

Track	Session Name	Session Description
Desalination and Water Reuse (W, WW & SW)	Concentrate Management Case Studies	This session will focus on concentrate management case studies. Presentations will include reviews of current state of practice for concentrate management (CM) including process design and configuration; regulatory settings; environmental issues; economic evaluation and implementation case studies. Case studies will address zero liquid discharge (ZLD) and near ZLD disposal, disposal of CM to ocean and bays, disposal of CM by deep well injection, land application, and evaporation ponds, and disposal of CM to sanitary sewers or surface waters.
Desalination and Water Reuse (W, WW & SW)	COVID-19: Desalination and Water Reuse	Emerging issues in water supply portfolio due to COVID-19 and the role of desalination and water reuse industries will be discussed.
Desalination and Water Reuse (W, WW & SW)	Desalination and Ecosystems	Desalination as an alternative to restore ecosystems will be discussed.
Desalination and Water Reuse (W, WW & SW)	Energy Storage and Renewable Energy Applications	Desalination technologies are energy-intensive. Breakthroughs in energy conversion, conservation and management is essential. Energy storage and renewable energy system integration is also very important. This session will highlight the energy aspects of desalination systems. Energy recovery and renewable energy generation and integration applications will be discussed.
Desalination and Water Reuse (W, WW & SW)	Integrated Desalination Systems for Industrial Water Reuse	Wastewater treatment with desalination technologies for industrial water reuse applications. This session will have presentations on brackish groundwater desalination and industrial wastewater reuse, municipal wastewater reuse for drinking/irrigation, storm water reuse for drinking/irrigation, and sea water integration with fresh water systems aligned with moving towards "One Water" concept.
Desalination and Water Reuse (W, WW & SW)	Novel Materials and Technologies	Novel materials and technologies are critical for improving the energy and resource efficiency in desalination systems. Environmental protection is another integral aspect of desalination plants. Similar approaches are also desired for water and wastewater treatment and water reuse systems. Presentations will include novel process design and configuration; membrane materials; heat transfer materials, valuable materials recovery; economic evaluation and implementation of systems which are novel and deviate from the conventional approaches.
Desalination and Water Reuse (W, WW & SW)	Techno-Economics of Desalination Systems	Technical and economic feasibility of desalination systems will be discussed. Environmental impact assessment will be highlighted.
Desalination and Water Reuse (W, WW & SW)	Water Reuse Case Studies	This session will focus on case studies of brackish groundwater industrial wastewater reuse, municipal wastewater reuse for drinking/irrigation, and sea water integration with fresh water systems aligned with moving towards "One Water" concept.
Emerging & Innovative Technologies (Interdisciplinary)	Advances in Algorithms, Sensors, Controls and User	Includes papers on innovations in software, hardware and user experience in the environmental and water resources sector.
Emerging & Innovative Technologies (Interdisciplinary)	Economics of Water Resources Technology	Focused on the business and economic aspects of technology uptake in the environmental and water resources fields.
Emerging & Innovative Technologies (Interdisciplinary)	Innovative Technologies at the Food-Energy-Water Nexus	Technology advances that strengthen resilience of food-energy-water interactions.
Emerging & Innovative Technologies (Interdisciplinary)	Water and Wastewater Treatment Technology Advances	Recent innovations in tools, methods and frameworks for treatment of water and wastewater.
Energy (Interdisciplinary)	Case Studies Using Renewable Energy for Food Production	This session requests authors to present case studies of renewable energy technologies implementation in Food Industry.
Energy (Interdisciplinary)	Renewable Energy Technologies - Drinking Water	This session requests authors to present their work in implementing renewable energy technologies (RETs) in drinking water infrastructure operation and management.
Energy (Interdisciplinary)	Renewable Energy Technologies - Wastewater	This session requests authors to present their work in implementing renewable energy technologies (RETs) in wastewater infrastructure management and operation.
Environmental	Case Studies in Environmental Health or Water Quality	Papers should present practical case studies of projects involving environmental health and/or water quality issues and emphasize lessons learned, including what worked well and what improvements would be useful for similar projects in the future.
Environmental	Characterization and Treatment of Contaminants in Surface Water and Groundwater	Papers can be from the perspective of the environmental occurrence of these potential contaminants, the sources and source pathways to the water environment, and other issues relevant to environmental health.
Environmental	Environmental Health and Water Quality	This session seeks papers on environmental health (human or ecological) and water quality issues. Papers can be from the perspective of assessment, monitoring, mitigation, prevention, or research into underlying scientific principles and processes or development of treatment technologies.
Environmental	Environmental Permitting and Endangered Species Considerations	This session seeks papers exploring how endangered species considerations play into permitting processes and permitting decisions. Endangered species considerations often create constraints on permit terms and extend the permit application process. How do endangered species restrictions affect project schedule and project viability?

Environmental	Environmental Permitting, Compliance and Standards	This session seeks papers addressing trends, challenges and issues associated with environmental permitting, compliance and related standards. Environmental permitting topics can be in the areas of stormwater permitting, wastewater permitting, air and greenhouse gas permitting, solid waste permitting and permitting for water withdrawal.
Environmental	Hazardous, Toxic and Radioactive Waste	This session seeks papers on all aspects of research, planning, development, remediation and management of hazardous, toxic, and radioactive waste and associated impacts.
Environmental	Models in Environmental Health Research	An increasing variety of numerical, spatial, and computational models are used to explore contaminants and their effects on human and ecological health in all environmental media and pathways. This session seeks papers on research that involves the development of new models or implementation of existing models in unique ways to explore the contaminant-environmental health relationships.
Environmental	Nature-based Solutions (NbS) for Environmental Health and Water Quality	Nature-based Solutions (NbS) range from Green Stormwater Infrastructure (GSI) to agricultural Best Management Practices. As these practices become more widespread, the ecosystem services provided by these systems are gaining increasing relevance. This session seeks papers that illustrate the effects of NbS on water quality and environmental health.
Groundwater Symposium	Aquifer Parameter Estimation, Inverse Modeling, and Data Assimilation	Aquifer properties significantly influence subsurface flow and transport. Rather than being measured directly, aquifer properties are often quantified through indirect methods, using observations of water levels and fluxes in models to infer the property values. This session invites contributions on the development and application of aquifer parameter estimation, inverse modeling, and data assimilation for the quantification of aquifer properties and processes.
Groundwater Symposium	Climate Change and Groundwater	This oral presentation session will have presentations on how climate change is (will be) effecting groundwater quality. The report by the Intergovernmental Panel on Climate Change has noted that the relation between climate change and groundwater has is apparent with climate change adversely affecting groundwater quality and quantity. In this session, the impact of climate change on groundwater quality (e.g. water quality degradation due to altered flow and water level) will be addressed. In addition, management strategies to deal with the effects of climate change on groundwater resources will be considered. Submissions that focus on the issues in the Great Lakes Area and the Mississippi River Watershed are particularly encouraged.
Groundwater Symposium	Contaminants of Emerging Concern: Monitoring Regulations, and Treatment	Emerging contamination from both natural and anthropogenic sources continues are presenting challenges and risks to groundwater sustainability. This session will address the issues of fate transport and modeling of emerging groundwater contaminants by bringing the practitioners and researchers to the same platform. Topics of interest include pharmaceuticals and personal care products (PPCPs), pesticides, engineered nanomaterials (ENMs), perfluorinated alkyl substances (PFAS), and transformation byproducts of conventional groundwater contaminants.
Groundwater Symposium	Deep Well Injection	Injection wells have a range of uses that have historically included disposing of waste, enhancing oil production, solution mining, and preventing saltwater intrusion. More recently, deep well injection of supercritical CO ₂ for geological sequestration is receiving interest as a means of attaining carbon neutrality goals set by governments and industries. The focus of this session is on the siting, construction, operation, testing, monitoring, and closure of injection wells.
Groundwater Symposium	Emerging Topics in Groundwater and Subsurface	Groundwater plays a critical role in the environment. Examples of recent concerns include water quality degradation, overuse, dwindling supplies, and overdraft. This session provides a forum for researchers, practitioners and policy makers to address current and postulated future groundwater issues and emerging issues in groundwater. This session invites presentations on new developments in scientific and engineering research related to groundwater, new tools or approaches, or new issues or policies that dictate groundwater allocation, use and protection.
Groundwater Symposium	Fate and Transport of Groundwater Contaminants	Contamination from both natural and anthropogenic sources continues to present challenges and risks in groundwater aquifers. Fate, transport and modeling of groundwater contaminants in the subsurface and vadose zone is critical and can significant influence groundwater quality protection. This session will address the issues of fate, transport and modeling of conventional groundwater contaminants by bringing the practitioners and researchers to the same platform. Topics of interest include transport and transformations of metals, inorganic and organic constituents, nutrients and/or microorganisms.
Groundwater Symposium	Flow and Contaminant Transport Modeling in the Vadose Zone	This session will cover all aspects on water quantity and quality modeling in the vadose zone. Typical topics may include: infiltration and overland flow generation, quantification of soil moisture conditions, modeling of unsaturated flow and solute transport under various climate, soil, and land use conditions, contaminant fate in the vadose zone and environmental assessment, as well as improved analytical and numerical modeling methods.
Groundwater Symposium	Groundwater Characterization	Characterizing groundwater and subsurface conditions is essential for quantifying groundwater flow and mitigating groundwater quality problems. Effective approaches for characterizing the subsurface and groundwater characteristics remains as an important challenge in the management of groundwater resources. These approaches can range from new analytical approaches to characterize flow and well test data to new instrumentation that allows for distributed characterization of the groundwater conditions. This session provides a forum for researchers and practitioners to present new approaches and tools and the latest research and developments in subsurface and groundwater characterization.

