*

Complicating the water supply picture, global climate change offers a new set of challenges and uncertainties. As climate change researcher Brad Udall testified before Congress in 2010, "water will be the delivery mechanism for many of the important impacts of climate change."

Scientists warn that the very regions experiencing the fastest growth are likely to suffer the greatest impacts from a warming atmosphere. The currently available predictions agree that this warming trend will continue, and scientists are already observing trends such as:

- Snowlines moving to higher elevations, with more precipitation falling as rain instead of snow in the winter, and earlier, "flashier" runoff patterns;
- Flooding and erosion during high-runoff events, causing murkier rivers and damaging riparian habitat;



- Low streamflows during the hottest months of the summer and early fall, with related fish kills, water quality problems, and competition among water users; and
- Drier western forests with more extensive insect infestations, leading to tree deaths and more frequent and intense fires.

The Colorado River Basin, which provides hydroelectric power and supplies drinking and irrigation water to 30 million people, may be especially vulnerable to these impacts. The Western Water Assessment concluded in a 2009 report that the reservoirs of the Colorado River could be dry up to half of the time if current demand projections are accurate and if Colorado River flows decline by 20 percent, as some studies suggest.<sup>7</sup>

*We are concerned that climate change may be a bigger issue for our state's water supply than population growth. Both come with a degree of uncertainty, but the more unpredictable of the two is climate change.*

The late Chips Berry, Denver Water, announcing formation of the Western Utility Climate Alliance in February, 2008.

Water suppliers recognize their vulnerability and are exploring a variety of avenues to ensure water security in a less certain future. For example, in 2008, eight of the nation's largest water utilities formed the Water Utility Climate Alliance (WUCA), aimed at combining resources "to improve research into the impacts of climate change on water utilities, develop strategies for adapting to climate change and implement tactics to reduce their greenhouse gas emissions." For its part, the Colorado Water Conservation Board sponsored a climate vulnerability study to help water managers understand and prepare for climate change impacts on shared watersheds.<sup>8</sup>

Some of the newest information on climate change illustrates a less-obvious connection between land use and water resources. Real estate development and recreational activities on desert lands in the Southwest generate large clouds of dust that travel to the high-country headwaters of the Colorado River, coating the winter snow with a dark, heat-absorbing layer that results in faster snowmelt which reduces the amount water available to fill basin reservoirs by 5 percent. While this increases the vulnerability of the desert states to water shortages, few expect political leaders in Arizona or Nevada to restrict such activities for the sake of the protecting high-country snowpack.

Similarly, recent analyses of the steep energy costs of developing, treating, and moving water have underscored the important link between water use and climate change. Water conservation initiatives thus do more than stretch that limited resource further; they also reduce the demand for energy and lower greenhouse gas emissions, thus providing some mitigation benefits.

<sup>7</sup> Rajagopalan et al. (2009).

<sup>8</sup> See <http://cwcb.state.co.us/environment/climate-change/Pages/main.aspx>

# WATER AND LAND USE PLANNING: THE HISTORICAL DISCONNECT

The persistent disconnect between water and land use planning arises from the separate legal bases for each area of governance. Water allocation occurs through thousands of individual decisions, with water rights administered by state agencies, while land use planning is within the authority of local officials. Generally speaking, water planning is subordinated to land use planning. That is, water planners obtain water to meet the demands of expected population growth; local land use planners do not constrain development in response to limited water supplies. It is important to understand these distinct legal authorities before considering options to bring the two closer together.

## *Water: Individual Actions, Limited State Oversight*

Historically, states have taken the lead in recognizing and protecting private claims to use water. Distinct rules for water rights in the eastern and western states reflect different precipitation levels, land use patterns, and other traditions. Eastern states adopted the riparian rights approach, a rule based on shared use of streamflows by owners of adjacent lands. In the drier western states, a self-help rule based on the principle of “first come-first served” developed into what is now known as the prior appropriation doctrine. Importantly, the prior appropriation doctrine separates water rights from land ownership. A few states retain a combination of these two principles, sometimes called a hybrid system of water rights.<sup>9</sup>

State water administrators or judicial officials preside over complex systems of water rights. In some states (such as Colorado), these rights are fully quantified, but many states are a long way from completing their adjudication procedures, so water rights holders are uncertain as to the amount of water they are legally entitled to use. Federal agencies and tribal governments participate in the state administrative processes through their assertion of reserved water rights—claims that date back to the establishment of national forests, national parks, and other federal reservations, as well



as the recognition of Indian nations' sovereign authority over lands and waters within their territory.

Groundwater is an increasingly important source of water for growing cities in the urbanizing West. Groundwater laws vary by state, and—with a few notable exceptions—generally do a poor job of regulating withdrawals or recognizing the connection between aquifers and surface water. In addition to large public water providers that depend on finite aquifers to provide long-term water supplies, a virtual explosion of private domestic wells raises concerns about impacts on surface water supplies, water quality, and public safety.

In most cases, private domestic wells are exempt from any state controls, other than a requirement that the state be notified when a well is drilled. This lack of regulation—and, frequently, lack of information about the extent of groundwater extraction—is a concern especially in rapidly growing rural and exurban areas throughout the country, many of which depend on individual wells rather than public water systems. In some cases, county officials continue to approve low-density housing developments in areas with limited or declining water tables, forcing homeowners to deepen their wells or face conflicts with senior water rights holders whose access to surface water is compromised by the proliferating domestic wells.

Water is a quintessentially public resource: State constitutions provide that the water itself remains the property of the state, and water rights guarantee only the right to use it under particular conditions. Regardless of this, water use is loosely “managed” in a highly decentralized aggregation of mostly private decisions. State officials, who legally operate as trustees for the public's resource, exercise limited authority over the allocation and use of water. They generally step in only when there is a proposed change in use requiring approval or a conflict between several existing water users requiring a determination of whose rights will prevail.

States historically managed water rights administration separately from water quality protection. Increasingly, however, they are recognizing that the two are closely linked. On the one hand, polluted water is less useful for domestic supplies, irrigation, and recreation, so all water users have a clear stake in

*Perhaps the single most common administrative challenge is the preference of some developers to use exempt wells to supply their subdivisions with water as a way of circumventing the permitting process needed to build community or public water systems. In some cases, such developers often install hundreds of wells in dense, concentrated subdivisions, and in many cases, these 'exempt' subdivisions are located in closed basins where water supplies are already limited.*

Nathan Bracken, Western States Water Council, Exempt Wells in the West (2010).

maintaining safe and sanitary water supplies. On the other hand, water diversions themselves may lead to the concentration of natural salts and chemicals and subsequent water quality problems—a fact that the legal system recognizes poorly if at all. Despite the physical realities of water use and quality, California is the only western state with a single administrative body (the State Water Resources Control Board) that considers the two together.

