EXECUTIVE SUMMARY

Water is essential for human life. From the beginning of civilization, human beings have devised ways to ensure that water is available when and where it is needed, as well as ways of addressing wastewater and of dealing with storms and flooding.

Historically, the work of land-use planners has not extended to water resource management. We have relied upon water utilities, public water departments, and the engineering community to deliver and manage the supply of water for cities and towns and to provide wastewater collection and treatment. While planners have become more involved in floodplain management and green infrastructure provision in recent years, most planners do not routinely work with water service or utility professionals. For these reasons, land-use planners have not needed to know much about water science, water infrastructure, and water resource management.

Water resource issues are now recognized to be highly interrelated with land development. Population and employment growth have placed increased demands on often scarce water supplies. Pollution and waste disposal practices have diminished the quality and availability of water. There is greater recognition of the need to preserve water for ecological purposes. And drinking water regulations require that cleaner water be delivered to customers even as the quality of many sources declines. In addition, emerging issues such as climate change, urban population growth, and the challenges posed by our aging industrial-era water service systems have given rise to the demand for new solutions for urban water services.

Water professionals are beginning to realize that planning water services should be better integrated with all levels of land-use planning. Many forward-thinking land-use planners, urban designers, and architects are developing new planning practices in concert with local utilities, water engineers, and landscape architects. This means that planners must be prepared to work more often, and more closely, with professionals in the local water supply, wastewater, stormwater, and disaster preparedness fields. Now more than ever, planners must consider how water needs are integrated into their current and future comprehensive plans, zoning ordinances, subdivision regulations, and capital improvements programs. There are many connections between urban planning and water.

The American Planning Association (APA) has recognized the need for a dedicated focus on water to help guide, support, and educate its members. This Planning Advisory Service report is one step among several that APA is taking to meet its members’ needs. This report (1) describes the integrated approach to planning and water resource management known as the One Water approach, (2) provides foundational concepts that are commonplace in water disciplines, (3) lays out water issues and challenges facing planners, and (4) presents best practices, case studies, and practical information that planners can apply and integrate into their work.

ONE WATER

Planners and water professionals are developing a postindustrial paradigm to replace the top-down, highly engineered, siloed water service systems of the industrial past and our legacy infrastructure. One Water is based upon the idea that all water within a watershed is hydrologically interconnected and is most effectively and sustainably managed using an integrated approach. One Water advances the rationale for managing water supply, wastewater, and stormwater as one resource—because that is how it exists in nature. The benefits of One Water include improved resource sustainability (greater reliability, security, and resilience), conservation of natural waters and related ecosystems, and flood avoidance. One Water management is a foundational element of the American Planning Association’s Policy Guide on Water.

One Water strategies highlight the natural interconnectedness of all water and present planning and management approaches that are based on integrated systems analysis. The more planners can factor the many dimensions of the natural and built environment into their evaluations and visions for the future, the greater will be the potential to realize sustainable and balanced water resource use. One Water provides the overarching structure, conveys the essential interconnectedness of the water systems, and advocates for integrated management, so that externalities are captured and practices in one water domain do not create problems in another. One Water is the structural basis of water sustainability.

By virtue of their skills in fostering collaboration and community engagement, and through their understanding of regulatory tools available to manage land use, planners have important roles to play in coordinating with the vari-
ous actors involved in water resource management and water services. The planning community is now rising to this challenge, as better understanding and skill in science, engineering, and consensus building across formerly siloed agencies become part of the planner toolkit.

Professional disciplines that are engaging in One Water approaches now include planners, engineers, landscape architects, and architects; members of many science communities (e.g., environmental scientists, water chemists, hydrologists, geologists); and professionals from the fields of law, public administration, economics, and finance.

WATER BASICS

For planners to begin working on water issues in their communities, engaging with water-sector professionals, and moving toward a One Water approach, they must first understand the basics of the water cycle—the continuous movement of water above, below, and on the earth’s surface—as well as the three basic types of water infrastructure systems: water supply, wastewater, and stormwater.

Water Supply

Water for human use comes from two main sources—surface water and groundwater. According to the most recent published U.S. Geological Society report, in 2010 about 355 billion gallons of water was withdrawn for use each day in the U.S. (Barber 2014). Trends show that overall per capita daily use, as well as total water withdrawals, have been steadily declining over the last few decades. Understanding water use helps to evaluate the effects of future development plans and trends, which in turn helps planners and water experts create more sustainable water use practices that can help meet future demand.

