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PRACTICE DROUGHT RESILIENCE

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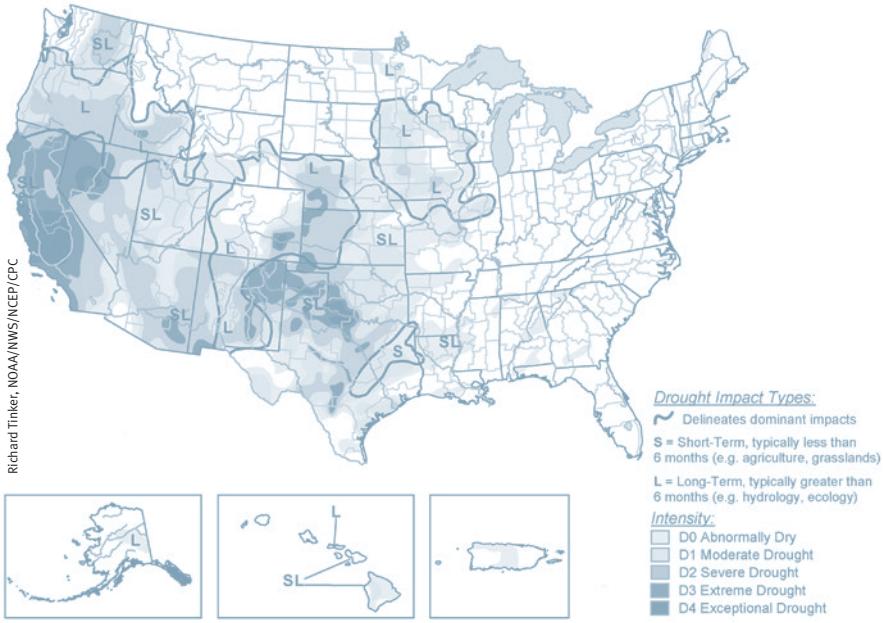
Promoting Drought Resilience Through Plans and Codes

By Marilyn Hall, AICP

Drought, especially prolonged drought, brings numerous detrimental impacts.



Richard Tinker, NOAA/NWS/NCEP/CPC

Documenting those impacts establishes a set of expectations against a baseline for normal conditions, so that a community can prepare for future droughts. But effective mitigation of drought involves more than simply knowing what to expect. It involves the use of planning to determine precisely what the community is in a position to do to reduce those impacts prior to and during a drought. The goal is to make a community more drought resilient through planning.

What does planning have to do with drought? There are two sides to the drought equation: water supply and water consumption. Water supply is largely a function of precipitation. But water consumption results from human uses and the nature of our built environment. The impacts of drought result from the combination of imbalances between these two and not just from prolonged reductions in precipitation. Planning cannot influence rainfall, but it can influence consumption patterns, both over the long term and during drought.

As of March 2014, a large area in central California and smaller areas in Nevada, Texas, and Oklahoma remain in a long-term exceptional drought (the most severe drought classification).

Ideally, a drought plan should include lists of actions to be taken in response to future drought. More importantly for planners, it should also offer lists of long-term changes that can reduce vulnerability to future droughts. Many changes related to land use or water infrastructure take years or even decades to implement, and would also need to be incorporated into infrastructure planning. Land development standards, comprehensive plans, codes and zoning ordinances, collaborative regional plans, and public engagement all play important roles in creating sustainable development, resulting in more sustainable water use and resilience to the impacts of drought.

THE BUILT ENVIRONMENT AND DROUGHT RESILIENCY

When the built environment uses water efficiently, less drastic conservation measures are needed to mitigate the impacts of drought, thereby making a community more resilient. Urban form influences water consumption in significant ways, as do building codes and landscaping choices. The precise impacts vary with climate, but regulations aimed at water conservation clearly help communities cope better with drought. Both water management and land-use planning play roles in determining how well communities handle drought.

Patterns of urban development impact water consumption in several ways. For example, large lots tend to encourage a significant amount of summertime lawn watering. More compact residential development does not eliminate water use for lawns, but reduces it considerably.