Groundwater Symposium	Groundwater Management and Modeling Under Uncertainty	It is always necessary to address uncertainty when conducting groundwater modeling and making management decisions. The uncertainty may arise due to various reasons such as heterogeneity of subsurface media, limited amount of data, and unknown future system conditions. This session invites presentations on theoretical and practical advancement about methodologies and techniques of groundwater modeling and management under uncertainty. Applications of interest may include advances related to aquifer operations and management.
Groundwater Symposium	Groundwater Modeling: Applications, Tools, and Techniques	This session aims to highlight advances in groundwater modeling, including, but not limited to, new modeling tools, novel modeling approaches, and innovative applications of groundwater modeling. We invite submissions of both theoretical developments and practical applications. All areas of groundwater modeling are welcome, such as groundwater flow modeling, reactive transport modeling, groundwater and surface water interactions, vadose zone modeling, and others.
Groundwater Symposium	Groundwater Quality Monitoring, Remediation and Treatment Technologies	Contamination from both natural and anthropogenic sources continues to present challenges and risks in groundwater aquifers. Remediation and treatment of these contaminants presents difficult challenges. In addition to conventional contaminants, emerging contaminants such as engineered nanomaterials, pharmaceuticals, personal care products, and perfluorinated compounds (PFCs) are also present in groundwater. This session will provide a platform for practitioners and researchers for the exchange of ideas on methods for groundwater remediation and protection, the latest research and developments, and future trends. Topics on in-situ and ex-situ remediation and treatment of conventional and emerging contaminants in groundwater are welcome. In addition, recognizing the new approaches for addressing treating groundwater for water supply, topics on treatment technologies for treating groundwater and groundwater under the direct influence of surface water (GWUDI) are encouraged as well.
Groundwater Symposium	Groundwater Surface Water Interactions	Groundwater and surface water are intrinsically connected in a hydrologic system. Understanding their physical, chemical, and biological linkages and interactions is essential to any water-related research. This session will cover all topics related to GW-SW interactions, including both field and modeling studies.
Groundwater Symposium	Impacts of Drought on Groundwater	Below average precipitation last winter and dwindling snowpack in the mountains, both exacerbated by human-caused climate change, have made for a dire drought in the western United States. This session is focused on the impacts of the drought on groundwater resources. Topics include groundwater depletion, conjunctive use of groundwater and surface water, and artificial groundwater recharge.
Groundwater Symposium	Land Subsidence Due to Groundwater Withdrawal	Compaction of soils in some aquifer systems can accompany excessive groundwater pumping and lead to permanent subsidence and related ground failures. This can result in differential settlement of structures and structural failures. Subsidence of low-lying areas, in combination with concurrent sea-level rise, can increase the flood risk of both urban and rural areas along coastlines. In some systems, when large amounts of water are pumped, the subsoil compacts, thus reducing in size and number the open pore spaces in the soil the previously held water, which can result in a permanent reduction in the total storage capacity of the aquifer system. This session will focus on land subsidence case studies, types of subsidence, monitoring techniques, and methods for managing and mitigating the risk of land subsidence.
Groundwater Symposium	Panel Discussion: Modeling Subsurface Flow and Transport Under Conditions of Aleatory and Epistemic Uncertainty	Consideration of uncertainty in the predictive modeling of natural phenomena is receiving more attention by decision makers. This has been common practice for seismic hazard analysis and is now being adopted for flood hazard assessment. The framework involves segregating the uncertainty into two components: aleatory uncertainty, which reflects natural randomness in a process, and epistemic uncertainty, which is the scientific uncertainty in the model of a process. The intent of this panel session is to engage in a conversation between researchers, practitioners, and policy makers on the state-of-the-art in modeling subsurface flow and transport under conditions of uncertainty.
Groundwater Symposium	Saltwater Intrusion and Coastal Aquifers	Coastal groundwater resources have been over stressed due to the rapid growth of urban population. Furthermore, climate change related phenomena, such as recharge reduction and sea-level rise, have the potential to further impact both groundwater quality and quantity. The focus of this session is on groundwater flow and associated contaminant transport in coastal aquifers. Topics include saltwater intrusion and its impacts on water supplies, as well as discharges of nutrients and other constituents to coastal regions.
Groundwater Symposium	The Floridan Aquifer: Development, Management, and Use as a Regional Groundwater Resource	The Floridan aquifer system is one of the most productive aquifers in the world. This aquifer system underlies an area of about 100,000 square miles in southern Alabama, southeastern Georgia, southern South Carolina, and all of Florida. The Floridan aquifer system provides water for several large cities and hundreds of thousands of people in smaller communities and rural areas. Locally, the Floridan is intensively pumped for industrial and irrigation supplies. Parts of the Lower Floridan aquifer that contain saltwater are locally used as receiving zones for industrial and municipal wastes disposed of through injection wells in Florida. This session is focused on the development, management, and use of the Floridan aquifer as a regional groundwater resource.
History & Heritage	ASCE Water Landmarks	Presentations on ASCE national and international historic civil engineering landmarks related to water resources projects including dams, flood control structures, river models, locks
History & Heritage	Georgia's Historic Canals	Presentations on Augusta Canal national heritage area and ASCE landmark, Savannah-Ogeechee Canal, Brunswick-Altamaha Canal

