

# Water and the Watershed

Davis, California

**Purpose:** The primary objective of the course is to provide participants with a broad background for watershed planning and management. Students will gain an understanding of 1) the Corps' approach to watershed projects, including history, policy, and regulations; 2) the physical nature of water in the watershed (area or land that drains to a common outlet); 3) the collaborative nature of watershed planning and the different roles therein, and 4) some of the conceptual, technical, and institutional tools available for watershed planning and management.

## Monday, 14 November

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| 8:00 – 9:00 a.m.   | <b>Welcome, Introductions, and Course Preliminaries</b>   |
| 9:00 – 9:15 a.m.   | Break   |
| 9:15 – 10:45 a.m.  | 1.1 Lecture <b>History and Evolution of Watershed Resources Management</b><br><br>The watershed perspective and approach are becoming increasingly important in determining the direction of Civil Works (CW) Program activities for improving watershed management and meeting clean water goals. Presentation focuses on the history and evolution of the Corps' watershed perspective. The Watershed Principles, which are associated with the perspective, will also be introduced. |
| 10:45 – 11:45 a.m. | 1.2 Lecture <b>Watershed View and Emerging Trends from HQUSACE</b><br><br>This lecture covers the latest trends and emerging directions on delivering enduring, essential water resources solutions including lessons learned from watershed assessments of 2006. The presentation also discusses the Corps' Strategic Plan and ongoing partnerships with other Federal, nonfederal, and nongovernmental agencies.  |
| 11:45 – 1:00 p.m.  | Lunch   |
| 1:00 – 1:45 p.m.   | 1.3 Lecture <b>Watershed Authorities, Policies and Procedures</b><br><br>This lecture covers the latest information on Watershed authorities, policies and procedures including fundamentals from EC 1105-2-411, Watershed Plans; the new watershed planning process in Planning Bulletin 2016-03, Watershed Studies; and trends in authorizations and appropriations.  |
| 1:45 – 3:15 p.m.   | 1.4 Lecture <b>Watershed View from Corps Regulatory</b><br><br>For many actions taken in the watershed, Regulatory is where the "rubber hits the road." The Corps is responsible for permitting of land use changes for wetland areas under the purview of the Clean Water Act. Corps Regulators are faced with challenges essential to the well-being of watersheds, including dealing with the  |

cumulative effects of small actions.

3:15 – 3:30 p.m. Break

3:30 – 4:00 p.m. 1.5 Lecture **Introduction to the Watershed Analysis Tool (HEC-WAT)**

To address the goal of performing watershed and/or system-wide studies, the Hydrologic Engineering Center has created the Watershed Analysis Tool (HEC-WAT) which streamlines and integrates the tools used during the analytical process, uses tools that are commonly applied by multi-disciplinary teams, prompts a team approach, and improves coordination and communication across Project Delivery Teams (PDT). An overview of HEC-WAT will be presented.

4:00 – 5:00 p.m. 1.6 Lecture **Occurrence, Movement, and Storage of Water**

An overview of the water components of a watershed and how they are affected by changes to the watershed.

## Tuesday, 15 November

8:00 – 8:35 a.m. 2.1 Lecture **Agency Perspective: NRCS Views and Methods for Watershed Planning and Management**

The Natural Resources Conservation Service (NRCS) provides leadership in partnership efforts to help people conserve, maintain, and improve our natural resources and environment. Through its strategic plans, NRCS hopes to improve the harmony between people and land by preventing land damage, restoring land where damage has occurred, and maintaining long-term conservation principles.

8:35 – 9:10 a.m. 2.2 Lecture **Agency Perspective: USEPA Views and Methods for Watershed Planning and Management**

The mission of the Environmental Protection Agency (EPA) is to protect human health and to safeguard the natural environment — air, water, and land — upon which life depends. For 30 years, EPA has been working for a cleaner, healthier environment for the American people. EPA is concerned with watershed preservation and restoration and recently announced a Watershed Protection Initiative.

9:10 – 9:45 a.m. 2.3 Lecture **Agency Perspective: USGS Views and Methods for Watershed Planning and Management**

The Geological Survey (USGS) is a world leader in the natural sciences and serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life. As the primary Federal science agency for water-resource information, USGS monitors the quantity and quality of water in the Nation's rivers and aquifers, assesses the sources and fate of contaminants in aquatic systems, develops tools to improve the application of hydrologic information, and ensures that its information and tools are available to all potential users.

9:45 – 10:00 a.m.	Break	
10:00 – 10:35 p.m.	2.4 Lecture	<p><b>Agency Perspective: TNC Views and Methods for Watershed Planning and Management</b></p> <p>Since 1951, The Nature Conservancy has been working to protect and preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. TNC works closely with communities, government agencies, and businesses, and to date has protected more than 103 million acres of valuable lands and waters worldwide. TNC is involved in watershed protection and restoration efforts across the U.S. and globally through extensive place-based to policy initiatives that benefit people and nature.</p>
10:35 – 11:10 p.m.	2.5 Lecture	<p><b>Agency Perspective: USFWS Views and Methods for Watershed Planning and Management</b></p> <p>The Fish and Wildlife Service (USFWS) leads federal efforts to protect the wildlife resources of the United States. USFWS manages refuges, scripts and enforces regulatory actions, and provides biological expertise to planning studies of all scopes. As nature and natural processes are related to watershed dynamics, USFWS supports watershed approaches to planning and management and emphasizes this philosophy in pursuit of effective wildlife stewardship.</p>
11:10 – 12:15 p.m.	2.6 Lecture	<p><b>Round-Table Discussion of Agency Perspectives</b></p> <p>Representatives from USACE, USEPA, NRCS, USGS, USFWS, and TNC will participate in a group discussion designed to clarify and contrast agency approaches to watershed investigations.</p>
12:15 – 1:30 p.m.	Course Photo and Lunch	
1:30 – 2:30 p.m.	2.7 Lecture	<p><b>Intro to the Ecosystem Functions Model (HEC-EFM)</b></p> <p>The EFM is a tool that uses hydrologic and hydraulic input to help make decisions about biological responses. An overview of the Ecosystem Functions Model (EFM) will be presented.</p>
2:30 – 2:45 p.m.	Break	
2:45 – 5:00 p.m.	2.8 Workshop	<p><b>Using EFM to analyze Eco-Hydro Relationships</b></p> <p>An overview of the Ecosystem Functions Model (EFM) will be presented. Class exercise to create and assess EFM relationships that link hydrology and ecology.</p>

