WaterSense at Work

Getting Started With Water Management

1.1 Introduction

Best Management Practices for Commercial and Institutional Facilities

EPA WaterSense

November 2023

WaterSense® is a voluntary partnership program sponsored by the U.S. Environmental Protection Agency (EPA) that seeks to protect the nation's water supply by transforming the market for water-efficient products, services, and practices.

WaterSense at Work is a compilation of water efficiency best management practices intended to help commercial and institutional facility owners and managers from multiple sectors understand and better manage their water use. It provides guidance to help establish an effective facility water management program and identify projects and practices that can reduce facility water use.

An overview of the sections in *WaterSense at Work* is below. This document, which introduces commercial and institution facility owners and managers to water efficiency, is part of **Section 1: Getting Started With Water Management**. The complete list of best management practices is available at www.epa.gov/watersense/best-management-practices. WaterSense has also developed worksheets to assist with water management planning and case studies that highlight successful water efficiency efforts of building owners and facility managers throughout the country, available at www.epa.gov/watersense/commercial-buildings.

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This document is one section from *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities* (EPA-832-F-23-003). Other sections can be downloaded from www.epa.gov/watersense/best-management-practices. Sections will be reviewed and periodically updated to reflect new information. The work was supported under contract 68HERC20D0026 with Eastern Research Group, Inc. (ERG).

Purpose

WaterSense is a voluntary partnership program sponsored by the U.S. Environmental Protection Agency (EPA) that seeks to protect the future of our nation's water supply. By transforming the market for water-efficient products, programs, homes, and practices, WaterSense is helping to address the increasing demand on the nation's water supplies and reduce the strain on municipal water infrastructure across the country. WaterSense labeled products are independently certified to use at least 20 percent less water and perform as well or better than standard models. In addition, WaterSense labeled homes incorporate water-efficient products and designs, and WaterSense labeled certification programs ensure knowledge of water-efficient practices by professionals.

Look for the WaterSense Label

The foundation of the WaterSense program is the WaterSense label, used to help consumers identify water-efficient products, homes, and programs. WaterSense labeled products use at least 20 percent less water and perform as well or better than standard products. Whether commercial and institutional building owners are constructing a new property or upgrading an existing one, specifying fixtures with the WaterSense label is a great way to start. Go to www.epa.gov/watersense/product-search to get started.

WaterSense has developed *WaterSense at Work*, a compilation of water efficiency best management practices, to help commercial and institutional facility owners and managers understand and better manage their water use. *WaterSense at Work* is designed to provide guidance to help establish an effective facility water management program and identify projects and practices that can reduce facility water use.

In today's economic and corporate environment, there is a strong business case to be made for undertaking activities to reduce water use, which in turn can reduce energy and other operating costs. By implementing water efficiency best management practices, commercial and institutional facility owners and managers can:

- **Achieve cost savings**. Improving water efficiency can lower variable costs associated with the operation and maintenance of equipment, as well as the energy embedded in the treatment, storage, heating, and movement of water throughout the facility. Organizations can often reduce associated costs of treatment chemicals, detergents, and other supplies when undertaking water efficiency improvements. When considered together, the cost savings from water, wastewater, energy, and other operations and maintenance costs create a greater return on investment and a shorter payback period for an improvement project, while reducing a facility's impact on local water supplies.

