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Cover design by Maxim Marketing & Graphic Services, Bettendorf, IA

REGIONAL WATER

CONVERSATIONS



This document is being distributed by:
Water Quality Management Technology
Red Rocks Community College 13300
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Lakewood, CO 80228
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Advanced Technology
**Environmental and
Energy Center**

A Report on a Series of Regional Conversations on Water Management Issues

The Advanced Technology Environmental and Energy Center (ATEEC) and the National Science Foundation (NSF) would like to acknowledge and thank the water management professionals who generously shared their time and expertise in providing regional information for the water management career field. Their expert insights gained from over 4,700 actual years of experience in this field were critical to developing appropriate water technology education and training programs to target geographically specific workforce needs. The Regional Water Conversations' host organizations and participants are listed at the end of this report.

ATEEC also would like to thank the Advanced Technological Education (ATE) program of the National Science Foundation (NSF) for its support and foresight in recognizing that improvements in water technology education must begin with obtaining a clear picture of what stakeholders need to ensure the water technology workforce adapts to a rapidly changing and increasingly critical field of water management.

ATEEC is part of the Eastern Iowa Community Colleges.



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This project was supported, in part, by the Advanced Technological Education program at the National Science Foundation (NSF). The opinions expressed in this report are those of the forum participants and do not necessarily represent NSF policy.

**Additional copies of this report can be downloaded at ATEEC's website:
www.ateec.org.**

INTRODUCTION

Water quality and availability have been recognized as serious global issues for many years, most closely by countries which lack these crucial resources. The U.S. is becoming increasingly aware of and focused on our own pressing issues of water management. Climate change, the advent of new technologies, the increased role of water in national security issues, the energy-water nexus, changes in regulatory compliance requirements, changing demands of industry, and public interest in green jobs call for a realignment of academia, industry, business, and government stakeholders. Current and upcoming retirements of water industry workers indicate a critical need for a new generation of technicians to replace the dwindling workforce, and for the education and training to effectively meet the demands of the 21st century water management field.

"NGO types, geologists, and climate scientists have been warning about freshwater scarcity for some time. What's striking today is the sheer number of gray suits who are sounding the alarm. 'Water now gets discussed at the board level,' David Grant, the senior manager for water risks and partnerships at SAB Miller, tells *Fortune*. (That Miller has a senior manager for water risks is telling in itself.)"

"PepsiCo CEO Indra Nooyi says, 'The world water crisis is one of the most pressing challenges of our age.'"

*—Fortune Magazine, CNN Money*⁵

There is little doubt that U.S. drinking water and wastewater infrastructures are in dire need of an overhaul, as well as source water quality efforts. The American Water Works Association reports that there are several fundamental concerns including source water availability, aging infrastructure, remediation, and workforce issues.¹ The U.S. Geologic Survey estimates that the U.S. wastes six billion gallons of clean drinking water each day, or 14 percent of total use, through leaky pipes in need of repair.² The American Society of Civil Engineers gave a grade of D- to both the nation's drinking water and wastewater infrastructures.³ According to the Water Environment Federation, one and a half million miles of pipeline comprise this infrastructure, most of which was built nearly a century ago and is literally falling apart. Most pipelines only have a lifespan of 50 to 100 years and were originally designed for populations half their current size.⁴

Concurrent with quality and infrastructure concerns is the serious potential economic impact from failing to manage our water resources effectively. According to a recent EPA report, "Every sector of the U.S. economy is influenced by water...Water is vital to a productive and growing economy in the United States, and directly affects the production of many goods and services...Changes to water use or impacts in one sector or region can produce ripple effects across the economy. The interconnectedness of water use and economic activity means that a systems-level perspective is needed when evaluating water's economic importance...and to fully understand the consequences of alternative water resource management strategies.

"A systems approach is also valuable in considering interrelationships in the use of water from an environmental and societal perspective. The waters within a local watershed are likely to supply multiple users and support a variety of uses, both water withdrawals and in-stream uses such as commercial navigation and recreational boating. As a result, the actions of one user can affect the welfare of many. This is most clearly the case when the water use by one customer precludes its use by others. It is also the case when use of the resource impairs the quality of water available to others. For example, pollutants discharged

References are listed at the end of this section.

from a facility may affect the quality of water downstream. These pollutants may affect the costs that a downstream municipality incurs to treat and supply drinking water to its residents.”⁶

Education is a primary factor in efforts to mitigate a looming water crisis. In response to the increasingly urgent need for developing and/or upgrading water technician education, the Advanced Technology Environmental and Energy Center (ATEEC) published the 2013 national *Defining Water Management*⁷ report. This report, funded by the National Science Foundation (NSF), contains the results of a national forum for defining water technology. The report provides an overview of the water field in the U.S., including:

- Title and definition of the field of water management
- Definition of the technician as a water professional
 - Occupational categories
 - Technician-level occupational titles
 - Job functions typically performed in each occupational category

“Willem Buiter, Citigroup's chief economist, sums up the thinking of many these days: 'Water as an asset class, in my view, will eventually become the single most important physical commodity—dwarfing oil, copper, agricultural commodities, and precious metals.'”

—Fortune Magazine, CNN Money⁵

Committed to promoting collaboration and flexibility among water stakeholders in order to meet the needs of the U.S. workforce, NSF decided that a second phase to this workforce analysis was in order, to begin to effectively and efficiently address the changes in the water management field and the resulting need for worker training. Pragmatically, there is a growing need to ensure that the rush to train water management professionals is balanced by a systematic analysis of what jobs are needed and where those jobs are located. The workforce cannot be well served by providing training to technicians without corresponding jobs in the labor market.

To this end, NSF tasked ATEEC with facilitating a series of six regional Water Conversations. The primary purpose of the conversations was to obtain a snapshot view of existing and upcoming water management jobs and to determine which jobs are currently needed in different regions of the country. This report is the result of these Water Conversations and is intended to provide a preliminary labor market analysis and needs assessment. This information allows educational organizations to most effectively target regional water industry requirements and to provide both short- and long-term education and training for the water management professionals of the 21st century workforce.

The audience for this report includes:

- Counselors, faculty, and administrators of academic institutions at all levels, but particularly in two-year colleges and high schools
- Technicians and employers of technicians (e.g., companies, government agencies)
- Leaders of professional societies
- Federal, state, and local government officials responsible for the quality and quantity of the nation's technical workforce

INTRODUCTION (cont.)

Ultimately, this report should contribute to addressing the workforce development needs of business, industry, and government by providing educators with information needed to develop relevant curriculum that prepares students for water management careers. The report will also be used to provide direction for future activities at ATEEC, a Center of Excellence partially funded through a grant from NSF. The Center brings together educational institutions, training organizations, and business and industry stakeholders from across the nation to promote and assist in developing relevant and high-quality water management programs.



BLUEPRINT OF THE WATER CONVERSATIONS

To begin the Regional Water Conversations project, ATEEC collaborated with the Partnership for Environmental Technology Education (PETE) to choose six representative regions in the country in which to hold each one-day Regional Water Conversation meeting. ATEEC coordinated the effort with regional host organizations, which invited experienced water technology industry practitioners in the region who have a broad perspective of the various occupational areas included in this field. The host organizations attempted to gather as broad a representation of participants from each region as possible within limited time and budget constraints.

Using the 2013 national *Defining Water Management* report as a point of reference, the 2014 Regional Water Conversations participants agreed to use the following general assumptions for the purposes of this discussion, in order to make the most efficient use of their expertise in targeting specific water management occupations:

- **Water Management** is a career field that applies the principles of science, math, technology, engineering, communication, economics, management, and law to ensure water quality and to sustainably manage water as a resource to protect public health and the environment.
- A **Water Professional** applies knowledge, skills, and abilities to perform scientific, technical, managerial, regulatory, and communication tasks and responsibilities.
- The **educational background** for technician-level water professionals typically ranges from a high school diploma plus on-the-job training to a two-year associate degree, usually in an applied technology program.



In each water conversation, ATEEC facilitators assisted participants working in large and small discussion groups to address the following items at a regional level:

- Specific technician-level **jobs** typically found in the area
- Types of **certification** required by these jobs
- **Labor market data** resources for the region
- Most prevalent and **fastest-growing jobs**
- Area's current **best practices** in education and training for water management jobs
- Common **technical skills** that cut across water occupations
- Common **employability skills** required for most of these occupations
- **Emerging issues and future trends** in the water management field

SUMMARY OF THE RESULTS

SOME COMMONALITIES AMONG REGIONS

- All representatives from utility companies agreed that the next five to ten years will see a significant and critical increase in the need for water management professionals. This is due to several factors, primarily the beginning of the retirement of much of the current workforce.
- Demand for clean water is growing as population and industry grow; behavioral conservation measures are fundamental to meeting demand.
- Workforce occupational analyses are based on regional needs, state certification requirements, and facility size (scale of operation).
- Differing certification requirements for many water management positions often hinders the rapid transfer of knowledge and training into the workforce.
- Most jobs were agreed to exist at the technician level; however the different regions often had different job titles. Some regions accepted "manager" or "supervisor" as a technician-level title, others did not.
- Most of the occupations in the water field are not new jobs; they are "increased demand" (e.g., plant maintenance technicians) or "enhanced skills" (e.g., water/wastewater operators) occupations. (See below for a good description of these distinctions from the U.S. Department of Labor.) The implication for education and training is that most curricula developed for the water management field will entail integrating minor new skills into an existing program or using an existing program as a base upon which to build new and/or enhanced water management skills.
- When developing any new water program, it is critical that the first step is a credible labor market assessment to ensure that training is directly associated with available and upcoming jobs. The second step is ensuring that the curriculum aligns with business and industry performance-based functions.
- To achieve the previous programmatic goal, educators must maintain regular, periodic interaction with business and industry (e.g., advisory committees, occupational analyses) to ensure that skills being taught align with the skills needed in the workplace.
- Business and industry representatives noted an increasing importance for short-term credit and non-credit certificates that emphasize skills.
- Core foundational courses and programs are needed that can be transferred to a variety of water management careers.
- Local, state, and federal funding and/or incentives are sorely needed to address the water industry's critical issues.

PRIMARY REGIONAL WATER RESOURCES

- Midwest: Surface water, ground water—Little to no water shortage
- Mountain West: Snowpack, catchment—Frequent periods of severe drought
- Northeast: Surface water, ground water—Little to no "perceived" water shortage
- Northwest: Surface water, ground water— Little to no water shortage
- Southeast: Surface water, ground water—Resources dwindling
- Southwest: Mainly sources external to region, e.g., surface water, some catchment— Increasingly consistent periods of severe drought

SNAPSHOT OF SOME REGIONAL TOP PRIORITIES

- **Infrastructure: All regions**
- **Personnel shortages: All regions**
- Scarcity/conservation: Southwest, Mountain West, Northwest
- Ground water contamination: Midwest, Northeast
- Surface water contamination: Midwest, Northeast
- Aquifer drawdown: Southwest, Northeast
- Surface water drawdown: Mountain West, Southeast, Southwest

GREEN JOBS ANALYSIS

While written to address the overall area of green jobs rather than the specific area of the water sector, the following excerpts from a report (Greening of the World of Work: Implications for O*NET®-SOC and New and Emerging Occupations⁸) from O*NET at the U.S. Department of Labor provide a pertinent description of occupational analysis of jobs in the water management field and accurately capture a major theme from the Regional Water Conversations:

To summarize, there are two primary implications for occupational analysis in general [...]. First, the vast job-level information in the existing green economy literature must be consolidated and interpreted for its meaning at the occupation level. In particular, a focus on occupational requirements (tasks, duties, tools and technology, knowledge, skills, and so forth) is essential for discovering the occupational implications of the green economy.

Second, any analytical or descriptive approach used to determine the occupational implications of the green economy must be sensitive to the varying degrees with which green economy activities shape occupational performance. This entails a definitional approach to “green occupations” that moves beyond labeling (i.e., green as adjective) to encompass the dynamic nature of occupational performance (i.e., greening as verb). A parallel can be seen in the shift away from an emphasis on “organization” to “organizing” in the general management literature in order to address the effects of contextual changes in the 1990s (e.g., flattening of firms, use of teams, project-based work).