Recent research in Portland, Oregon, explores the extent that specific zoning and structural characteristics of urban development impact water consumption (Shandas and Parandvash 2010). The researchers used GIS to integrate land-use records, water consumption data, sociodemographics, and property tax information for 122,550 parcels to measure the effect of urban form on regional water demand. This is what they found:

- For every one acre of additional multifamily residential development built, an additional 1.27 million gallons (MG) of water per year is required.
- For every one acre of additional single-family residential development built, an additional 1.24 MG per year is required.
- For every one acre of additional commercial-industrial development built, an addition of more than a half-million gallons of water per year is required.

ASK THE AUTHOR JOIN US ONLINE!

Go online during the month of April to participate in our "Ask the Author" forum, an interactive feature of Zoning Practice. *Marilyn Hall, AICP, will be available to answer questions about this article. Go to the* Zoning Practice *section of the APA website at www.planning.org/zoningpractice and follow the links to the Ask the Author forum. From there, just submit your questions about the article to the active thread. After each thread closes at the end of the month, the archived questions and answers will be available through the Ask the Author forum.*

About the Authors
Marilyn Hall, AICP, is the water conservation coordinator for the Unified Government of Athens–Clarke County, Georgia. She has 16 years of professional experience in outreach and public involvement, drought response, program management, environmental program development, comprehensive and environmental planning, ordinance writing, and planning for public utilities. Under her leadership the Athens–Clarke County Water Conservation Office earned the U.S. Environmental Protection Agency's 2013 WaterSense Partner of the Year award.

- An increase of 100 square feet of single-family residential development resulted in an increase of nearly 970,000 gallons of water consumed per year.
- A $1,000 increase in median income per block group resulted in a 46,000 gallon increase in water consumption per year.
- An increase of 100 college-educated residents per block group resulted in a 65,000 gallon per year reduction in water consumption.

The researchers estimate that a 25 percent reduction in the average building size for new single-family residential developments in the study region is associated with a 6.6 MG reduction in water consumption per year.

Additional studies found that smaller home sizes lessened water use in Utah, where 60 percent of residential water is used to water lawns and landscapes. The study found that households on 0.2-acre lots use only half as much water as those on 0.5-acre lots. In Seattle, during the peak irrigation season households on 0.15-acre lots used 60 percent less water than those on 0.37-acre lots (Western Resources Advocates 2003).

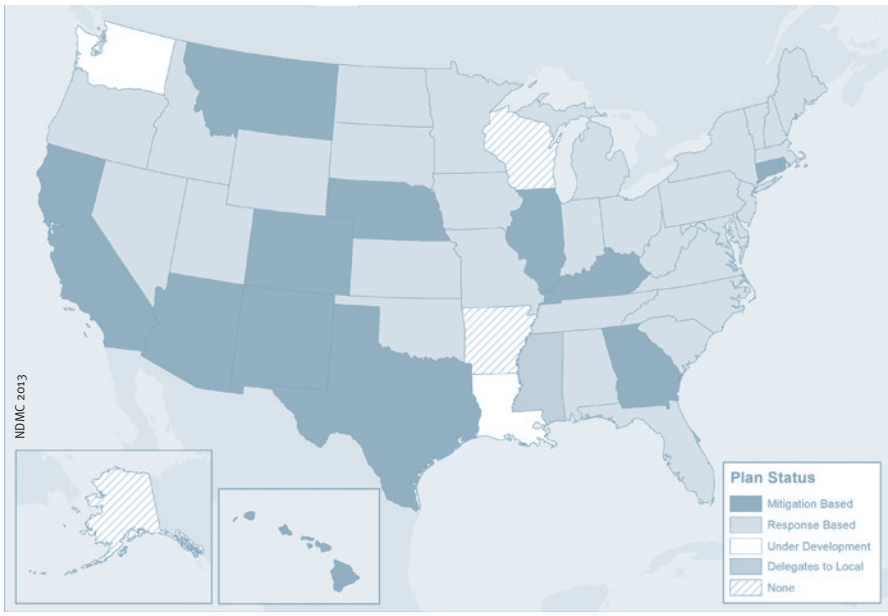
Water savings can be realized if new urban and suburban developments incorporate mixed uses, higher densities, water reuse, and water-efficient landscape design and irrigation practices.