- **Increase competitive advantage**. Demand for green buildings and sustainable products is increasing as consumers become more aware of the environmental impacts of water and energy use. By promoting tangible improvements in a facility's environmental performance, organizations can reinforce their image as a sustainable brand while reducing their environmental impact on the community. Practicing water efficiency not only enhances the public perception of the organization, it can also help differentiate the organization from its competitors.
- **Reduce risk**. Water-efficient facilities can be less vulnerable to fluctuations in water supply and pricing by reducing their dependence on limited local water resources. This not only reduces risk, but also the burden on associated water and wastewater utility infrastructure, ensuring a more sustainable future water supply.
- **Demonstrate leadership**. Water-efficient organizations can demonstrate their commitment to the community and environmental leadership. By implementing projects that result in water savings, an organization can share both quantitative and qualitative results. Water efficiency also contributes to reducing climate impacts, can help in meeting corporate sustainability goals, and demonstrates an organization's contribution to reducing demand on natural resources.
- **Access opportunities in the green building marketplace**. The principles of water efficiency are becoming ingrained in the commercial real estate market as an integral part of green building and sustainable planning. Implementing specific measures that make a facility more water- and energy-efficient helps an organization earn recognition, such as from local green building programs, ENERGY STAR®, or the U.S. Green Building Council's LEED® rating system. Many national, state, and local organizations have instituted environmental requirements for both their own facilities and those where meetings and conferences are held. Hotels, restaurants, and other facilities can strengthen their ability to compete in this growing market niche by undertaking specific water and energy efficiency measures.
- **Meet local requirements**. State and local governments are increasing efforts to establish building performance standards and/or adopt codes that require reporting of energy or greenhouse gas emissions.[1] Many jurisdictions are also including reporting requirements related to water use as part of these policies.[2] Adopting water-efficient products and practices can help buildings meet performance requirements and/or be seen favorably relative to other buildings.

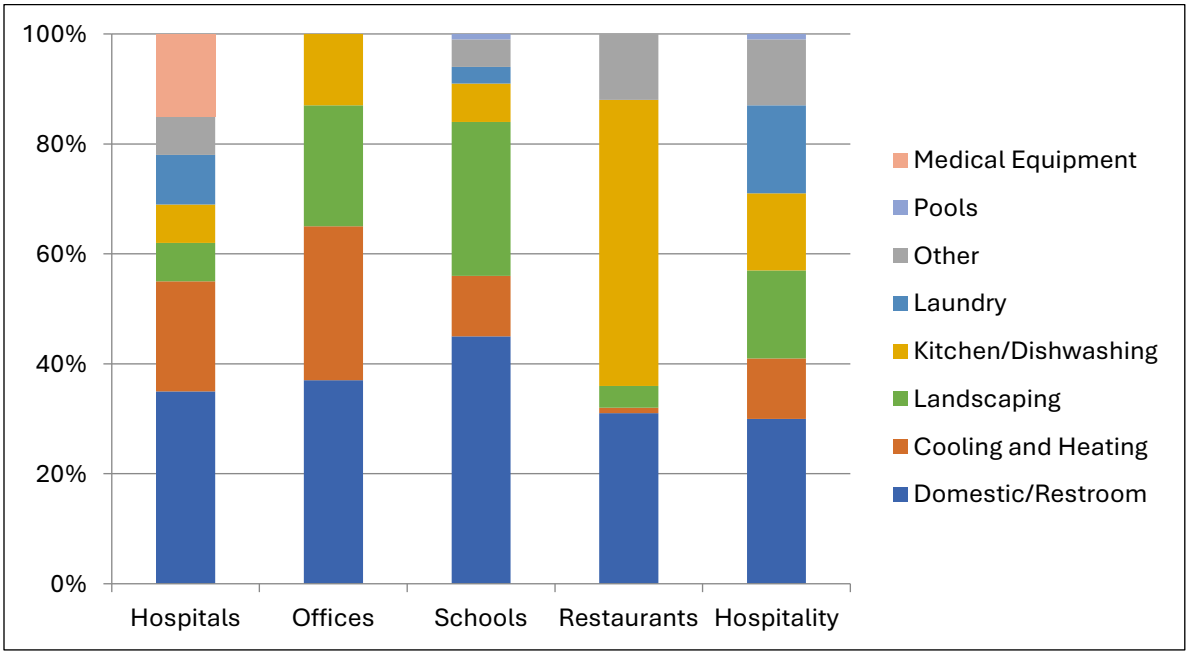
[1] U.S. Environmental Protection Agency's (EPA's) Benchmarking and Building Performance Standards Policy Toolkit helps state and local governments exploring policies to reduce energy use and greenhouse gas emissions from existing buildings and may include more information about water use in the future (www.epa.gov/statelocalenergy/benchmarking-and-building-performance-standards-policy-toolkit).
[2] The Institute for Market Transformation (IMT) maintains a map of city, county, and state policies that require commercial buildings to report energy (and often water) data for benchmarking and transparency purposes (www.imt.org/resources/map-u-s-building-benchmarking-policies/).