SUMMARY OF THE RESULTS (cont.)

GREEN JOBS ANALYSIS (cont.)

This definition lends itself to three general categories, each describing the differential consequences of green economy activities and technologies on occupational performance. These categories of occupations are described below and include examples of the effects indicative of each. [...]

Green Increased Demand Occupations. The impact of green economy activities and technologies is an increase in the employment demand for an existing occupation. However, this impact does not entail significant changes in the work and worker requirements of the occupation. The work context may change, but the tasks themselves do not. [An example is the increased demand for plant maintenance technicians, who keep the systems of water and/or wastewater machines in efficient working order.]

Green Enhanced Skills Occupations. The impact of green economy activities and technologies results in a significant change to the work and worker requirements of an existing occupation. This impact may or may not result in an increase in employment demand for the occupation. [An example is the water/wastewater operator who operates and manages a system of machines to transfer or treat water or wastewater.] The essential purposes of the occupation remain the same, but tasks, skills, knowledge, and external elements, such as credentialing requirements, have been altered.

New and Emerging (N&E) Green Occupations. The impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements, resulting in the generation of a new occupation. This new occupation could be entirely novel or “born” from an existing occupation. [An example would be a water conservation technician, specializing in determining and implementing methods to reduce water use, reclaim wastewater, and reuse water in different site-specific applications, including residential, commercial, and industrial settings.]



USING THIS REPORT

A small poster follows this introductory section, depicting a snapshot view of the fastest-growing jobs in each region. The full results of the input gathered from the water management experts across the country are contained later in the report. These results are presented by region and detail the area's occupational information for the water management field. Data in green text indicate regional differences from the national data contained in the *Defining Water Management* report. The report continues with additional cross-cutting occupational data that applies to jobs in the water sector. The final section takes a look at emerging issues and future trends in technology and employment in the water management field.

ACKNOWLEDGMENT

Participants expressly asked ATEEC to include in this report their thanks to the National Science Foundation for providing this opportunity for the diverse sets of water management stakeholders to gather and share their needs and knowledge. They hope that conversations such as these can continue to be promoted by government entities to help integrate the requirements of business and industry with the education and training needed by technicians of the U.S. workforce to successfully keep pace with a rapidly changing industry and world.

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Fastest-Growing Technician Jobs in the Water

National

Water Treatment Operator, **Wastewater** Treatment Operator, **PLC/SCADA** Instrumentation

North

Water & Wastewater Operator, **Instrumentation Technician**, **SCADA Technician**, Maintenance Technician, Drinking Water Operator, **Collection System**

South

Water Treatment Operator, **Wastewater Plant Operator**, Plant Maintenance Technician, **Utility** Process Control Technician, **PLC/SCADA Technician**, Lab

Mid

Water Treatment Operator, **Wastewater Plant Operator**, Stormwater/MS4 Environmental Sampling/Monitoring Technician, **Green Infrastructure Specialist**, **IT Pro**

Mountain

Water Treatment Operator, **PLC/SCADA Specialist**, Water Reclamation Plant **Distribution Operator**, Instrumentation & Control **Asset & Capital Improvement Planning Manager**, **Collection System**

South

Water Treatment Operator, **Wastewater Plant Operator**, Environmental Compliance **Instrumentation Technician**, **PLC/SCADA** **Mechanical Maintenance Technician**, Water Conservation

North

PLC/SCADA Programmer, **Instrumentation Technician**, Operations **Stormwater Facility Installation/Maintenance Specialist**, **GIS Specialist**, **Water Treatment**

Jobs Field



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ational

Programmer,
n Technician

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Technician,
n Operator

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ty Locator,
o Technician

west

Technician,
rofessional

West

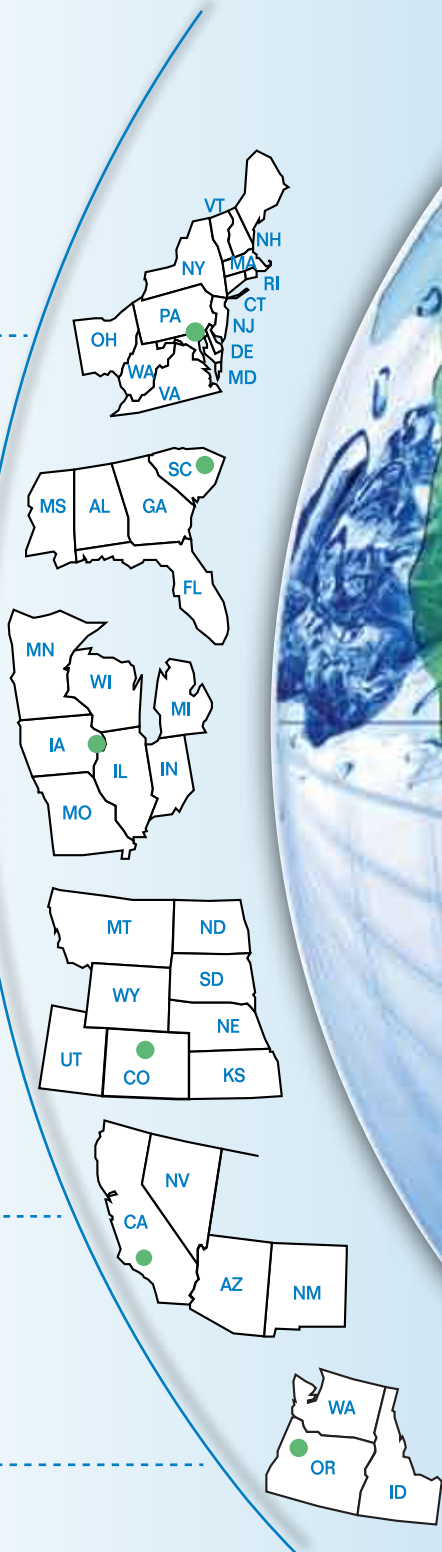
ant Operator,
ol Technician,
n Operator

west

ce Technician,
Programmer,
n Technician

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Technician,
t Operator



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MIDWEST WATER CONVERSATION

Note: Bold text in the box below indicates the primary fastest-growing jobs. Green text in this section indicates regional differences between national and regional occupational titles. National job titles are based on those listed in the national report, *Defining Water Management* (<http://ateec.org/defining-water-management-report/>).

FASTEST-GROWING JOBS IN THE MIDWEST

- **Water Treatment Operator**
- **Wastewater Plant Operator**
- **Stormwater/MS4 Technician**
- **Environmental Sampling/
Monitoring Technician**
- **Green Infrastructure Specialist**
- **IT Professional**
- CAD Technician
- Erosion Control Specialist
- GIS Technician/Specialist
- Lab Analysis Technician
- Low Voltage Technician
- Plant Maintenance Technician
- PLC/SCADA Programmer

JOB CATEGORIES AND TITLES

Administration

Customer Service Representative
Health & Safety Coordinator
Information Technology (IT) Professional
Project Manager

Deleted:

Public Relations & Human Resources Specialist
Regulatory Compliance Manager
Security Coordinator

Engineering

Computer-Aided Drafting (CAD) Technician
Construction Inspector
Geographic Information Systems (GIS) Specialist
Hydrology Technician
Modeling Technician
Surveyor

Deleted:

Construction Supervisor
Corrosion Control Specialist
Hydraulic Specialist

Laboratory

Environmental Sampling/Monitoring Technician
Instrumentation Technician
Lab Analysis Technician
Quality Assurance/Quality Control (QA/QC) Technician

Deleted:

Laboratory Health & Safety Supervisor

Plant Maintenance

High Voltage Electrician
Low Voltage Electrician
Plant Maintenance Technician

Deleted:

Plant Maintenance Supervisor

Regulations & Compliance

Biosolids Land Application Technician
Combined Sewer Overflow/Sanitary Sewer Overflow (CSO/SSO) Monitoring Specialist
Cross-Connection Control Specialist
Enforcement Specialist
Environmental Compliance Technician
Fats/Oils/Grease (FOG) Inspector
Industrial Pretreatment Specialist
Large Animal Confinement Inspector
Permit Specialist
Stormwater Compliance Inspector

Deleted:

FOG Manager
Pretreatment Manager

Wastewater Operations

Chief Operator
Collection System Operator*
Industrial Pretreatment Operator
Instrumentation Technician*
Plant Mechanic
Plant Operator* (treatment, biosolids, reclamation, construction)
Programmable Logic Controller/Supervisory Control & Data Acquisition (PLC/SCADA) Programmer
Pretreatment Coordinator
Process Control Operator**

Water Operations

Cross-Connection Control Specialist
Distribution Operator/Foreman
Heavy Equipment Operator
Industrial Water Systems Operator
Instrumentation Technician
Leak Detection Technician
Meter Reader/Installer
Meter Tester/Mechanic
PLC/SCADA Programmer
Treatment Plant Mechanic
Utility Locator ("Dig Safe")
Water Treatment Operator*

Watershed & Runoff Control

Agricultural Water Specialist
Aquatic Habitat Restoration Technician
Dredge Operator
Erosion Control Specialist
Forestry Technician
GIS Technician
Green Infrastructure Specialist
Ground Water Remediation Technician
Hydrogeology Technician
Hydrology Technician
Irrigation Control Specialist
Modeling Technician
QA/QC Technician
Residential Water Purification Technician
Roadside Vegetation Manager
Septic Tank Maintenance Technician*
Stream Bank Stabilization Technician
Stormwater/MS4 Technician
Surface Water Monitoring Technician
Sustainable Landscaper
Water Conservation Technician
Well Driller
Wetland Delineation Specialist

*Various levels (e.g., supervisor, team leader, senior lead, shift supervisor, operator I-III, non-certified maintenance worker, operator-in-training (OIT))

**Various levels (e.g., operator, engineer, supervisor)

OCCUPATIONAL DATA

Labor Market Data Resources

American Society of Landscape Architects
American Water Works Association (national & state)
American Society of Civil Engineering
Association of Boards of Certification
American Public Works Association
Center for Watershed Protection
Environmental Systems Research Institute
Institute for Sustainable Infrastructure
International Erosion Control Association
Iowa Economic Development Authority
Local & Regional Watershed Management Authorities
National Assn. of Regulatory Utility Commissioners

National Ground Water Association
Salary Surveys (WEF or IAWEA)
State Departments of Natural Resources, Environmental Protection, etc.
State Environmental Protection Agencies
Succession Planning for a Vital Workforce report
U.S. Department of Agriculture, Agricultural Research
U.S. Department of Transportation
U.S. Environmental Protection Agency
U.S. Geological Survey
Water Environment Federation
Water Utility Compensation Survey AWWA
Work for Water (ISAWWA, NRWA)
Workforce Planning for Water Utilities report