Many communities are already promoting compact, sustainable development. Water savings can be realized if new urban and suburban developments incorporate mixed uses, higher densities, water reuse, and water-efficient landscape design and irrigation practices. Water use resulting from urban sprawl can be reduced by modifications to development densities, the chosen type of developed landscape, and the source of the landscape irrigation water.

It is important for every community to address drought in one or more types of plans used within the community, but it is just as important to make good judgments about which types of plans are most appropriate and to explain those decisions clearly.

For communities not facing an immediate crisis but anxious to plan for the eventuality, it makes perfect sense to include provisions addressing drought somewhere in the comprehensive plan, in whatever element seems best. Options include green infrastructure, natural resources, land use, water management, environment, and others depending on the orga-

The 12-acre Teller Lake No. 5 in Eastern Boulder County, Colorado, dried completely during a severe drought in 2012.



Most state-level drought plans have traditionally focused primarily on monitoring and response, but many recently updated plans also address mitigation.

nization of the comprehensive plan. Equally important, drought should be included as a potential hazard in completing a local hazard mitigation plan to meet the Federal Emergency Management Agency requirements for hazard mitigation grant eligibility under the Disaster Mitigation Act of 2000.

CODES AND ORDINANCES

Communities adopting water conservation-related regulations gain valuable experience in better managing water consumption and measurable gains toward sustainability goals. Some possible strategies include developing and modifying existing regulations involving water wasting and irrigation ordinances, outdoor watering restrictions, and landscaping regulations. A community could also consider requiring sustainability goals in developer agreements, rezoning approvals, and performance standards. Building codes play an important role in water consumption. Such codes influence the use of water-conserving devices but usually only apply to new construction. Plumbing codes related to water-efficient devices and fixtures have proven very effective in reducing water use.

State and local water and energy-efficiency standards have contributed to more sustainable communities. Efforts to reduce a community's energy use and greenhouse gas emissions increasingly include complementary water-efficiency measures. For example, the U.S. Green Building Council's LEED program includes water-efficiency measures in its standards.

There are several examples that highlight the importance of local planning agencies' water-efficient landscape ordinances in the establishment of drought-resistant urban landscapes. California's Model Water Efficient Landscape Ordinance sets a water budget based on the square footage and climate of the region. According to Assembly Bill 1881 (2006), cities in California are required to adopt local ordinances that are "at least as effective as" the state's model ordinance.

Regulations work well in regulating the conditions affecting new construction. Incentives work better in inducing existing property owners and residents to comply with the overall goals of a water-conservation program. Incentives for conservation in existing development provide an effective complement to regulations controlling the nature of new development, such as zoning, subdivision controls, and building codes.

California requires water suppliers to prepare water contingency plans that form a reference point for land-use planning. Under California's Water Code, local water suppliers with more than 3,000 customers and those supplying more than 3,000 acre-feet of water

CIVANO, a master planned community located in southeast Tucson, Arizona, serves as a model of how to significantly reduce potable water usage at the development level. In 2000 the average annual residential potable water use in metropolitan Tucson was approximately 113 gallons per person per day, with an average interior potable water use of 68 gallons per person per day. Meanwhile, nonresidential uses were consuming 36 gallons per person per day (Tucson 2003). Through a development agreement with the city, Civano's developers adopted an Integrated Method of Performance and Cost Tracking (IMPACT) System that sets resource conservation and efficiency standards and performance targets. These targets and standards include reducing interior residential potable water use to 53 gallons per person per day, reducing interior nonresidential water use to 15 gallons per employee per day, establishing a water budget per household of 28 gallons of water per person per day for exterior uses, and discouraging the construction of private swimming pools (Tucson 2003).