Reducing facility water use not only makes sense at the facility level, but it also helps communities to delay costly infrastructure upgrades, while preserving limited water supplies for future generations. *WaterSense at Work* is designed to help facility owners and managers do their part to reduce water demand and achieve organizational goals in the process.

Water Use in the Commercial and Institutional Sector

The commercial and instutional sector includes a variety of facility types such as hotels, restaurants, office buildings, schools, hospitals, laboratories, and government and military institutions. Each facility type has different water use patterns depending on its function and use. Figure 1 shows how water is used within several types of commercial and institutional facilities.

Figure 1. End Uses of Water in Various Types of Commercial and Institutional Facilities[3]



In general, commercial and institutional buildings can use water indoors, outdoors, and for heating and cooling purposes. The proportion of water used by different commercial

[3] Created from analyzing data in: Schultz Communications. July 1999. *A Water Conservation Guide for Commercial, Institutional and Industrial Water Users*. Prepared for the New Mexico Office of the State Engineer. www.ose.state.nm.us/WUC/PDF/cii-users-guide.pdf; Dziegielewski, Benedykt, et al. American Water Works Association (AWWA) and AWWA Research Foundation. 2000. *Commercial and Institutional End Uses of Water.*; East Bay Municipal Utility District. 2008. *WaterSmart Guidebook: A Water-Use Efficiency Plan Review Guide for New Businesses*. www.ebmud.com/water/conservation-and-rebates/commercial/watersmart-guidebook; AWWA. *Helping Businesses Manage Water Use—A Guide for Water Utilities*.

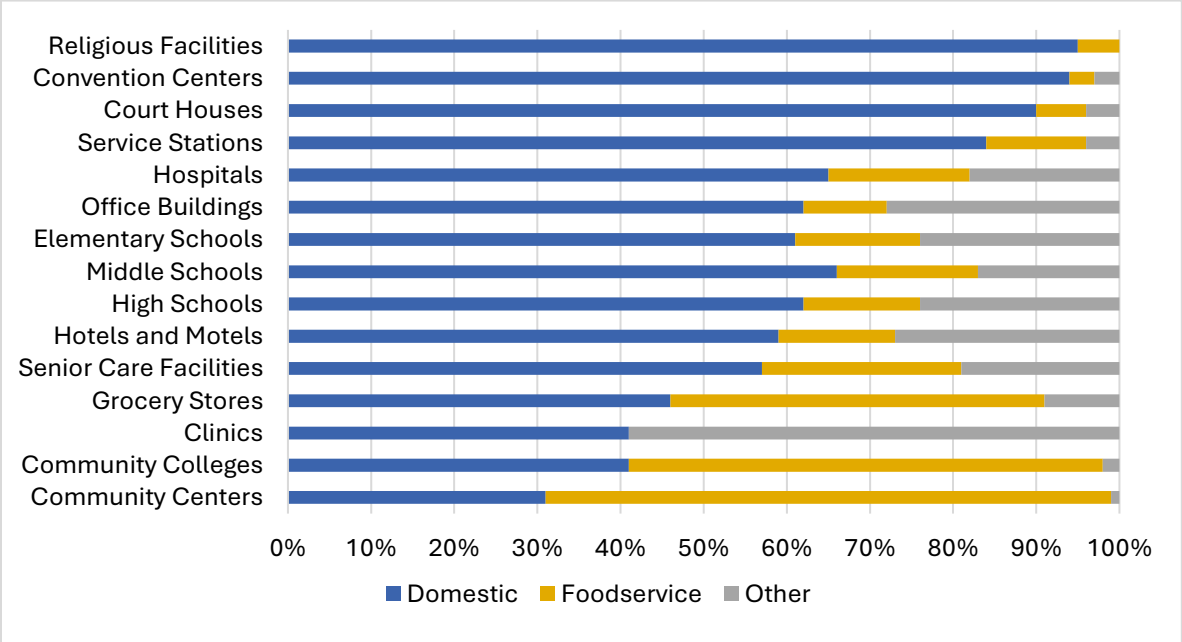
and institutional facilities can vary substantially depending on the type of facility, facility size, occupancy, landscape area, and local climate. The best way for facilities to understand their specific water use is to engage in water management planning, as discussed in more detail in *WaterSense at Work Section 1.2: Water Management Planning* at www.epa.gov/watersense/best-management-practices.

