Workshop on Coastal Flood Modeling with *WMS* and *GSSHA*

August 30 & 31, 2022

Hybrid In Person/Virtual Training sponsored by the H&H Set Program

Web meeting information:
Join by video
URL: **https://usace1.webex.com/meet/hwai-ping.cheng**
Meeting Number: **199 630 5824**
Join by phone
+1-844-800-2712 US Toll Free
+1-669-234-1177 US Toll
Access code: **199 630 5824**

WMS Software Download:
https://www.aquaveo.com/downloads
Download Version 11.1
Security String: **LDMURZM**

Course Materials:
WMS tutorials are available here: https://www.aquaveo.com/wms-learning-tutorials
Additional materials will be posted on the GSSHA wiki home page:
https://www.gsshawiki.com
Additional materials may be provided directly to participants at the beginning of the course

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Students will learn the basics of:

- *Gridded Surface Subsurface Hydrologic Analysis* (*GSSHA*) model, developed at the U.S. Army Corps of Engineers, Engineering Research and Development Center and the University of Wyoming
- *Dept. of Defense Watershed Modeling System* (*WMS*), developed by Aquaveo LLC
- Spatial data needed to estimate distributed *GSSHA* model parameters, including data requirements, basics of *GSSHA/WMS* and how to find and use spatial geographic data to develop GSSHA models using the *WMS Hydrologic Model Wizard*.
- How to use *GSSHA* to analyze coastal flooding

The *GSSHA* model with *WMS* support constitutes a complete watershed analysis system that can be used for a variety of hydrologic science and engineering computation and design evaluation, such as flood simulation, hydrologic impacts of land use change, best management practice design, and testing of flood mitigation measures.

Course Layout:
Through a combination of lectures and experiential applications, the course features the spatially distributed modeling components of this system. The course begins with an overview of the capabilities of the *WMS* to ensure maximum benefit from the hands-on

portions of the class. Attendees will learn to use *WMS* to set up *GSSHA* models that include overland flow, infiltration, distributed rainfall, hydraulic structures, flood modeling, and flood inundation mapping.

Outcome:
Having completed this course, attendees will gain a working knowledge of the U.S. Army Corps of Engineers (USACE), Engineer Research and Development Center (ERDC) *GSSHA* model that is supported by the Watershed Modeling System (*WMS*) graphical user interface software. Attendees will also understand how, when, and why to apply the tools to specific studies as well as understand input data requirements. This class provides users with enough background to easily deploy a sophisticated hydrological model. This course will specifically focus on the development and use of GSSHA to model hydrology and hydraulics contributing to coastal flooding problems.

Who Should Attend?
The course is intended for anyone interested in watershed hydrology, including flooding, and flood control measures, especially in the coastal zone. Experience with hydrologic modeling and numerical methods are a plus, but not required. Some college-level background in hydrologic science and/or engineering is required.

Instructors: This short course will be taught by the *GSSHA* developers Drs. Charles W. Downer and Aaron R. Byrd USACE-ERDC, and *GSSHA* application expert Mr. Stephen J. Turnbull USACE-ERDC. Attendees will be assisted by *WMS* expert Mr. Clay Lahatte USACE-ERDC.

Requirements: Attendees will provide their own computer. Licenses for Watershed Modeling System11.1 software will be provided (see download information in the heading section of this document).

Tutorial Downloads:
Students shall download most of the tutorials from: http://www.aquaveo.com/software/wms-learning-tutorials

PDFs of the presentations can be downloaded from the main page of GSSHA wiki at: http://gsshawiki.com/Gridded_Surface_Subsurface_Hydrologic_Analysis

Fees, access, other: This course is sponsored by the USACE H&H Set Program and is offered free of charge. The course is available to all USACE and DoD personnel. The course may be attended by others with permission of the lead course instructor. Access to the physical course may be restricted. The course will be physically conducted at the Coastal and Hydraulics Laboratory at the US Army Waterways Experiment Station, 3909 Halls Ferry Rd, Vicksburg, MS. The class will be held in the CHL Conference Room, Room 200. Students should enter the station at the front gate on Halls Ferry Rd, where they will check in with Security and proceed to the PAO office where they will be greeted by one of the course instructors. Travel funds may be available for USACE and DoD personnel.