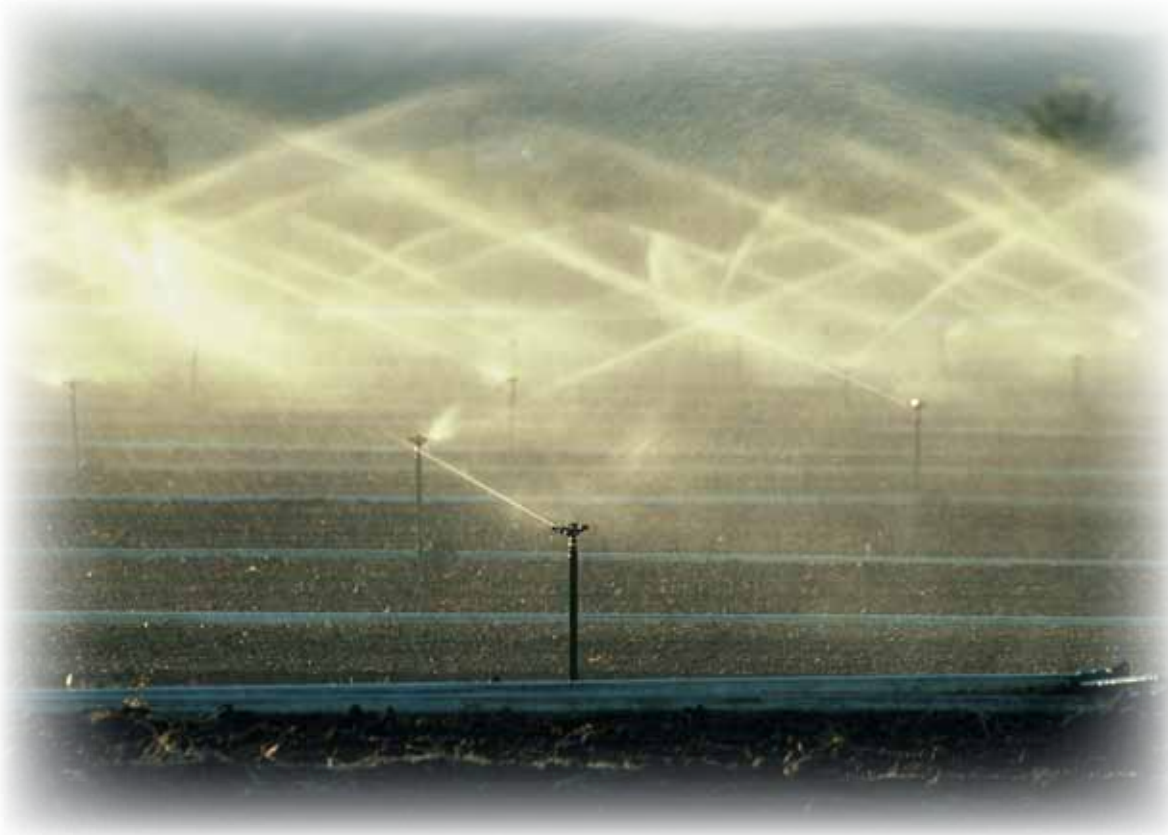
MIDWEST WATER CONVERSATION (cont.)

OCCUPATIONAL DATA (cont.)

Best Practices

Bi-State Regional Commission
Bluethumb
Chesapeake Stormwater Network
Educators: Cooperatives, internships, mentoring
Iowa Department of Agriculture & Land Stewardship
Iowa Flood Center
Iowa Nutrient Reduction Strategy
Iowa Rural Water Association
Iowa Soybean Association
Iowa Storm Water Education Partnership
Iowa Stormwater Management Manual
Land and Water magazine

League of Cities
Low Impact Development Center (IA)
Partners of Scott County Watersheds (IA)
Project AWARE
Public Health Departments (septic, fluoridation)
Rainscaping Iowa
River Action
Spatial Data Standards for GIS
State Community & Technical Colleges
State Land Grant Universities
U.S. Department of Agriculture, Natural Resource
Conservation Service
*Water Quality: The Next Generation—Promoting
Environmental Careers through Innovative
Education Programs* report



Certification/Licensure (includes required and preferred)

Note: The following training may be required or preferred, depending on local and state regulations, size and complexity of facility, etc. An “R” indicates that the training is required.

Occupation/Category	Certification/Licensure (R=Required)
General	ACI—American Concrete Institution
	Asbestos Inspector Certification (R)
	OSHA 10-Hour Training (R)
	OSHA 40-Hour HAZWOPER (R)
Administration	National Registered Environmental Manager
CAD Technician	CD—Certified Drafter
Electrician	Certified/Licensed by State & Municipality (R)
Engineering	NICET—National Institute for Certification in Engineering Technology
GIS Technician	GISP—Geographic Information Systems Professional
Heavy Equipment Operator	CDL—Commercial Driver’s License (R)
Instrumentation Technician	Certified Automation Professional
	Certified Control System Technician
	International Society of Automation
Modeling Technician	CAD Software-Specific Modeling Certification
Sustainable Landscaper	LEED—Leadership in Energy Efficient Design
	Rainscaper Program Certification
Septic Tank Maintenance Technician	Municipality-Specific Septic Certification (certified time & transfer)
Stormwater Compliance Inspector	State-Specific Inspector Program Certification (R)
	CESSWI—Certified Erosion Sediment & Stormwater Inspector
	CISEC—Certified Inspector of Sediment & Erosion Control
	CMS4S—Certified Municipal Separate Storm Sewer System Specialist
	CPESC—Certified Professional Erosion Sediment Control
	CPSWQ—Certified Professional in Stormwater Quality
CSM—Certified Stormwater Manager	
Surveyor	Land Surveyor Certification (R)
Wastewater Operations	Collection System Operator License
	Industrial Wastewater Systems Operator License (state-specific, includes collection & distribution) (R)
	Wastewater Treatment Operator License (state-specific, typically 4-stage license level, may include maintenance staff) (R)
	Water Monitoring Certification (state-specific) (R)
Water Operations	Cross-Connection Control Device Tester Certification (R)
	Cross-Connection Control Inspector Certification (R)
	Industrial Water Systems Operator License (state-specific, includes distribution) (R)
	Water Monitoring Certification (state-specific) (R)
	Water Treatment Operator License (state-specific, typically 4-stage license level, may include maintenance staff) (R)
Watershed & Runoff Control	Herbicide Application License (R)
	Prescribed Burn Certification
	Rainscaper Program Certification
	Volunteer Certification
	Wetlands Delineation Training (R)
Well Driller	Well Drilling License (state-specific)

MOUNTAIN WEST WATER CONVERSATION

Note: Bold text in the box below indicates the primary fastest-growing jobs. Green text in this section indicates regional differences between national and regional occupational titles. National job titles are based on those listed in the national report, *Defining Water Management* (<http://ateec.org/defining-water-management-report/>).

FASTEST-GROWING JOBS IN THE MOUNTAIN WEST

- **Water Treatment Operator**
- **PLC/SCADA Specialist**
- **Water Reclamation Plant Operator**
- **Distribution Operator**
- **Instrumentation & Control Tech**
- **Asset & Capital Improvement Planning Manager**
- **Collection System Operator**
- Maintenance Tech
- Health & Safety Coordinator
- IT Technology Professional
- Project Manager
- Regulatory Compliance Manager
- Utility/Public Works Manager
- GIS Specialist
- Hydraulic Specialist

JOB CATEGORIES AND TITLES

Administration

Administrative Assistant
Asset & Capital Improvement Planning Manager
Customer Service Representative
Health & Safety Coordinator
Information Technology (IT) Professional
Project Manager
Public Relations & Human Resources Specialist
Regulatory Compliance Manager
Security Coordinator
Utility/Public Works Manager

Engineering

Construction Inspector
Construction Supervisor
Corrosion Control Specialist
Geographic Information Systems (GIS) Specialist
Hydraulic Specialist
Hydrology Specialist
Survey Technician

Laboratory

Environmental Sampling/Monitoring Technician
Instrumentation Technician
Lab Analysis & Data Technician
Lab Health & Safety Supervisor
Quality Assurance/Quality Control (QA/QC) Technician

Maintenance

Instrumentation & Control Technician
Maintenance Supervisor
Maintenance Technician
PLC/SCADA Specialist
Deleted:
High Voltage Electrician
Low Voltage Electrician

Regulations & Compliance

Biosolids Land Application Technician
Combined Sewer Overflow/Sanitary Sewer Overflow (CSO/SSO) Monitoring Specialist
Cross-Connection Control Specialist
Environmental Compliance Technician
Large Animal Confinement Specialist
Pretreatment Specialist
Stormwater Compliance Specialist
Water Quality Specialist
Deleted:
Enforcement Specialist
Fats/Oils/Grease (FOG) Manager
FOG Inspector
Industrial Pretreatment Specialist
Permit Specialist

Water Operations

Chief Operator
Corrosion Control Specialist
Cross-Connection Control Specialist
Distribution Operator*
Heavy Equipment Operator
Industrial Water Systems Operator
Instrumentation Technician
Leak Detection Technician
Meter Technician
Plant Operator*
PLC/SCADA Specialist
Utility Locator ("Dig Safe")
Water Treatment Operator
Deleted:
Distribution Operator/Foreman
Meter Reader/Installer
Meter Tester/Mechanic
Treatment Plant Mechanic

Water Reclamation Operations

Chief Operator
Closed Circuit Television (CCTV) Operator
Collection System Operator*
Heavy Equipment Operator
Industrial Pretreatment Operator
Instrumentation Technician*
Onsite Wastewater Treatment Technician (septic tank)
Water Reclamation Plant Operator* (treatment, biosolids, reclamation, construction)
PLC/SCADA Specialist
Pretreatment Coordinator
Process Control Operator**

Watershed & Runoff Control

Agricultural Water Specialist
Aquatic Habitat Restoration Technician
Dredge Operator
Forestry Technician
Ground Water Remediation Technician
Hydrogeology Technician
Hydrology Technician
Residential Water Purification Technician
Septic Tank Maintenance Technician*
Source Water Technician
Stormwater/MS4 Technician
Surface Water Monitoring Technician
Sustainable Landscaper
Water Conservation Technician
Well Driller
Wetlands Delineation Specialist
Deleted:
Modeling Technician
Source Water GIS Technician

*Various levels (e.g., supervisor, team leader, senior lead, shift supervisor, operator I–III, non-certified maintenance worker, operator-in-training (OIT))

**Various levels (e.g., operator, engineer, supervisor)

MOUNTAIN WEST WATER CONVERSATION (cont.)

OCCUPATIONAL DATA

Labor Market Data Resources

Association of Boards of Certification's *Need-to-Know Criteria*
American Society of Civil Engineers (ASCE) reports on poor condition of infrastructure assets
American Water and Wastewater Association's (AWWA) Annual Report & Workforce Strategies report
Association of State Drinking Water Administrators
AWWA's *Buried No Longer* report on infrastructure needs
Colorado Department of Labor and Employment's "Connecting Colorado" project
Colorado River Basin Bureau of Reclamation
Disability Vocation Rehabilitation
Federal & state codes & regulations
Mountain States Employers Council
National climate forecasting
Operator Certification Program Office
Rocky Mountain Sector of AWWA's "Get Into Water" project
Rocky Mountain Water Environment Association
State of Colorado as primary outreach, development, & implementation of Source Water Protection Plans
USAJOBS.org
School career centers
U.S. EPA's Operation Certification Board
U.S. Homeland Security's Water and Wastewater Sector, "Critical Infrastructure and Key Resources"
U.S. Forest Service's *Burn Area Emergency* report
Veterans Administration Association jobs reports
Water Infrastructure Network
Water Research Foundation
Water Research Foundation's "Competency Model"

Best Practices

Best Management Practices (BMP) Manual for Drinking Water System Releases from California-Nevada AWWA
Environmental, Health & Safety Committee
"Best Practices in Efficient Stormwater Management" from Minnesota Pollution Control Agency's GreenStep
Cities program
Biosolids Best Management from the National Biosolids Partnership
Climate Ready Water Utilities from the National Drinking Water Advisory Council
Core Attributes of Effectively Managed Wastewater Collection Systems from American Public Works Association,
ASCE, National Association of Clean Water Agencies, and Water Environment Federation (WEF)
Electronic Consumer Confidence Report (eCCR) Best Practice Guide from AWWA
Manuals of Water Supply Practices from AWWA
Municipal Wastewater Reuse by Electric Utilities: Best Practices and Future Directions from WEF
Process Control System Security Guidance for the Water Sector from AWWA

Certification/Licensure (includes required and preferred)

Note: The following training may be required or preferred, depending on local and state regulations, size and complexity of facility, etc. An “R” indicates that the training is required.