EPA has compiled some general information on end uses of water to help guide facilities in knowing where to focus water management planning and water efficiency efforts. While the equipment and processes vary widely, there are opportunities in all commercial and institutional buildings to achieve significant water savings indoors, outdoors, and within heating and cooling equipment by making improvements in several operational areas.

Indoor Water Use

Indoors, water can be used for domestic purposes (e.g., restrooms, breakrooms, drinking fountains), food service (e.g., food preparation and dishwashing), and within laundry, laboratory, medical, and specialty water treatment equipment. There is no universal source of statistical information about end uses of water in different types of commercial facilities, but Figure 2 shows how water is used indoors within several types of commercial and institutional facilities based on data collected by a professional experienced in carrying out water assessments in different types of facilities.

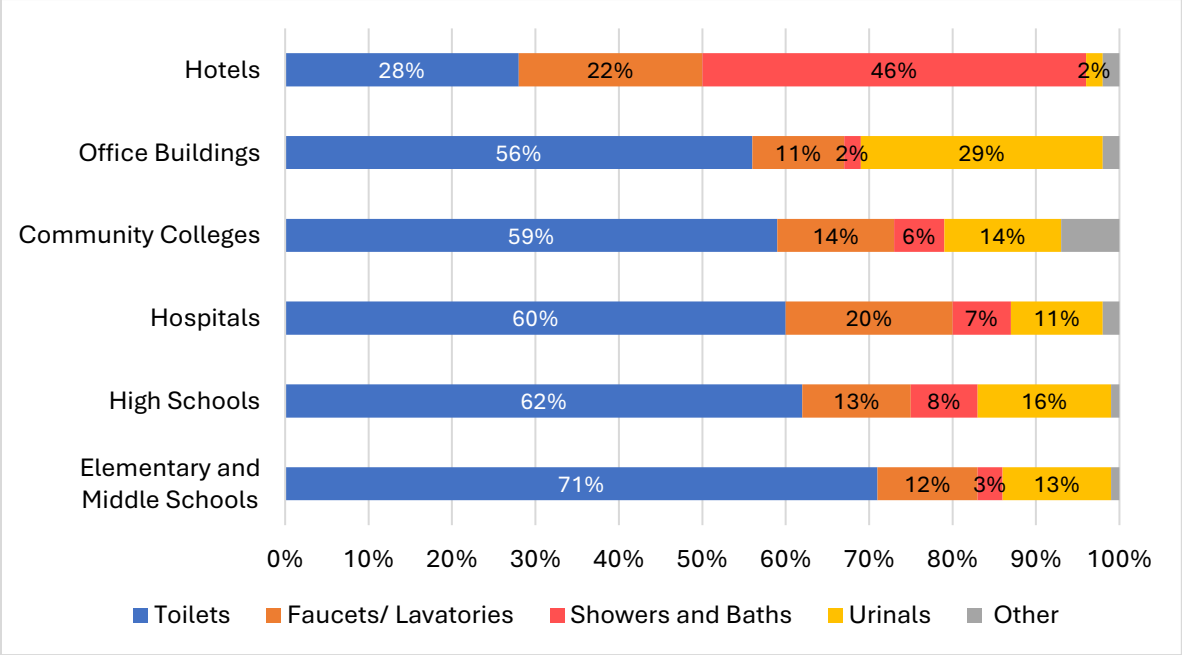
Figure 2. Indoor Water Use Within Different Commercial and Institutional Facilities[4]