History & Heritage	National and International Water History	The History & Heritage Committee always attracts abstracts that don't always follow the major themes of the conference but are deserving of being included in the program, since we know the H & H sessions always are well-attended. This third session will cover these "other" proposals.
Hydraulics & Waterways	Advances in Computational Hydraulics	This session attracts papers on the numerical methods and their results and performance in the general area of computational hydraulics. It includes innovations in computational methods applied to river, reservoir, coastal and watershed modeling. The models range from 1D, 2D and 3D models in flows, sediment transport, and water quality. The session seeks novel numerical schemes, novel meshing methods, turbulence models, and the comparison of different methods in performance and accuracy.
Hydraulics & Waterways	Coastal and Estuary Hydraulics	Coastal and estuarine systems present complex and challenging hydraulics and offer ample opportunities for research activities to improve our understanding of the underlying physical processes. This session will revolve around recent research and applications of numerical, experimental, or analytical tools exploring new and innovative techniques and solutions. One of the topics currently presenting special challenge is the transition from inland to coastal processes. The applicability of most of the existing numerical tools (coastal or inland) breakdown at the interface or transition zone. Presentations discussing possible coupling mechanisms among inland and coastal models to provide adequate representation of the transition zone processes will be of interest to this session. Other presentations discussing sedimentation, water quality and salinity topics are also of great interest.
Hydraulics & Waterways	Ecohydraulics	This session is expected to attract papers on models which link hydraulics to ecological systems in flowing waters. Topics may include emerging techniques and advances in ecohydraulic modeling, including model development, application, and scope. Ecohydraulic modeling for river and floodplain restoration; representation of river vegetation, turbulence boundaries, and roughness layers within ecohydraulic models; ecohydraulic implications of sediment transport; modeling for habitat assessment; and discussions of ecohydraulic model reliability and accuracy are also suitable to this session.
Hydraulics & Waterways	Flood Forecasting and Modeling	With the ever increasing computational power of the new state of the art software and water management tools, flood forecasting became a very important tool for flood managers. The need to improve water management and flood forecasting has been amplified by the increasing frequency of extreme events. This session will focus on application of single or multi-dimensional models that may be coupled models to perform Hydrologic & Hydraulic (H&H) analysis for the purpose of flood forecasting. Also, it will include new state of the art technology and innovations that are applied in real-time flood forecasting. This session plans to include practitioners, scientists, engineers and academia in this field of practice.
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Hydraulics & Waterways	Lakes and Reservoir Processes	This session will host papers and presentations on lake and reservoir hydraulics including stratification, selective withdrawal, thermal and water quality modeling, turbidity and its venting, sediment sluicing, seiche and flooding. The associated coastal processes include storm winds, river inflows, waves, sediment transport and water quality. Papers related to reservoir sustainability are also welcome. Papers and presentations may include numerical solution techniques, laboratory experiments, field observations and case studies.
Hydraulics & Waterways	Levee and Dam Breach Modeling	Thousands of dams and levees built in the U.S. and around the world have a potential to be overtopped or broken by flood flows. Each dam/levee failure event may cause disastrous flood damage to human lives, property and infrastructure nearby. Modeling the dam/levee breach processes is crucial for risk assessment and decision making for safety and maintenance of dams and levees. The proposed session covers laboratory experiments, field investigations and numerical/empirical modeling of embankment erosion and the resulting flood propagation. The session(s) will provide a platform to exchange information and knowledge of the latest modeling technologies and practices among interested individuals and agencies.
Hydraulics & Waterways	Turbulent Flows	This session is expected to attract papers on theoretical analysis, laboratory experiments, field measurements and computational modeling of turbulent flows encountered in Hydraulic, Environmental and Coastal Engineering. RANS turbulence models, Large Eddy Simulations and Direct Numerical Simulations are also suitable to this session. Turbulent flows in channels, pipes and others are included.
Hydro-climate/Climate Change (Watershed)	Advances in Flood Forecasting in the Context of Climate	This session targets topics on ensemble or probabilistic hydro-meteorological forecasting to enhance flood mitigation strategies. Advances may include innovative use of data assimilation, quantification of predictive uncertainty, improved ensemble pre-processing methods, modeling and forecasting techniques.
Hydro-climate/Climate Change (Watershed)	Emerging Concepts and Methods in Modeling Hydrologic and Hydro-Climatic Processes	This session will address newly emerging approaches to hydrologic and hydro-climate modeling, such as fractional governing equations and models for various processes, ensemble modeling of hydrologic and hydro-climate processes, scaling and self-similarity in hydro-climate processes, and coupled modeling of hydrologic-atmospheric processes.

Hydro-climate/Climate Change (Watershed)	Flood Estimation and IDF Updating under Climate Change	This session focuses on recent advances in flood estimation under climate change and on emerging techniques for updating intensity-duration-frequency (IDF) curves to account for climate change effects.
Hydro-climate/Climate Change (Watershed)	Hydroclimatology of Droughts: Past, Present and Future	This session will examine several facets of droughts and climate from historical events, managing current droughts and looking to the future with climate change.
Hydro-climate/Climate Change (Watershed)	Impacts of a Changing Climate on Hydrologic Design	This session will address how the changing climate may impact the hydrologic design standards and methods. As the severities of both floods and droughts are intensifying around many parts of the world, the design of the hydraulic structures and their maintenance will require new standards and methods. This session will discuss how the design standards may need to be revised in order to meet the needs of a changing hydro-climate.
Hydro-climate/Climate Change (Watershed)	Integrated Modeling of Hydrologic Processes at Watershed Scale	This session will provide a forum for those who are working on the area of modeling hydrologic processes to share and explore the innovations in a wide range of interdisciplinary modeling on hydrological processes at the watershed scale. Topics to be addressed include i) Hydrological models and simulation tools that could be employed to simulate hydrological processes, their associated uncertainties, validation, calibration and controlling methods, and ii) Simulation and observation of hydrological processes to wide range of river catchment scales.
Hydro-climate/Climate Change (Watershed)	Modeling Ecosystems in a Changing Climate	Ecosystems within a watershed are affected both by the hydrologic and atmospheric (such as radiation and temperature) conditions. This session will focus on the modeling of the ecosystems within the framework of a changing climate when the atmospheric and hydrologic conditions change.
Hydro-climate/Climate Change (Watershed)	Modeling Hydrologic Processes at the Catchment Scale in the Context of Changing Climate	A watershed simulation model is commonly considered as an essential tool for evaluating the sources and controls of nutrient, sediment, animal, pesticide and pathogen loading to surface waters. Simulation tools provide a framework for integrating the data that describe hydrologic processes and land-surface characteristics to determine water balance, pollutant loads and transport to nearby water bodies, then to river systems. The utilization of watershed models, however, is a difficult task because of the broad spatial and temporal scales that must be considered, as well as the large amount of data that must be compiled, integrated, analyzed and interpreted. Depending on the need of the user, a high degree of accuracy may be a requirement. However, this is not always the case. Model users will usually want the best model to meet their needs based on the amount of available input information. Many different model evaluation efforts have been initiated to evaluate and compare with the observations for particular situations. Model evaluation efforts can be useful in helping a potential model user select a model. However, a comprehensive effort is needed periodically to encompass new developments and components which are still not clarified for practical users. In addition, consideration of climate change effects makes the watershed modeling more challenging. An accumulation of the uncertainty from hydrological and climatic data also makes the calibration and validation procedures of a hydrologic model more difficult. This session will provide a forum for the colleagues who are working on the area of modeling hydrologic processes, to discuss and refresh the knowledge base and to share and explore the innovations in a wide range of interdisciplinary modeling on hydrological processes at the catchment scale. Topics to be addressed include but are not limited to the following: <ul style="list-style-type: none"> • Hydrological models and simulation tools that could be employed to simulate hydrological processes, their associated uncertainties, validation, calibration and controlling methods. • Simulation and observation of hydrological processes to a wide range of river catchment scales, and in the context of climate change impacts. <ul style="list-style-type: none"> • Uncertainty in climate change impacts on hydrologic processes.
Hydro-climate/Climate Change (Watershed)	Modeling Projections of Climate Change at Regional Scale	This session will cover presentations on various approaches to modeling climate change at regional (state/country/continental) scales with respect to hydrology and water resources of the region.
Hydro-climate/Climate Change (Watershed)	New Frontier in Estimation of the Probable Maximum Precipitation	Probable Maximum Precipitation (PMP) is a design standard for high-risk, flood-hazard structures such as dams and nuclear power plants. In the U.S. PMP estimates have been published in a series of Hydrometeorological Reports by the National Weather Service. In these reports, storm data up to 1970s combined with heuristic analyses were used to establish the current PMP estimates. In the last 40 years, meteorological data and climate science have progressed and scientists have a better understanding of the mechanisms of extreme rainstorms. However, applications of these advances to the estimation of the PMP have lagged behind. This session invites presentations from new or emerging methods in estimating PMP and associated uncertainties, including (but not limited to) modeling approaches, storm analysis, statistical methods, and considering the effects of climate change.
Hydro-climate/Climate Change (Watershed)	Panel Discussion - Advancing New Methods for the Treatment of Climate Change and Extreme Events	This panel discussion will offer a chance to interact with a panel of esteemed colleagues that are active in the development of new methods related to climate change and extreme events. The panel will have 4-5 speakers who will offer their insights in 10 minute opening remarks and then interact with the audience on the new methods and gaps remaining that research can address, and areas in need of additional exploration to help water management navigate a highly variable and uncertain 21st century that is expected to include more extreme events.