In addition to minimizing the discharge of pollutants into surface waters, resource managers may seek to dilute contaminants through streamflow protection measures. Recreationists and other instream users benefit when streamflows are maintained for water quality protection. Conversely, water quality is a benefit not often recognized when justifying environmental flow protection programs for fish, wildlife, recreation, and scenic purposes. Alaska, Idaho, Oregon, and Washington are among the few states that provide for environmental flow protection specifically aimed at water quality protection.

State agencies responsible for water rights administration often engage in planning efforts to balance long-term supplies for their residents with protection of the public's water resource in its rivers, lakes, and aquifers. State water planning has historically focused on maximizing water use and fostering economic development. It rarely considers the value choices inherent in choosing among competing demands for water or allows for dialogue about the desired future conditions of public resources affected by water use.

In a promising move in this direction, in 2005 the state of Colorado convened nine Basin Roundtables involving diverse local leaders and stakeholders in a statewide conversation about water choices. This collaborative approach emerged from a Statewide Water Supply Initiative, and aimed at involving diverse groups of people to learn about and provide input on water planning. The 2005 legislation also created a 27-member Inter-Basin Compact Commission to facilitate conversation within and among the state's river basins. The Roundtable process is a work in progress, and some are frustrated by the lack of concrete outcomes, but it offers the starting point for a dialogue and shared learning progress that is lacking in most states.

Some states do not conduct statewide water planning at all. Maryland, for example, leaves long-term water supply planning to its river basin commissions, which only cover portions of the state.<sup>10</sup>

Importantly, many critical water decisions occur at the local level, as municipal and regional water suppliers seek and hold water rights that enable them to ensure consistent deliveries into the future. While state agencies may be responsible for large-scale planning, the long-range plans of these local water suppliers play a key role in determining where water will come from and where it will be used in

<sup>10</sup> See the comparative analysis of Maryland, Florida, New Jersey, and Oregon in Cohen (2004).

the future. This jurisdictional proximity to local land use planners offers the opportunity for more coordinated efforts, but such collaboration is not uniformly pursued.

### *Land Use: A Local Concern*

In contrast with state-led water rights administration, land use decisions occur at the local level, though often under the guidance of state law. Unlike water law, land use planning explicitly embraces public values beyond a single resource use. Land use regulations significantly restrict the exercise of private property rights in favor of benefiting the public interests identified in a comprehensive plan and in other public documents.

A community's long-term vision is set out in its comprehensive (or general) plan, a policy document intended to guide specific land use decisions in the future. The comprehensive plan thus provides a blueprint for growth, defining the parameters within which development should be allowed and articulating priorities for community amenities.

Several aspects of a typical comprehensive plan relate closely to water planning. First, the plan typically assumes full build-out of available land in predicting population numbers, which are in turn used by water suppliers to forecast future demands. Second, the comprehensive plan includes a water infrastructure element, looking at the facilities necessary to serve projected development. This does not typically include a broad assessment of alternative sources of water or of development patterns that might minimize impacts on aquatic resources.

The comprehensive plan is implemented through land use decisions specific to particular areas and proposed developments. Typically a development permit is conditioned on a certification of water availability, which may be issued by the local utility or a state agency administering water rights.

In some cases, development is allowed even in the face of uncertain water supplies. For example, outside the highly regulated "Active Management Areas" of Arizona's most developed cities are numerous fast-growing communities in which development is proceeding in spite of documented insufficient groundwater to serve their domestic wells.



As described in more detail below, some states and local governments are requiring more rigorous assessments of the reliability of water necessary for new development. Although an encouraging trend, such "show-me-the-water" requirements occur late in the land use planning process. Accordingly, some land use experts are now calling for a more meaningful assessment of water resources earlier in the process, at the comprehensive planning stage.<sup>11</sup>

<sup>11</sup> Legal scholar Michelle Bryan Mudd at the University of Montana School of Law is analyzing existing comprehensive plan water elements mandated by state laws throughout the country, and will publish recommendations for a model ordinance. Her initial research indicates a wide variation in required analyses and projections.

## The Federal Overlay

### Federal Environmental Laws

Local land use and water decisions take place within the sidebars laid out by federal environmental statutes. The two most influential legal mandates with respect to local land and water decisions are the Endangered Species Act (which requires any action involving a federal permit to assure protection of listed species) and Section 404 of the Clean Water Act (which requires a permit for dredging and filling waters of the United States). These laws, enacted by Congress to provide a base level of protection for aquatic and other resources, mandate standards and processes with which local decisions must comply.

In 1990, for example, the EPA vetoed a federal permit for the proposed Two Forks Dam on Colorado's South Platte River, intended to augment long-term water supplies for Denver and surrounding communities. EPA Administrator William K. Reilly determined that there were other, more acceptable sources of water that would not destroy valuable wetlands, wildlife areas, and a scenic canyon in a gold-medal trout stream. The dam was never built, and Denver has since implemented aggressive water conservation and reuse measures, water purchases and leases from farmers, and innovative arrangements to maximize coordination of surface and groundwater.

In addition to this important regulatory role, federal agencies also provide incentives, in-kind support, and information to support sustainable land use planning and practices. For example, the EPA's promotion of a watershed approach includes extensive on-line resources such as a "Watershed Academy" and support for local governments, landowner groups, and nongovernmental organizations wishing to plan for watershed protection and restoration.<sup>12</sup>

### Federal Public Lands

This discussion focuses on public processes that influence decisions about water and private lands, but it is important to bear in mind the importance of federally managed public lands—particularly national forests—in any discussion of the water-land linkage.

Congress authorized the creation of the national forests more than a century ago, in part, "for the

*The most impressive innovations [in state water law and policy] were produced by federal regulatory pressure and locally based problem-solving efforts, often supported by federal participants.*

David H. Getches, "The Metamorphosis of Western Water Policy" (2001).



<sup>12</sup> See, e.g. EPA's "Healthy Watersheds" program, <http://water.epa.gov/polwaste/nps/watershed/index.cfm>

purpose of securing favorable conditions of water flows.” Today, the U.S. Forest Service (within the Department of Agriculture) manages 193 million acres of public forestland, much of it in the high-country headwaters of our nation’s major river systems. Former Forest Service Chief Mike Dombeck described water as the “forgotten forest product,” but that is beginning to change with a growing awareness of the critical importance of these watersheds.

