

Risk Analysis for Flood Damage Reduction Studies

Davis, California

Course Objectives

The Risk Analysis for Flood Damage Reduction Studies course presents risk concepts and analysis methods required by present Corps guidance in the study of flood damage reduction projects. The course objective is to enable participants to readily adapt the methods to specific studies after successfully completing the course. The course emphasizes policy issues, statistical analysis concepts, and the implementation of risk and uncertainty methods for sizing and evaluating flood damage reduction projects. Workshops enable participants to obtain hands-on experience in applying risk concepts.

The course is intended for persons who are presently or will soon be actively involved in risk analysis for flood damage reduction studies. Participants should have a minimum of two years experience in hydrologic, engineering, economics, project planning, or life cycle study management.

Monday

- 8:00 - 8:45 a.m. **INTRODUCTION and PRETEST**
- 8:45 - 9:00 a.m. Break
- 9:00-10:15 a.m. 1.1 Lecture: **OVERVIEW OF RISK ANALYSIS FOR FLOOD DAMAGE REDUCTION PROJECTS**
- An overview of the concepts of risk analysis as applied to performing flood damage reduction studies will be given. These include the study configuration, hydrologic engineering, and economics. The interrelationship of discharge-probability, stage, and damage functions and their uncertainties will be discussed. Plan formulation and evaluation within the risk analysis framework will also be reviewed.
- 10:15-11:00 a.m. 1.2 Lecture: **RISK ANALYSIS - HQ PERSPECTIVE**
- A presentation of current risk analysis philosophy and application from HQ perspective. A discussion on what might be in the future for risk analysis.
- 11:00-12:00 a.m. 1.3 Lecture: **BASIC STATISTICAL ANALYSIS**
- Random variables, sampling, and definitions of risk and uncertainty will be described. Emphasis is on defining statistical parameters, probability density functions, and cumulative functions.
- 12:00 - 1:00 p.m. Lunch
- 1:00 - 2:30 p.m. 1.4 Lecture: **STATISTICS IN RISK ANALYSIS**
- The statistical concepts used in risk analysis for flood damage studies will be presented. These include median and expected values of analytical functions used for evaluation and Monte Carlo simulation.
- 2:30 - 2:45 p.m. Break
- 2:45 - 4:00 p.m. 1.5 Workshop: **USING THE HEC-FDA PROGRAM**
- Participants use the HEC-FDA computer program to define a new study, input study information, and configuration data (Streams, Damage Reaches, Analyses years, and Plans) for the Bear Creek workshop study.
- 4:00 - 5:00 p.m. 1.6 Lecture: **BACKGROUND POLICY AND REGULATIONS FOR RISK ANALYSIS**
- A description of the present HQUSACE policy, risk analysis requirements, and ongoing Corps activities will be made. An overview of ER 1105-2-101 on Risk-Based Analysis Framework for Performing Flood Damage Reduction Studies will be presented.

Reading Assignment (download ERs from USACE publication library).

ER 1105-2-101, Risk-Based Analysis for Evaluation of Hydrology/Hydraulics, Geotechnical Stability, and Economics in Flood Damage Reduction Studies, March 1996 (TAB 1.2).

EM 1110-2-1619, "Risk-based Analysis for Flood Damage Reduction Studies," March 1996

Prior to Monday:

ER 1105-2-101,
Chapters 1-3 of EM 1110-2-1619.

Prior to Tuesday:

Chapters 4-6 of EM 1110-2-1619.
Chapters 1-6 of HEC-FDA User's Manual.

Tuesday

- 8:00 - 9:00 a.m. 2.1 Lecture: **DISCHARGE- AND STAGE-EXCEEDANCE PROBABILITY RELATIONSHIP UNCERTAINTY DERIVATION**
- A presentation of approaches defined in ER 1105-2-101 for estimating the uncertainty of discharge- and stage- exceedence probability relationships will be made. The effects of projects that modify these relationships will be discussed.
- 9:00 - 9:15 a.m. Break
- 9:15-10:15 a.m. 2.2 Lecture: **STAGE-DISCHARGE RELATIONSHIP UNCERTAINTY DERIVATION**
- Approaches defined in ER 1105-2-101 for estimating the uncertainty of the stage-discharge relationships will be presented. Emphasis will be on estimating the uncertainty associated with each approach for gaged and ungaged locations.
- 10:15 - 11:30 p.m. 2.3 Lecture: **STAGE-DAMAGE RELATIONSHIP UNCERTAINTY DERIVATION**
- Approaches defined in ER 1105-2-101 for estimating the uncertainty of the stage-damage relationships will be presented. The corresponding effects of projects that modify the stage-damage relationship will be discussed.
- 11:30-12:30 p.m. Lunch
- 12:30-1:00 p.m. **REVIEW OF RISK COURSE, DAYS 1 and 2**
- 1:00 - 2:15 p.m. 2.4 Lecture: **OVERVIEW OF HEC-FDA FUNCTIONALITY**
- A presentation of the basic data entry functions within HEC-FDA will be made. A demo of the program will be given to help give the student an understanding of how all the different information provided in the preceding presentations fits together within HEC-FDA. This lecture/demo will familiarize the student with HEC-FDA functionality, which will help them complete the upcoming workshops.
- 2:15 - 2:30 p.m. Break
- 2:30 - 5:00 p.m. 2.5 Workshop: **BEAR CREEK RELATIONSHIP UNCERTAINTIES ANALYSIS**
- The study setting and data for the Bear Creek project used in the remaining workshops will be presented. Participants will evaluate the uncertainties of specific discharge-probability, stage-discharge, and stage-damage relationships during concurrent H&H and economics sessions.

Reading Assignment

Prior to Wednesday:

Chapters 7-8 of EM 1110-2-1619.

Thursday

8:00 - 10:15 a.m. 4.1 Workshop: **LEEVE ANALYSIS**

The participants will evaluate the economic feasibility and project performance of alternative levee sizes. Recommendations as to the "best project" will be made.

10:15 - 10:30 a.m. Break

10:30 - 10:45 a.m. **LEEVE ANALYSIS WORKSHOP REVIEW**

10:45 - 12:00 p.m. 4.2 Lecture: **CASE STUDY**

This case study will present a risk-analysis study on the Lower Sacramento River.

12:00 - 1:00 p.m. Lunch

1:00 - 1:30 p.m. 4.3 Lecture: **FDR CENTER OF EXPERTISE**

This presentation on the Corps' Center of Expertise for Flood Damage Reduction will provide students with information on what the Center of Expertise provides and how they can take advantage of it.

1:30 - 5:00 p.m. 4.4 Workshop: **PLAN FORMULATION**

Participants will perform risk analysis to formulate and evaluate flood damage reduction plans using HEC-FDA. The workshop will emphasize formulation and evaluation of several flood damage reduction plans for the Bear Creek Project. The plans will include levee only, detention only, and detention with levee.

Friday

8:00 -8:30 p.m. **WORKSHOP REVIEW**

8:30 - 9:30 a.m. 5.1 Lecture: **HEC-FDA/FIA with GIS**

An introduction to HEC's flood impact analysis program (HEC-FIA) will be given. HEC-FIA is a program for analyzing flood damages for a specified event and allocating the damage prevented to projects in the system. Also, GIS techniques for use within HEC-FDA and HEC-FIA will be presented.

9:30 - 9:45 a.m. Break

9:45-10:30 a.m. 5.2 Lecture: **OPEN DISCUSSION ON RISK ANALYSIS**

Discussion on risk analysis issues and procedures will be held.

10:30-11:30 a.m. **POST TEST, CRITIQUE, AND CLOSING**