Simmons B. Buntin

This house in Arizona's Civano community includes water-conservation design features such as xeriscaping and a water-harvesting system.

Other specific requirements include limiting site clearance for residential lots in order to preserve desert vegetation and maximize natural drainage; protecting important plant species and requiring that a significant portion of each building site maintain existing natural desert vegetation; requiring that all landscape irrigation be accomplished with nonpotable water through the use of reclaimed water, graywater systems, and water-harvesting systems; and other alternative irrigation systems.

ONLINE DROUGHT RESOURCES

The website of the National Drought Mitigation Center (drought.unl.edu) has been compared to an online textbook for drought planning. It includes an overview of key concepts related to drought and drought planning and has an extensive collection of state and local drought plans and resources.

The Drought Management Database (http://drought.unl.edu/droughtmanagement/Home.aspx) is a new and growing collection of information about what has been tried in responding to and preparing for drought in the United States. It's categorized by sector: farming, livestock production, water supply and quality, energy, recreation and tourism, fire, plants and wildlife (environment), and society and public health. Each sector is further divided into subsectors and is searchable by activities such as "Planning and Policy" and "Mitigation/Adaptation" (pre-drought).

annually must develop and implement Urban Water Management Plans (UWMPs) and update them every five years. They must make every effort to ensure the appropriate level of reliability in water sufficiency to meet the needs of customers during normal, dry, and multiple dry years. Furthermore, the approval of large new developments in California must be linked to assurances that there is an adequate water supply. If a proposed project was not accounted for in the most recently adopted UWMP, the development is required to determine whether the water supplier's total projected water supplies available during normal, dry, and multiple dry years will meet the projected water demand associated with the proposed project during a 20-year time frame. Without assurances that there is a reliable source of water, even in dry years, large development projects cannot proceed.

COLLABORATION AND PUBLIC OUTREACH

Finding the intersection between compact, sustainable land-use planning and integrated water management planning, and ensuring that they complement rather than conflict with each other, is a challenge. The first step for planners and water managers is to inform other agencies and stakeholders of their institutions' policies and planning processes. The next step is to become involved in the planning processes of other agencies. If formal agreements are not likely, establishing the roles and responsibilities of the involved parties informally can help to avoid problems later in the process.

Including water suppliers in the land-use planning process will allow for a synchronization of data, policies, actions, and resources. Likewise, involving land-use planning agencies in the water-shortage contingency planning of water suppliers is a way to avert conflicting policies and duplicative actions. By sharing data and other resources, land-use and water-management agencies and the whole community can benefit.

Building an in-house drought and climate action planning team can make the process easier. Planners can begin by involving other related departments or agencies within their own units of government. In addition to the planning department, there are a number of other departments that the team might include. These include building and zoning, economic development, emergency services, public works, parks, and others.

While many of the activities associated with planning processes involve gathering and analyzing technical information, it is essential to involve and brief elected officials, supervisors, general managers, boards of directors, and others who make the political decisions that shape and implement policies related to the planning process. Likewise, the formation of a community advisory committee can be a definite advantage. Members of the advisory committee should include agricultural interests, building industry organizations, large commercial and industrial water users, environmental organizations, landscaping industry representatives, and others. The committee should develop recommendations or policies related to water conservation and drought planning, draft ordinances, and lead community education and outreach efforts. The committee should hold government officials accountable for implementing drought-related goals, policies, objectives, and action items.

A strong public culture of support for drought mitigation depends on early and constant involvement. The best way to build involvement is through a proactive outreach program aimed at key stakeholders. Undertake community education and outreach to ensure that the planning process is collaborative and transparent, that all relevant stakeholders are at the table, and that there is community buy-in. A regional, interagency public communications program is most effective. A planning agency need not start from scratch, but can partner with the water supplier to enhance or expand existing messages.