Vicksburg is an historic town of about 50,000 residents located on the Mississippi River. The closest airport is in Jackson, MS, about a 45-minute drive away. Accommodations include several hotels and B&Bs that can be acquired at per diem. Students will provide their own meals. Breakfast and lunch are available on station, as well as at several chain, regional, and local restaurants outside of the station. Contact Steve Turnbull for additional information, stephen.j.turnbull@usace.army.mil.

Due to possible DoD travel restrictions associated with the global COVID-19 pandemic and to reach the widest possible audience, the course is offered virtually as well.

PDHs are awarded based on contact hours. There are 16 possible contact hours.

Information: For additional information about the course and to sign up for the course contact Charles W. Downer charles.w.downer@usace.army.mil.

Schedule: The basic course is two days.

Day 1 – Introduction to *WMS* and *GSSHA* and Building a Basic *GSSHA* Model with the Hydrologic Wizard
Day 2 – Flood simulations with *GSSHA*

A detailed itinerary follows.

DETAILED SCHEDULE

All Times CDT (UTC-5)

Day 1 Tuesday, August 30, 2022.

Introduction to GSSHA and Building a Basic GSSHA Model with the Hydrologic Wizard

Start	Finish	Duration	Activity	Topic
08:30	08:45	15	Greeting	Introduction of Instructors/Attendees
08:45	09:30	45	Lecture	Introduction to Hydrologic Modeling – Presentation 1
09:30	10:15	45	Lecture	Introduction to *GSSHA* – Presentation 2
10:15	10:30	15	Break	
10:30	10:45	15	Lecture	*WMS* overview using digital spatial data – Presentation 4
10:45	11:00	15	Lecture	Images and projections – Presentation 5
11:00	12:00	60	Workshop	Complete 3 Tutorials: IntroductionWMS.pdf, Images-WMS.pdf, and ProjectionsWMS.pdf
11:25	12:00	30	Demo	Using the *WMS Hydrologic Model Wizard*
12:00	13:00	60	Lunch	
13:00	13:15	15	Demo	Using the WMS Hydrologic Model Wizard
13:15	13:35	20	Lecture	Watershed delineation using DEMs – Presentation 7
13:35	13:45	10	Lecture	Basic model setup in *WMS* – Presentation 9
13:45	14:05	20	Lecture	Overland flow modeling in *GSSHA* – Presentation
14:05	14:35	30	Workshop	GSSHA-InitialSetup.pdf (GSSHA Initial Overland Flow Model Setup)
14:35	15:00	25	Lecture	Stream routing – Presentation 12A
15:00	15:15	15	Lecture	Assigning channel properties with *WMS* – Presentation 12B
15:15	15:25	10	Break	
15:25	15:50	30	Workshop	GSSHA-StreamFlow.pdf
15:50	16:10	15	Lecture	Developing index maps with spatial data – Presentation 10
16:10	16:40	30	Lecture	Modeling infiltration – Presentation 11A
16:40	16:50	10	Lecture	Using *WMS* to develop infiltration inputs – Presentation 11B
16:50	17:50	60	Workshop	Complete 2 Tutorials: GSSHA-Infiltration.pdf, GSSHA-Roughness.pdf

Day 2, Wednesday, August 31, 2022
Flood Modeling with GSSHA

Start	Finish	Duration	Activity	Topic
08:30	08:45	15	Recap of 1st day	
08:45	09:00	15	Lecture	Hydraulic structures and embankments – Presentation 15
09:00	09:30	30	Lecture	Distributed rainfall – Presentation 14
09:30	10:00	30	Lecture	Flood inundation modeling – Pres 20&21
10:00	10:15	15	Break	
10:15	11:15	60	Workshop	GSSHA-Overland-Flow-Hydrograph-BC.pdf, GSSHA-Overland-Flow-Variable-Stage-BC.pdf
11:15	11:45	30	Lecture	Compound flooding
11:45	13:00	75	Lunch	
13:00	13:30	30	Presentation	Hurricane Sandy Model
13:30	14:30	60	Workshop	Hurricane Sandy
14:30	14:45	15	Break	
14:45	15:15	30	Presentation	Buffalo Bayou Model
15:15	16:15	60	Workshop	Buffalo Bayou
16:15	16:30	15	Lecture	Additional resources – Presentation 23
16:30	16:45	15	Course wrap up	