Wastewater

Wastewater or sewage is the byproduct of many uses of water, including typical household uses such as showering, dishwashing, laundry, and flushing the toilet. Additionally, industries and commercial enterprises use water for these and many other purposes, including processing products and cleaning or rinsing equipment.

Today’s wastewater management systems are designed to ensure that harmful waterborne pollutants do not contaminate surface or groundwater sources. Centralized systems consist of networks of collection pipes that collect sanitary waste (and in some cases stormwater as well) and treatment plants that clean the wastewater to the extent needed to return it to water bodies. Decentralized systems provide on-site collection, treatment, and dispersal of wastewater from an individual property or small area. Wastewater is increasingly being viewed as a commodity with potential for resource recovery and reuse.

Stormwater

Stormwater is precipitation, such as rain or snowmelt, that is not absorbed into the ground but flows overland as runoff. In urbanized areas where impermeable surfaces such as streets, sidewalks, parking lots, and buildings predominate, flooding can occur when large volumes of runoff flow into streams and rivers (Konrad 2003).

Historically, stormwater infrastructure, policy, and practice were designed to address urban flooding by collecting and removing stormwater from where it fell as quickly as possible. But in the later part of the 20th century, concerns over pollution, coupled with the impacts of climate change, have pushed water professionals, planners, urban designers, and engineers to rethink traditional approaches of engineered, or gray, infrastructure. Increasingly, communities are turning to more natural approaches of green stormwater infrastructure and low-impact development designs to reduce runoff by infiltrating it on-site in more cost-effective and ecologically friendly ways.

WATER SYSTEM CHALLENGES AND FACTORS FOR CHANGE

The U.S. water system is one of the largest and most sophisticated in the world. However, increasingly complex challenges face water utilities and the natural water environment. Water system problems can be characterized in one of three ways (Sullivan 2016):

- There is not enough water.
- There is too much water.
- The quality of water is compromised for the proposed use.

These three issues translate into challenges of scarcity of water supplies, flooding, and water pollution and contamination. Aging and deteriorated infrastructure compounds these problems, which impact the environment, the economy, and society. Two factors—climate change and population change—are exacerbating existing water management challenges and creating new ones.
Emerging Drivers of Change in Water Management

A leading challenge in the water sector is climate change. The higher average surface temperatures across the continents are causing two water-related phenomena of concern. First, sea levels are rising. Second, weather patterns are becoming more volatile, extreme, and geographically distinct, with wetter areas becoming susceptible to increased floods and dryer areas to droughts (IPCC 2014). At the same time, both the frequency and intensity of extreme weather events are increasing. The many manifestations of climate change have the potential to negatively impact communities in a wide range of ways.

As the population of the world grows, competition will increase for water supplies, which are limited or diminishing in many parts of the world. In the U.S., population growth has accelerated in many water-scarce regions, such as the arid southwestern states. A national 150-year trend of population clustering in urban areas is expected to continue for the foreseeable future. Exacerbating the challenges of supplying water to growing populations are accompanying water demands for agriculture and food production, energy generation, business and industrial use, and recreation.

Challenges to Water Management

Freshwater shortages are occurring in the U.S. because of the depletion or loss of traditional natural water storage such as aquifers, diminished snowpack levels, decreased precipitation as a result of climate change in some areas, and long-term drought. Pollution of existing water sources can also contribute to water scarcity. Additional new demands on water supplies include such uses as hydraulic fracturing to extract natural gas. Overpumping of groundwater systems (aquifers) may cause land subsidence, aquifer collapse, and damage to water distribution infrastructure and facilities.

Several issues have arisen in recent years regarding contamination of the water supply by known contaminants, such as lead, as well as potential contamination by contaminants of emerging concern—potentially harmful chemical compounds that have no regulatory standard but have been recently discovered in natural aquatic environments. Despite an overall improvement in water quality since the 1970s resulting from enforcement of the federal Clean Water Act and Safe Drinking Water Act, many water bodies still suffer from pollution. Both urban and agricultural activities can pollute stormwater (U.S. EPA 2017e).

Flooding is the most common and costliest natural hazard facing the U.S. Over the last 30 years, floods have caused an average of $8 billion in damages and 82 deaths per year nationwide (AGI 2017). Flooding has many causes, including heavy rainfall, rapid snow melt, and broken dams or levees. In coastal areas, flooding can occur during hurricanes and storm surges, which cause sea levels to rise temporarily. Extreme precipitation events caused by the impacts of climate change have increased the frequency of flood events in many parts of the U.S.