Hydro-climate/Climate Change (Watershed)	Panel Discussion on State-of-the-Art of Uncertainty Analysis in Hydroclimate Modeling	The proposed panel comprises of four academic and professional authorities with long standing experience in hydroclimate modeling and uncertainty characterization and discuss the state-of-the-art on how to address and incorporate the notion of uncertainty in modeling, forecasting and projection across spatial and temporal scales. This is intended to be a lively discussion by engaging the audience and providing the latest and robust methods/approaches to inform professionals/stakeholders in their designs and operation and also educators and researchers.
Hydro-climate/Climate Change (Watershed)	Sea Level Rise and Coastal Flooding Processes: Modeling and Assessment in a Changing Climate	This session will focus on various approaches to the determination and modeling of sea level rise and coastal flooding within the framework of a changing climate.
Hydro-climate/Climate Change (Watershed)	Trends and Variations in Hydroclimatic Variables: Links to Climate Variability and Change	This session focuses on objective assessment of trends in hydroclimatic variables at different temporal, regional and continental scales to assess any discernible links to climate variability and change. Emerging methods for the assessment of trends and variations is the focus of this session.
International Issues	Clean Water and Sanitation in Developing Countries	No description submitted.
International Issues	Data and Model Integration in Hydro World	No description submitted.
International Issues	Downscaling the Sustainable Development Goals (SDGs) for Water Resources Planning and Management	The Sustainable Development Goals (SDGs) of the United Nations cover all living things on Earth. However, downscaling the SDGs to appropriate scales for water resources planning and management is challenging. In this session, we call for presentations that are to discuss the conversion of the general SDGs into tangible and actionable goals, targets and indicators for water resources planning and management crossing the various scales from field to watershed, large basin and, continent, and the world. Specific talks can include but not limited to decision making and decision support systems that are based on the SDGs, development tracks of a water system (e.g., a river basin), implications for integrated water resources management, and country/region experiences.
International Issues	Estimating Future Surface Water Availability in Water Planning Effort – Methodology and Modeling	No description submitted.
International Issues	Flood Risk Assessment and Management Around the World	No description submitted.
International Issues	Food, Energy, Water Nexus	This will be a panel discussion session
International Issues	Global Climate Change and Resilience Concepts for Water Resources Management	No description submitted.
International Issues	Hydropower Systems Operations Around the World	No description submitted.
International Issues	Increasing Sustainability of Water, Energy or Land Around the World: Case Studies and Methods	No description submitted.
International Issues	Integrated Water Resources Management: Past, Present and Future Challenges	This will be a panel discussion session
International Issues	International Water Issues: Successful Case Studies	No description submitted.
International Issues	Leadership of Women in International Collaboration for Achieving Global Water Goals	This session sponsored by the Women Water Nexus Committee addresses collaborations across countries between women in leadership and activities for achieving global water goals. This session invites interdisciplinary presentations on public-private partnerships, education, field case studies, or other data-driven examples that address these challenges and present options on how to overcome the barriers identified here.

International Issues	The Mighty Brahmaputra River in Asia – Flooding, Erosion, and Resource Sharing	<p>The Brahmaputra River, a large river system known by various names in its 2,880 km (1,790 mi) journey from the Upper Himalayas to the Bay of Bengal via China, India, and Bangladesh has been causing serious flooding and bank erosion damages in its nearly 800 km reach in the Indian State of Assam after its steep fall (~3 km) through approximately 250 km long narrow gorge crossing the China-India border. In addition, impacts of upstream hydropower projects in the tributaries have been felt with accelerated flooding and erosion. Future projects without regulations will have worsening impacts.</p> <p>Papers/presentations addressing recurring floods; erosion of the banks taking away residential properties, schools, cultural establishments, agricultural and industrial lands, and forests (State and National) serving homes for animals with endangered species, and even the flood control levees protecting the above; its vast resources including water harvesting, hydropower, navigation, and recreational activities with tourist attractions; and lastly (not least) transboundary issues and resolutions while sharing resources among countries and political units without negatively impacting each other are encouraged and invited.</p>
International Issues	Transboundary Water Management and Conflict Resolution	No description submitted.
Irrigation & Drainage	Advances in Irrigation Scheduling	Presentations are invited for studies or projects that advances the topic area of irrigation scheduling, including systems that integrates multiple data sources, utilizes artificial intelligence, employs sensor technology, accommodates variable rate application or similar. Presentations may be from ongoing or completed studies, proof-of-concept evaluations, new systems design or other advancements.
Irrigation & Drainage	Agricultural Water Use Efficiency	Presentation are invited from studies in the field of on farm irrigation agricultural water use efficiency.
Irrigation & Drainage	Climate Change Effects on Irrigation and Drainage	Presentations are invited for studies of climate change effects on irrigation and drainage. The studies may employ novel or existing practices applied across scales and can be field studies, modeling, or summary reports. Presentations may also address local or state strategies for climate change adaptation or mitigation in irrigated or drained agricultural landscapes.
Irrigation & Drainage	Crop Models in Irrigation and Hydrology	Presentations are invited for studies of crop models in irrigation and hydrology, including studies of near term (0-10 days) forecasting ET with crop and hydrological models, testing of water balances within crop models or other applications of crop models. Also included are studies and applications of different evapotranspiration estimation methods.
Irrigation & Drainage	Drainage for Water Table Management	Presentations are invited from studies addressing challenges and opportunities related to drainage for water table management in agricultural or horticultural systems. Presentations can be from ongoing or completed studies across scales, meta analysis or summary projects.
Irrigation & Drainage	Drainage Issues in the Mid-West US	No description submitted.
Irrigation & Drainage	Eco Irrigation in Agriculture	Presentation are invited from studies in the Eco irrigation techniques and methods improvements which promote the efficiency of water use in agriculture.
Irrigation & Drainage	Evapotranspiration and Irrigation in Urban Landscapes	Presentations are invited for studies of evapotranspiration estimation and irrigation management in urban settings. Studies may include practical water quality or quantity aspects, irrigation management systems, socioeconomic aspects or policy implementation. Presentations may include ongoing or completed studies, pilot studies, and project evaluations.
Irrigation & Drainage	Evapotranspiration in Irrigation and Hydrology	Presentations are invited from studies of evapotranspiration in irrigation and hydrology. This includes studies of hydrology in agricultural crop production systems across scales, irrigation water management, soil or water salinity management, agricultural water use and systems to manage evapotranspiration in irrigation and hydrology.
Irrigation & Drainage	Flow Measurement at Both On-Farm and District Level	Presentation are invited from studies to measure or monitor the flow measurement at both the farm and the district levels.
Irrigation & Drainage	Innovation in Irrigation Delivery and Use	No description submitted.
Irrigation & Drainage	Innovation in Irrigation Delivery and Use	Presentation are invited from studies in an innovative way to deliver and use of irrigation water.
Irrigation & Drainage	Irrigation System Hydraulics	Presentation are invited from studies of irrigation systems hydraulics.
Irrigation & Drainage	Irrigation Water Issues in the Southeast US	Presentation are invited from studies of irrigation water issues in the Southeast United States.
Irrigation & Drainage	Leaching Issues for Sustainable Irrigation	Presentation are invited from studies to manage the leaching issues for sustainable irrigation in agriculture.
Irrigation & Drainage	New Technologies and Methods in Water Quality and Drainage	Presentations are invited for studies or concepts of new and emerging technologies in drainage water management, including but not limited to new hardware or software systems, management strategies, proof of concept, system design or other advancements.