*National forests compose only 17% of the land area in 8 Inland West states, but deliver 62% of their water, making them the water towers of the Inland West.*

USDA Forest Service

National forests provide water to 66 million people in the United States, including a high proportion of those in the western part of the country. For example, national forests supply over half of Wyoming’s water yield, more than two-thirds of Colorado’s water yield, and over 70 percent of the water used in Colorado’s public water systems.

In addition to providing the source of water to downstream water users, national forests furnish critical “ecosystem services,” such as preventing erosion, filtering sediment and pollutants, replenishing aquifers, moderating floods and high runoff flows, and protecting water quality. Water flowing through national forests also supports ecologically valuable wetlands, meadows, and riparian corridors, as well as lakes and streams that provide economically important recreational opportunities.

*Action Item 9.4c: Develop a pilot project with state and local partners to integrate land conservation with watershed scale water management.*

Some of these services can be quantified and assigned dollar values; others are less easy to measure. But, as described in more detail below, national forest managers are working together with municipal water suppliers to explore innovative partnerships to maintain and enhance these valuable services.

America’s Great Outdoors: A Promise to Future Generations (Feb. 2011).

The Forest Service’s new draft planning rule (released in February 2011) requires national forest planners to identify priority watersheds for maintenance or restoration early in the assessment process. The draft rule further requires each Forest Plan to include “components to maintain, protect, and restore public water supplies, groundwater, sole source aquifers, and source water protection areas” located on national forest lands.<sup>13</sup>

The Obama Administration’s “America’s Great Outdoors” report<sup>14</sup> recognizes the critical role that public lands play in providing clean and sustainable water supplies, although the report focuses far more on water’s importance for recreation and fish and wildlife habitat. It urges a landscape-scale (“all-lands”) approach to coordinated management across jurisdictional lines to protect and restore healthy river systems.

<sup>13</sup> See 76 Fed. Reg. No. 30, 8480, 8491 (2/14/11).

<sup>14</sup> See <http://americasgreatoutdoors.gov/>

# EMERGING STRATEGIES TO LINK LAND AND WATER

Despite the many disconnects between water and land use planners, there is now widespread recognition of the need to think about these resources in a more integrated way. The following public policy statements and actions illustrate how this awareness is emerging at many different levels of government:

- Responding to the disconnect between water resources and land use decisions, California’s Local Government Commission established a “First Stop Shop for Water Resources,” a clearinghouse for information and resources related to co-management of land and water resources<sup>15</sup>;
- A 2008 report of the Western Governors’ Association included four specific recommendations for member states to integrate land use and water planning;
- The U.S. Departments of Interior and Agriculture each announced national water initiatives linked to public land management, explicitly acknowledging the role of public lands as watersheds and calling for management practices aimed at ensuring sustained supplies of clean water for downstream urban residents and others;
- British Columbia’s 2008 “Living Water Smart” and “Green Communities Initiative” together articulate a policy framework and implementing actions aimed at settlement patterns aligned with sustainable use of water and other resources; and
- At the Fifth World Water Forum in 2009, international discussions of “water security” included responsible growth as a critical component of achieving this goal.

Although these developments are encouraging, implementation remains a work in progress. The discussion that follows highlights emerging strategies in two broad areas: (1) land-use planning and decision processes; and (2) water supply planning and management. Each section begins with a proposed vision statement of what we might aim at achieving (the “toward what end?” question mentioned in the introduction), followed by specific examples of approaches that are moving us in that direction.

## *Water-Conscious Land-Use Planning*

**Vision:** *Land use decisions take into account where the necessary water will come from, and at what cost (economic, environmental, and social). Land use decisions are coordinated on a large-landscape scale across jurisdictional*

<sup>15</sup> See <http://water.lgc.org/>

*boundaries. Land use planning is mindful of water supply constraints, and prioritizes development that is most consistent with maintaining water quality and ensuring sustainable supplies.*

## “Show Me the Water”

Before approving proposed development, many states and municipalities require assurance that water is available to meet projected demands. In many cases, this is a cursory “check-off” step, but sometimes this evaluation proves an important opportunity for local land use officials to take a hard look at development options and impacts. A survey conducted by the Western Water Assessment concluded that nine of the eleven western states have some form of assured water supply statute; Utah and Idaho address this issue only through local initiatives.<sup>16</sup> Another study found that only two states outside the West—Vermont and Florida—have such statutes.<sup>17</sup>

The goals of assured water supply statutes include:

- Protecting homeowners by preventing “high and dry” subdivisions;
- Protecting taxpayers and other water customers by ensuring that developers cover the cost of new service; and
- Directing growth to minimize environmental impacts.

The states’ approaches vary a great deal, as do their standards for what constitutes “adequate” water for new development. Although many have written on this subject, University of Utah Law Professor Lincoln Davies provided the most comprehensive framework for comparing the various approaches. He categorized the laws by the following design elements:<sup>18</sup>

- **Compulsory:** Whether there is a strict requirement for all development defined by the statute or an option for local governments to require such review;
- **Stringency:** Whether the law requires substantial proof of “wet water” rather than paper rights, and whether it defines the scope of hydrological review;
- **Universality:** Whether it applies statewide or just in particular designated areas;
- **Granularity:** Whether the law applies to all development or only those exceeding a threshold size or category; and
- **Interconnected with other plans:** Whether the required analysis must explicitly link to existing water planning processes or documents.

<sup>16</sup> See Klein and Kenney (undated).

<sup>17</sup> See Davies, “East Going West?” (2010).

<sup>18</sup> See Davies (2007).

No state in the country has enacted an assured water supply law that incorporates all these design elements. The examples here illustrate the widely varying approaches among the states that have enacted some form of legislation to ensure adequate water for new development.

Arizona, which enacted the first such law in 1980, provides the best example of a non-universal approach. There are vastly different requirements for development within or outside of the state's five major urban areas, which are designated as "Active Management Areas" (AMAs) for groundwater conservation.<sup>19</sup> Within an AMA, development must be conditioned on proof of an "assured water supply" for 100 years. In the many fast-growing communities outside the AMA, development may proceed in the face of a certification from the state engineer's office that the water source is "not reliable" due to insufficient supplies.