[4] Created from data collected by HW (Bill) Hoffman & Associates, LLC from water assessments at 173 commercial and institutional buildings in Texas between 2011 and 2015. "Other" includes laundry, laboratory and medical, special water treatment equipment, and other miscellaneous indoor uses.

Figure 3 further breaks down the proportion of water used for domestic purposes, primarily in restrooms, within different facility types.

Figure 3. Percent of Restroom Use by Facility Type[5]



Information on estimating and reducing indoor water use can be found in *WaterSense at Work* Section 3: Sanitary Fixtures and Equipment; Section 4: Commercial Kitchen Equipment; and Section 7: Laboratory and Medical Equipment at www.epa.gov/watersense/best-management-practices.

Outdoor Water Use

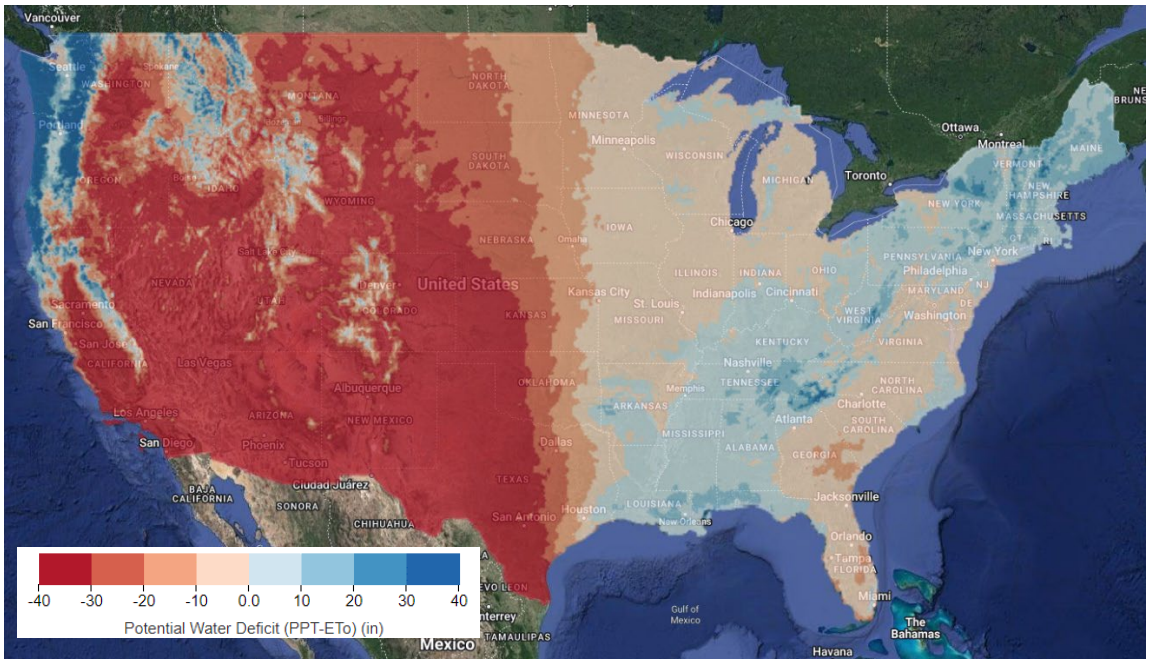
Landscape irrigation is the primary source of outdoor water use for most commercial and institutional buildings. Outdoor water use can also include water used within water features, pools and spas, and for vehicle washing.