Occupation/Category	Certification/Licensure (R=Required)
Operations	Backflow Prevention Assembly Tester (R)
	Biosolids Applier/Manager
	Corrosion Control NACE (R)
	Cross-Connection Control Specialist (R)
	Industrial Wastewater Operator: Class A, B, C, D (R)
	Lab Technician (R)
	Residential Wastewater Operator: Class A, B, C, D, S (R)
	Wastewater Collection Operator: Class 1, 2, 3, 4 (R)
	Water Distribution Operator: Class 1, 2, 3, 4 (R)
Water Treatment Operator: Class A, B, C, D, S, T (R)	
Pesticides	Pesticide Application Technician (R)
Safety & Health	Odor Observations Training (R)
	OSHA 10-Hour Training (R)
	OSHA 40-Hour HAZWOPER (R)
Wells	Well Drilling License (state-specific) (R)



NORTHEAST WATER CONVERSATION

Note: Bold text in the box below indicates the primary fastest-growing jobs. Green text in this section indicates regional differences between national and regional occupational titles. National job titles are based on those listed in the national report, *Defining Water Management* (<http://ateec.org/defining-water-management-report/>).

FASTEST-GROWING JOBS IN THE NORTHEAST

- **Water & Wastewater Operators**
- **Instrumentation Technician**
- **SCADA Technician**
- **Maintenance Technician**
- **Drinking Water Operator**
- **Collection Systems Operator**
- Trained Wastewater Operator
- Small Treatment Plant Operator
- Stormwater Utility Technicians
- Trainers
- GIS Technician
- Certified Distribution Operator
- Operations & Maintenance Field Specialist
- Pretreatment Coordinator
- Lab Technician
- Environmental Compliance Technician
- Composting Technician

JOB CATEGORIES AND TITLES

Administration

Fiscal Clerk

Health & Safety Coordinator

Information Technology (IT) Professional

Project Manager

Human Resources Specialist

Regulatory Compliance Manager

Security Coordinator

Deleted:

Customer Service Representative

Public Relations Specialist

Engineering

Construction Inspector

Construction Supervisor

Corrosion Control Specialist

Engineering Technician*

Hydraulic Specialist

Hydrology Technician

Surveyor

Deleted

Geographic Information Systems (GIS) Specialist

Laboratory

Environmental Sampling/Monitoring Technician

Instrumentation Technician

Lab Analysis Technician

Deleted:

Laboratory Health & Safety Supervisor

Quality Control/Quality Assurance (QA/QC) Technician

Plant Maintenance

Plant Maintenance Supervisor

Plant Maintenance Technician

Qualified Electrical Worker

Deleted:

High Voltage Electrician

Low Voltage Electrician

Regulations & Compliance

Biosolids Land Application Technician

Cross-Connection Control Specialist

Environmental Compliance Technician

Industrial Pretreatment Specialist

Deleted:

Combined Sewer Overflow (CSO)/Sanitary Sewer

Overflow (SSO) Monitoring Specialist

Enforcement Specialist

Fats/Oils/Grease (FOG) Manager

FOG Inspector

Industrial Pretreatment Specialist

Large Animal Confinement Inspector

Permit Specialist

Pretreatment Manager

Stormwater Compliance Inspector

Wastewater Operations

Chief Operator (experience based)
Collection System Operator**
Heavy Equipment Operator
Industrial Pretreatment Operator
Instrumentation Technician**
Pretreatment Coordinator
Process Control Operator***
SCADA Technician
Small Wastewater System Operator
Utility Locator ("Dig Safe")
Wastewater Plant Operator* (treatment, biosolids, reclamation, construction)

Water Operations

Cross-Connection/Backflow Control Specialist
Distribution Operator**
Drinking Water Operator
Heavy Equipment Operator
Industrial Water Systems Operator
Instrumentation Technician
Leak Detection Technician
Residential Water Purification Technician
SCADA Technician
Maintenance Technician
Utility Locator ("Dig Safe")
Water Treatment Operator**
Deleted:
Distribution Foreman
Meter Reader/Installer
Meter Tester/Mechanic
Programmable Logic Controller (PLC) Programmer
Treatment Plant Mechanic

Watershed & Runoff Control

Aquatic Habitat Restoration Technician
Forestry Technician
Ground Water Remediation Technician
Hydrogeology Technician
Hydrology Technician
Stormwater Technician
Surface Water Monitoring Technician
Sustainable Landscaper
Well Driller
Deleted:
Agricultural Water Specialist
Dredge Operator
Modeling Technician
Residential Water Purification Technician
Septic Tank Maintenance Technician
Source Water GIS Technician
Water Conservation Technician
Wetland Delineation Specialist

*Includes computer-aided drafting (CAD), computerized management maintenance system (CMMS), sustainable/renewable resource management, asset management, & geographic information systems (GIS)

**Various levels (e.g., supervisor, team leader, senior lead, shift supervisor, operator I, operator II, operator III, non-certified maintenance worker, operator-in-training (OIT))

***Various levels (e.g., operator, engineer, supervisor)

NORTHEAST WATER CONVERSATION (cont.)

OCCUPATIONAL DATA

Labor Market Data Resources

American Water Works Association (AWWA) surveys on succession planning

Individual business and/or municipality staffing projections (Example: In the next five years,

East Providence, MA projects the need for 13 new people (8 operators, 3 mechanics, 1 pretreatment specialist, 1 lab technician))

Joint Environmental Training Coordinating Committee (JETCC)—Unofficial survey (Maine) on average age of wastewater operators

Known job vacancies (higher level in Connecticut)

Massachusetts Operator Survey

New England & state associations

New England Interstate Water Pollution Control Commission (NEIWPC) Job Corps Survey (Dec 2003)

“New Plant Construction Across Massachusetts”—Metadata

Promoting Entry to Career Pathways in the Drinking Water and Wastewater Sector, University of Massachusetts–Lowell (2012)

Professional Associations

- National level
 - o American Water Works Association (AWWA)
 - o New England Water Environment Association (NEWEA)
 - o New England Water Works Association (NEWWA)
 - o Water Environment Federation (WEF)
- Local level
 - o Joint Environmental Training Coordinating Committee (JETCC)
 - o Maine Water Environment Association (ME WEA)
 - o Massachusetts Water Pollution Control Association (MWPCA)
- State licensing authorities
 - o Average age of operator
 - o Certification level

U.S. Department of Labor (DOL) Statistics (water & wastewater)

Wastewater management boot camp (shows need for Maine workers & training)

Water & wastewater periodicals

Water Environment Technology magazine, May 2014 article “Help wanted: Five steps to navigate the current & future worker shortage successfully” by Steven Niro, Senior Vice President at Woodard & Curran—Atlanta

Waterforjobs.org

WEF Task Force on workforce in 10/15/2008

WEF 2007 abstract workforce planning performance management

WEF/WET “Help Wanted” classified sections

Best Practices

American Water Works Association (AWWA)
Bristol Community College
Coast Guard training
EPA training
Gateway Community College (New Haven, CT)—
Clean water program
Interstate Water Pollution Control Commission
Maine JETCC
Manufacturing vendors
Massachusetts Board-approved training courses in
water & wastewater
Massachusetts Regional Waterworks Organizations

Massachusetts Water Resources Authority
Massachusetts Water Works Association
New England Water Environmental Association
New England Water Works Association
OSHA/State DOL
Red Cross/first aid training (e.g., CPR)
State & Regional Rural Water Associations
State Drinking Water Programs
State Water Pollution Control Association
University of Sacramento correspondence course
Water Environment Federation
Water Environment Research Foundation



NORTHEAST WATER CONVERSATION (cont.)

Certification/Licensure (includes required and preferred)

Note: The following training may be required or preferred, depending on local and state regulations, size and complexity of facility, etc. An “R” indicates that the training is required.

Occupation/Category	Certification/Licensure (R=Required)
Administration	Utility Manager Certification
Electrical	Electrically Qualified Operator
Heavy Equipment	CDL—Commercial Driver’s License (R) : <ul style="list-style-type: none"> • Class A • HazMat • Tank • Air Brake
	Hoist (R)
Operations	Maine Department of Environmental Quality, Division of Water Quality (R) : <ul style="list-style-type: none"> • Wastewater Operator, Grades I–V • Industrial Wastewater Operator • Drinking Water License, Treatment • Drinking Water License, Collection • Water Operator License: Classes I–IV, Very Small, & Operator-In-Training (OIT) <ul style="list-style-type: none"> ○ Distribution Operator ○ Water Treatment Operator
	Rhode Island Department of Environmental Management, Office of Water Resources (R) <ul style="list-style-type: none"> • Wastewater Treatment Operator, Grades 1–4 & OIT
	Rhode Island Department of Health, Office of Drinking Water Quality (R) <ul style="list-style-type: none"> • Distribution Operator, Grades 1–4 & OIT • Treatment Operator, Grades 1–4 & OIT • Very Small System Operator
	Connecticut Department of Energy and Environmental Protection, Bureau of Water Protection & Land Reuse <ul style="list-style-type: none"> • Wastewater Operator, Classes I–IV & OIT (R) • Collection System Operator • Lab Analyst
	Connecticut Department of Public Health, Drinking Water Section <ul style="list-style-type: none"> • Water System Operator, Classes I–III & Very Small (R)
	New England Water Environment Association (NEWEA) (voluntary): <ul style="list-style-type: none"> • Wastewater Collection Systems Operator (Grades I–IV) • Wastewater Laboratory Analyst (Grades I & II)
	Backflow Tester
	Cross-Connection Surveyor
	Underground Storage Tank
	Safety & Health
OSHA Confined Space, Lockout/Tagout, Asbestos Pipe	
Incident Command System/National Incident Management System Certification	

NORTHWEST WATER CONVERSATION

Note: Bold text in the box below indicates the primary fastest-growing jobs. Green text in this section indicates regional differences between national and regional occupational titles. National job titles are based on those listed in the national report, *Defining Water Management* (<http://ateec.org/defining-water-management-report/>).

JOB CATEGORIES AND TITLES

Administration

Asset Management Specialist/Coordinator
Billing Specialist
Customer Service Representative
Health & Safety Coordinator
Human Resources Specialist
Information Technology (IT) Professional
Outreach & Education Specialist
Project Manager
Public Relations Specialist
Purchasing Coordinator*
Regulatory Compliance Manager/Specialist/Technician
Sustainability Coordinator
Deleted:
Security Coordinator

Engineering

Construction Inspector
Contract Specialist
Engineering Technician (includes CAD, design)
Geographic Information Systems (GIS) Specialist
Hydraulic Specialist (computer modeling)
Project Coordinator (e.g., consultants, contractors)
Survey Technician
Deleted:
Construction Supervisor
Corrosion Control Specialist
Hydrology Technician

Laboratory

Environmental Sampling/Monitoring Technician
Instrumentation Technician (in-house, e.g., QC services)
Lab Analysis Technician
Quality Assurance/Quality Control (QA/QC) Technician
Deleted:
Laboratory Health & Safety Supervisor

Plant Maintenance

Electrician (journeyman)
Equipment Maintenance Technician
Facilities Maintenance Technician
Instrumentation Technician
Plant Maintenance Supervisor
Deleted:
Plant Maintenance Technician

FASTEST GROWING JOBS IN THE NORTHWEST

- **PLC/SCADA Programmer**
- **Instrumentation Technician**
- **Operations Technician**
- **Stormwater Facility Installation/Maintenance Specialist**
- **GIS Specialist**
- **Water Treatment Operator**
- Alternative Water Source Specialist
- Communication Technician
- Outreach & Education Specialist
- Engineering Technician
- Environmental Sampling & Monitoring Technician
- Equipment Maintenance Technician
- IT Professional
- Lab Analysis Technician
- Sustainability Coordinator
- Water Conservation Technician

Regulations & Compliance

Agricultural/Forestry Environmental Inspector
Biosolids Land Application Technician
CSO/SSO Monitoring Specialist
Cross-Connection/Inflow Infiltration Specialist
Enforcement Specialist
Environmental Compliance Technician
Erosion Control/Land Drainage Inspector
Fats/Oils/Grease (FOG) Inspector
FOG Manager
Good Agricultural Practices (GAP) Tech (ag irrigation)
Illicit Discharge Technician
Industrial Pretreatment Specialist
Permit Specialist
Pretreatment Manager
Spill Response Technician
Stormwater Compliance Inspector
Deleted: Large Animal Confinement Inspector

NORTHWEST WATER CONVERSATION (cont.)