California has pursued an aggressive—but highly decentralized—approach. Legislation enacted in 2001 requires:

- (1) An "early warning" in the form of assessment of water supply reliability for large residential, commercial, and industrial development as part of the environmental impact reports at the initial stage of development approval, prepared under the California Environmental Quality Act (CEQA); and
- (2) Later in the process, at the subdivision map stage, written verification of the availability of water for any project meeting these criteria and subject to CEQA.<sup>20</sup>

California does not prohibit developments from proceeding in the face of uncertain water supplies, but it does require rigorous assessment of water availability and impacts of necessary mitigation measures—essentially mandating a risk assessment as part of the development approval process.<sup>21</sup> This is a good example of Davies' "stringency" element, as the statute spells out fairly explicit criteria for assessing the actual availability of water required by the proposed subdivision "during normal, single-dry, and multiple-dry years within a twenty-year projection."<sup>22</sup>

The California approach integrates land use decisions with water planning by explicitly referencing urban water management plans as part of the process—and thus has resulted in more effective communications among planners from these different sectors.



<sup>19</sup> See Ariz. Rev. Stat. Sec. 45-401 et seq. (1980 Groundwater Management Act) and the implementing regulations at Ariz. Dept. of Water Resources, R. 12-15-703(b).

<sup>20</sup> S.B. 221, ch. 642, 2001 Cal. Stat. 88; S.B. 610, ch. 643, 2001 Cal. Stat. 94. For a more detailed description of how these laws are implemented, see Hanak (2010).

<sup>21</sup> The California Supreme Court articulated guidelines for water adequacy analysis in *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova*, 40 Cal. 4<sup>th</sup> 412 (2007). For a detailed analysis of this and related decisions, see Moose (2010).

<sup>22</sup> Calif. Govt. Code Sec. 66473.7(a)(2).

The main objection to the state’s approach is that too many projects escape scrutiny; the 500-unit threshold means that it does not meet the “granularity” element. The water verification mandate also does not apply to such big water users as industrial parks, hotels, or office buildings.

Some states with universal requirements, such as Nevada, require that a developer obtain certification of water availability from the State Engineer’s Office. This is a more centralized approach than in California, but does not necessarily result in more rigorous analysis of water reliability or necessary mitigation. The New Mexico State Engineer’s Office examines proposed subdivisions in unincorporated areas to make sure that county plans will fulfill the anticipated maximum water requirements. This review includes analysis of both anticipated water demand and water availability (including water rights and hydrology) over a 40-year planning period.

Colorado’s subdivision regulation statute<sup>23</sup> provided the authority for El Paso County to enact a stringent regulation requiring developers to secure a 300-year water supply for each proposed subdivision. Colorado municipalities lacked the authority to enact such requirements until 2008, when H.B. 1141 specifically granted municipal governments the same authority as counties to require that developers show an adequate water supply, calling for professional assessment under “various hydrologic conditions.”<sup>24</sup> H.B. 1141 also only applies to subdivisions exceeding 50 units, and local governments have complete discretion in their evaluation of water adequacy.

Florida incorporates water needs into local planning by requiring each municipality to adopt a ten-year Water Supply Facilities Work Plan, which must project the local government’s needs for the coming decade, identify and prioritize the water supply facilities and source(s) of water that will be needed to meet those needs, and include capital improvements identified as needed for the first five years.<sup>25</sup> This “concurrency” review requirement effectively integrates land use and water supply planning, although it does not impose as strict an evaluation or balancing requirement as the California model.

Evaluating the effectiveness of assured-supply laws is tricky, given all the variations in their design, but Davies<sup>26</sup> concluded that these statutes have succeeded in:

- Protecting consumers;
- Improving local planning by requiring consideration of water supplies;
- Encouraging coordination among water and land use planners;
- Providing valuable early warning of legal and other uncertainties that might make water supplies vulnerable in the future; and

<sup>23</sup> Colo. Rev. Stat. 30-28-133.

<sup>24</sup> Colo. Rev. Stat. 29-20-303.

<sup>25</sup> Florida’s program is described in Cohen (2004).

<sup>26</sup> See Davies, “Assured Water Supply Laws in the Sustainability Context” (2010).

- Promoting water conservation, as developers have an incentive to reduce projected demands by incorporating water-saving measures into the new homes.

He strongly cautioned, however, that such laws have little impact on sprawl and do not ensure meaningful consideration of environmental, equity, or economic considerations. If poorly designed, he concluded, these laws could do more harm than good, by encouraging over-estimation of water needs (and thus depletion of natural sources) and by misleading the public into believing that their community's water use is sustainable.

Importantly, assured-supply laws are not the only approach to assessing the reliability and impacts of obtaining water for projected growth. State legislatures could encourage this analysis earlier in the process by strengthening the requirements for a water resources element in comprehensive plans. For example, they might require that such plans:

- Identify the known supplies of water for future development;
- Quantify the demand that would result from projected population growth; and
- Analyze how demand will be met by available supplies (or what additional water will have to be obtained).

This level of analysis at the broader planning stage may prove more useful than asking for assurances that water is immediately available once a particular development is under consideration. It would be particularly useful if land use planners worked in close cooperation with water planners in this exercise in long-term thinking, and if the public were involved in a broad dialogue about the choices inherent in such planning.<sup>27</sup>

## Limiting Growth

Water adequacy issues also arise when municipal growth outruns available water supplies or the infrastructure to deliver water to new users. In some instances, local governments have taken measures to slow or halt new development if water supplies are inadequate or if there is a direct impact on water quality that cannot be mitigated. Courts will uphold a city's power to refuse service until an area is ready for development and to deny subdivision approvals for new subdivisions with water and sewer service that are inconsistent with a county's land use plan. These generally are temporary limits.<sup>28</sup>



<sup>27</sup> For a description of an impressively forward-looking water element in Yankeetown, Florida's comprehensive plan, see Juergensmeyer (2010) at 369. See also Santa Fe County's recently enacted Sustainable Growth Management Plan, which explicitly links water infrastructure to desired growth areas. [http://www.santafecounty.org/growth\\_management/sgmp](http://www.santafecounty.org/growth_management/sgmp)

<sup>28</sup> For a detailed discussion of the legal issues raised by growth limits and moratoria, see Tarlock and