Irrigation & Drainage	Reclaimed Water Use for Ornamental Plants and Golf Courses	Presentations are invited from studies or management of the use of reclaimed water use for ornamental plants and golf courses. Studies may include practical water quality or quantity aspects, water management systems, socioeconomic aspects or community response to the practice. Presentations can be from pilot or case studies, ongoing and completed projects.
Irrigation & Drainage	Use of Remote Sensing for Irrigation Decision Support	Presentation are invited for studies using remote sensing to estimate evapotranspiration and for irrigation decision support, including ground-based systems, unmanned aerial vehicles (UAVs), airplanes, satellites or other platforms. Presentations may include method development and testing, applications or summaries.
Irrigation & Drainage	Water Quality and Drainage	Presentations are invited from studies and strategies addressing water quality issues in drained agricultural systems. Studies can relate to capture of drainage water, water storage, agronomic benefit of drainage, water capture and reuse or similar. Presentations may be from ongoing or completed studies and at scales from the subfield to watershed levels.
Municipal Water Infrastructure	Water Infrastructure Project Delivery	This session will include technical papers and presentations on innovative project delivery model(s) and methods (not limited to): DB/PDB/DBB/DBOM/DBOOM; CMAR; P3; and, other performance assurance methods are welcome. Abstracts providing information on various water (drinking water, wastewater, stormwater, and water reuse) projects in final-design, implementation, and lessons-learned, will be reviewed toward an acceptance.
Municipal Water Infrastructure	Sludge or Residuals Dewatering at Small, Medium and Large Municipal Water Facilities.	This session will include papers and presentations on water or wastewater solids' dewatering, utilizing mechanical or non-mechanical techniques. Abstracts providing information on field-proven sludge dewatering project(s) will be considered. New liquid-solids separation technologies with verified pilot-testing data would also be considered for presentation(s).
Planning & Management	Conflict Resolution and Multi-Objective Decision Making	Water resources conflicts may arise at different levels among stakeholders from economic, social, and political aspects of the design, operation and management of water resources systems. Conflicts over water resources can be increased with the growing and more diverse demands on water resource systems. The situation can get exacerbated by climate change impacts on availability of water resources and on the frequency of extreme events such as floods and droughts. In face of the future challenges, understanding conflict and cooperation among water resources stakeholders may reduce negative impacts of expected future climatic and socio-economic changes. Various conflict resolution methods provide strategic insights into existing conflicts, facilitate cooperation between the conflicting parties, and ensure fairness and efficiency of the solutions. The major goal of this session is to provide a forum for presenting the development and application of formal approaches to water resources conflict resolution and cooperation. Presentations in this session may include applications of non-cooperative and cooperative game theory, shared-vision and participatory modeling and management, group decision making, multi-objective programming, and development of Negotiations Support Systems (NSSs) and Decision Support Systems (DSSs) in the water resources context.
Planning & Management	Data and Stakeholders in the Food-Energy-Water Nexus	The need to consider increasingly complex interactions within the food-energy-water (FEW) nexus has created the demand for data that is often proprietary, private, scarce and/or has never been collected. Increasing concerns about data privacy and the competitive edge that data can provide in economic markets often creates distrust among stakeholders and results in hesitation to share the data. Additionally, the integration of socio-cultural, -ecologic and -economic data often relies on the subjective values, trust, and beliefs in a community, and therefore requires the use of approaches that are costly and time consuming (e.g., stakeholder interviews, surveys, etc.). Moreover, if data is available and shared, often significant pre-processing must be completed to synthesize the data from different sources with missing values, widely different spatial and temporal scales and different standards. Finally, the broad range of spatio-temporal scales used for decision making in each of the FEW nexus sectors creates challenges for visualizing results that are appealing and informative to all stakeholders. This session invites abstracts that examine challenges, barriers, standards, technologies, and solutions for acquisition, comparison, integration, analytics, security, privacy, and visualization of physical and social data necessary for the management of FEW nexus.
Planning & Management	Economic and Ecological Aspects of Water Resources Planning and Management	This session addresses the role of economics and ecology in multipurpose water resources development and operational planning. Applications of economics and related decision sciences in water resource systems planning may include traditional cost-benefit analysis, monetization of environmental and social effects, risk-based planning, cost allocation procedures, subventions policies, ability to pay determination, cooperative gaming, and incorporation of these and other decision support techniques in water resource system models. Ecological considerations in water resource systems planning may include location decisions, limiting materials and maintenance procedures, monetization of environmental effects, risk based planning, funding options and balancing efficient operations with ecologically beneficial operations.
Planning & Management	Forecast Informed Reservoir Operations	This session explores the possibilities and pitfalls of incorporating precipitation, streamflow, and other forecast and outlook information into reservoir operations. Topics include partnerships between forecast producers and users, approaches to addressing additional risk and uncertainty, the essential role of reforecasts (timeseries of the forecasts that would have been produced over this historic record using current techniques) in the development of operating rules and challenges to producing them, identifying skill and tailoring operating rules to exploit the skill, and institutional challenges.
Planning & Management	G.V. Loganathan Memorial Track on Reservoir Systems Operation	In honor of our colleague and friend Dr. G.V. Loganathan, this track features advances in reservoir systems operation, including hydropower operations, use of forecasts, and use of models in real-time operations. Papers addressing the gap between research and practice are especially encouraged.

Planning & Management	Hydro-Climatic Prediction for Effective Management of Water Resources	Over the past two decades, the use of hydro-climatic forecasts for water resources systems planning and management has been greatly debated. While practitioners often point to poor forecast skill, inappropriate scale or insufficient lead times, researchers suppose that imperfect forecasts may help improve the decision-making process if forecast uncertainty and institutional barriers are recognized and properly taken into account. This session focuses on the operational value of forecasts through case studies highlighting the successful or unsuccessful use of hydro-climatic forecasts in decision making. We welcome contributions in the following areas: reservoirs operation, agricultural water management, operation of hydroelectric systems and thermal power stations, water supply, water quality management, and the use of early warnings of extreme events. We also invite contributions related to that impact of water policy, socio-economic setting, and end-user's behavior on the potential benefit and effective use of forecast information.
Planning & Management	Innovations in Collaborative Modeling and Data Management for Water Systems Planning	Collaboration in modeling and efficient data sharing has long been valued in the water resources system modelling community to support water system planning, but has been hampered by technological limitations. Recent years have seen significant advancements in information technology tools to vastly improve collaboration on and sharing of models and data throughout society. This session invites methods, tools, and case studies that demonstrate how water system planners, managers, modelers, and stakeholders can leverage modern information technology methods and tools to improve collaboration and discovery in models and data for water system planning. For modeling, this includes in particular novel collaborative, participatory and/or shared-vision modeling practices, especially those with web-based collaboration applied in practice. For both modeling and data, this includes not only collaboration in data generation (co-production of knowledge), but also sharing for discoverability and reproducibility. Lessons learned are also welcome.
Planning & Management	Panel discussion: Hydro-climatic Prediction for Effective Management of Water Resources	Efficient use of water resources is a critical aspect of sustainable water, energy, and food management. While water scarcity already imposes significant challenges, population growth and human development may further stress water resources systems. For many locations, hydro-climatic predictions may serve to improve the efficiency, resilience, and sustainability of water resources, particularly under more frequent extreme events. The panel will bring together experts from international organizations, funding agencies, and academia to share their lessons learned from successful or unsuccessful utilization of predictions in real-world decisions, and to discuss unique complexities and challenges faced by both forecast producers and users, with the goal of identifying and exploiting the opportunities to achieve more effective use of predictions.
Planning & Management	Resilience, Vulnerability and Equity in Multi-actor Water Resources Systems	Climate change and increased human demands pose serious challenges for the management of water resources systems in the 21st century. Intensified hydrologic variability brought about by a changing climate implies higher risks for both flood and drought management, while increasing demands further stress water supply. The local manifestation of these global trends often cannot be characterized by a known probability distribution, necessitating their treatment as "deeply uncertain". The challenge of planning under deep uncertainty is compounded by the fact that water resources systems are managed by multiple actors, not always in cooperation, where competing interests and power dynamics complicate the task of discovering optimal planning alternatives. Recent paradigms for decision making under deep uncertainty have advocated for the identification of robust strategies that result in satisfactory performance under a wide set of plausible states of the world. These paradigms, however, often ignore the potential for multi-actor asymmetries in experienced impacts in a region, both at the operational and management levels, through to the individual end-users and to sectoral stakeholders. Planners working in multi-actor systems therefore face significant challenges in defining robustness, resilience, and vulnerability metrics that appropriately capture the values, needs, and experiences for all actors in a water resources system. This session seeks contributions on the development and application of formal and systematic approaches to defining and measuring the concepts of robustness and resilience for multi-actor systems under deep uncertainty, as well as their use in the identification of management policies.
Planning & Management	Strategies for Joint Management of Water and Energy	This session will be devoted to investigations of new strategies for managing interdependent energy and water resource systems under hydroclimatic uncertainty and within changing technological, regulatory, and market environments. Developing a better understanding of the tradeoffs, intersections, and feedbacks across water resource management, energy system dynamics (including rapid decarbonization), and ecosystems will contribute to the more informed management of natural resources. As the interdisciplinary nature of these strategies involves elements of hydrology, engineering, environmental science and economics, contributions crossing some or all of these disciplines are encouraged.
Planning & Management	Systems Thinking and Decentralized Modeling for Complex Adaptive Systems	Emerging water resources and environmental issues are increasingly complex. Systems thinking and system dynamics modeling offer a promising framework for holistic conceptualization of emerging issues in coupled water resources, environmental, social, and ecological systems. The framework places emphasis on understanding feedbacks that influence system resilience and sustainability with the ultimate outcome of identifying promising policy levers to improve system performance. This session provides a venue for applications of systems thinking and system dynamics modeling, and agent-based modeling, along with other decentralized modeling approaches in complex adaptive water resources systems. It also promotes modes of holistic dynamic thinking that value collaboration, knowledge integration, adaptability, shared visioning, and innovation.