JOB CATEGORIES AND TITLES (cont.)

Wastewater Operations

Chief Operator
Collection System Maintenance Tech (video crew)
Collection System Operator*
Instrumentation Technician*
Operations Supervisor
Operations Technician*
Plant Manager
Pretreatment Technician
Process Control Analysis Technician**
PLC/SCADA Programmer
Pump Station Collection Operator
Vector Truck Operator
Deleted:
Industrial Pretreatment Operator

Water Operations

Communication Technician
Cross-Connection Specialist
Distribution Operator/Foreman
Heavy Equipment Operator
Industrial IT Professional
Industrial Water Systems Operator
Instrumentation Technician
Leak Detection Technician
Meter Reader/Installer
Meter Tester/Mechanic
PLC/SCADA Programmer
Pump & Reservoir Technician
Safe Drinking Water Act (SDWA) Technician
Treatment Plant Mechanic
Utility Locator ("Dig Safe")
Water Conservation Technician
Water Sampling Technician
Water Treatment Operator

Watershed & Runoff Control

Agricultural Water Specialist
Alternative Water Source Specialist
Aquatic Habitat Restoration Technician
Erosion Control Specialist/Technician
GIS Specialist
Ground Water Remediation Technician
Hydrogeology/Hydrology Technician
Modeling Technician
Residential Water Purification Technician
Septic Tank Maintenance Technician
Spill Response Technician
Stormwater Facility Installation/Maintenance Specialist
Stormwater/MS4 Technician
Surface Water Monitoring Technician
Sustainable Landscape Designer
Sustainable Landscaper
Watershed Science Technician
Well Driller
Wetland Delineation Specialist
Deleted:
Dredge Operator
Forestry Technician
Source Water GIS Technician
Water Conservation Technician

*Various levels (e.g., supervisor, team leader, senior lead, shift supervisor, operator I, operator II, operator III, non-certified maintenance worker, operator-in-training (OIT))

**Various levels (e.g., operator, engineer, supervisor)

OCCUPATIONAL DATA

Labor Market Data Resources

Plant Maintenance & Water Operations

American Backflow Prevention Association
American Water Works Association (AWWA)—Young Professional Committee of the Association
AWWA Professional Committee of the Assn.
AWWA Water Research Foundation
International Society of Automation
Linn-Benton Community College water program
Oregon Association of Water Utilities
Oregon Drinking Water Services—*Pipeline* magazine
Oregon State University
Oregon Water/Wastewater Agency Response Network (ORWARN)
San Diego State University—Ken Kerri course
The Water Report newsletter
University of Southern California—Cross-Connection Foundation
Water System Operator magazine

Engineering & Watershed

Advisory Committees (water conservation & watershed)
Alliance for Watershed Efficiency
American Geophysical Union
American Public Works Association
American Society of Civil Engineers
American Society of Landscape Architects
AmeriCorps
Association of Boards of Certification
Association of Clean Water Agencies
Association of General Contractors
Association of Watershed Councils
Center for Watershed Protection
Construction Specifications Institute
Engineers Joint Contract Documents Committee
Environmental Systems Research Institute
Independent Educational Consultants Association—Salary surveys
International Society of Automation
International Society of Wetland Scientists
Irrigation Association
Lane Community College water program
National Ground Water Association
National Oceanic and Atmospheric Administration—Fisheries
National Sanitation Foundation
North American Lake Management Society

Northwest Water and Energy Institute
Oregon Bureau of Labor and Industries
Oregon Department of Environmental Quality
Oregon Division of Employment
Oregon Division of Natural Resources
Oregon State University, Institute for Water and Watersheds—Listserv
Salmon-Safe—Farm Certification Program
Student Conservation Association
U.S. Department of Agriculture—Soil and Water Conservation Districts
U.S. Department of Energy
U.S. Environmental Protection Agency—*WaterSense*
U.S. Geological Survey
USAJobs.gov
Washington State Department of Ecology—“Water Market,” “Watershed Management,” “Water Rights,” & “Databases”
Water Environment Federation

Laboratory & Wastewater

American Public Works Association
American Water Works Association
Brown and Caldwell—“Now Hiring” job bank
National Association of Clean Water Agencies
Oregon Association of Clean Water Agencies
Oregon Department of Environmental Quality
Oregon Environmental Lab Association—Accreditation program
Pacific Northwest Clean Water Association
Water Environment Federation

Administration & Regulations/Compliance

Colleges & universities
Business & industry’s Human Resources Departments
Milliman—Northwest Utilities Salary, Wage, and Benefits Survey
Oregon Dept of Community Colleges and Workforce Development
Oregon Dept of Land Conservation and Development
Oregon Green Career Pathways
Oregon Labor Market Information System
Oregon Water Resources Department
Regional Water Authority
U.S. Army Corps of Engineers
U.S. Department of Education
U.S. Department of Labor, Bureau of Labor Statistics
Unions
Washington State Department of Ecology—“Water Market,” “Watershed Management,” “Water Rights,” & “Databases”

NORTHWEST WATER CONVERSATION (cont.)

OCCUPATIONAL DATA

Best Practices

Alliance for Water Efficiency
American Backflow Prevention Association
The American Rainwater Catchment Systems Association
American Water Works Association (AWWA)—Young Professional Committee of the Association
ANSI standards
AWWA standards
AWWA subsections
AWWA Water Research Foundation
Center for Watershed Protection
Conferences:

- AWWA
- Pacific Northwest Clean Water Association
- WEFTEC (Water Environment Federation conference)

Electrical Power Research Institute
Energy audits
High Performance Human-Machine Interface Handbook
International Society of Automation
Irrigation Association
ISO (EMS) standards
Life-cycle cost analysis vs. low bid
Most qualified bidder (best contractor vs. lowest bidder)
National Association of Clean Water Agencies
National Sanitation Foundation
Oregon Association of Water Utilities
Oregon Department of Agriculture
Oregon Department of Ecology
Oregon Department of Environmental Quality
Oregon Department of Forestry
Oregon Water Resources Department
Oregon Health Authority/Drinking Water Services—*Pipeline* magazine
Pacific Northwest Source Control Training Association
Peer ad agencies
Program management
Trade journals
University of Southern California—Cross-Connection Central
U.S. Department of Agriculture—County extension offices
U.S. Department of Energy
U.S. Environmental Protection Agency—*WaterSense* program
Washington State Water Resources Association
Water Environment Research Federation

Certification/Licensure (includes required and preferred)

Note: The following training may be required or preferred, depending on local and state regulations, size and complexity of facility, etc. An “R” indicates that the training is required.

Occupation/Category	Certification/Licensure (R=Required)
Administration	Asbestos Inspector (R)
	Boating License (standard) (R)
	Cyber Security
	Driver's License (standard) (R)
	First Aid/CPR/AED (R)
	GROL—General Radio Operator License
	ICS—Incident Command System (FEMA) (R)
	OSHA 24-Hour HAZWOPER Training (site specific) (R)
	OSHA 40-Hour Training (R)
	Traffic Control Flagging (R)
CAD	CD—Certified Drafter
Electrical	Certified/Licensed by State & Municipality (R)
Energy	Limited Energy License (R)
Engineering	NICET—National Institute for Certification in Engineering Technology
GIS	GISP—Geographic Information Systems Professional
Heavy Equipment	Aerial Lift (R)
	CDL—Commercial Driver's License (R)
	Fork Lift (R)
	Mobile Crane (R)
	Well Drilling (state-specific) (R)
Instrumentation	International Society of Automation
Modeling	CAD Software-Specific Modeling
Septic Tank Maintenance	Government-Specific Septic (certified time & transfer)
Stormwater Compliance	Inspector Program (state-specific) (R)
	CESSWI—Certified Erosion Sediment & Stormwater Inspector
	CISEC—Certified Inspector of Sediment & Erosion Control
	CMS4S—Certified Municipal Separate Storm Sewer System Specialist
	CPESC—Certified Professional Erosion Sediment Control
	CPSWQ—Certified Professional in Stormwater Quality
CSM—Certified Stormwater Manager	
Surveying	Land Surveyor (R)
Wastewater Operations	Collection System Operator (R)
	Industrial Wastewater Systems Operator (state-specific, includes collection & distribution) (R)
	Operations Technician (Levels I, II, & III) (R)
	Pump Station Collection Operator (R)
	Wastewater Treatment Operator (state-specific, typically 4-stage license level, may include maintenance staff) (R)
Water Monitoring (state-specific)	
Water Operations	Cross-Connection Control Device Tester (R)
	Cross-Connection Control Inspector (R)
	Water Systems Distribution Operator (state-specific) (R)
	Water Monitoring (state-specific)
	Water Treatment Operator (state-specific, typically 4-stage license level, may include maintenance staff) (R)
Watershed & Runoff Control	Green Roof Professional
	Herbicide Application (R)
	Irrigation Contractor (R)
	Landscape Contractor (R)
	Landscape Irrigation Auditor
	LEED—Leadership in Energy Efficient Design
	Prescribed Burn
	Rainwater Harvesting
Wetlands Delineation (R)	

SOUTHEAST WATER CONVERSATION

Note: Bold text in the box below indicates the primary fastest-growing jobs. Green text in this section indicates regional differences between national and regional occupational titles. National job titles are based on those listed in the national report, *Defining Water Management* (<http://ateec.org/defining-water-management-report/>).

FASTEST-GROWING JOBS IN THE SOUTHEAST

- **Water Treatment Operator**
- **Wastewater Plant Operator**
- **Plant Maintenance Technician**
- **Utility Locator**
- **Process Control Technician**
- **PLC/SCADA Technician**
- **Lab Technician**
- Environmental Compliance Technician
- Watershed Protection Technician
- Heavy Equipment Operator
- GIS Technician
- Inflow/Infiltration Technician
- Community/Public Relations Technician
- Leak Detection Technician
- Project Coordinator

JOB CATEGORIES AND TITLES

Administration

Customer Service Representative
Health & Safety Coordinator
Information Technology (IT) Professional
Project **Coordinator**
Human Resources Specialist
Public Relations Specialist
Regulatory Compliance Manager
Security Coordinator

Engineering

CAD Operator
Construction Inspector
Construction Supervisor
Corrosion Control Specialist
Engineering Technician
Erosion Control Specialist
GIS Specialist
Hydraulic **Technician**
Right-of-Way Acquisition Technician/Agent
Surveyor
Telemetry & Automated Meter Reading Technician
Deleted:
Hydrology Technician

Laboratory

Environmental Sampling/Monitoring Technician
Instrumentation Technician
Lab Health & Safety **Technician**
Lab Technician
Quality Assurance/Quality Control (QA/QC) Technician
Deleted:
Lab Analysis Technician

Plant Maintenance

Low/High Voltage **Technician**
Plant Maintenance Technician
Deleted:
High Voltage Electrician
Low Voltage Electrician
Plant Maintenance Supervisor

Regulations & Compliance

Biosolids Land Application Technician
Cross-Connection Control Specialist
CSO/SSO Monitoring Specialist
Enforcement Specialist
Environmental Compliance Technician
Fats/Oils/Grease (FOG) Manager
FOG Inspector
Industrial Pretreatment Specialist
Large Animal Confinement Inspector
Pretreatment **Coordinator/Technician**
Safety Supervisor/Specialist
Stormwater Compliance Inspector
Deleted:
Permit Specialist

Wastewater Operations

Collection System Operator*
Industrial Pretreatment Operator
Instrumentation Technician*
Pretreatment Coordinator/Technician
Process Control Technician/Operator**
Wastewater Plant Operator* (treatment, biosolids, reclamation, construction)
Deleted:
Chief Operator

Water Operations

Closed Circuit TV (CCTV) Analyst
Cross-Connection Control Specialist
Fleet Services Mechanic
Heavy Equipment Operator
Industrial Water Systems Operator
Instrumentation Technician
Leak Detection Technician
Meter Technician
PLC/SCADA Technician
Process Control Technician
Residuals/Solids Operator
Utility Locator ("Dig Safe")
Water Distribution Operator/Foreman*
Water Treatment Operator*
Deleted:
Distribution Operator/Foreman
Meter Reader/Installer
Meter Tester/Mechanic
Treatment Plant Mechanic

Watershed & Runoff Control

Aquatic Habitat Restoration Technician
Forestry Technician
Ground Water Remediation Technician
Hydrogeology Technician
Hydrology Technician
Modeling Technician
Residential Water Purification Technician
Septic Tank Maintenance Technician
Source Water GIS Technician
Stormwater/MS4 Technician
Surface Water Monitoring Technician
Water Conservation Technician
Watershed Management Technician
Well Driller
Wetland Delineation Technician
Deleted:
Agricultural Water Specialist
Dredge Operator
Sustainable Landscaper

*Various levels (e.g., supervisor, team leader, senior lead, shift supervisor, operator I, operator II, operator III, non-certified maintenance worker, operator-in-training (OIT))

**Various levels (e.g., operator, engineer, supervisor)



SOUTHEAST WATER CONVERSATION (cont.)

