

Work Plan

Background

El Cajon reservoir was developed as part of the El Cajon hydroelectric Project in order to meet the demand for electric energy. The reservoir is part of the Santiago Hydrologic system, a system capable of a hydroelectric potential of 4,300 MW, more than 60% of that available on the entire Colorado River. El Cajon is second only to Aguamilpa-Solidaridad Station in power and generation. The El Cajon dam and reservoir are located in the state of Nayarit (21°25'41" N, 104°27'14" W), 47 km from the capital, Tepic. Since the low water quality on this stretch of the Santiago River rendered the water nearly useless for industry and consumption, this site was particularly attractive for a large hydroelectric project.

Overview

For this project, a water quality model will be designed for El Cajon reservoir. The El Cajon reservoir presents a variety of environmental issues. Reservoir volume is an important issue in controlling pollutant concentrations. This is especially important for El Cajon reservoir, since the dam has been filling faster than any of the experts had predicted, likely due to the high sediment volumes and solid waste concentrations of the reservoir inflow. Dams constructed in series along the same river decrease the natural self-purification process of the river, so that pollutant concentrations increase with the construction of each new dam. Ecosystems surrounding the Santiago River have also been affected by the construction of El Cajon dam. A secondary issue is the possible increase of greenhouse gases as a result of water usage in the generation of energy.

A second dam along the Santiago River, La Yesca is currently under construction with another dam downstream of the El Cajon dam planned for the near future. The construction of these two dams introduces additional environmental concerns that a model of El Cajon may help address.

Objectives

To develop a hydrologic model for the El Cajon reservoir to be used as a prototype for identifying and evaluating environmental impacts of similar reservoir projects in the future. Special attention should be paid to the stretch of the Santiago River between the La Yesca dam site and El Cajon reservoir as it represents the primary inflow to El Cajon.

General Approach

Researchers and students at ITESO University in Guadalajara (Jaime Severino, Jorge Abraham del Valle and Adan Espejo) will provide much of the data needed to construct the water quality model. Technical knowledge and support will be provided by BYU engineering students Clark Barlow and Oliver Obregon. Teaching assistants Ahmad Salah and Ana Paz will provide special technical expertise.

Schedules

Task	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Establish contact with ITESO clients	X					
Create Team Charter	X					
Create project plan (statement of work)	X	X				
Turn in statement of work		X				
Identify necessary model input	X	X	X			
Obtain necessary model input			X	X		
Preliminary model run				X		
Identify and address model errors				X	X	X
Prepare presentation						X

Resource requirements

- Digital Elevation Maps (DEMs)
- Topographic Maps
- Pollutant Concentration Reports
- Water quantity data (peak flows, etc.)
- Software tools (WMS, CE-QUAL-W2)
- Information exchange medium (websites, email)

Personal

Those involved in the water quality project should have a basic knowledge of hydrologic principles and some water modeling experience. Experience with CE-QUAL-W2 is helpful. Participants with a special interest in water quality and/or environmental engineering are also helpful. At the very least, participants should be eager to learn and enthusiastic about water quality issues. Participants under the age of 12 should have parental permission to participate.

Evaluation methods

Preliminary evaluations will be provided by BYU faculty and students. Final evaluations will be provided by ITESO faculty and students in Guadalajara. The criteria for project performance include the degree to which model results are accurate and useful for the community of Nayarit.

Potential problems

Potential problems include a lack of available data to obtain meaningful model output, communication and data exchange, time constraints, a lack of resources to obtain necessary data, a lack of understanding of the project site, and a lack of experience with running the CE-QUAL-W2 model.