For example, in 2009, Washington's Department of Ecology placed a 120-day emergency ban on new wells in part of Kittitas County, responding to developers' practice of stretching the exempt-well rules to provide water for subdivisions without getting permits. This remains a thorny area for state-local authority, as documented in a 2010 Western States Water Council report.<sup>29</sup> In fact, despite the state agency's bold action, the scope of environmental regulators' authority to regulate domestic wells remains unclear. The Washington State Attorney General issued an opinion recognizing the agency's power to close over-appropriated basins to exempt wells, but not to change the terms of the exemption; only the Legislature may change the exempt-well standards.<sup>30</sup>

In 2008, Washoe County, Nevada, passed a ballot measure directing city and county officials to revise growth plans to not exceed a total population of 600,000, a number based on evaluation of available water supplies. In the following year, the state legislature considered, but did not enact, a bill that would have elevated this to state law and included stricter growth limits. The subsequent economic slowdown reduced pressure on Washoe County's water resources, and a 2010 assessment concluded that sustainable water resources of approximately 183,200 acre feet per year are more than adequate to serve a projected 2030 population of 590,500 based on the 2010 Census forecast.<sup>31</sup>

## Protecting and Restoring the Source

Planners and local government officials are taking steps to address the watershed-wide impacts of their land use decisions. Some examples include zoning and subdivision rules aimed at protecting sensitive stream corridors, aquifer recharge initiatives, and clustered development to minimize impervious surfaces (streets, parking lots, and other hard surfaces that prevent precipitation from soaking into the soil). These measures protect water quality, enhance public safety, and provide amenity values such as community open space and greenways.

Protecting a local water source usually requires reaching well beyond municipal boundaries, forming partnerships with people and agencies that own the lands that provide valuable watershed services. For example, in 1997 New York City entered into an agreement with regional partners to protect its 2,000-square-mile watershed, which extends 125 miles north and west of the city. Collaborative work with a regional forum called the Watershed Protection and Partnership Council protects the city's drinking water quality and avoids the estimated \$8 billion price tag for a new filtration system, plus \$300 million annual operating costs. The partnership also emphasizes economic opportunities for residents in the upstate watershed communities.<sup>32</sup>

Other cities are working directly with public land managers to protect their

Van de Wetering (2006) and Tarlock (2010).

<sup>29</sup> Bracken (2010).

<sup>30</sup> Carswell, Cally. "Death by a Thousand Wells." *High Country News*, Oct. 26, 2009. [http://www.hcn.org/issues/41.18/death-by-a-thousand-wells/article\\_view?b\\_start:int=0&-C=](http://www.hcn.org/issues/41.18/death-by-a-thousand-wells/article_view?b_start:int=0&-C=).

<sup>31</sup> Traver, Jess. "Western Regional Water Commission Approves "2030 Sustainable Water Forecast." *The Builders Magazine*, 2010. <http://buildersmagazine.com/2010/ja/water.htm>.

<sup>32</sup> See <http://www.dos.state.ny.us/watershed/index.html>.

watersheds. A literature review conducted by the Sonoran Institute for the nonprofit Carpe Diem West<sup>33</sup> concluded that the annual value of water produced by Forest Service lands alone is in the billions of dollars. Thus, the trend toward “payment for watershed services” (or, as Carpe Diem West describes it, “user contribution programs”) illustrates a mutually beneficial partnership model.

Denver’s “Forest to Faucet” initiative is the largest example of such an approach. Large wildfires in 1996 and 2002 led to erosion and sedimentation in Denver Water’s mountain reservoirs, forcing the municipal supplier to spend some \$30 million to dredge the muck from just one reservoir. To prevent such expensive impacts in the future, the agency partnered with the U.S. Forest Service to assess and prioritize threats to the watersheds that supply the city’s water. In August 2010, the two agencies signed a memorandum of understanding in which they agreed to equally share the \$32 million price tag of on-the-ground treatment projects over five years.<sup>34</sup>

Most of the projects contemplated by the Forest to Faucet agreement are aimed at reducing the risk and severity of wildfires on lands owned by the Forest Service and Denver Water, largely by thinning and prescribed burning. Additional measures may include road and culvert removal. Denver Water intends to pay for its share of the work with a modest rate increase for water customers, and reports that it does not expect significant customer resistance.

Santa Fe’s watershed protection program predated Denver’s, emerging in the wake of the Cerro Grande Fire in 2000. The fire prompted Santa Fe officials to address the vulnerability of their watershed on national forest land. Using a \$50,000 grant from the Forest Service’s Collaborative Forest Restoration Program, the city developed a comprehensive watershed plan addressing water and vegetation management, education, and funding. The plan calls for a phased-in “ecosystem services” fee (estimated at \$4-8 per year) for water customers to support this work.<sup>35</sup>

The nonprofit National Forest Foundation pioneered such programs by encouraging voluntary water user fee programs throughout the country. For example, in 2006 Snowbird Resort in Utah initiated an opt-out program that adds a one-dollar charge to each guest’s bill to pay for watershed projects that will benefit the Little Cottonwood Canyon watershed. No guest has ever opted out of the charge. A three-member board (including Snowbird, the Forest Service, and the National Forest Foundation) determines how to spend the funds raised through this fee. The National Forest Foundation offers a 25 percent match for watershed protection funds raised through such partnerships.

River and watershed protection cannot be achieved solely by regulations



<sup>33</sup> The literature review and a policy paper outlining key principles of User Contribution Programs are both available at [www.carpediemwest.org](http://www.carpediemwest.org). The program descriptions that follow draw heavily from the Carpe Diem West policy paper, dated October 2010, which also describes programs in Ashland (Ore.), Phoenix, Tacoma (Wash.), and Salt Lake City.

<sup>34</sup> See <http://www.denverwater.org/SupplyPlanning/WaterSupply/PartnershipUSFS/>.

<sup>35</sup> View the full plan at [www.santafenm.gov/documentview.aspx?DID=4354](http://www.santafenm.gov/documentview.aspx?DID=4354)

and intergovernmental partnerships; thousands of individual residents' choices and land use practices are equally important for the protection of any given watershed. Accordingly, agencies and nongovernmental groups direct a wide range of educational campaigns at landowners and urban residents to urge better practices—not dumping oil and other pollutants into stormwater drains, avoiding construction within an active river channel, and a variety of “water smart” landscaping practices to minimize runoff and contamination.<sup>36</sup>

## Reducing Our Water Footprint

We are coming to understand that our patterns of water use are not sustainable over the long run. Journalist Marc Reisner made a compelling case for the political folly of overreaching water projects and growth premised on a limited and declining resource in his 1986 book, *Cadillac Desert: The American West and Its Disappearing Water*. A quarter-century later, a group of 15 scientists revisited and applied quantitative measures to Reisner's major observations, and found them prescient and accurate today.<sup>37</sup> These experts concluded that the key action step for “reclaiming freshwater sustainability” in the arid parts of the country is to reduce regionwide human appropriation of streamflows by 16 percent, suggesting that significant gains could be achieved through improved urban and agricultural water use efficiency.