OCCUPATIONAL DATA

Labor Market Data Resources

American Water Works Association (AWWA) (national & local chapters)

- Regional Committees
- Surveys
- Water Research Foundation

Education

- Community/technical colleges & 4-year institutions—Labor market assessments & environment scans
- Local school districts Career Technology Education Clusters

Environmental training centers (e.g., Georgia Environmental Training Center)

Georgia Association of Water Professionals

Georgia Secretary of State Office, State Licensing Board

Georgia Water Environment Association

Georgia Water/Wastewater Institute

Networking (e.g., word of mouth through professional associations)

Regional Council of Governments—Demographics information/statistics by region

South Carolina Rural Water Association (SCRWA)

Staffing Companies/Agencies—Collect local, regional, & national employment statistics & needs

State/regional/local workforce development programs

- Websites for career listings
- Database of people seeking employment

State apprenticeship programs for water & wastewater

State Environmental Agencies—Number of people taking & pass/fail rate of exams

State (if available) & local Chambers of Commerce

- Economic development/job creation trends/skills needed
- Connection of business to education
- Employability skill development

State licensing authorities

- Average age of operator
- Certification level

State retirement system office—Should show high retirement rate forecast

South Carolina Department of Labor, Labor Licensing & Regulations

- Can query operators licensed by county
- Trends used to develop certification requirements (can identify skills needed)

U.S. Department of Labor Statistics (water & wastewater)

U.S. EPA workforce reports

Water Environment Federation (WEF)

- WEF Task Force on workforce in 10/15/2008
- WEF 2007 abstract workforce planning performance management
- WEF/WET “Help Wanted” classified section

Water Environment Society of South Carolina (WEASC)

Best Practices

Associations

- American Water Works Association (AWWA)
- Association of Boards of Certification (ABC)
- Rural Water Association
- Water Environment Association (WEA)
- Water Environment Federation (WEF)

Brokers (such as worker's compensation)

Education & training

- Apprenticeships
- Correspondence course (Sacramento State)
- Customized training
- Major universities—Research dissemination
- On-the-job training/on-site training
- Online training
- Summer internships
- Vendors—Latest equipment/processes

Manufacturers—Identify technical equipment changes/training

Peer groups—Exchange of information within industry (region, state, national, international)

State Community College System, environmental training

- Central Community College
- Central Pathways
- GA Environmental Training Center

State environmental agency

Red Vector

Regulatory agencies—Changes in regulations requiring new skills

Webinars—Information sharing & dissemination

Certification/Licensure (includes required and preferred)

Note: The following training may be required or preferred, depending on local and state regulations, size and complexity of facility, etc.

Occupation/Category	Certification/Licensure	
Electrical	Journeyman	
	Master	
Engineering	American Society of Civil Engineers (equipment)	
Heavy Equipment	Commercial Driver's License (CDL)	
Miscellaneous	D-level driver's license	
Operations	Applicable license or 4-year degree: <ul style="list-style-type: none"> • Wastewater collection • Water distribution • Water treatment 	
	Backflow prevention	
	Biosolids	
	Biological wastewater	
	Hazardous waste	
	HVAC certification	
	Physical/chemical	
	Pipeline Assessment & Certification Program	
	Safety & Health	First aid/CPR
		HAZWOPER
Certified Safety Specialist		
Stormwater	Certified stormwater inspector (state)	
Welding	Welding certification	
Well drilling	Drilling certification	

SOUTHWEST WATER CONVERSATION

Note: Bold text in the box below indicates the primary fastest-growing jobs. Green text in this section indicates regional differences between national and regional occupational titles. National job titles are based on those listed in the national report, *Defining Water Management* (<http://ateec.org/defining-water-management-report/>).

FASTEST-GROWING JOBS IN THE SOUTHWEST

- **Water Treatment Operator**
- **Wastewater Plant Operator**
- **Environmental Compliance Technician**
- **Instrumentation Technician**
- **PLC/SCADA Programmer**
- **Mechanical Maintenance Technician**
- **Water Conservation Technician**
- Distribution Operator/Foreman
- Electrical Maintenance Technician
- GIS Specialist
- Collection System Operator
- Information Technology
- Networking/Security Technician
- Plant Maintenance Technician
- Public Outreach Specialist

JOB CATEGORIES AND TITLES

Administration/Management

Budget Specialist
Customer Service Representative
Emergency Services Coordinator
Finance Specialist
Health & Safety Coordinator
Human Resources Specialist
Information Technology (IT) Professional
Project Manager
Public Information/Social Media Strategist
Public Outreach Specialist
Public Relations Specialist
Security Coordinator
Web Specialist
Deleted:
Regulatory Compliance Manager

Engineering

Construction Professional
Corrosion Control Specialist
Engineering Technician
Geographic Information Systems (GIS) Specialist
Hydrology Technician
Surveyor
Utility Locator ("Dig Safe")
Deleted:
Construction Inspector
Construction Supervisor
Hydraulic Specialist

Laboratory

Environmental Sampling/Monitoring Technician
Instrumentation Technician
Lab Analysis Technician
Laboratory Health & Safety Supervisor
Quality Assurance/Quality Control (QA/QC) Technician

Plant Maintenance

Electrical Maintenance Technician
Industrial Electrician
Instrumentation Technician
Mechanical Maintenance Technician
Planner/Scheduler
Plant Maintenance Professional
Deleted:
High Voltage Electrician
Low Voltage Electrician

Regulations & Compliance

Biosolids Land Application Technician
CSO/SSO Monitoring Specialist
Concentrated Animal Feeding Operations Inspector
Cross-Connection Control Specialist
Enforcement Specialist
Environmental Compliance Inspector/Technician
Fats/Oils/Grease (FOG) Inspector
Permit Specialist
Pretreatment Specialist
Regulatory Compliance Specialist
Stormwater Compliance Inspector
Deleted:
FOG Manager
Industrial Pretreatment Specialist
Large Animal Confinement Inspector

Wastewater Operations

Chief Operator*
Collection System Operator**
Electrical Maintenance Technician
Industrial Pretreatment Operator
Instrumentation Technician*
Mechanical Maintenance Technician
Process Control Operator**
PLC/SCADA Programmer
Systems Operation Control Technician
Wastewater Plant Operator* (treatment, biosolids, reclamation, construction)
Deleted:
Pretreatment Coordinator

Water Operations

Chief Operator*
Cross-Connection Control Specialist*
Distribution Operator/Foreman**
Electrical Maintenance Technician
Industrial Water Systems Operator
Instrumentation Technician*
Leak Detection Technician
Mechanical Maintenance Technician
Meter Reader/Installer
Meter Tester/Mechanic
PLC/SCADA Programmer
Residential Water Purification Technician
Septic Tank Maintenance Technician
Systems Operation Control Technician
Utility Worker
Water Treatment Operator**
Deleted:
Heavy Equipment Operator
Treatment Plant Mechanic

Watershed & Runoff Control

Agricultural Water Specialist
Forestry/Watershed Technician
Ground Water Remediation Technician
Habitat Restoration Technician
Hydrogeology Technician
Hydrology Technician
Modeling Technician
Nonpoint Source Pollution Specialist
Reservoir Operations Specialist
Source Water GIS Technician
Stormwater/MS4 Technician
Sustainable Landscaper
Water Conservation Technician
Well Driller
Wetland Delineation Specialist
Deleted:
Aquatic Habitat Restoration Technician
Dredge Operator
Residential Water Purification Technician
Septic Tank Maintenance Technician
Surface Water Monitoring Technician

*Various levels (e.g., supervisor, team leader, senior lead, shift supervisor, operator I, operator II, operator III, non-certified maintenance worker, operator-in-training (OIT))

**Various levels (e.g., operator, engineer, supervisor)

OCCUPATIONAL DATA

Labor Market Data Resources

American Water Works Association (AWWA) (national & state)
Association of Boards of Certification (ABC)
American Public Works Association (APWA)
California Association of Sanitation Agencies (CASA)
Center for Watershed Protection (CWP)
Local & Regional Watershed Management Authorities

National Association of Regulatory Utility Commissioners (NARUC)
National Ground Water Association
Salary Surveys (WEF)
U.S. Environmental Protection Agency (U.S. EPA)
U.S. Geological Survey (USGS)
Water Environment Federation (WEF)
Water Utility Compensation Survey (AWWA)

SOUTHWEST WATER CONVERSATION (cont.)

OCCUPATIONAL DATA (cont.)

Labor Market Data Resources (cont.)

ABC

- “Continuing Education Review” program
- *Model Standards of Operator Certification*
- Voluntary certification program for water treatment, distribution, collection, wastewater treatment, & industrial waste operators; water & wastewater laboratory analysts; plant maintenance technologists; & biosolids land appliers

American Federation of State, County, and Municipal Employees (AFSCME)—Partnering with unions for apprenticeships as part of college programs

American Membrane Technology Association (AMTA)—Membrane Technology Fact Sheets

American Public Works Association (APWA)—Top 10 Public Works Leaders

AWWA

- Arizona, California/Nevada, & Inter-Mountain Sections
- Effective Utility Management Award
- *Manuals of Water Supply Practice*
- *Utilities Helping Utilities: An Action Plan for Mutual Aid and Assistance Networks for Water and Wastewater Utilities*
- “Water Matters! Fly-In”
- Work for Water (in partnership with WEF)—Resources for students, job seekers, & employers in the water field

Bay Area Clean Water Agencies—*Nutrient Management Strategy*

BAYWORK—“Careers” & “Resources” online tools

CASA—Bay Area Consortium of Water & Wastewater Education, an operator training program run by a partnership between a local community college & 18 local water/wastewater agencies

California Rural Water Association (CRWA)—Academy of Water Education

California Stormwater Quality Association (CASQA)—*Best Management Practices (BMP) Handbooks*

California Urban Water Conservation Council (CUWCC)—Foundational & programmatic *Best Management Practices (BMPs)*

California Utility Executive Management Association (CUEMA)

California Water Environment Association (CWEA)—Certification for Wastewater Professionals training & online “Information for Those Seeking a Wastewater Career”

Emergency Response Network of the Inland Empire (ERNIE)

International Council on Education for Teaching (ICET)

International Standards Organization (ISO) 14000 series standard

Maintenance Managers Association

Nevada Water Environment Association (NWEA)—Annual awards for collection system operator, industrial waste inspector, operator, plant maintenance technologist, rookie, & wastewater quality analyst

Partnership for Safe Water—Encourages & assists U.S. water suppliers to voluntarily enhance their water systems performance, for greater control of cryptosporidium, giardia, & other microbial contaminants.