Planning & Management	Water Resources Modeling, Management, and Policy	Water managers and policy makers must understand how various human activities affect water resources and how variable hydrology affects humans' well-being. Water resources simulation, optimization, conflict resolution, and system dynamics models provide tools to integrate and study the major physical, socioeconomic, and political aspects of water resources systems. For decades, water resources professionals have developed and used models to address water resources problems. Early efforts focused on representing hydrologic processes. More recent interdisciplinary efforts have led to increasing complexity and integration of environmental, social, and economic system components. Yet water resources models are still evolving in terms of approach, application, and ability to provide managers and policy makers with actionable results in a timely fashion and at reasonable cost. At the end of the day, what changes as a result of the modeling study? This session solicits contributions that use systems analysis methods to inform water resources management, operations, and/or policy making. We welcome case studies that describe how systems analysis work changed system management, operations, or policy. We encourage contributions that show how to increase the policy--- relevance of systems analysis work. And we seek contributions that demonstrate how models and the new understandings reached through their use help inform management and policy.
Planning & Management	Water Resources Systems Analysis Panel Discussion	The first part of this session will feature a panel comprised of well-established and up-and-coming water resources systems analysis researchers and practitioners. Each panel member will reflect on their and others' past successes in the field. Panelists will also identify some of the future challenges that await the field in the years and decades ahead. Topics for consideration will include linear programming, non-linear programming, dynamic programming, simulation, software development, decision support, visualization, evolutionary algorithms, stochastic analysis, conflict resolution, agent-based modeling, multi-objective planning, high-performance computing, to name a few. In the second part of the session, the moderators will facilitate a discussion between the panel members and audience to prioritize the challenges the systems analysis community should consider and address in future work.
Stormwater (UWRRC)	Advances in Bioretention Design, Research, and Implementation	This session will encourage the discussion of practical design, monitoring, and implementation advances for bioretention, biofiltration, bioinfiltration, biofilters, and rain gardens.
Stormwater (UWRRC)	Advances in Bioretention Media Design for Targeted Water Quality Treatment	This session consists of 3-4 invited speakers that will focus on advancements in bioretention media and how these impact bioretention water quality performance. Particularly, media blends and amendments will be discussed as they relate to regional water quality problems and issues. Perspectives will come from industry, researchers, and state agencies.
Stormwater (UWRRC)	Advances in Stormwater Management and Research	This session will focus on improvements made to the design, construction, and maintenance of stormwater control measures.
Stormwater (UWRRC)	Advances in the Design of Green Infrastructure	This session will focus on new design strategies to improve green infrastructure effectiveness and maintenance.
Stormwater (UWRRC)	Constructing and Maintaining Stormwater Control Measures	This session will focus on lessons learned from constructing and maintaining stormwater control measures. The goal is to give attendees practical information that can be used to optimize stormwater construction projects and improve the maintenance of stormwater control measures.
Stormwater (UWRRC)	Credit Trading and Incentivizing Stormwater Management	As urbanization increases the demand for stormwater management to effectively protect downstream resources increases. This session will focus on implementing implement stormwater management programs appropriate for a watershed's current and future needs. This session will also focus on regulatory frameworks developed for stormwater nutrient offsets and trading.
Stormwater (UWRRC)	Dealing with Uncertainty and Climate Change in Stormwater	Climate change affects the function of urban drainage systems. This session will focus on efforts made to account for climate change through the modeling, design, implementation, and maintenance of stormwater control measures.
Stormwater (UWRRC)	Designing Stormwater Control Measures: Treatment and Performance	This session encourages presentations focused on how stormwater control measure design affects performance. The goal is to give attendees practical information that can be used to optimize stormwater designs.
Stormwater (UWRRC)	Developing Novel Media for Stormwater Treatment	Media filters are a commonly used class of stormwater treatment devices. Given the myriad stormwater contaminants that exist, media needs to be optimized for treatment of local pollutants of concern. This session will focus on media composition and amendments and how these impact pollutant removal.
Stormwater (UWRRC)	Education, Outreach, and Tools for Green Infrastructure and Stormwater Management	Community buy-in is crucial for effective stormwater management. This session will focus on successful tools and strategies used to increase the public's knowledge and acceptance of stormwater management.
Stormwater (UWRRC)	Evaluating and Designing Green Infrastructure for Ecosystem Services	Green infrastructure has many benefits beyond stormwater management (e.g., carbon sequestration). This session will focus on evaluating and designing green infrastructure to maximize these benefits.
Stormwater (UWRRC)	Funding Stormwater Management Projects	Available funding limits the implementation of stormwater control measures. This session will encourage the discussion of how to secure and manage funding for stormwater management projects. Authors may also submit case studies focused on volunteer efforts to implement stormwater control measures.

Stormwater (UWRRC)	Green Infrastructure for SSO and CSO Mitigation	Green infrastructure is being implemented to reduce infiltration and inflow and mitigate SSO/CSO events. This session will focus on lessons learned from these projects.
Stormwater (UWRRC)	Managing the Assets: Making Sense of Distributed	This session will focus on case studies and examples of asset management tools being utilized across the country, with focus on management of new assets, existing assets, and operations and maintenance.
Stormwater (UWRRC)	Modeling Green Infrastructure	Successful modeling is critical for green infrastructure's ultimate acceptance by the design community and public. This session will focus on the software used to model green infrastructure for design and implementation purposes. Authors may also submit case studies focused on lessons learned, calibration and validation methods, and improvements to existing stormwater models.
Stormwater (UWRRC)	Modeling Stormwater Control Measures to Ameliorate Flooding	Due to increased development and more frequent storms, flooding has become a major issue for municipalities. This session will focus on modeling efforts to reduce and or prevent flooding through the implementation of stormwater control measures.
Stormwater (UWRRC)	Monitoring Stormwater Control Measures for Performance	This session will focus on lessons learned during the monitoring of stormwater control measures, including hydrologic and water quality performance, ecosystem services, infiltration, and other factors.
Stormwater (UWRRC)	Real-Time Control for Stormwater Management	"Smart" technologies enable "smart" or efficient stormwater management. Real-time control (RTC) is quickly becoming an alternative for large and/or inter-connected systems. This session will focus on advancements made to RTC, case studies, and lessons learned from implementing RTC.
Stormwater (UWRRC)	Revising Regulations to Overcome Water Quality and Quantity Issues	Efforts are being made nationwide to revise stormwater regulations to improve water quality and reduce flooding. This session will include case studies that focus on watershed improvement plans, creating and implementing stormwater utility fees, and revising stormwater ordinances.
Stormwater (UWRRC)	Social Implications of Stormwater Management	Over the recent years there has been a greater effort to use a holistic approach to manage stormwater. This approach accounts for the social and economic benefits of stormwater infrastructure. This session will focus on how to incorporate the holistic approach into the planning and design phases of a project as well as case studies highlighting the lessons learned from using a holistic approach to manage stormwater.
Stormwater (UWRRC)	Stormwater Failures and Lessons Learned	Not all projects succeed. What can we learn from our stormwater failures? What are the weak points in our designs that need to be improved upon?
Stormwater (UWRRC)	Stormwater Infrastructure in Transportation Corridors	Transportation corridors provide room for cities and transportation authorities to treat stormwater runoff. This session will focus on the lessons learned from designing, constructing, and monitoring stormwater infrastructure implemented along roadways.
Stormwater (UWRRC)	Stormwater Treatment at the Watershed Scale	Cities across the world are retrofitting green infrastructure at massive scales. This session will focus on large-scale efforts to green cities and improve watershed health.
Stormwater (UWRRC)	Ultra-Urban Green Infrastructure: Green Roofs, Permeable Pavements, and High-Flow Filters	What do you do when you have no space?! This session will be comprised of talks on ultra-urban stormwater control measures, including those listed in the session title but also underground infiltration, underground detention, and proprietary systems.
Sustainability (Interdisciplinary)	Adaptation to Changing Climate	The impacts from climate change (economic, political, social) in different geographic regions are expected to be as variable in solution as they are in effect. Accordingly, there is no one-size-fits-all solution for communities to anticipate, plan, and adapt to the changing climate. Presentations in this session will address those anticipated variabilities and vulnerabilities.
Sustainability (Interdisciplinary)	Environmental Justice and Regional Legacies	Environmental injustices are relevant from local to global scales. This session will focus on research and case studies on justice and injustice in the context of sustainability, legacy infrastructure, and resource management.
Sustainability (Interdisciplinary)	Food-Energy-Water Nexus	Water, energy, and food systems are linked. This session will include presentations about these linkages, including water for energy (power generation, transportation fuels), energy for water (treatment, heating, reuse), water for food (irrigation, virtual water), and other nexus discussions.
Sustainability (Interdisciplinary)	Resilience in Sustainability	Climate change and other modern environmental problems will challenge the function of society moving forward. This session will highlight assessment and deployment of interventions that decrease our vulnerability to and/or increase our ability to recover from those events threatening effective resource management systems.
Sustainability (Interdisciplinary)	Sustainability Assessment, Methods, and Metrics	This session focuses on tools, methods and metrics used to measure, assess and report the social, economic and environmental performance of resource management systems. This session particularly invites discussion and analysis on methods and metrics, including life cycle assessment and footprinting.
Sustainability (Interdisciplinary)	Urban Sustainability	As the world continues to populate and urbanize, increasing the sustainability of residential, commercial, industrial and agricultural sectors is important. This session will highlight research and innovative ideas related to sustainability across these end-use sectors, particularly as they relate to urban sustainability.