Local officials are increasingly incorporating conservation and efficient use requirements in building codes and similar measures. In some cases, the goal is “no net increase” in water demand through mandatory offsets for new uses. The City of Santa Fe's Water Budget Program, for example, requires that the impact of proposed new development be offset either through conservation in existing development or transfer of water rights to the City.<sup>38</sup> In general, new development projects with lower water use may offset demand through transfer of water rights and/or through conservation achieved in existing development. New development projects with higher demand<sup>39</sup> are only allowed to offset demand through transfer of water rights.

It is not surprising that the strictest water conservation ordinances match up with the driest part of the country. The high-desert city of Prescott, Arizona, for example, enacted mandatory standards for new construction and replacement fixtures in existing homes. The city offers substantial incentives (monetary awards reflected as credits on homeowners' water bills) for homeowners installing more efficient fixtures and water-saving systems such as rainwater cisterns.

But other parts of the country are feeling the water pinch as well, and many are taking steps to reduce water demand through building codes and other local

<sup>36</sup> Among the many examples, see the Clark Fork Coalition's Stream Care Guide at [http://issuu.com/clarkforkcoalition/docs/cfc\\_stream\\_care\\_guide](http://issuu.com/clarkforkcoalition/docs/cfc_stream_care_guide). See also the EPA's watershed protection resources at <http://water.epa.gov/type/watersheds/index.cfm>.

<sup>37</sup> See Sabo et al. (2010).

<sup>38</sup> See Harwood (2007).

<sup>39</sup> This includes commercial projects that require 5 acre feet per year or more, residential projects that require 10 acre feet per year or more, or mixed use projects that require 7.5 acre feet per year or more.

ordinances. For example, in 2008 the City Council of Alpharetta, Georgia mandated a 10 percent reduction in water use, which has since been implemented through water conservation permit requirements. A developer must submit a water reduction plan with the application for a construction permit, referencing a matrix to determine the amount of water normally consumed by a commercial building (including landscaping).

In other cases, communities are updating building codes to encourage people to capture rainfall in order to reduce stormwater runoff (a major source of pollution) and store water for landscape irrigation. Rainfall harvesting is growing quickly in popularity throughout the country, with practices ranging from simple home rain barrels to elaborate catchment systems on commercial buildings, as well as “green roofs” capable of absorbing rainfall and storing it for later use. The City of Portland, Oregon, pays incentives to residents who disconnect their homes’ downspouts and redirect rainwater from the storm sewer to their gardens instead. Albuquerque requires new homes to be constructed with rainwater collection systems.<sup>40</sup>

Conservation and “smart growth” groups provide many suggestions for how to incorporate water-saving measures into new construction,<sup>41</sup> and the U.S. Green Building Council’s LEED certification includes a prerequisite of a 20 percent reduction in aggregate water use.<sup>42</sup> Sometimes, the key is removing obstacles to water conservation, such as homeowner covenants that require minimum lawn sizes or restrictions on gray water reuse. Colorado amended its state law to allow rainwater harvesting in 2009,<sup>43</sup> but the bill has serious limitations that do not allow this practice in urban settings or on commercial buildings.<sup>44</sup>

## Community-Conscious Water Planning

**Vision:** *Water planning and development decisions acknowledge that infrastructure availability often sparks growth (“build it and they will come”), and thus incorporate deliberative public dialogue about long-term land use priorities. Water suppliers seek to make the best use of limited resources, minimizing demands, and ensuring that the impacts of water development on highly valued landscapes are acknowledged and taken into account before final decisions are made. Residents are aware of the source of their water and the benefits of conservation and efficient use.*



<sup>40</sup> These programs are described in Glennon (2009) at 191.

<sup>41</sup> See Western Resource Advocates (2009); see also the Rocky Mountain Land Use Institute’s Sustainable Community Development Code: <http://law.du.edu/index.php/rmlui/program/sustainable-community-development-code-framework>

<sup>42</sup> Once this prerequisite is met, the developer may earn additional points for planting water-efficient landscaping, using innovative wastewater technologies, and reducing water below the initial 20 percent threshold. U.S. Green Building Council, LEED 2009 for New Construction and Major Renovations. 2009.

<sup>43</sup> Colo. Sen. Bill 09-080, codified at Colo. Rev. Stat. 37-90-105(f).

<sup>44</sup> For a thorough treatment of the legal issues raised by rainfall harvest, see Juergensmeyer (2010); this article provided several of the examples cited above and is an excellent source on options for achieving conservation through local land use measures.

## Regional Water Planning and Collaboration

Very few river basins exist within a single political jurisdiction. More commonly, waterways traverse counties, states, and sometimes nations. Thus, water is shared among people living in places with different rules, visions, and practices. Water can be a source of extreme conflict or a connection that unifies people across these artificial lines.<sup>45</sup>

Water- and growth-related challenges in places as diverse as Atlanta and Las Vegas illustrate the need for solutions that transcend jurisdictional boundaries. In some places, diverse groups of stakeholders and government officials have invented new forms of governance based on river basin and watershed coordination. Such initiatives range from informal cooperative partnerships to entities authorized by federal legislation and often focused on endangered species recovery or other large-scale restoration goals.<sup>46</sup> In addition to hundreds of smaller watershed alliances, the larger formal entities include:

- Comprehensive Everglades Restoration Plan
- Chesapeake Bay Program
- Lower Colorado Multi-Species Conservation Program
- North Platte Endangered Species Implementation Program
- Missouri River Recovery Implementation Committee
- Shared Strategy for Puget Sound

Regional collaborative initiatives emerge to form gaps in governance—situations in which no single entity has the full range of legal authority and political capital necessary to address difficult boundary-crossing issues. In short, parties engage in collaboration for the very practical reason that it often leads to better decisions with greater likelihood of implementation than more traditional approaches (notice-and-comment rulemaking, litigation, etc.). Merely applying scientific or technical knowledge to address economic, social, or environmental concerns cannot close the governance gap that prompts these initiatives. Nor is the answer simply a matter of managing land or water more efficiently.