The need for landscape irrigation can vary substantially depending on: the type of facility; size and orientation of the landscape; plant species within the landscape; and the local climate. The amount of water theoretically needed to keep a landscape healthy is the amount of water that is lost due to evapotranspiration. In some places in the United States with more frequent rainfall, precipitation can replace evapotranspiration and eliminate the need for irrigation. However, where precipitation is insufficient to meet the evapotranspiration needs of plants, irrigation water may need to be applied.

[5] Created from data collected by HW (Bill) Hoffman & Associates, LLC from water assessments at 173 commercial and institutional buildings in Texas between 2011 and 2015.

Figure 4 includes a map of the United States showing the average annual difference between precipitation and evapotranspiration in inches per year from 1981 to 2022. Blue areas are areas where precipitation exceeds evapotranspiration. Darker orange and red areas show where annual evapotranspiration more substantially exceeds precipitation and, therefore, where irrigation may be needed in landscaped areas.

Figure 4. Average Annual Potential Water Deficit (Precipitation Minus Reference Evapotranspiration in Inches) in the United States from 1981 to 2022[6]



Information on estimating and reducing outdoor water use can be found in *WaterSense at Work* Section 5: Outdoor Water Use at www.epa.gov/watersense/best-management-practices.

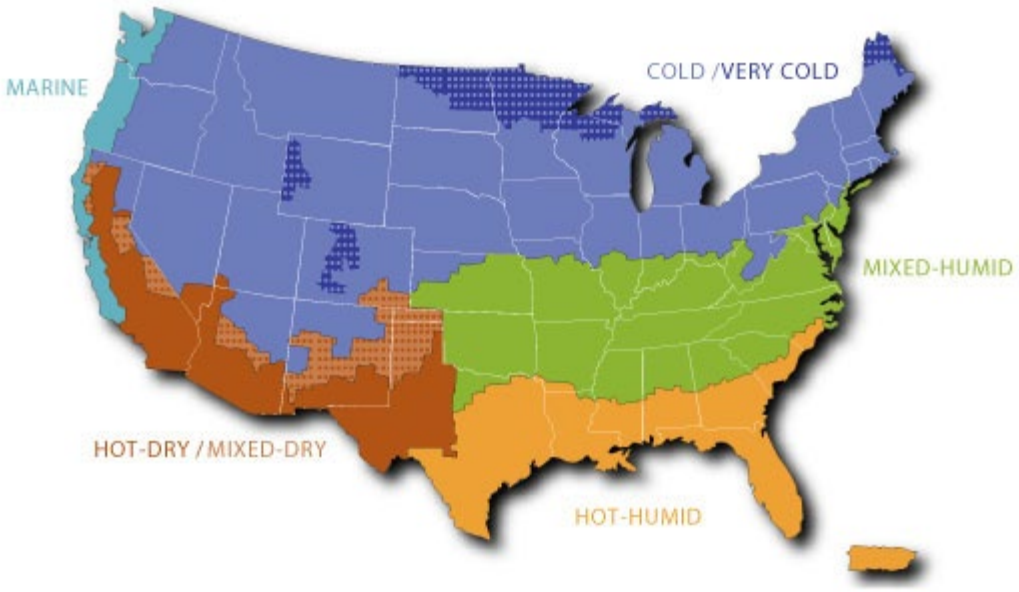
Water Used for Cooling

According to the Commercial Buildings Energy Consumption Survey (CBECS), about 4 percent of commercial and institutional buildings use central chillers or district chilled water for space and equipment cooling. These are larger facilities that account for nearly a quarter of the commercial and institutional floor space in the United States.[7] Central chillers and district chilled water plants are commonly paired with cooling tower systems. Building types that commonly include cooling towers are hospitals, hotels, laboratories, supermarkets, universities, manufacturing facilities, and large office buildings.

