

## 3-Day: Water Resources Applications for Advanced

### Overview

This course covers GIS applications and modeling for water resources. Upon completion an attendee will know the fundamentals for data structure, modeling and model integration in GIS for water and watershed related applications, and explore how these applications work together to provide a complete GIS solution.

This course will introduce fundamentals of modeling for water related applications on Day 1 followed by hands-on experience working with water related data and models on Day 2. Day 3 explores advanced data mining strategies.

### Prerequisites and Recommendations

Participants should know how to use MS windows software and Beginner workshop called 'Water resources Applications for Beginner'. This 3-day course is for those who have completed this Beginner workshop and know how to use ArcGIS including: ArcMap™, ArcCatalog™, and ArcToolbox™.

### Module I: Review of Raster Data, Analysis and Applications

#### Learning Objectives

- Suitability Analysis
- Edge Effect Analysis
- Change Detection Analysis
- Summarizing Raster Data
- Review of Raster Algebra
- Data Integration

Case Study: Working with Raster Data and Map Algebra

Case Study: Find a Potential Reservoir

Case Study: Working with Elevation data

Case Study: Water Quality and Data Integration

### Module II: Introduction to Modeling

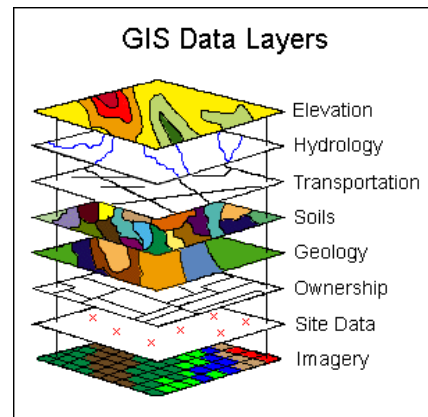
#### Learning Objectives

- Fundamentals of Watershed Delineation
- Data Quality, Errors and Uncertainty
- Introduction to Modeling

### Module III: Getting Started with Watershed Delineation

#### Learning Objectives

- Introduction to DEMs and Flow calculation
- Introduction to Watershed Delineation with ArcHydro
- Introduction to Watershed Delineation with ArcGIS



Case Study: Watershed Delineation with Archydro

Case Study: Application of DEMs for water resources

#### **Module IV: Watershed Characterization**

Learning Objectives

- Applications of Watershed Characterization using soils, slope and landuse

Case Study: Characterization of Alafia Watershed

Case Study: Urbanization within a Watershed

Case Study: Examining Spatio-Temporal Relationships of Landuse Change, Population Growth and Water Quality

#### **Module V: Multi-Criteria Decision Making (MCDM)**

Learning Objectives

- Integration of MCDM with GIS with examples
  - MCDM Model Coupling for Assessing Human Health Risks
  - Performing Logistic Regression in R and
  - Incorporating the Model into ArcGIS

Case Study: Assessment of Spatial Distribution of Groundwater Vulnerability to Pathogens

Case Study: Assessment of Aquifer Vulnerability Using the DRASTIC Methodology

#### **Module VI: Advanced Data Mining Strategies**

Learning Objectives

- Theory & Application Logistic Regression
- Theory & Application of AI tools such as fuzzy logic, artificial neural networks

Case Study: Performing Logistic Regression in R and Incorporating the Model into ArcGIS

Case Study: Incorporating Decision Maker's Uncertainty Using Fuzzy Logic

Case Study: Performing Neural Networks in R and Incorporating the Model into ArcGIS

