

# Agenda

*Presented by Gregory H. Nail, PhD, PE*

## Introductions and Exploring Open Channel Hydraulics

Introduction and overview      Exploring open channel hydraulics

## Steady One-Dimensional Open Channel Hydraulics Background and Theory

Conservation of energy: steady one-dimensional  
Conservation of momentum      Conservation of energy: energy losses  
Conservation of energy: computational enhancements  
Bernoulli's Equation      Computer based analysis and computations

## HEC-RAS and Water Surface Profiling

Required data and boundary conditions  
Backwater and forewater calculations      Bridge and culvert modeling

## History and Development of HEC-RAS

### Demonstration 1 – Building a HEC-RAS Model without GIS

HEC-RAS user interface  
Building a hydraulic model without geo-referenced data  
Steady flow computational simulation      Viewing of results  
Trapezoidal channel example

### Demonstration 2 – GIS Basics

Introduction and overview      Geographic versus projected coordinate systems  
Raster versus Vector Files      ArcMap versus ArcCatalog  
ArcMap interface basics      Digital elevation model  
Other files

### Demonstration 3 – Building a HEC-RAS Model with GIS

RASMapper interface and the projection file  
Digital elevation models and geometry creation  
Building a hydraulic model with geo-referenced data  
Steady flow computational simulation      Display and interpretation of results

### Demonstration 4 – Typical HEC-RAS River Reach and Mixed Flow

Subcritical flow      Mixed flow

### Demonstration 5 – Typical HEC-RAS Bridge Model

Cross section locations      Expansion and contraction coefficients  
Implementing the bridge      Steady flow simulation  
Viewing and interpreting results

### Demonstration 6 – Typical HEC-RAS Culvert Model

Cross section locations      Implementing the culvert  
Steady flow simulation      Viewing and interpreting results

### Demonstration 7 – Introduction to 2D-Unsteady Flow Modeling

2D-unsteady flow versus 1D-steady flow  
Geometry and computational mesh      Boundary conditions  
2D-unsteady flow simulation      Viewing and interpreting results

## Introduction to HEC-RAS Modeling

Lafayette, LA - Thursday, May 14, 2020

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## Learning Objectives

### You'll be able to:

**Discuss** the principles of open channel hydraulics, including conservation of momentum, conservation of energy and Bernoulli's Equation.

**Discuss** the history and development of HEC-RAS and get tips on building models with and without GIS.

**Learn** about modeling bridges in HEC-RAS, using expansion and contraction coefficients and steady flow simulation.

**Create** a typical HEC-RAS culvert model using steady flow simulation.

**Compare** 2D unsteady flow to 1D steady flow, and get an introduction to 2D modeling.



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# Introduction to HEC-RAS Modeling

*Lafayette, LA - Thursday, May 14, 2020*



**Understand** the history and development of HEC-RAS

**Explore** open channel hydraulics background and theory

**Learn** about building a HEC-RAS model with and without GIS

**Review** GIS basics

**Discuss** typical HEC-RAS river reach and mixed flow

**Learn** about typical HEC-RAS bridge and culvert models

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