With such a culture in place, a widely shared public discussion of mitigation priorities allows the community to preserve the best of its local character while achieving effective drought mitigation. In terms of effecting change in water-use patterns in existing developments, planning agencies may have greater access to the urban citizenry than do water management agencies, and so they should take the lead in public outreach activities, especially for residential developments.

While planners and water managers traditionally may have included elements in their plans related to drought, taking a broader, longer-range, and cross-jurisdictional look at the potential impacts and mitigation measures related to extreme drought is increasingly important. Many local governments and water districts recognize the benefits of working together on a regional basis to adopt one

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regional or several consistent local landscape ordinances. They undertake an integrated, cooperative approach to water-supply management on a watershed or basin-wide level. This could be achieved formally through laws or agreements or more informally through established planning frameworks. In either case, the approach should be in place prior to the onset of drought, include strategies that apply at various stages of drought, ensure a consistent approach by all agencies involved, establish a common set of triggers and actions, and require regular communication and open dialogue between stakeholders.

CONCLUSION

Many of the potential reductions in the impact of drought can be addressed in comprehensive plans and in the codes and ordinances that implement the goals of the plan. Integrating drought mitigation and climate change considerations into routine planning processes is an effective way to alert the community, bring resources together, and set systems in place before the onset of full-blown water shortage. This early integrated planning can also build community resilience and facilitate a more rapid recovery from drought and other related hazards.

ESTABLISHMENT CLASSIFICATION	DESCRIPTION OF ESTABLISHMENT	DRINKING FOUNTAIN REQUIREMENTS (PER NUMBER OF OCCUPANTS)
Assembly	Theaters and other buildings for the performing arts and motion pictures	1 per 500
	Nightclubs, bars, taverns, dance halls, and buildings for similar purposes	1 per 500
	Restaurants, banquet halls, and food courts	1 per 500
	Auditoriums without permanent seating, art galleries, exhibition halls, museums, lecture halls, libraries, arcades, and gymnasiums	1 per 500
	Passenger terminals and transportation facilities	1 per 1,000
	Places of worship and other religious services	1 per 1,000
	Coliseums, arenas, skating rinks, pools, and tennis courts for indoor sporting events and activities	1 per 1,000
	Stadiums, amusement parks, bleachers and grandstands for outdoor sporting events and activities	1 per 1,000
Business	Buildings for the transaction of business, professional services, other services involving merchandise, office buildings, banks, light industrial, and similar uses	1 per 100
Educational	Educational facilities	1 per 100
Factory and Industrial	Structures in which occupants are engaged in work fabricating, assembly, or processing of products or materials	1 per 400
Institutional	Residential care	1 per 100
	Hospitals, ambulatory nursing home care	1 per 100
	Prisons, reformatories, detention centers, and correctional centers	1 per 100
	Adult day care and child care	1 per 100
Mercantile	Retail stores, service stations, shops, salesrooms, markets, and shopping centers	1 per 1,000
Residential	Hotels, motels, boarding houses (transient)	N/A
	Dormitories, fraternities, sororities, and boarding houses (not transient)	1 per 100
	Apartment house	N/A
	Congregate living facilities with 16 or fewer persons	1 per 100
	One- and two-family dwellings	N/A
	Congregate living facilities with 16 or fewer persons	1 per 100
Storage	Structures for the storage of goods, warehouses, storehouses, and freight depots. Low and Moderate Hazard.	1 per 1,000

International Building and Plumbing Code drinking fountain requirements.

NEWS BRIEF

SLAKING THIRST THROUGH ZONING

By James C. Schwab, AICP

Public access to drinking water is a subject that has received minimal attention in planning and zoning literature until now. It is gaining some traction because of a renewed focus on the intersection of public health and planning, but the data are still far from readily available. At the same time, the nation has experienced a relatively robust debate in recent years around issues of obesity, the health impacts of sugared beverages, and the environmental impacts of bottled water—the last point heavily but not exclusively focused on the ultimate disposition of all those plastic containers.