Water Distribution System Analysis (Planning & Management)	Advances in Testing, Surveillance, Modelling, Detection and Public Health Responses to the SARS-CoV2 virus in Drinking and Wastewater Infrastructure	Since the onset of the COVID-19 pandemic, water utilities like the rest of the world have been hard at work to manage their water systems to protect the public from COVID-19. Given the rapid evolution of the COVID-19 pandemic, the development of proper approaches to secure water infrastructure against the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)—an enveloped RNA virus— and limit the spread of infection is unfolding at a rapid pace. This session invites talks on topics broadly related to testing, monitoring, surveillance, modelling, detection, and management responses to the SARS-CoV2 virus in drinking and wastewater infrastructure systems. The focus may be on developing standard methods for the detection of the genetic fingerprint of SARS-CoV2 in water or wastewater, the surveillance and monitoring approaches of SARS-CoV2 in wastewater and drinking water; early detection and modelling and prediction tools for COVID-19 transmission in water systems, and public health management and response frameworks to protect the public. Studies based on field experience are welcome.
Water Distribution System Analysis (Planning & Management)	Advances in Water Distribution Network Modeling Software	EPANET is a core software tool used for water distribution systems research and development as well as commercial applications; many advancements in EPANET and related software have been made in the private sector, research and open source communities. Papers are encouraged in the areas of open source or commercial development; improvements to graphical user interfaces; enhancements to core hydraulic and water quality engines; model calibration; software testing and quality assurance best practices; and gaps, needs, and a vision for future development.
Water Distribution System Analysis (Planning & Management)	Advances in Water Distribution System Water Quality Modeling	Drinking water systems are responsible for the delivery of safe, potable water to customers. However, many things can affect the quality of the water as it moves throughout the distribution system. Papers are encouraged in the area of water quality concerns related to seasonal influences; biofilms; disinfection and disinfection by products; turbidity and discoloration; low pressure events; reductions in consumer demand; unintentional (e.g., natural disasters) and intentional contamination; as well as water quality indicators and water age; modeling using reaction rate dynamics; dispersion effects; case studies with water systems around the world; water quality model calibration, and field studies in support of water quality models.
Water Distribution System Analysis (Planning & Management)	Cyber-physical Security of Water Distribution Systems	The continuous modernization of critical infrastructure relies on the integration of physical processes and assets with networked devices that monitor and control the operations of the entire system. While digitalization significantly improves the automation and performance of urban water infrastructure, it also exposes it to cyber threats—as demonstrated by the recent, sharp increase in the number of attacks to water utilities. This session invites talks on topics broadly related to cyber-physical security of water distribution systems. The focus may be on investigating the vulnerability and resilience of such infrastructure to cyber-attacks, modeling contamination events and water quality issues caused by cyber-attacks, developing attack detection and control algorithms, designing strategies to increase the security levels, and informing decision-makers about risks and challenges. Studies based on actual historical incidents are also welcome.
Water Distribution System Analysis (Planning & Management)	Leakage, Pressure and Energy Management in Water Distribution Systems	Water distribution systems are often among the largest energy consumers in a community. Electricity is used to power water pumps and controlled devices such as automated valves. Leakage is one of the main reasons for energy and water waste in water systems. Papers are encouraged related to mathematical, computational and experimental leak detection; new technologies/devices which manage leakage; pressure management strategies to reduce leakage; and ways to improve energy efficiency and energy assessment methods in WDSs.
Water Distribution System Analysis (Planning & Management)	Premise Plumbing Modeling	Premise plumbing is the final step in the delivery of water to the customer. This session focuses on advancing the science of water delivery from source to water taps. Papers are encouraged related to systems analysis of water quality within buildings including, formation and delivery of opportunistic premise plumbing pathogens and corrosion products, hydraulic design for improved efficiency, cost effectiveness and resource conservation; and water security relevant to premise plumbing.
Water Distribution System Analysis (Planning & Management)	Water Distribution System Design, Optimization, Operation & Maintenance	Modeling and optimization can be used to improve the design of and the operation and maintenance of water distribution systems. Papers are encouraged in the areas of optimization of operations; optimal design; water quality management through disinfection, monitoring or other strategies; financial or cost management; development or applications of asset management, condition assessment, and GIS technologies; case studies and model applications; creation of district metered areas; and demand management.
Water Distribution System Analysis (Planning & Management)	Water Distribution System Real-time Modeling, Data Analytics, System Operation & Control	Real-time modeling connects hydraulic and water quality models to real-time field data and provides predictions to improve water utility operations. Papers are encouraged related to real-time modeling, real-time access to SCADA, field, and customer usage data, communication methods among network components, embedded systems issues in automated water distribution systems, real-time control and operation of water distribution systems, applications of these technologies to water systems, demand forecasting and data analytics.

Water Distribution System Analysis (Planning & Management)	Water Distribution System Risk, Vulnerability, Reliability, & Resilience	Water distribution systems are vulnerable to a wide variety of threats including natural disasters, physical terrorist attacks, source water contamination, climate change and other emergencies. Papers are encouraged in the areas of methods that can be used to assess vulnerability, risk, reliability, and resilience; strategies to reduce risk and vulnerability and improve reliability and resilience; models for simulating failure scenarios, damage to infrastructure, pipe breaks, leaks, and changing customer demands during such incidents; analysis of interdependencies with electrical, transportation, wastewater and other critical infrastructure sectors; and development of performance measures/metrics.
Water, Wastewater & Stormwater	CFD Modeling	Computational fluid dynamics are used in many aspects of water system design from mixing systems, to pressure vessels to pumped systems.
Water, Wastewater & Stormwater	Distribution System Modelling	This session will include hydraulic modeling, water age and chemical modeling of water distribution systems.
Water, Wastewater & Stormwater	Groundwater 2 - Nitrate and Ammonia Removal	This session will look at the growing challenge of nitrate and ammonia in groundwater and innovative treatment systems to remove these contaminants.
Water, Wastewater & Stormwater	Groundwater Treatment - PFAS and CECs	This session will focus on groundwater treatment issues for synthetic chemicals and contaminants of emerging concern.
Water, Wastewater & Stormwater	Intermittent Distribution Systems	In many parts of the world, water supply is not continuous which poses many challenges for distributing the water reliably and safely.
Water, Wastewater & Stormwater	Source Water Management for Algae Control	Monitoring and control systems in source waters for control of algae, taste and odor and algal toxins in drinking water systems.
Water, Wastewater & Stormwater	Water and Energy Nexus	This session will focus on water utilities using alternative energy, including pumping schemes, wind, solar & battery systems, pumped storage and other ideas.
Water, Wastewater & Stormwater	Water Treatment and Reuse	Treatment processes for wastewater reclamation including membrane filtration and other advanced processes for emerging contaminant removal. Water quality Policy and regulations related to wastewater reclamation, recycle and reuse.
Water, Wastewater & Stormwater	Nanotechnology for Water and Wastewater Treatment	Nanocomposites and nanoadsorbents for treatment of water, wastewater and storm water
Water, Wastewater & Stormwater	CFD Modeling in Wastewater Treatment	Computational fluid dynamics for studying momentum, heat and mass transfer in conventional and newly designed wastewater treatment plants
Water, Wastewater & Stormwater	Membrane Processes and Applications for Wastewater	Innovative membrane processes, membrane bioreactors, membrane fouling
Water, Wastewater & Stormwater	Biofilms, Electrochemical and Bio-electrochemical Processes for Wastewater Treatment	Wastewater treatment for energy production and resource recovery. Wastewater reuse. Topics of interest include material and process aspects of membrane bioreactors, microbial fuel cells, microbial electrolysis cells, microbial electrochemical systems (MXCs).
Water, Wastewater & Stormwater	Wastewater Treatment Process Design and Modeling	Simulations and modeling studies for process design and optimization of aeration, energy consumption, nutrient removal and solids handling
Water, Wastewater & Stormwater	Advances in Resource and Nutrient Recovery Processes for Wastewater Treatment	Enhanced nutrient removal processes including various biological processes for nitrogen and phosphorous removal, innovative configurations, wetland applications, polishing ponds and microalgal systems
Water, Wastewater & Stormwater	Aging American Water and Wastewater Infrastructure: Corrosion and Material Degradation Challenges	Crown corrosion, concrete corrosion, corrosion mitigation with protective coatings and cathodic protection, sewer overflows
Water, Wastewater & Stormwater	PFAS and Emerging Contaminants in Wastewater and Biosolids	Characterization and reduce of perfluorinated carboxylic acid produced and used worldwide as an industrial surfactant in chemical processes and as a material feedstock, and is known as an emerging health concern and subject of regulatory action and voluntary industrial phase-outs
Water, Wastewater & Stormwater	Fate and Transport of Nanomaterials in Water and Wastewater Infrastructure	Characterization, modeling, and experimental studies of nanomaterials
Water, Wastewater & Stormwater	Environmental Sustainability of Wastewater Treatment and Waste-derived Products	Life cycle analysis, sustainability metrics, net zero energy, wastewater reuse, wastewater treatment for production of energy and value added products
Water, Wastewater & Stormwater	Advanced (Bio-) Treatment Technologies for Emerging Pollutants	Emerging biological processes for treating recalcitrant contaminants in water