At its core, regional collaboration is a question of how people can integrate the interests and concerns of multiple jurisdictions, government agencies, and public stakeholders to address complex regional issues. On the other hand, focusing entirely on building relationships will not restore a compromised river ecosystem or recover an endangered species. A successful regional initiative articulates clearly the measures by which success will be judged, and is prepared to adapt practices if necessary to achieve its goals.

<sup>45</sup> For a thoughtful exploration of this concept, drawing upon experience in transboundary river basins throughout the world, see Delli Priscoli & Wolf (2009).

<sup>46</sup> This discussion is excerpted from Center for Natural Resources & Environmental Policy, “Federal-State Collaborative Initiatives for Resource Management and Restoration,” which includes details on the examples listed here. See [http://cnrep.org/documents/montana\\_policy\\_reports/Federal-State-Collaborative-Initiatives-12-2-09.pdf](http://cnrep.org/documents/montana_policy_reports/Federal-State-Collaborative-Initiatives-12-2-09.pdf)

Historically, federal efforts to encourage river basin-scale planning have not been successful, but a number of people are calling for a return to a more formal approach to watershed planning and coordination.<sup>47</sup> Legal scholar Janet Neuman, for example, proposed a planning framework that would start with a realistic assessment of sustainable water supplies and new sources, and would aim at producing more informed public decisions on water use.<sup>48</sup>

## Projecting Ahead

There is a limited but potentially powerful role for water providers and state water agencies to help tie together land use and water planning. A 2005 master's thesis identified the population projection process as a critical intersection of land use and water planning. The researcher also noted this process as an unrealized opportunity to question the assumptions that often lead to aggressive pursuits of water with little or no considerations of the tradeoffs of growth, alternative future scenarios, or whether residents are willing to pay for the infrastructure to support projected growth.<sup>49</sup>

A study of water for growth in California highlighted the importance of coordinated infrastructure planning that includes accurate population projections. That state's mandatory Urban Water Management Plans<sup>50</sup> offer tremendous tools for local land use planners, especially when their demand projections look at both land use patterns and accurate population projections.<sup>51</sup>

In October 2007, the Colorado Supreme Court interpreted the state water agency's responsibility for determining the appropriate water supply planning period and evaluating potential population growth and water demands during that period. It questioned the reliability of a planning period that exceeds fifty years, noting that projecting water needs over such a long period may lead to speculation.<sup>52</sup>

## Limiting and Mitigating for Water Use

It is no longer possible to "build our way out" of complex water disputes, but we can reduce or avoid some conflicts by reducing demands and ensuring more sustainable long-term water supplies. State water laws have evolved to recognize the value of encouraging more efficient uses of water (e.g. salvage laws; conjunctive management of surface and groundwater; water banking; tiered pricing). Economics and environmental concerns are encouraging a great deal of movement in this direction.

*Although plumbing and appliance codes will moderate indoor use in new homes, growth patterns are putting upward pressure on outdoor use, a major share of the total.*

Ellen Hanak, Water for Growth in California (2005)

<sup>47</sup> See, for example, the recommendations of the Western Water Policy Review Advisory Commission (1999).

<sup>48</sup> Neuman (2005).

<sup>49</sup> See Coulson (2005).

<sup>50</sup> California's Urban Water Management Plan requires the state's 400 largest wholesale and retail municipal suppliers (those with at least 3,000 connections or delivering at least 3,000 acre-feet per year to prepare 20-year Urban Water Management Plans (UWMPs) every five years.

<sup>51</sup> Hanak (2005).

<sup>52</sup> *Pagosa Area Water and Sanitation Dist. v. Trout Unlimited*, 219 P.3d 774 (2009).

Since conservation is the cheapest source of new water, municipal and other suppliers find it worthwhile to provide direct incentives for reduce customer demand and thus alleviate the need for costly new infrastructure. The Southern Nevada Water Authority's "Cash for Grass" program pays \$1.50/square foot of irrigated lawn converted to less water consumptive landscaping. In 2007, nearly 5,400 homeowners converted 6.5 million square feet of grass under this program, while 468 businesses removed more than 12 million square feet of grass.<sup>53</sup>

In some instances, water providers have responded to limited water supplies by pursuing much stricter limits on water use—essentially declaring "no net increase" in water usage, regardless of expanded demand. (See discussion above about similar goals set by local land use officials in communities such as Santa Fe.) California's East Bay Municipal Utility District (EBMUD) considered the likely increased uncertainties of its water sources and determined that all new service would be conditioned on "water-neutral" development, achieved by developer-paid investments in water conservation, both on-site and off-site.<sup>54</sup>

In the first development approved under this provision, EBMUD required the developer to demonstrate that twice as much water would be conserved through various efficiency measures as would be required to serve the development's needs. Developers achieved on-site water saving with efficient appliances, water-efficient landscaping, and recycled water for common areas. Developers paid a "Water Mitigation Fee" (which was approximately \$8,600 in 2009) to finance off-site conservation measures.

A similar program in Washington State requires homeowners in certain heavily used groundwater basins to purchase a "groundwater mitigation credit" prior to building a home that depends on a shallow domestic well. Monies generated by this fee go toward acquisition of senior water rights to enhance instream flows that otherwise would be impacted by the cumulative impact of multiple "exempt" wells.<sup>55</sup>

Far more aggressive means of stretching limited water supplies will become attractive as supplies tighten. Tucson, Arizona, has been treating and reusing wastewater for landscape irrigation for more than two decades, and other cities are following suit: San Diego, Las Vegas, San Antonio, Boca Raton, Long Beach, St. Petersburg, Los Angeles, and parts of New York City. Some communities are experimenting with programs to treat this water to a high enough quality to supply indoor use, including drinking water.<sup>56</sup> In California, Orange County's "Groundwater Replenishment System" recharges the groundwater basin with 70,000 acre-feet per year of highly purified recycled water for storage and reuse.<sup>57</sup>

Finally, water providers can reduce overall water usage using pricing mechanisms (such as tiered pricing or rebates for conservation) that provide penalties for profligate use and incentives for reduced consumption. Studies of existing programs indicate that price signals need to be aggressive enough to encourage new behavior; people will save water if it saves them money.

<sup>53</sup> "Cash for grass program taking steps to entice more businesses." *Las Vegas Sun*, June 17, 2008.

<sup>54</sup> For more information on the EBMUD experience, see Kanouse and Wallace (2010).

<sup>55</sup> For information on the pioneering program in Walla Walla County and several others emerging in the region, see Bates (2009).

<sup>56</sup> See the chapter titled "Shall We Drink Pee?" in Glennon (2009).