The legacy water infrastructure in the U.S. dates from the late 1800s and relies on aging underground pipes and centralized treatment facilities as well as a complex and context-dependent organizational framework for managing and operating these systems. Both situations present challenges. In 2017, the American Society of Civil Engineers (ASCE) gave the nation’s drinking water infrastructure a D grade while wastewater and wet weather infrastructure earned a D+. The U.S. needs to invest $150 billion in its water and wastewater infrastructure systems but has only provided $45 billion, leaving a funding gap of $105 billion (ASCE 2017).

Additional Impacts of the Changing Context for Water

The combination of climate change and urban population growth, coupled with legacy water system problems and long-term water management challenges, has wide-ranging impacts. Decisions about where to direct diminishing water resources can raise ecological and environmental issues, and the impacts of water on economic growth and environmental justice are becoming increasingly clear.

Human overuse of scarce water supplies and water pollution threaten regional biodiversity and the ecosystem services provided by plants and wildlife. Inefficiencies and failures in the functioning of U.S. water systems can diminish the attractiveness of cities, suburbs, and rural areas for investment by the private sector. Flooding can have extremely costly impacts on local economies.

Water is a universal need, but its cost can create equity challenges, especially for vulnerable low-income populations. The question of affordability can be considered from three different perspectives: the utility’s cost of providing water services, the community’s ability to pay for increases in water service, and the affordability of water services for individual households, especially economically challenged households. Federal requirements for water and wastewater systems can result in significant investments by communities in water treatment and distribution and higher water and sewerage fees for consumers. Legacy cities—older cities with declining populations and diminished economic conditions—are especially challenged by water system affordability and reliability.
Though average water and sewer costs together account for less than 0.8 percent of total household expenditures, these costs are rising rapidly (Beecher 2016). Further increases in water and sewer bills anticipated over the coming years raise concerns about the ability of low- and moderate-income households to pay for water.

Water challenges such as threats to safe quality of water supplies, high costs of water services, and negative impacts on water-related cultural and economic activities have a disproportionate effect upon minority and low-income communities. Flooding also presents special risks to these households, who may be less likely to receive news and heed warnings from mainstream weather services.

Access to clean, safe, and affordable water is a fundamental human right, and is essential for a healthy population, environment, and economy. Justice requires that the risks to health and public safety from water, or lack thereof, be equal across income levels and other measures of human diversity, so that all citizens share equally in the benefits, as well as the risks and efforts, of maintaining sustainable water systems.

### PLANNING FOR SUSTAINABLE WATER: RECOMMENDED PRACTICES

Planners have important roles in transforming water systems and resources to advance sustainability and resiliency goals. Planning initiatives and practices are beginning to reflect the need to address increasingly severe and unpredictable water management issues. Progress is being made both at the local level, where individual initiatives are emerging in forward-thinking communities working in coordination with water utilities, as well as at the regional and national scales, where new information systems, alternatives analysis tools, and regulatory approaches are being created.

Two strategic planning frameworks can improve water planning and management by helping planners integrate water issues into planning work: APA’s “five strategic points of intervention” and APA’s Sustaining Places initiative.

### Water and the Five Strategic Points of Intervention

Planners engage in a great many activities, but those that are central to their professional functions and positions and that hold the most promise for making a difference in most planners’ basic work tasks can be boiled down to five key areas: visioning; plan making; standards, policies, and incentives; development work; and public investments (Klein 2011).

When considering how planners can improve water resource planning and management by applying improved planning practices, it is useful to consider these “strategic points of intervention.” While there may be additional opportunities for strategic intervention as planners, opportunities for strategic intersection with other water professionals is emerging as an equally important planning function. For points of intervention, planners are typically the lead party. For points of intersection, planners need to collaborate on water management with a range of water professionals, as each of the many disciplines involved has much to contribute to sustainable water management.

### Water in the Context of Sustaining Places

While the traditionally understood role of planning and planners is well represented by the five strategic points of intervention, planning is shifting toward a new paradigm with a goal of overarching, integrated sustainability. This can be characterized by APA’s Sustaining Places initiative, which provides a fresh lens to help planners better integrate water issues into their work. The APA Comprehensive Plan Standards for Sustaining Places presents six principles, two processes, and two attributes for plan-making standards, each accompanied by multiple best-practice actions that support plan implementation. The standards can help advance more sustainable water management and suggest how planners might create additional opportunities for water management best practices.

