Tell Us About Your Organization

One dimension of the mission of the *International Journal of Forest Engineering* (*IJFE*) is to help link the worldwide forest engineering community. There is a host of research institutions and groups, technology development units, and departments spread throughout most forested countries of the world. The *IJFE* would like to publish brief profiles of the research and development groups, institutes, and organizations whose activities overlap with *IJFE*'s technical scope.

The profiles should describe the technical and geographic scope of the organization, their location, a brief list of some publications and products that represent the work conducted, and a description of the organization itself (location, number of staff, affiliation with university or government institutions, and key personnel). In addition, complete contact information should be provided to allow further contact by readers.

Each profile should be no longer than one page in the *IJFE*. Text, artwork, logos, or icons used in the profile must be provided in electronic format and in hard copy. Submissions should include a contact person for editorial changes or questions.

Please submit profiles to:

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Forest Engineering at the University of New Brunswick

Introduction

Why did the overflow channel of a small pond retaining dam on the University of New Brunswick (UNB) forest lands experience severe wash out? Is the structure still safe to operate? What needs to be done in order to avoid further damage and release of sediments into the nearby stream?

Students in their final year at UNB's Forest Engineering program were asked these questions in the recently established core course, "Structural Design of Forest Engineering Systems."

Forest Engineering Program

The Forest Engineering program at the UNB is the only forest engineering undergraduate program accredited by the Canadian Engineering Accreditation Board (CEAB) that allows graduates to qualify for P.Eng. designation. The program is also unique in its use of learning outcomes. One of the main outcomes of this redesigned 4-year program is that students learn to design and analyze structures occurring in natural environments.

New Course

In order to create learning opportunities around this outcome and allow students to demonstrate competence in it, they analyze and design structures such as forest roads, culverts, embankments, small dams, and short span bridges in a forest environment.

Each year students are confronted with an actual problem similar to the one outlined. Using a general problem solving approach, they explore and define exactly what the problem is, they consider problem solving strategies, they determine and then assess their solution. The problems are solved in an integrative approach, which means not only applying technical knowledge and skills to solve the problem, but also evaluating the problem and possible solutions with respect to economic, ecological, and social impacts. Students have the opportunity to understand the full range of impacts related to the problem and design a viable solution, which embraces all mentioned aspects.

In the description that follows, students' technical and ecological considerations when analyzing and solving the problem are described.

Reason for Washout

To determine the reason for the washout of the overflow channel, students analyzed the discharge capacity of the pond's major water level control structure, a reinforced concrete drop inlet box with open top and timber stop logs at the front side for water level adjustment of the pond. This structure was supposed to handle the pond's discharge during average weather conditions, while the additional overflow channel ensured excessive discharge during storm events. Using Geographical Information System (GIS), the students outlined the watershed feeding the pond and analyzed weather data to determine peak stream flows for different storm events. The students' findings revealed that the control structure, even with all but two timber stop logs removed, was only capable of handling storm events with an average return period of two years. Normally, structures are expected to be capable of handling severe storm events with an average return period of 25 or 50 years (on Crown Land so-called 100 year peak flows are used for design of stream crossings). Clearly the structure was well undersized when erected in 1994. All excessive water was released through the overflow channel, which was not designed for this discharge amount and frequency, and therefore resulted in its present washout.

Structural Integrity of the Dam

To assess the structural integrity of the dam structure, the students performed an intensive site survey of the pond and retaining dam with an electronic totalstation. The data was used to generate a digital elevation model using RoadEng software (**Fig. 1**). The model helped to

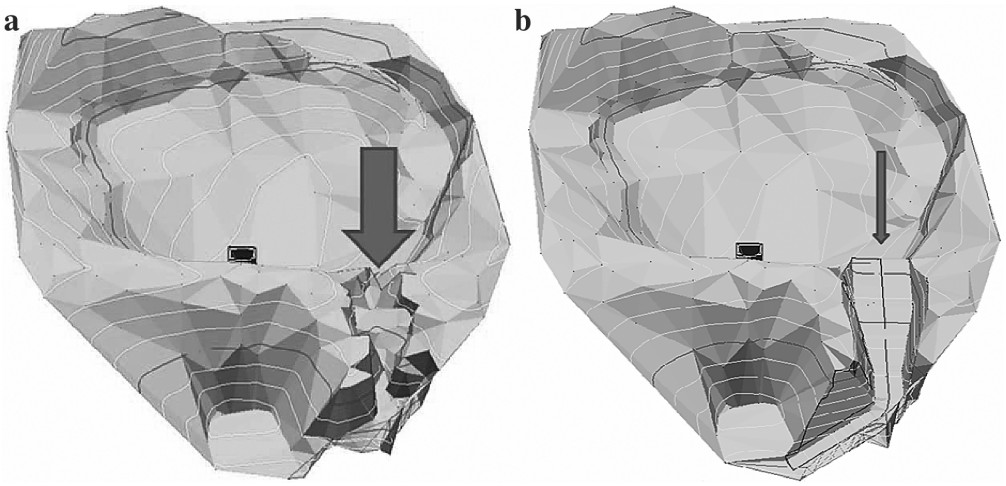

Figure 1. ~ *Three-dimensional digital terrain model of the pond with retaining dam (3x exaggerated) and drop inlet box (black). a) shows the major wash-out in the dam (big arrow). b) shows the model with re-designed overflow channel (small arrow).*

simulate different filling levels of the pond and related pressure exerted on the dam structure. In addition, the density and permeability of the dam's aggregate were measured using a nuclear density and moisture gauge and a Guelph Permeameter, respectively. Results showed sufficient structural integrity of the dam allowing its safe future use; however, some leakage of the dam was identified, which needs continuous monitoring.

Ecological Impacts

Students examined the ecological value of the pond. While it adds variety to the existing habitat mix in the UNB woodlot, its ecological value is limited, because the shallow water level (less than 1 m with timber logs removed) heats up rapidly in the summer and freezes to the bottom in the winter. The overflow structure as is does not allow for fish passage.

Solution

The requested low-cost solution the students developed recommends a redesigned overflow channel able to handle 100 year peak flows. The newly designed overflow channel is shown in **Figure 1 a**.

The flow volume and velocity in the overflow channel during severe storm events was modeled using STELLA software. The results were used to determine the needed minimum gravel (rip-rap) size for channel stabilization to avoid future washouts and release of sediments into the stream. The bottom surface of the channel was designed to have a rough shape with small depression resting pools, which enable upstream migration of fish during peak flows.

Conclusion

The described problem and its possible solution focuses on technical and ecological aspects and gives an example of the scope of this new forest engineering course. It illustrates integration of engineering design and ecological considerations typical in a forest environment. It also demonstrates how this course contributes, by a problem-based learning approach, to one of the main goals of the UNB Forest Engineering program: students are able to design and analyze structures occurring mostly in natural environments. Is there a better way to become prepared for the forest engineering profession? Visit www.forestengineering.unb.ca for additional information about UNB's Forest Engineering program,

SCOPE

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An important role of the *IJFE* is to report on existing practices and innovations in forest engineering by scientists and professionals from around the world which promote environmentally sound forestry practices and contribute to sustainable forest management.

Published semiannually, the *IJFE* is committed to serving the international forest engineering community as the voice of new ideas and developments in forest engineering.

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Where tree or other biological species is an important feature of the results of the paper, the Latin names (without authorities) should be included in the keywords. This will aid people searching for papers about forest operations with specific species or ecosystems. In addition, the keywords should include the country where the field work was conducted or to which the results apply.

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