Wednesday, 16 November

- 8:00 – 11:30 a.m. 3.1 Field Trip **Working in Partnership: Yolo Wetlands Restoration**
- A partnership in water resources from a local perspective. Field trip will be preceded by an introduction to the Yolo Basin project.
- 11:30 – 1:30 p.m. Lunch and Travel
- 1:30 – 4:30 p.m. 3.2 Field Trip **Resource Management on the Lower American River: Nimbus Fish Hatchery and The Water Forum**
- Field trip to see the American River salmon run and operations of the Nimbus fish hatchery. Visit will conclude with a lecture by The Water Forum about resource management and ongoing partnerships for better stewardship of the Lower American River.

Thursday, 17 November

- 8:00 - 8:45 a.m. 4.1 Lecture **Integrating Flood Management for Multiple Benefits: Mississippi, Sacramento**
- The Army Corps' system-scale management of the 2011 flood on the Mississippi River demonstrated the value of using floodplains to reduce flood risk. The Yolo Bypass demonstrates that floodplains can provide many more benefits beyond flood-risk reduction. Other multipurpose projects will be discussed including the integration of reservoir and floodplain management.
- 8:45 – 9:45 a.m. 4.2 Discussion **System-scale Approach to Minimizing Flood Risk**
- Facilitated discussion of opportunities for multipurpose projects and system-scale management to minimize flood risk and benefit the environment.
- 9:45 – 10:00 a.m. Break
- 10:00 – 11:00 a.m. 4.3 Lecture **The Hydrologic Regime – A Master Variable for River and Stream Ecological Integrity**
- The hydrologic regime is a key ecological process which, if maintained within its natural range of variability, helps support healthy freshwater ecosystems and the valuable services they provide. This session will offer some perspectives on freshwater ecosystem health as well as insights on linkages to hydrologic regime.
- 11:00 – 12:15 p.m. 4.4 Workshop **Small Group Exercise (Ecosystem Flow Prescriptions)**
- The audience will be divided into small groups for a hands-on exercise in defining environmental flow requirements for different ecosystem components and addressing the challenge of developing an integrated environmental flow prescription. HEC-RPT (Regime Prescription Tool) will be used to help draft flow requirements.

- 12:15 – 1:15 p.m. Lunch
- 1:15 – 1:45 p.m. 4.4 Workshop **Small Group Exercise Wrap-up**
- The small groups will present their environmental flow requirements and we will examine integration of the flow recommendations for the different ecosystem components.
- 1:45 – 2:15 p.m. 4.5 Lecture **Ecologically Sustainable Water Management (ESWM)**
- An introduction to the six-step ESWM process will be provided, along with a discussion of its application to specific rivers. An emphasis will be given to how environmental flow prescriptions have been developed and are being implemented through changed operations of Corps dams under the Sustainable River Project, an ongoing nation-wide partnership between the Corps and The Nature Conservancy.
- 2:15 – 4:15 p.m. 4.6 Lecture **Sculpting the Watershed**
- Principles of geomorphology and other natural processes that shape the watershed.
- 4:15 – 5:15 p.m. 4.7 Lecture **Climate Change: Planning for a Resilient and Sustainable Future**
- Planners, engineers, and economists are increasingly required to account for climate variability in technical analyses of projects such as those designed for flood risk reduction in river and coastal systems, water supply provision, and protection and restoration of ecosystem health and services. Challenges remain, but emerging methods and tools can help guide resilient and sustainable solutions. This presentation provides an overview of one such tool and case studies of its application, with time for discussion.

Friday, 18 November

- 8:00 – 8:45 a.m. 5.1 Lecture **Regional and Basin-Wide Conservation Assessments**
- Existing scientific information and knowledge and GIS and other tools are being used to help guide conservation efforts across landscapes toward the places and actions that will be most effective in sustaining ecosystems and the services they provide society. This lecture provides an overview of regional and basin-wide assessments, with time for discussion.
- 8:45 – 9:00 a.m. Break
- 9:00 – 10:30 a.m. 5.2 Lecture **Case Study Demonstrating the Use of Watershed Principles**
- Presentation discusses a watershed project, known as the Central Valley Integrated Flood Management Study (CVIFMS), which is a follow up to the Sacramento and San Joaquin River Basins Comprehensive Study. The Comp Study was a General Investigation at the Sacramento District that

sought to reduce flood damages and restore ecosystems in the Central Valley, California. This lecture provides an overview of the study and details how the teams employed a watershed approach in planning and technical elements.

10:30 – 11:15 a.m. Course Summary and Critique

11:15 – 12:00 p.m. 5.3 Lecture **Requested Model Demos (optional)**

Opportunity to see more of the software tools used during the course or to explore other HEC tools. Demos provided upon request.