[6] Climate Engine. 2023. Desert Research Institute and University of Idaho. Accessed on August 8, 2023. https://climateengine.org/, Version 2.1.
[7] U.S. Energy Information Administration (EIA). Commercial Buildings Energy Consumption Survey. 2018.

Cooling tower water use can account for a significant portion of facility or campus total water use. This water use can vary depending on cooling load, local climate, incoming water quality, and system design and operation. Figure 5 shows how the U.S. Department of Energy (DOE) differentiates regions of the country by climate zones.

Figure 5. Climate Regions of the United States[8]

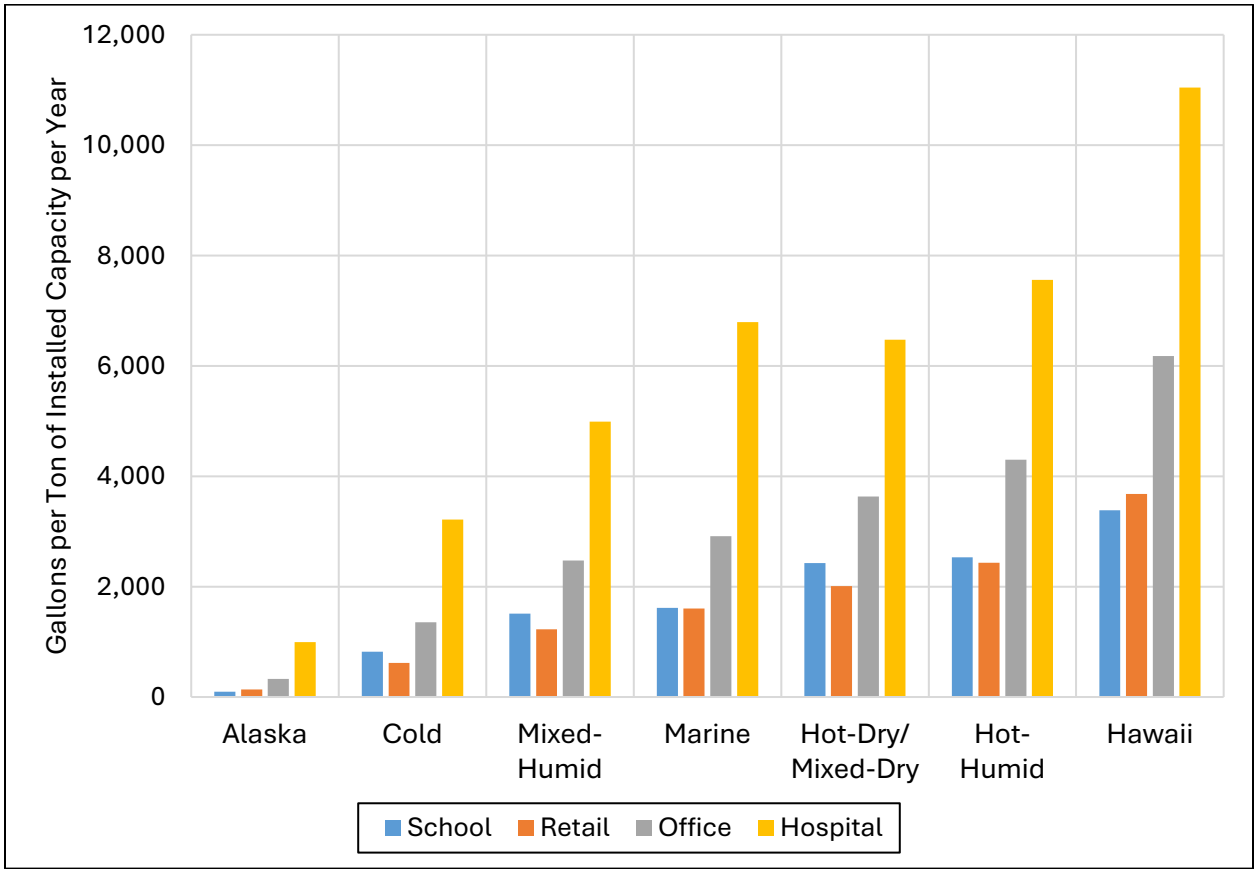


Using the climate regions presented above, Figure 6 on the next page shows the estimated annual water use required per ton of capacity for a cooling tower to operate at 4.0 cycles of concentration for different building types.

