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INTEGRATED RESEARCH AND SOCIETAL ENGAGEMENT TO ADDRESS GLOBAL WATER CHALLENGES

NON-TECHNICAL SUMMARY: The Water Umbrella group is an integral part of an extensive group of water researchers, educators, and extension professionals at Washington State University (WSU). Water research performed by this group is a subset of the current WSU water work that is spread across almost all aspects of water-related work ongoing at WSU. As population growth and variable weather patterns place increasing demands on water supply, solutions for water quantity and quality issues will require interdisciplinary research and societal action. The Water Umbrella Group provides an agile and dedicated research group from multiple academic disciplines within WSU to find solutions to complex scientific and social issues related to water resources that are vital to Washington and globally. The Water Umbrella group is engaged in fundamental and applied water resources research spanning irrigation efficiency and food production, stormwater quality and aquatic ecosystem improvement, and integrated water management involving agricultural and energy production, drought and flood prevention, and economic and societal outcomes. Our irrigation group works on improving irrigation water management to reduce water use, improve crop yields, decrease costs, and improve water quality. Our stormwater management group is developing cost-effective stormwater practices to remove toxic pollutants from stormwater thus improving river water quality and reducing toxic effects on a range of aquatic organisms including salmon. Our integrated water management group is focusing on water supply and demand projections and agricultural production in the face of regional climate change for the Columbia River Basin in Washington State and the economic analysis of resilience and economic tradeoffs at the Food-Energy-Water nexus.

OBJECTIVES: The overarching goal of this project is to improve water use efficiency and water quality management through the pursuit of various objectives, including (a) research and extension efforts to improve irrigation water management to reduce water use, improve crop yields, decrease costs, and improve water quality; (b) Stormwater Management to minimize flooding, protect clean water, and promote thriving ecosystems; and (c) Integrated Water management to address complex integrated water management issues by incorporating climate change, analyzing resilience, and quantifying economic tradeoffs. The objectives of the irrigation management group

are to: 1) develop robust and appropriately-scaled methods of irrigation scheduling using one or more soil-, plant- or weather-based approaches; 2) develop microirrigation designs and management practices that can be appropriately scaled to site-specific characteristics and end-user capabilities; and 3) develop technology transfer products for a diversity of stakeholders to promote adoption of microirrigation. The objectives of the stormwater management group are to 1) characterize the chemical composition of stormwater collected from urban roads in the Puget Sound region of Washington State, 2) evaluate the toxicity of untreated stormwater to coho salmon, zebrafish, water fleas (*Daphnia*), and aquatic insects, and 3) assess the ability of bioretention systems to reduce or remove toxicity from urban stormwater. The integrated water management sub-objectives will focus on 1) several critical cases of trade-offs at the nexus of food, energy and water (FEW) with a focus on how changes in climate, technology, and policy affect FEW system resilience, 2) micro- and meso-level analysis on the effects of climate change on agricultural production systems, and 3) to create a solid link between researchers included in the Water Umbrella group and those who use, manage or impact water resources in the state to facilitate a multidisciplinary flow of information in both directions and to increase the practical relevancy of the research conducted.

APPROACH: This is a broad, integrated research, extension, and education project. Methods will vary substantially depending on the goals of specific activities contributing to the various objectives. These methods range from randomized controlled trials for assessing new irrigation technologies, demonstration project development, new technology design, watershed modeling, economic and econometric modeling and testing, and innovative stakeholder engagement methods.

KEYWORDS: water; irrigation; stormwater; watersheds; integrated water management