To begin to probe this question, APA released in November 2013 an online paper, "Quenching Community Thirst: Planning for More Access to Drinking Water in Public Places," by Nick Kushner (www.planning.org/research/publichealth/pdf/wateraccessreport.pdf). This article summarizes the issues that pertain directly to code requirements and incentives while addressing a few points that connect such initiatives with overall success in widening public access to drinking water.

STUDY BACKGROUND

The Kushner article notes a relative paucity of prior research, most of it within the last five years. One study in Germany found a reduced propensity for German students to be overweight when new drinking water fountains were made available; the other studies cited dealt with the availability of public drinking

Drinking water is also a subject of regulations in building and plumbing codes, which are equally significant tools in shaping the built environment.

water fountains and their condition. None of that dealt directly with questions of zoning or codes.

In contrast, the APA study, under the auspices of the Planning and Community Health Research Center, as part of APA's Healthy Planning research with funding from the Centers for Disease Control, examined the inclusion of drinking water goals and policies in comprehensive and other plans and the strategies used to implement them. In addition to reviewing the plans that were part of the Healthy Planning study, which focused on public health, the Kushner study used Google's search engines to find additional plans specifically addressing drinking water in public places. The study then included case study interviews in seven cities and identified plan policy language regarding access to drinking water.

PLUMBING AND BUILDING CODES

Before turning to provisions in zoning codes, it is worth noting that drinking water is also a subject of regulations in building and plumbing codes, which are equally significant tools in shaping the built environment. The difference is that they deal almost entirely with the internal access to drinking water, whereas zoning can also deal with more public access outside buildings. The study notes that all but two states have adopted some version of the International Building and Plumbing Code, although state and local adopters can obviously create variations on specific points. Kushner also notes, "These codes also allow the ability to substitute water coolers or bottled water dispensers for up to 50 percent of the drinking fountain requirement and waive any requirements for building tenants to provide drinking access if their location is not more than 300–500 feet from the nearest public drinking fountain." It could also be noted that, while most of the building types may involve restricted access, drinking water fountains in such places as shopping centers and malls provide at least quasi-public access, even if the intent is to serve the needs of customers.

ZONING CODES

Most provisions in zoning codes address access by using either requirements or incentives (or both) for installing public drinking fountains. The language is typically less mandatory than it is in plumbing and building codes. Two examples may serve to highlight this approach.

Phoenix has a section of its zoning code devoted to "High-Rise Incentive District—High-Rise and Mixed Use District." For mixed commercial/residential development, it allows an increase in commercial usage of floor area from 50 to 75 percent with the inclusion of a pedestrian mall on the ground floor, which can earn a 10 percent increase in commercial gross floor area by including, with five other specified elements, "a. Fountains (water elements) and sculptures" and "g. Public outdoor drinking fountains."

Newburg, Oregon, in a section on commercial design standards for its Riverfront Subdistrict, allows a 20-foot increase in maximum front-yard setback with the inclusion of any of five amenities, including a drinking fountain, "for each 100 square feet of hard-surfaced area between the building and the street lot line."

MAKING IT ALL WORK

One point the study stresses is that such provisions often require larger efforts or initiatives to achieve their underlying public health goals. Partnership with other city agencies, such as health departments and water utilities, can help to educate residents about the benefits of drinking water as opposed to alternatives, especially where people may harbor negative perceptions of tap water quality, which have often driven sales of bottled water. In addition, partnerships with the private and nonprofit sectors may bolster such messages and also contribute to drinking water fountain maintenance. Other strategies can include the involvement of business improvement districts or the use of complete streets funding for fountain installation. The biggest issue, however, may simply be that this is an issue that has so far received inadequate attention even though planning departments have some tools available to address it.

James C. Schwab, AICP, is a senior research associate for the American Planning Association and the manager of APA's Hazards Planning Research Center. He is also coeditor of Zoning Practice.

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AMERICAN PLANNING ASSOCIATION

205 N. Michigan Ave.
Suite 1200
Chicago, IL 60601–5927

1030 15th Street, NW
Suite 750 West
Washington, DC 20005–1503