### Recommended Practices

New approaches, alliances, interdisciplinary strategies, and roles in planning for water are constantly evolving and being tested. Creative adaptation, modification, and interdisciplinary approaches can make a world of difference in improving the potential usefulness of existing practices or in creating innovative new practices. The principles of One Water management are readily adaptable to similar geographies and water resource settings. In many cases, implementation of best practices will benefit from collaboration and interaction between planners and other water professionals, such as hydrologists and hydrogeologists, civil and environmental engineers, landscape architects, environmental scientists, economists, lawyers and regulatory experts, local government officials, and others.

### Water Supply Practices

There are four main roles for planners that relate to water supply: (1) to coordinate with the local water supply provider
to ensure that the water utility’s water management plan and its capital improvement program reflect the vision of the local government, and that the utility’s water facilities and investments are consistent with the local land-use plan; (2) to ensure that the community’s own long-range or comprehensive land-use plan is linked to adequate water quantity and quality and supports One Water management; (3) to ensure that local development regulations protect traditional water resources and appropriately allow for new water sources; and (4) to ensure that development proposals address adequate water supply and site-specific infrastructure and do not compromise the water environment (Johnson and Loux 2004).

City and county land-use planners can improve planning and water management by sharing data, plans, and information about their comprehensive plans and development proposals with water utilities, and the reverse is also true. Demand management and conservation strategies should be related to, and referenced in, the comprehensive plan. Planners can use zoning and subdivision regulations, which should implement water-related goals and objectives, to protect water supplies. Communities can address water shortages by enacting “water offset” policies and regulations. Planners have the responsibility to ensure that adequate water is available for new developments or large-scale changes of use; collecting information about water resource availability, competition for use of water, and situations where demand might exceed supply is essential when considering approving new development.

**Wastewater Practices**

At the city, county, and regional levels, planners should be part of conversations regarding the implementation of innovative wastewater infrastructure. Sewers are powerful determinants of where growth in an area will go—in shaping development, a city’s choice of sewer investment can be more important than the city’s land-use plan (Scott et al. 2005). Planners can help local policy makers decide where and, just as importantly, when to expand municipal wastewater service (Tabors 1979). Planners can also work with wastewater utilities to integrate their sustainability goals into comprehensive plans and development regulations.

The field of wastewater management is seeing innovative developments involving on-site and district-based nonpotable reuse of wastewater, which also contains valuable resources including water, carbon, nutrients, trace metals, and embedded energy that can be captured. Another exciting effort is the use of the energy contained in sanitary wastewater for heating and cooling.

Smaller on-site or decentralized and satellite systems are possible with new technologies such as advanced filters and intelligent monitoring systems. Natural treatment systems are of considerable interest today both in the U.S. and abroad because of the importance of wetlands in carbon sequestration and their ability to naturally treat wastewater.

**Stormwater Practices**

Planners can advance policies to integrate stormwater best practices into the design of the city through the comprehensive plan, the capital improvement plan, and development regulations (Novotny, Ahern, and Brown 2010). Best practices include replacing gray infrastructure conveyance systems that remove stormwater runoff from a site as quickly as possible with more decentralized green systems that seek to infiltrate and store stormwater near to where the rain lands.

Planners are using subdivision and land development regulations, as well as separate stormwater management ordinances, to promote on-site capture, infiltration, and slow release of stormwater. Designing with nature at the site level where the precipitation falls helps to protect water supplies, causes less runoff, and contributes to a more attractive and resilient urban environment. Such approaches include low-impact development and green stormwater infrastructure. Source control—preventing pollutants in urban runoff from getting into the pipe collection system—and stream and creek restoration efforts are also important strategies.

**THE FINANCIAL ASPECTS OF WATER**

To adapt, replace, and reinvent the aging U.S. water system is not only a technical and organizational challenge, but a financial one as well. The One Water paradigm calls for adopting integrated water-sector planning and breaking down the barriers between “silo” financing and fee structures of the separate water utility sectors. This paradigm also calls for new and creative ways of financing investment for the new vision of water.

