A Proposal for the Cooperative Promotion of
Water Conservation through Teacher Professional Development
Summer 2024

The University of Houston-Victoria (UHV) proposes to extend and expand the cooperative effort with the Victoria County Groundwater Conservation District (VCGCD) to promote water conservation through a project to deliver professional development to teachers of middle school science classes and teachers of high school aquatic science and environmental systems classes. This proposal expands the professional development activities by 1) conducting a workshop at the Wetland Education Center located at the INVISTA Victoria Plant Wetland in Victoria County and 2) including a presentation by UHV staff on the application of Artificial Intelligence/Machine Learning to water resource management.

Tim Andruss, VCGCD General Manager, will facilitate workshops with the assistance of John Snyder, VISD Environmental Science Specialist and UHV Professors Dmitri Sobolev and Teresa LeSage-Clements to deliver the professional development. The workshops will focus on 1) increasing awareness, knowledge, and technical skills related to the hydrologic cycle, water resources, risks to water resources including over-production and pollution, and 2) expanding knowledge and skills that align with the related Texas Essential Knowledge and Skills (TEKS) for the purposes of promoting water conservation.

The facilitator of the project will seek participation in the professional development from teachers of middle school science classes and teachers of high school aquatic science and environmental systems classes. These teachers are responsible for providing instruction to students directly related to water resources as outlined in the Texas Essential Knowledge and Skills (TEKS) and would benefit from learning about the characteristics, properties, and processes of local aquifers and watershed. This knowledge base will assist the teachers in being better prepared to adequately present and assess student knowledge of the related knowledge and skill elements. Through the activities and exercises of the project, participants will learn about the characteristics, properties, and processes of the Gulf Coast Aquifer, the Guadalupe River Watershed, potential risks to water resources, and water conservation.

The facilitator of the project will recruit participants from schools serving students that reside within the boundaries of cooperating groundwater conservation districts and limit participation to ten teachers. In addition to professional development, participants will receive 1) 14 hours of continuing education credit awarded by the UHV and the Texas Education Agency and 2) receive a $500.00 stipend upon completion of the workshops and associated activities. Participants will complete a pre-workshop survey and post-workshop survey to assist in assessing the benefits of the project and improve future efforts to promote water conservation.

The facilitator and assisting professionals will conduct the professional development workshops during June 2024 between the hours of 9:00AM to 4:00PM at the following locations: the Wetland Education Center located at the INVISTA Victoria Plant Wetland in Victoria County, the Riverside Park in the City of Victoria, the Clements Ranch in Victoria County, and UHV Campus in the City of Victoria.

The facilitator and assisting professionals will develop and submit a summary report of the professional development project to the VCGCD and cooperating entites, within 90 days of the conclusion of the workshops. The report will include a summary of the participants, the activities and exercises completed, the pre-workshop and post-workshop surveys, and an assessment of the surveys.

The VCGCD will facilitate the project by providing staff to coordinate the project, facilitate the workshops, equipment, and supplies. The VCGCD will provide water test kits, aquifer kits, and 3-dimensional models of an aquifer and a river watershed for use during the workshops.

The UHV will support the project by providing staff to support the workshops, access to facilities, equipment, and supplies. The VCGCD will reimburse the UHV for transportation costs and wages of student research lab assistants.

The VISD will support the project by providing staff to support the workshops, access to facilities, equipment, and supplies.

The UHV will incur the expenses related to providing transportation and wages for student research lab assistants through the administration of the project. The VCGCD will reimburse the UHV for these expenses.

The following schedule identifies the expenses to be incurred by the VCGCD.

Description	Unit Costs	Units	Total Costs
Stipends – Participants	$500.00	10	$5,000.00
Equipment - Sand & Gravel Simulator with Rainmaker by Creative Labworks, Inc.	$1,800.00	2	$3,600.00
Equipment - Stormwater Floodplain Simulation System by Ward's Science	$1,800.00	2	$3,600.00
Supplies - Well Drillers Master Water Test Kits by Sensafe	$250.00	2	$ 500.00
Supplies - Awesome Aquifer Kit by Groundwater Foundation	$50.00	12	$ 600.00
Supplies - Meals	$20.00	40	$ 800.00
UHV Reimbursement - Transportation for Daily Shuttle Services	$1,000.00	2	$2,000.00
UHV Reimbursement - Wages of UHV Student Research Lab Assistants	$15.00	96	$1,440.00
		Total	$17,540.00

The proposal does not assign a cost to the valuable contributions of time to be made by Teresa LeSage-Clements of UHV, Dmitri Sobolev of UHV, John Snyder of VISD, Tim Andruss of VCGCD, or the administrative staff members of the cooperating entities. Furthermore, the proposal does not assign a cost to the valuable contributions made by the UHV, the City of Victoria, the VISD, the INVISTA Victoria Plant Wetland, or the Clements Ranch for providing access to facilities to be used during the workshops.