<sup>57</sup> See Hanak (2005).

## Moving Water to Meet New Needs

Water managers face many challenges today: recurrent drought and projected impacts of climate change; fierce and diverse challenges to new dams, pipelines, and other infrastructure; and rising costs for the energy necessary to move water from its source to where it's needed. In response, it simply makes good sense to explore flexible institutional arrangements to ensure reliable water supplies in cooperation with others.

Water banks, water leasing arrangements, regional drought contingency plans, and other initiatives suggest that measures encouraging voluntary transfers of water from lower to higher-valued uses may provide an important means of ensuring sufficient water supplies over time. And, as legal scholar Robert Glennon puts it, "water marketing lessens the pressure to build new dams, divert additional surface water, and drill more wells."<sup>58</sup> Glennon also notes, however, that, "Resistance to water marketing is visceral in some quarters, an ideological response rooted in opposition to markets, especially for water."<sup>59</sup>

Given the large proportion of water commanded by irrigators in the western United States, transfers from agricultural to urban uses are likely to continue and expand. Historical bad practices—such as the "buy and dry" strategy of acquiring vast tracts of farmland for its water—left a deep distrust among many rural residents and environmentalists. New approaches that respect these concerns include dry-year lease options, "smart fallowing," and requirements that any transfers include dedication of water for instream flows.<sup>60</sup>

Moreover, the market serves environmental interests by allowing state agencies and nongovernmental groups to purchase or lease senior water rights and convert those diversions to instream flows, restoring important fisheries or recreational rivers. These voluntary transactions often involve relatively small amounts of water, but this can make a tremendous difference to the viability of a tributary stream that otherwise would be dried up during peak irrigation season. Montana's Clark Fork Coalition—an advocacy group whose focus includes clean-up and protection of impaired waterways—recognized several years ago that full restoration often includes a "just add water" step, and thus expanded its toolkit to include water leasing and flow restoration.<sup>61</sup>

As noted by Colorado Supreme Court Justice Greg Hobbs, one of the advantages that the prior appropriation system of water rights in the western U.S. is the opportunity it provides to move water from one use to another: "Flexibility emanates from the fact that the right of use can be transferred to another, subject to the requirement that other appropriators not be injured by the change."<sup>62</sup> This flexibility offers an important tool to address the challenges of matching water demand with sustainable supplies, especially in the arid western U.S.



<sup>58</sup> Glennon (2009).

<sup>59</sup> *Id.*

<sup>60</sup> There is a large and growing literature describing the important role that water transfers will play in meeting future water demands. See, e.g., National Research Council (1992), Glennon (2005), and Colby & Jacobs (2007).

<sup>61</sup> See <http://www.clarkfork.org/stream-renewal-initiative/flow-restoration.html>

<sup>62</sup> Hobbs (2007).

## POLICY OPTIONS TO BRIDGE THE GOVERNANCE GAP

This report describes the historical disconnect between water supply planning and land use decision processes. Despite the obvious relationship between where and how people live and the water they need to do so, our institutions have been slow to encourage decision makers to think about land and water use together and to engage in a dialogue with affected publics about the consequences of those decisions. The dual pressures of population growth and climate change (along with impacts of energy production) are prompting a more urgent look at this connection.

Fortunately, in the four years since we published the first edition of this report, we have observed far broader interest in this subject and many new initiatives aimed at overcoming the disconnect. The strategies profiled here offer ideas of how to integrate consideration of water resources into land use planning, as well as examples of state water and land use policy reforms that may encourage more integrated approaches in the future.

Based on our experience and discussions with the people on the front lines of this work, a few key policy options would encourage better overall integration of water and land use planning:

- Evaluate broad questions related to water supplies and quality early in the planning process (e.g. comprehensive plan), and require a hard look at the sustainability of anticipated water sources for proposed new development prior to approval;
- Tighten the exempt-wells loophole to discourage its use in subdivision development, and implement appropriate measures to mitigate for the impacts of groundwater pumping on streams and aquifers;
- Value and protect the ecosystem services of key watershed lands, source aquifers, and other landscape components that enhance water supplies and quality;
- Evaluate development implications of alternative water supply scenarios, and ensure consistency with land use priorities; and
- Reduce overall demands and stretch existing supplies by mandating and providing incentives for conservation and efficiency throughout the water and energy sectors.

Facing the consequences of well-established growth patterns is not an easy proposition, but it is a necessary step in moving toward a sustainable future. We can no longer be indifferent to the environmental and other costs of our land use and water management practices. In taking the first step and thinking more deliberately about the consequences of growth, communities facing water security concerns will alter our course toward a more sustainable way to live in and with this landscape.

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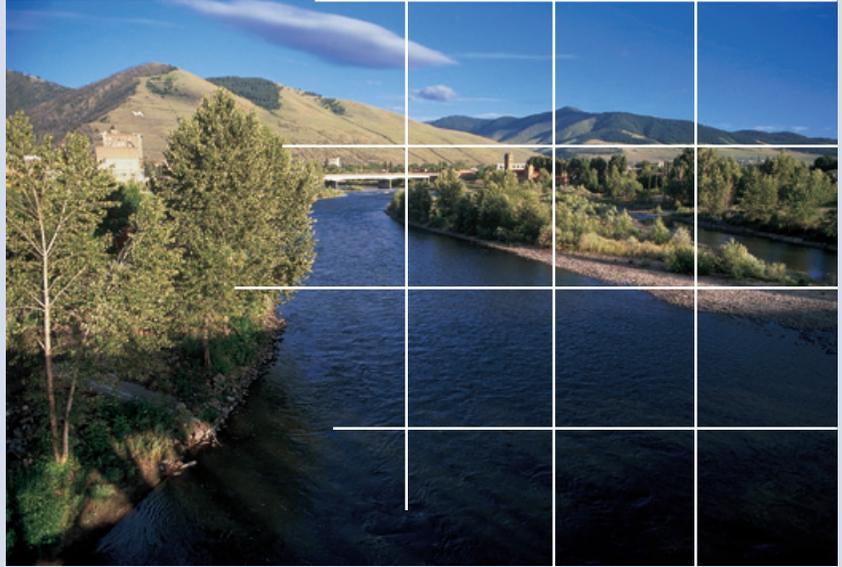
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The University of  
**Montana**

Center for Natural Resources  
and Environmental Policy

32 Campus Drive  
University Hall  
Missoula, MT 59812  
406-457-8475  
[www.cnrep.org](http://www.cnrep.org)