Historically, water has been treated as a common good, available to all at a price based only on the cost of treating and delivering the water—but significant costs to society and the environment have not been incorporated into water prices or fees to the consumer. Economics posits that any item of value not assigned an appropriate price reflecting that value will be overconsumed or inefficiently managed. The price of water services is a key factor in being able to influence more efficient use of water, reduce pollution, and
contribute to the use of more sustainable and equitable water technologies and systems.

**Pricing and Rate Structures for Water Systems**

The major actors in rate setting and spending on water are state and local governments, including water utilities. The price of water services is passed on to consumers through fee or rate structures, or user fees. Water and wastewater utilities use a combination of a fixed (base) fee—the price the customer pays to help cover costs of maintaining existing infrastructure and repaying loans and bonds used to build that infrastructure—and a variable fee for the volume of water used that reflects the costs of treating and providing that water. Several different types of rate structures can be used by water and wastewater utilities, and fees can vary among residential, commercial, and industrial users. Using conservation rate structures such as increasing block rates, seasonal rates, drought rates, or water budget-based rates can reduce water demand significantly.

Stormwater runoff has traditionally been the responsibility of city or county public works departments, funded by municipalities’ general funds as part of street and sewer improvements and maintenance. Early financing for off-site municipal infrastructure investments also relied upon general funds from property taxes. The best practice today is for a locality to establish a stormwater utility (SWU) empowered to set user fees. Most SWUs today tie their fees to the amount of impervious surface of a parcel and hence to the volume of storm runoff generated by the user.

**Capital Improvement Strategies**

Since the 1950s, the federal government’s expenditures to build dams, levees, reservoirs, and other water containment systems have declined substantially (CBO 2015). In the 1970s and 1980s the federal government made significant investments in wastewater treatment plants due to Clean Water Act requirements, but today federal capital expenditures for local water services are much reduced.

Historically, water and wastewater utilities have relied on bonds for capital investment or infrastructure and user fees for operations and maintenance. Most large-scale capital facilities for all three water sectors are paid for by funds from bonds issued by the local water utility or the local government. Today the federal Clean Water and Drinking Water State Revolving Loan funds offer seed money for states to capitalize state loan funds. These programs have issued more than 36,000 low-interest loans amounting to more than $111 billion to communities, funding water quality protection projects for wastewater treatment, nonpoint source pollution control, and watershed and estuary management (U.S. EPA 2017b).

In the 1980s, many local governments struggled to finance water and sewer infrastructure to accommodate rapid development. Accordingly, some cities and counties began to charge one-time fees during the development review process that allowed the locality to fund the cost of the new infrastructure needed to support that project (Galardi et al. 2004). There are three approaches to establishing development impact fees: a system buy-in or reimbursement approach for new development based on existing facilities and costs, a requirement that new development pays for the cost of new facilities, or a combination of these two.

Distributed and multipurpose systems—including satellite treatment plants, on-site water and nutrient reuse, and green infrastructure—have been noted by many as a way of addressing some of the problems with the industrial era system (Novotny, Ahern, and Brown 2010; Nelson 2012; Brown 2014). However, traditional governance systems and financing mechanisms are difficult to use for these innovative systems due to regulatory barriers at the state and local levels and a lack of organizational commitment and capacity by the water utilities. A shift toward distributed and small-scale systems will require changes in the financial markets as well as local and state regulations.

**Water Markets and Water Rights**

Water marketing can be defined as “the voluntary transfer of the right to use water from one party to another on a temporary, long-term, or permanent basis, in exchange for compensation” (Hanak and Stryjewski 2012, 7). Water markets are created by the interactions of buyers and sellers regarding quantities and quality of water. They can reallocate water rights from lower- to higher-valued uses, thereby, according to economists, making water use more efficient. They can also be used to incentivize conservation in low-cost water sectors such as agriculture to make more water available for higher-valued residential markets. Water markets are governed by water rights.

Water rights for surface water can be divided into two categories: riparian rights/reasonable use doctrine and prior appropriation. Riparian rights allow the property owner adjacent to a river to withdraw as much water as needed for use on the property as long as there is no harm to the downstream user. The doctrine of “reasonable use” to refine the unlimited use of a riparian right emerged in the later part of the 19th century with the rise of mills and other industrial uses with large water needs. Prior appropriation doctrine arose in the
semi-arid west, where water needed to be moved from rivers to users, and holds that the first entity to take water from a surface water source for a “beneficial use” has the right to continue to use the same amount of water for that given use. Water rights for groundwater has been dominated by the “rule of capture” but this is now changing.