Appendix A: Workshop Descriptions

Workshop 1 - The activities and exercises of this workshop will focus on the processes and mechanics of the hydrologic cycle and the impact on water resources. Participants will receive a presentation that explains and demonstrates the water cycle using physical, 3-dimensional models of an aquifer and a river watershed. Participates will complete an exercise using the models of an aquifer and a river watershed to simulate hydrologic processes such as precipitation, infiltration, runoff, and water storage.

- Activity 1.1: Hydrologic Cycle and Water Resources (Location: Wetland Education Center)
    - Exercise 1.1 – Hydrologic Cycle using Physical Models of Watersheds and Aquifers
        - Simulation of Precipitation
        - Simulation of Storm Water Runoff and River Flow
        - Simulation of Infiltration and Aquifer Recharge
        - Simulation of Surface Water and Groundwater Interactions
    - Exercise 1.2 – Assemble and Use a Basic Aquifer Model

Participants will travel to three water resource sites to develop a first-hand appreciation for water resources and the settings in which those resources exist and the context in which each is accessed and used. Participants will collect water samples at each site to facilitate the activities and exercises to be completed during Session 2.

- Activity 1.3: Lake/Wetlands Site Visit (Location: Wetland Education Center or Clements Ranch)
    - Exercise 1.3 – Lake/Wetlands Water Sample Collection
        - Observation of Hydrologic Processes
        - Collection of Surface Water Sample using Field Protocols
- Activity 1.4: River Site Visit (Location: Riverside Park)
    - Exercise 1.4 – River Water Sample Collection
        - Observation of Hydrologic Processes
        - Collection of Surface Water Sample using Field Protocols
- Activity 1.5: Water Well Site Visit (Location: Clements Ranch)
    - Exercise 1.5 – Water Well Groundwater Sample Collection
        - Observation of Hydrologic Processes
        - Collection of Groundwater Sample using Field Protocols

Workshop 2 - The activities and exercises of this workshop will focus on exploring the potential risks to and the impacts on water resources and approaches to mitigating those risks and conserving water resources. Participants will receive presentations and demonstrations that explain how the development and use of water resources and pollution could negatively impact the quality and character of those resources. Topics of discussion will include aquifer depletion, subsidence, saltwater intrusion, pollution migration and aquatic habitat impacts, and water conservation. Participants will complete exercises using the models of an aquifer and a river watershed to simulate aquifer depletion, types of pollution and related impacts, and groundwater conservation and preservation such as aquifer storage and recovery, brackish groundwater development, and conjunctive use of groundwater and surface water.

- Activity 2.1: Risks to Water Resources
    - Exercise 2.1 – Aquifer Depletion and Pollutant Migration in Aquifers and Watersheds
        - Simulation of Drawdown and Aquifer Depletion

        - Simulation of Saltwater Intrusion
        - Simulation of Pollution Migration across a Watershed
        - Simulation of Pollution Migration in an Aquifer
    - Exercise 2.2 – Water Sample Analysis and Comparison
        - Measurement of Basis Water Quality Characteristics
        - Measurement of Select Analytes
        - Comparison of Lake Water, River Water, and Groundwater
- Activity 2.2: Water Resource Conservation Approaches and Technology
    - Exercise 2.3 – Groundwater Conservation and Preservation
        - Simulation of Aquifer Storage and Recovery
        - Simulation of Brackish Groundwater Development
    - Exercise 2.4 – Technology and Science in Water Conservation
        - Simulations of Groundwater using Artificial Intelligence/Machine Learning (AI/ML)

Appendix B: TEKS Matrix

The following chart illustrates the alignment of relevant TEKS, by school grade and class, to the activities and exercises of each workshop.

TEKS	Activity 1.1	Activity 2.1	Activity 1.2	Activity 1.3	Activity 1.4	Activity 2.2
Science, Grade 6						
112.18(b)(1)(B)	X	X	X	X	X	X
112.18(b)(3)(B)	X	X				X
112.18(b)(3)(C)	X	X				X
Science, Grade 7						
112.19(b)(1)(B)	X	X	X	X	X	
112.19(b)(8)(C)		X				X
Science, Grade 8						
112.20(b)(1)(B)	X	X	X	X	X	
112.20(b)(3)(B)	X	X				
112.20(b)(3)(C)	X	X				
High School Aquatic Science						
112.32(c)(1)(B)	X	X	X	X	X	
112.32(c)(4)(A)	X	X	X	X	X	
112.32(c)(4)(C)			X	X	X	
112.32(c)(5)(B)			X	X	X	X
112.32(c)(7)(A)	X	X				X
112.32(c)(12)(A)	X	X				X
112.32(c)(12)(E)						X
High School Environmental Systems						
112.37(c)(1)(B)	X	X	X	X	X	
112.37(c)(4)(C)	X	X	X	X	X	
112.37(c)(5)(B)	X	X	X	X	X	X
112.37(c)(5)(C)	X	X	X	X	X	
112.37(c)(5)(D)	X	X	X	X	X	
112.37(c)(5)(E)	X	X	X	X	X	
112.37(c)(9)(A)		X	X	X	X	
112.37(c)(9)(B)		X	X	X	X	X
112.37(c)(9)(C)		X	X	X	X	X