Information on water used for heating and cooling can be found in *WaterSense at Work* Section 6: Mechanical Systems at www.epa.gov/watersense/best-management-practices.

[8] DOE, Office of Energy Efficiency & Renewable Energy. Building America Climate-Specific Guidance Map. www.energy.gov/eere/buildings/building-america-climate-specific-guidance-image-map.

Figure 6. Estimated Annual Water Use Per Ton of Installed Capacity With a Cooling Tower Operating at 4.0 Cycles of Concentration[9]



Using *WaterSense at Work*

WaterSense at Work provides water efficiency best management practices relevant to multiple commercial and institutional sectors. Depending on the water-using equipment or systems installed, these best management practices can be used as a whole or in part to guide facility water management planning and facilitate water reductions. Table 1 on page 10 provides an overview of what can be found in *WaterSense at Work*.

Facility managers, owners, or employees involved in resource conservation can use *WaterSense at Work* to help:

- Assess facility water use.
- Establish a water management plan.

[9] Estimates calculated based on information from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers' (ASHRAE's) *Climatic Data for Building Design Standards* and Chapter 32 of the *2007 ASHRAE Handbook—Heating, Ventilation, and Air-Conditioning Applications*.

- Effectively communicate and achieve water management goals.
- Reduce water loss from leaks.
- Understand how water is used in different water-using fixtures, equipment, systems, and processes.
- Generate ideas for increasing the efficiency of water-using fixtures, equipment, systems, and processes.
- Identify opportunities for reusing onsite alternative water to replace potable water use.

Facility owners and managers interested in better managing and reducing facility water use should review Section 1: Getting Started with Water Management Planning and Section 2: Water Use Monitoring at www.epa.gov/watersense/best-management-practices. These sections provide overarching information and best management practices applicable to all facility types and outline actions that can be taken to ensure the success of any water management plan or water use reduction strategy. Sections 3 through 8 address opportunities associated with specific equipment and systems used at commercial and institutional facilities.

WaterSense provides additional resources related to water use and efficiency in commercial and institutional buildings, including assessment tools, worksheets, case studies, and webinars, at www.epa.gov/watersense/commercial-buildings.

Table 1. Guide to *WaterSense at Work*

Section	Best Management Practices (BMPs) Covered
1. Getting Started With Water Management	• Water Management Planning • User Education and Facility Outreach • Codes, Standards, and Voluntary Programs for Water Efficiency • Energy-Water Nexus • Water Quality and Safety
2. Water Use Monitoring	• Metering and Submetering • Leak Detection and Repair • Benchmarking
3. Sanitary Fixtures and Equipment	• Toilets • Urinals • Faucets • Showerheads and Bath and Shower Diverters • Laundry Equipment
4. Commercial Kitchen Equipment	• Pre-Rinse Spray Valves • Commercial Ice Machines • Combination Ovens • Steam Cookers • Steam Kettles • Wok Stoves • Dipper Wells • Wash-Down Sprayers • Food Disposals • Commercial Dishwashers • Food Thawing
5. Outdoor Water Use	• Landscaping • Irrigation • Commercial Pool and Spa Equipment • Vehicle Washing
6. Mechanical Systems	• Single-Pass Cooling • Cooling Towers • Chilled Water Systems • Boiler and Steam Systems
7. Laboratory and Medical Equipment	• Water Purification • Vacuum Pumps • Steam Sterilizers • Glassware Washers • Fume Hood Filtration and Wash-Down Systems • Vivarium Washing and Watering Systems • Photographic and X-Ray Equipment
8. Onsite Alternative Water Sources	• Onsite Alternative Water Sources

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