Watershed	Advances in Watershed Modeling and Applications	The presented papers will discuss recent watershed modeling approaches and advances in water quantity (rainfall-runoff) and/or quality simulations of urban or rural agricultural watersheds and applications of those to quantify and assess existing flooding problems and water quality standard violations, e.g., Total Maximum Daily Loads (TMDL) and evaluations of alternative measures, e.g., Best Management Practices (BMP) to eliminate, minimize, or improve the water quantity (flooding) and quality issues and problems. Papers focusing on building resiliency against climate change and sea level rise in watershed modeling are encouraged.
Watershed	Development of Intensity-Duration-Frequency Curves Considering Climate Change	Precipitation intensity-duration-frequency (IDF) curves are commonly used in the design of stormwater drainage systems and soil erosion control measures. This session invites papers that explore methods for developing IDF curves and extreme precipitation frequency estimates for the effects of climate change under various emissions scenarios.
Watershed	Frontiers in Modeling and Predictions of Floods Under a Changing Climate, Sea Level, and Environment	Flooding has been a devastating natural hazard throughout the human history. With the increasing temperature, rising sea level, and progressive urbanization, extreme flooding events have become more and more frequent. These events typically involve pluvial (stormwater) flooding, fluvial (riverine) flooding, oceanic (storm surges) flooding, or a combination there of (i.e., compound flooding). We invite abstracts on topics including, but not limited to, latest studies on data collections and analyses, empirical and mechanistic modeling, as well as prediction and engineering tools for pluvial, fluvial, and oceanic floods under a changing climate, sea level, and environment.
Watershed	Modeling of Wetland Hydrological, Biogeochemical, and Ecological Processes	Wetlands present unique physiochemical, biogeochemical, and ecological settings that provide valuable watershed and ecosystem services. However, a complex interplay of the climatic, land use, hydrological, and ecological drivers determines the role and effectiveness of wetlands in providing the critical, often competing services. Subject to the process complexity and uncertainty, the available wetland data and models are inadequate to accurately and robustly predict the interacting wetland structure and functions at variable scales. We invite abstracts on topics including, but not limited to, new methods in data collections and analyses, empirical and mechanistic modeling, as well as prediction and engineering tools for wetland hydrological, biogeochemical, and ecological processes at variable time, space, and process scales.
Watershed	Stochastic Modeling of Nonstationary, Extreme Floods, Droughts, and Sea Levels	Stochastic and probabilistic approaches for analyzing floods, droughts, and sea level extremes have been widely used in hydrology and water resources for decades and many successful applications can be found in literature. However, new challenges have evolved due to nonstationarity, which has been attributed to various factors such as human-made interventions (e.g. land use changes and deforestation) and the effect of climate variability and change. The intent of this track/session(s) is to discuss new concepts and techniques and applications thereof, for the stochastic and probabilistic description and modeling of floods and extreme sea levels that may occur in nonstationary environments.
Watershed	TMDL Analysis, Modeling, and Case Studies	The objective of this session is to present developments and applications of water and water quality analysis and modeling systems in support of TMDLs. The presented papers will discuss TMDL studies (both development and implementation focusing on their successes and lessons learned. Studies on advances in modeling (calibration, validation, uncertainty/sensitivity analysis, pollutant source assessment, BMP evaluations); accounting for climate change, land use change, and sea-level rise in ongoing or future TMDLs; and TMDL planning (e.g., stakeholder engagement, group decision making and cost-sharing) are encouraged.
Watershed	Wetlands for Watershed and Coastal Management	Wetlands play critical roles in water resources management, including water quality improvement, water storage and flood attenuation, recharging aquifers, and restoring/maintaining critical ecological habitats. Wetlands represent one of the highest rates of ecological carbon sequestration, although they can also act as sources of greenhouse gases (GHGs) to the atmosphere. The proposed session invites abstracts from scientists, engineers, practitioners, and stakeholders with contributions on basic and applied research regarding the roles and effectiveness of wetlands in watershed and coastal management. We will entertain a range of relevant topics such as wetland hydrology, biogeochemistry and nutrient cycling, GHG fluxes and carbon sequestration, and habitat ecology in natural and constructed wetlands of the inland and coastal regions. We welcome case studies to share outcomes from short- and long-term monitoring, engineering, and management projects at site, regional, and global scales.
Watershed - Hydro-Climate/Climate Change	Ensemble/Probabilistic Forecasting and Verification	This session solicits papers that present new ensemble/probabilistic approaches and verification techniques for forecasting streamflow, precipitation, soil moisture, snow depth, and other hydrologic variables to support applications and decision making in water resources management. Topics of interest include, but are not limited to, ensemble generation techniques, downscaling of meteorological/climate forecasts, post-processing (bias correction), data assimilation, multi-modeling, probabilistic decision rules, uncertainty characterization approaches, objective verification metrics, and estimation of forecast variables associated with a particular probability of occurrence. Efforts related to forecast calibration, weighting of ensemble members, parameterization of hydrological models, and different climate change scenarios at scales from local to global are welcomed as well.
Watershed - Hydro-Climate/Climate Change	Hydrologic Trends, Variability, and Uncertainty	The planning of water resources largely depends on the hydrologic variables in terms of their distribution in space and time. Hydrologic trends and variability have significant impact on water resources, biodiversity, crop production, environmental and different socio-economic sectors. On the other hand, quantifying uncertainty can improve better understanding the complex nature of hydrologic processes. This session invites topics related to methods and concepts applied to investigate trends, variability, and uncertainty associated with hydrologic processes and variables.

<p>Watershed - Hydro-Climate/Climate Change</p>	<p>State-of-the-Art Risk and Uncertainty Analysis</p>	<p>It is essential to properly characterize, quantify and communicate risk and uncertainty in weather, climate, and hydroclimatic simulation/forecasts to be able to effectively support emergency management and water resources decision making. In hydroclimatology, the importance of accounting for various types of uncertainty involved in the prediction process has been increasingly recognized in recent years. Uncertainty in these predictions can originate from several major sources, including errors in the model structure and model parameters, as well as model initial conditions and hydrometeorologic forcing. Effective quantification and reduction of these compound uncertainties is necessary to enable the generation of forecast products with accurate and actionable guidance on predictive uncertainty to enable risk-based decision making given the nonstationary behavior of hydroclimate variables under climate change. This session invites abstracts related to methods and concepts used to analyze, quantify and communicate risk and uncertainty in hydrology, hydroclimatology, hydrometeorology, environmental engineering, and water resources.</p>
<p>Watershed - Hydro-Climate/Climate Change</p>	<p>Statistical Analysis of Extreme Hydrological Events</p>	<p>Floods and droughts have a large impact on water resource systems, and careful statistical analysis of existing records can inform management decisions. Statistical analysis is especially important when making inferences about extreme events, which may or may not have been observed in the historical record. Analysis methods that can incorporate information on changing watershed conditions are especially important for water resources planning.</p>