Rural Community Assistance Program

Rural Water Association of Arizona—“Water University”

Southwest Membrane Operators Association—Annual awards for Outstanding Membrane Plant and Outstanding Membrane Operator

State of Nevada—Use of 100% reclaimed water

U.S. EPA

- Community-Based Water Resiliency Tool
- Tabletop Exercise Tool for Water Systems: Emergency Preparedness, Response, and Climate Resiliency (TTX Tool)
- Water Incident Preparedness and Response Contacts
- Water Security Related Links, including state drinking water protection websites
- Water/Wastewater Agency Response Network (WARN)

University of California–Berkeley Institute of Transportation Studies—Traffic control/flagger certification

University of Southern California Foundation for Cross-Connection and Hydraulic Research—Online “Training Tools” & “Resources”

WEF

- *Layperson's Guide to California Wastewater*
- Water Advocates program
- Water Leadership Institute
- Water's Worth It—a public awareness campaign about the value & importance of water
- Work for Water (in partnership with AWWA)—Resources for students, job seekers, & employers in the water field

SOUTHWEST WATER CONVERSATION (cont.)

Certification/Licensure (includes required and preferred)

Note: The following training may be required or preferred, depending on local and state regulations, size and complexity of facility, etc. An “R” indicates that the training is required.

Occupation/Category	Certification/Licensure (R=Required)
Administration	California Environmental Quality Act (CEQA) Training
	Human Relations Certification
	Purchasing Certification
Heavy Equipment	CDL—Commercial Driver’s License (R)
	Fork Lift/Crane Operator Certification (R)
Information Technology	Network Systems (e.g., Cisco)
Operations	American Water and Wastewater Association (AWWA), California-Nevada section: <ul style="list-style-type: none"> • Backflow Prevention Assembly Tester • Cross Connection Specialist • Water Distribution Operator & Associate • Water Quality Laboratory Analyst • Water Treatment Operator & Associate • Water Use Efficiency Practitioner
	California Department of Public Health Operator Certification (R) : <ul style="list-style-type: none"> • Distribution Operator, Levels D1–D5 • Water Treatment Operator, Levels T1–T5
	California Office of Operator Certification (COOC)—Wastewater Treatment Plant Operator Certification (Publicly Owned Utilities), Grades I–V & Operator-in-Training (R)
	California Water Environment Association (CWEA) Certification of Competency in Wastewater (Privately Owned Industrial Wastewater Pre-treatment Facilities) (R) , including: <ul style="list-style-type: none"> • Biosolids Land Application Management • Collection System Maintenance • Electrical/Instrumentation • Environmental Compliance Inspection • Industrial Treatment Plant Operations • Laboratory Analysis • Mechanical Technologist • Wastewater Treatment Plant Maintenance (includes Electrical/Instrumentation & Mechanical Technologist) • Wastewater Treatment Plant Operator (See COOC above.)
	Nevada Bureau of Safe Drinking Water—Water Operator Certification (R) : <ul style="list-style-type: none"> • Distribution Operator, Levels D1–D4 • Treatment Operator, Levels T1–T4
	Nevada Water Environment Association (NWEA)—Wastewater Operator Certification, Grades I–V & Operator-in-Training (R) : <ul style="list-style-type: none"> • Collection System Operator • Industrial Waste Inspector • Industrial Waste Operator • Plant Maintenance Technologist • Wastewater Quality Analyst • Wastewater Treatment Plant Operator
Safety & Health	OSHA/CAL-OSHA/NVOSHA Safety Training (R)
	OSHA Traffic Safety Flagger Certification (R)
Stormwater	Qualified Stormwater Plan Developer Certification
	Qualified Stormwater Pollution Prevention Certification
Welder/Pipefitter	Plumbers & Pipefitters Certification (R in CA)

ADDITIONAL OCCUPATIONAL INFORMATION

Note: This section is a compilation of input from all regions.

CROSS-CUTTING TECHNICAL KNOWLEDGE AND SKILLS

Agricultural land/stormwater best practices/design/training (includes Integrated Pest Management (IPM))	Industry principles & concepts
Analysis & interpretation of data (& make process adjustments)	Interdisciplinary knowledge
Asset management & capital improvement	Irrigation system design
Business fundamentals	Kinesthetic learning aptitude (hands on)
<ul style="list-style-type: none">• Budgets• Triple bottom line• Water economics	Lab operations
Carpentry, basic	Leak detection
Characteristics of materials	Legacy skills (systems) (e.g., manual operation, older equipment)
Codes, regulations, & laws (application)	Lifecycle analysis
Computer systems	Logistics/supply chain management, basic
<ul style="list-style-type: none">• Basics (e.g., keyboarding, Internet use, email)• CAD/CAM basics• Database management• Data recording• Modeling applications• Productivity software (e.g., MS Office programs, spreadsheets)• Programming (PLCs)• Simulation programs	Measurement/metrology
Conducting feasibility studies	Mechanical/electrical connections
Construction, basic	Materials handling
Control systems, basic	Math & science, applied
Customer service	<ul style="list-style-type: none">• Chemistry, basic• College-level algebra• Data analysis• Construction calculations (e.g., estimation)• Degree of competency• Geometry• Math, remedial/basic• Math, translated/applied• Microbiology, applied• Physics, applied• Plant identification• Return-on-Investment (ROI) calculation• Soil analysis (basic)• Statistical analysis
Diagnostics	Measure/estimate water use
Drafting	Mechanical equipment (diagnose, repair, & calibrate)
Drivers license/CDL	Mechanics/hydraulics, basic
Electricity/electronics theory, basic	Motors & controls
Electrical/mechanical systems & integration	Plumbing
Emergency response	Power systems
Energy/water connection	Presentation abilities
Environmental/sustainability concepts, basic	Print/map reading
Environmental laws & regulations (e.g., HazMat, waste disposal)	Process ability/troubleshooting
Exposure to field work	Process controls/instrumentation systems
Feasibility studies	Pumping system design
Geographic Information Systems (GIS)	Quality assurance/quality control (QA/QC)
Geographic Positioning Systems (GPS)	Quality continuous improvement
GIS/GPS database Web development	Read as-built prints & base plans
Hand tools/power tools/large equipment	Read blueprints/schematics
HVAC, basic	<ul style="list-style-type: none">• Electrical• Landscape• Mechanical
Hydraulics/pneumatics	
Industry maintenance practices	

ADDITIONAL OCCUPATIONAL INFORMATION

CROSS-CUTTING TECHNICAL KNOWLEDGE AND SKILLS (cont.)

Read plans (water/energy terminology/acronyms)

Read engineering drawings

Records/bookkeeping

Safety & health (awareness, training, & practices)

- Boat safety/management
- Codes, local
- Confined space entry
- Electrical & electrical metering safety (NFPA 70E)
- Electrical/fire code compliance (NEC) (e.g., arc flash)
- Excavation safety
- Fire training
- First aid/CPR
- HazMat
- HAZWOPER
- Injury prevention
- Instrumentation
- Lockout/tagout
- OSHA 10-hour training
- Personal, environmental, & facility applications
- Personal protective equipment
- Rooftop safety
- Safety Data Sheets
- Tower rescue
- Traffic control
- Work zone safety

Sampling & monitoring

Security awareness

Site analysis

Social & legacy media communication

Standard Operating Procedures (SOPs)

Supervisory Control & Data Acquisition (SCADA)

Sustainability awareness

Tool use (hand, power, large equipment)

Treatment process basics

Troubleshooting

Technical aptitude/mechanically inclined/spatial relationships

Waste management

Water literacy (basic)

- Applied
- Economics
- Engineering
- Sources & distribution

Water occupation basics, not otherwise covered

- Basic rigging
- Chemical control
- Climbing
- Nutrient management
- Torque & tensioning

Welding

Writing (internal/external, technical, reports, grants)

CROSS-CUTTING EMPLOYABILITY KNOWLEDGE AND SKILLS

ACT WorkKeys® foundation skills

- Applied math
- General writing
- Listening
- Locating information
- Observation
- Reading for information
- Technical writing

Communication

- Cell phone/technology etiquette
- Communicating to diverse audiences
- Data recording accuracy (notebooking skills)
- Email/text
- Language skills
 - Good English-speaking skills (applicable to the needs of job)
 - Need to have appropriate language skills for safe & proper work
- Listening
- Media interaction
- Networking
- Penmanship
- Persuasiveness
- Reading with comprehension
- Sharing knowledge
- Speaking, interpersonal (e.g., face-to-face, small group conversations)
- Speaking, presentation (e.g., public and/or formal presentations)
- Writing, technical & report

Interpersonal

- Conflict resolution
- Desire to participate
- Empathy
- Intergenerational interaction
- Mentoring
- Respectfulness
- Teamwork/team building/collaboration
- Tolerance of diversity (e.g., race, age, culture)

Miscellaneous

- Diversity of skills
- Encouraging bilingualism (English speakers to adopt second language)
- Entrepreneurial skills
- Stable career history (minimum of job hopping)
- Sustainability awareness/practices

Personal effectiveness

- Ability to learn
- Accountability
- Balance long-term goals & instant gratification
- Dependability
- Ethics/social responsibility
- Flexibility & adaptability
- Initiative
- Integrity
- Personal hygiene
- Professionalism
- Reliability
- Self-care (physical & mental health)
- Self-development (ongoing)
- Self-motivation/self-direction
- Time management

Professional development

- Career awareness/networking (e.g., face-to-face, online)
- Career planning
- Interview skills
- Leadership/initiative
- Lifelong learning

ADDITIONAL OCCUPATIONAL INFORMATION (cont.)

CROSS-CUTTING EMPLOYABILITY KNOWLEDGE AND SKILLS (cont)

Professionalism

- Attendance/punctuality/promptness
- Appropriate workplace dressing
- Business etiquette (bosses, clients)
- Career-oriented
- Confidentiality
- Dedication to work/duty
- Marketing (e.g., company, oneself, networking)
- Professional/business ethics
- Work ethic
- Work well with others
- Workplace etiquette (e.g., noise, food, cleanliness)

Work skills (requires high school introduction/ reinforcement)

- Customer relations (internal & external)
- Decision making
- Entrepreneurism
- Flexibility (organizational fit)
- Innovation
- Learning mindset
- Long-term thinking
- Multitasking
- Objectivity
- Planning, organizing, & scheduling
- Problem solving & critical thinking skills (exposure to scientific methodology)
 - o Research
 - o Scientific method
- Research skills
- Time-On-Task (TOT)
 - o Deadlines
 - o Keeping commitments
 - o Learning how to make time
 - o Prioritization
 - o Staying ahead of the game
 - o Timelines
 - o Time/project management
- Working independently, with minimum supervision
- Working with tools & technology

Workplace requirements

- Bigger picture thinking
- Business fundamentals
- "Chain of command" skills & group culture
- Cross-functional teams/matrix management
- Documentation (SOPs)
- Driver's license & insurability
- Following verbal & written directions
- High school diploma/GED
- Teamwork
- Passing a drug test
- Physical skills (e.g., lifting 50 lb.)
- Safety consciousness & practice
- Sales techniques
- Security systems
- Security/background check
- Supervising others
- Working with clients

EMERGING ISSUES AND FUTURE TRENDS

ISSUES

Education

Articulation agreement emphasis, from high school to associates to bachelor degrees (2+2+2)

Career awareness/career pathways

Class enrollments

Company incentives from state/federal government

Education on water resources

- Accountability—Alignment of performance & metrics
- Deficiencies in STEM education impacting industry
- Economies of learning (better, less expensive, more efficient)
- K–12 level, especially high school water programs
- Multicultural, diverse outreach
- Social awareness
- Technician training (career opportunities)
- Teaching water efficiencies at all levels:
 - o Design & construction
 - o Residential/commercial/industrial (e.g., Advanced Metering Infrastructure)
 - o Retrofitting

Education on importance & value of water management career field

Lifecycle analysis—Educating business on green economy

Membrane & newer technologies to be properly addressed in post-secondary technician education

More business & industry input to build appropriate programs

Training for local jobs

Training/education system—Ongoing flux

Energy

Infrastructure

Insufficient stormwater systems

Nuclear power—Water consumption for generation

Retrofitting of existing residential systems

Security of water systems

Seismic design

Transportation/mass transit (need reduced parking spaces & pavement)

Updating aging water systems (e.g., sewers, pipes, control systems)

Management/Financial

Artificially low rates

Business continuity planning

Continuous review/adaptation of all current business models

Decoupling (tie fixed costs to fixed rates)

Ecosystem markets

Educating existing business community on advantage of green business

Emergency response planning

Equipment investments

Finding new methods for recruitment of millennial generation

Formalizing cross-training knowledge for redundancy

Hiring good workers to be trained in management

EMERGING ISSUES AND FUTURE TRENDS (cont.)