How Planners Can Get More Involved
Planners can effectively participate in the financial decisions their communities make through capital improvement plans (CIP) and budgets, fair and equitable fee structures and programs, and cost reduction measures. The water sectors’ CIPs should be consistent with and integrated into the city or county’s CIP and comprehensive plan. Planners have a responsibility to work with their local utilities to ensure that the procedures for setting fees and collecting revenues are fair and equitable. They should also ensure that preparation for the comprehensive plan includes an analysis of low-income households’ abilities to accommodate future water price increases.

PLANNING FOR WATER: THOUGHTS FOR THE FUTURE
This report introduces a very complex subject matter—water—for which planning practices are rapidly evolving as planners seek to implement more integrated water systems. Yet more needs to be done by the planning profession, water professionals, and the engineering and architectural community to address water resource management challenges, protect our cities from climate change impacts, and transition to the next generation of One Water infrastructure.

Key Questions for the Planning Profession
As our communities grow, improved planning practices will better anticipate changing patterns of growth and resource use and provide more approaches to guiding that growth. The planner of the 21st century faces resource scarcity, increased competition over available resources, climate change variability and risk, infrastructure deficiencies, funding shortages, and local political barriers. Planners must consider a number of key questions:

1. How can planners better address key drivers and causes of water vulnerability?
2. How can planners build collaborative strategic partnerships and better operate across professions, communities, and regions?
3. What role can planning and design play?
4. What knowledge and tools should be applied? What new tools are needed?
5. How can planning address uncertainty and risk, and anticipate instability?

Partnerships and Conversations
The challenge of breaking down silos and engaging across disciplines is ever present in the planning profession. Given the interdisciplinary nature, range, and complexity of water management, it is virtually impossible for any single profession to identify all the system interactions and solutions. Planners should embrace this challenge and forge new connections with their counterparts at water-focused agencies, organizations, and departments.

There are increasing opportunities to engage in productive, inclusive conversations with a broad base of practitioners, citizens, and stakeholders who depend on sound water management. Interdisciplinary efforts have proven to be transformative by synthesizing the knowledge of different disciplines to guide decisions for improved outcomes. Planners must better define the dimensions of water resource challenges, work interactively with peer professions such as engineering and landscape architecture, and use decision support and public communications tools to support an interactive work environment. A broader vision and broader engagement helps to create more sustainable water management outcomes. Creating new conversations that lead to exchanges of information and science will help to forge new permanent partnerships that will not be limited by siloed missions.

Water Education for Planners
As planners, we have responsibilities not only to practice but to continue educating ourselves, the communities around us, and future planners. We need to improve water education for planning students so they are adequately prepared to address water challenges from the start of their planning careers. At the same time, educational opportunities must be made available for elected and appointed officials and practicing planners facing water-related challenges that require action now. APA can offer guidance, support, and perhaps most importantly, educational opportunities to prepare planners and decision makers to lead and respond effectively to emerging water challenges.

It is important to arm planners, both in the classroom and in continuing education, with more technical skills to address water issues so they have the confidence to not only facilitate the water management dialogue but also drive it.
Broadening the education of the populace about water-related principles, issues, and opportunities, as well as providing training for jobs in this emerging sector, is essential if the planning profession truly wants to integrate water management into traditional planning practice.

**APA’s Water and Planning Network**

APA is dedicated to adding value not just to the growing network of water disciplines, but to its own members, ensuring they receive the guidance, support, and access to practical and educational opportunities they need to do their jobs well. Rising to the challenge and understanding its responsibility, in May 2017, APA launched the Water and Planning Network (WPN). The mission of the WPN is to provide a professional forum for the interdisciplinary exchange of ideas and planning methods. It will operate as a communications and information-sharing network to connect members to the most current water research, science, policy, technology, and best practices.

**Conclusion**

Planners play key roles in influencing land-use patterns and helping communities guide how development and redevelopment occur. Planners do this by planning at all scales, creating land-use regulations, and reviewing development projects. This provides planners with opportunities to advance more sustainable water systems. Planners can incorporate dynamic, nature-based, sustainable systems that do not rely solely on pipes, pumps, and treatment plants to solve water problems. Planners can help reconnect society to water’s natural setting—and identify the complex interdependencies between water use, wastewater disposal, runoff management, surface and groundwater resources, and the natural environment—to start solving the many challenges of planning for land use and water resources.