ISSUES (cont.)

Management/Financial (cont.)

Increased venture capital investment for new green technologies
Maintenance as rate basis
Mobile/transient workforce
More business & industry input to build appropriate programs
Permitting
Recruitment of new operators
Retiring workforce (potential for lost knowledge/expertise)
Security communications—Need redundant methodologies
Security measures increase—Corresponding training increase
Self-sustainability
Standardization & documentation of current SOPs & practices to pass on to new workers
Staying current with emerging science technologies & regulations
Succession planning
Training
Trending away from public & private water facilities (e.g., towards engineering firms)
True cost of service & infrastructure
Union issues
Using more automation, but still need to know how to manually run a plant for emergency situations
Valuing the product
Wages & benefits (keeping up with demand)

Policy/Regulation

Agricultural, nonpoint source discharge management
“Clean” energy definition (e.g., to include nuclear or not)
Communication with politicians/public officials
Economic vs. workforce development
Federal involvement in water (e.g., tax policies)
Government application of business’ asset management process to water as a finite, natural resource—Results will more accurately inform regulatory & economic policies
Incentivizing ecosystem services
Increased federal & state regulatory requirements (e.g., water, air, agriculture)
Increased siting/land use conflicts
Industry capital investment incentives
Legislation/regulations:

- Economic recovery—Incentives/funds
- More stringent greenhouse gas emissions standards
- More stringent water quality standards
- New Endangered Species Act listings
- Nuclear power—Clean Water Act provisions
- Tax credits, incentives, & subsidiaries—Give to all sectors

Rapid changes in policy/regulations
Transition movements—Planning
U.S.—Strive to be global model of water conservation/use
Wastewater temperature control of effluent
Water auditing (legislation may increase need)
Water distribution issues
Water rights issues

Social/Cultural

Changing political environment

Collaboration—Examples:

- Agricultural/urban areas collaboration
- Interstate/regional
- Flood mitigation
- Field instrumentation & lab instrumentation
- Wildfire response

Environmental awareness

Increased demand

Scarcity of resource due to geographic, socio-economic factors

Water organizations—Collaborate more & get out of silos

Science

Climate change affects (including coastal adaptations)

Contaminants of emerging concern

Lowering of detection limits

Nonconventional pollutants & treatments (e.g., nanoparticles, microbeads)

Ocean acidification

Source water biota awareness

Source water quality

Water as an environmental & energy priority

Water scarcity (includes U.S., not just global)

Technology

Fracking

Fuel cells/energy storage

Technology identifies contaminants; technology-to-treat/removal is lagging

Treatment

Class A sludge (sludge for agricultural application) increasing

Endocrine disruptors (pharmaceuticals—Impact on treatment plants & discharge to receiving streams)

Flushables (stopping the flushing of wipes, pharmaceuticals, etc.)

Food waste (new regulations)

Increased water quality problems

Nonpoint source pollution

- Salt (e.g., ice, snow)
- Chemical (e.g., lawn care, agriculture)

Treatment of water system for corrosion

EMERGING ISSUES AND FUTURE TRENDS (cont.)

TRENDS

Best Practices

- Agriculture & sustainable water management
- Advanced Metering Infrastructure
- Collaborative agreements
- Commoditization of wastes (alternative fuel/energy sources)
- Culvert removal
- Ecosystem restoration/reconstruction
- Energy efficiency of capital projects
- Environmental management systems
- Fisheries mitigation
- Flood control/mitigation
- Increased energy efficiency
- Increased ground water monitoring data
- Increased public–private partnerships
- Municipal model—Utility board model
- Rainwater harvest/storage
- Regional water management
- Resource sharing (possibly by employees)
- Review water conservation trend using current engineering water modeling tool
- Rural water expansion
- Smaller house & property sizes (cluster developments)
- Smart growth—Transit-oriented development, land development, urban planning (e.g., Reston model, mixed-use)
- Total resource recovery—Nutrient, energy, water (new)
- Water reuse from wastewater side
- Water conservation (e.g., rain water harvest)
 - Alternative source
 - Aquifer storage & recovery
 - Brown/black/gray water
 - Reclamation
 - Reuse
 - Sustainable landscape

Education

- Changes in degree completion
- Continuing education/lifelong learning
- Online training

Energy

- Energy management
- Energy measurement (e.g., smart meters)
- Energy storage
- Energy–water nexus (e.g., mutual affects, resources linkage)
- Hydroelectric
- Renewable energy—Small contractors (e.g., plumbers, electricians, HVAC) will add 1 to 5 jobs per company to add solar, small wind, geothermal systems

Infrastructure

Asset management & capacity

- Mapping
- Data collection/analysis
- Inventory

Dam removal & building

Dual plumbing

Urban development & planning

Management/Financial

Asset management (e.g., GIS, CMMS)

- Mapping
- Data collection/analysis
- Inventory

Change in economies of scale

Combining water & wastewater at same site

Compressed natural gas (as a fuel)

Consumer sales

- Educate the public
- Represent the product/service
- Talk the “green” talk; talk the “efficiency” talk

Cross-disciplinary movement—Technicians will operate across disciplines

Expanding markets, including global

Feasibility & cost benefit analyses

Green mortgage availability

Knowledge management

New business models (water use)

New manufacturers (e.g., PVCs, stormwater)

Planning for the future trend

R&D leading to lower costs

Regionalization of municipalities (primarily water reclamation)

SCADA data collection

Security (facility, data, & cyber)

Triple bottom line

Workplace policies (e.g., schedules, telecommuting)

Miscellaneous

Changes in the Operator title

Plant sophistication more technical—Corresponding demand for more highly trained workforce

EMERGING ISSUES AND FUTURE TRENDS (cont.)

TRENDS (cont.)

Policy/Regulation

Building codes (including plumbing)

Cap & trade of water quality & nutrients

Decentralization of water, wastewater, & stormwater management

Desalinization regulations

Distributed generation with renewables:

- 1 to 5 megawatts throughout region
- Homeland security

Electronic reporting

Increased federal support

Municipal governments as water planners

Permitting

Reuse regulations

Sustainable funding for water & wastewater infrastructure

Utility free credits

Water auditing (legislation may increase need)



Social/Cultural

Career awareness (K–12)
Cultural/social attitude changes
Green economy—Public demand for green products/services
Increased interest in sustainability
Increased knowledge of water issues due to globalization of companies & overseas water crises
Multicultural & diversity outreach
Public demand for clean water
Social networking use (increased value)
Water no longer an unseen resource

Technology

3-D technologies (e.g., modeling, printing)
Advances in water quality testing
Automated systems—Remote operation
Big data/data mining/remote sensing/data management
Carbon sequestration
Cogeneration/waste-to-energy
Corrosion knowledge & materials technology
Desalinization
Drones for security, right-of-way, data collection
Geophysical equipment
Geothermal
Increased solar thermal use
Inherently safer technology
Innovation integration
Internet of Things (advanced connectivity of devices, systems, & services)
Power over Ethernet (systems which pass electrical power along with data on Ethernet cabling)
Redesign/retrofit technology (to address new needs)
Resource recovery
RFID sensor devices for real-time water quality monitoring
Simulations
Smart grid
Time-of-Use metering
Transition to paperless
Trenchless (no dig) pipe replacement
Turbine technology (in-line hydro power)
Virtual machines

Treatment

Advanced ground water treatment
Biological treatment vs. physical/chemical
Fats, oils, & greases—Push to build more anaerobic digesters
Innovative energy efficient management of biosolids, partially treated wastewater
Point-of-Use treatment
Total Maximum Daily Loads (TMDLs)

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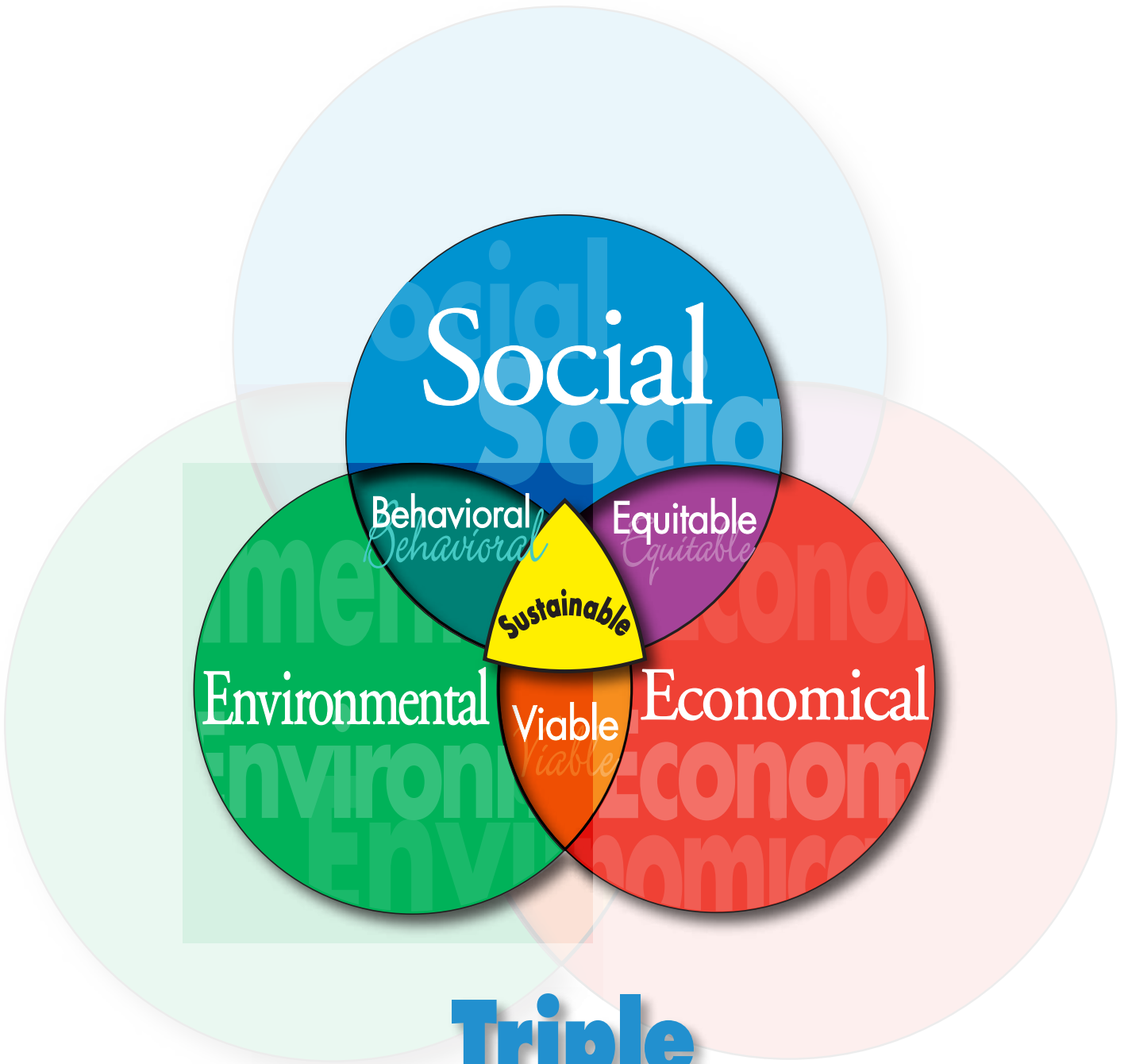
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Triple Bottom Line of Sustainability

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