Landscape Evolution Models as a Public Education Tool

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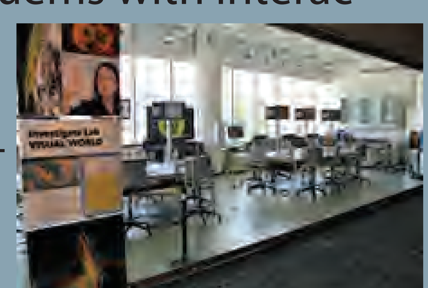
Abstract
(abbreviated)

We are developing a module where museum visitors investigate geomorphic and land-use scenarios through a landscape evolution model. Visitors use touchscreen computers to select simplified inputs for the CHILD model. These scenarios provide relatable experiences to visitors, an opportunity to educate them upon the science behind the scenarios, and the purpose and limitations of models. We will first develop the framework of the module to be able to accept scenarios and its inputs, including digital elevation models, such that others can contribute scenarios. This module is early in its conception, thus we will present our initial framework with the intent to elicit feedback from the community.

Intended audiences

The public: Science musuems with interactive, inquiry-based exhibits are becoming more common, such as the Visual World Investigation lab shown to the right.



Students in introductory courses: Science labs can use the program to investigate a topic and how models can be integrated with the scientific method. Computer models that facilitate student investigations can improve learning in undergraduate geoscience labs (figure to the right; Lyons *et al.*, 2012).

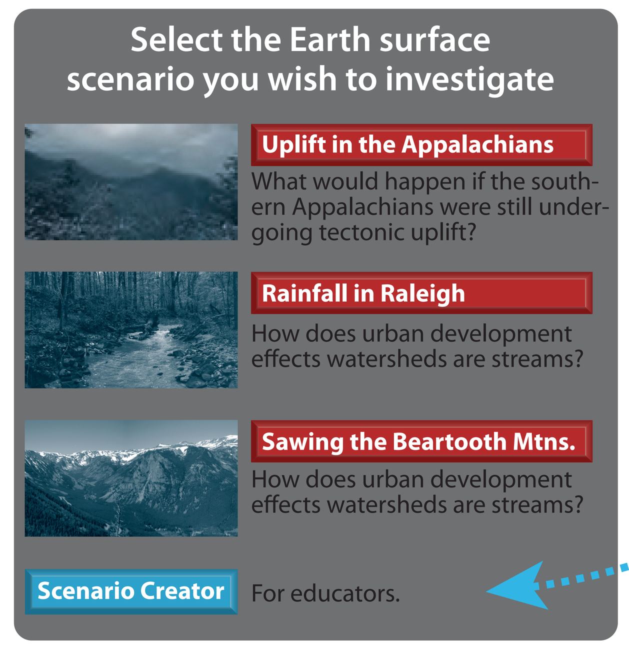
Program contribution

Interfaces for landscape evolution models are designed for non-experts as education tools commonly using scenario-based exercises, such as the Web-based Interactive Landform Simulation Model (WILSIM, 2013). Currently, a program that incorporates real landscapes does not exist. Our interface, "Earth Surface Modeler" presents investigations conducted by researchers upon real landscapes represented in the model. Our experiences working with the public and undergraduate students has lead us to believe that this authenticity will heighten interest in the geosciences and models. The Channel-Hillslope Integrated Landscape (CHILD) model includes many parameters from which scenarios related to recent geoscience research can be created (Tucker *et al.*, 2001).

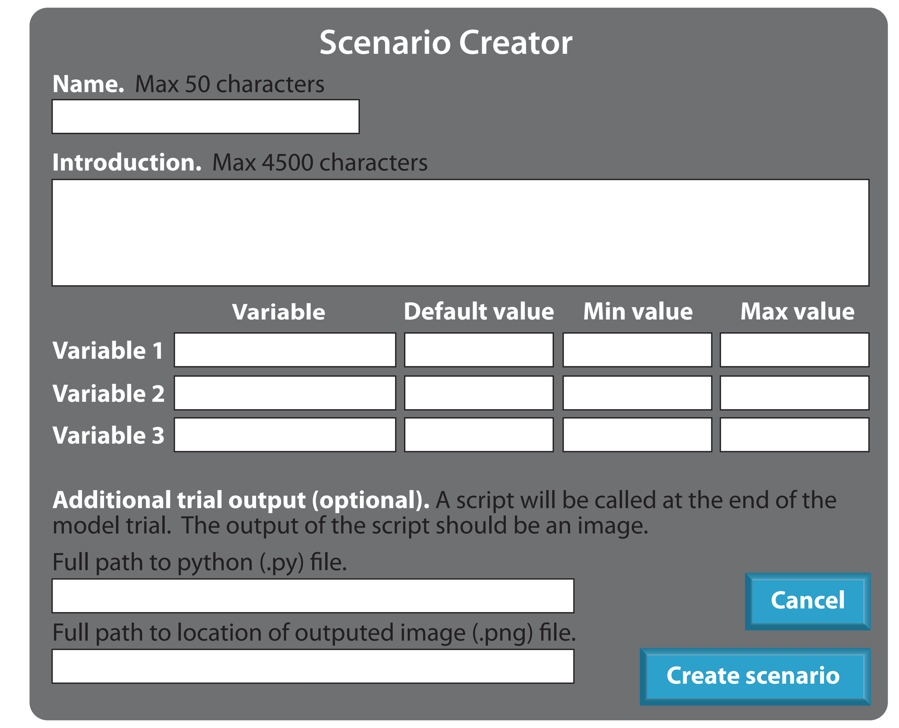
Interface of "Earth Surface Modeler"

Scenarios present simplified, well-defined Earth surface topics.
Interface elements adjust to meet the needs of scenarios.
Touch and mouse inputs are accepted.

1 Users select the scenario that interests them from a menu. Sceneraios are included with the program and created by educators.

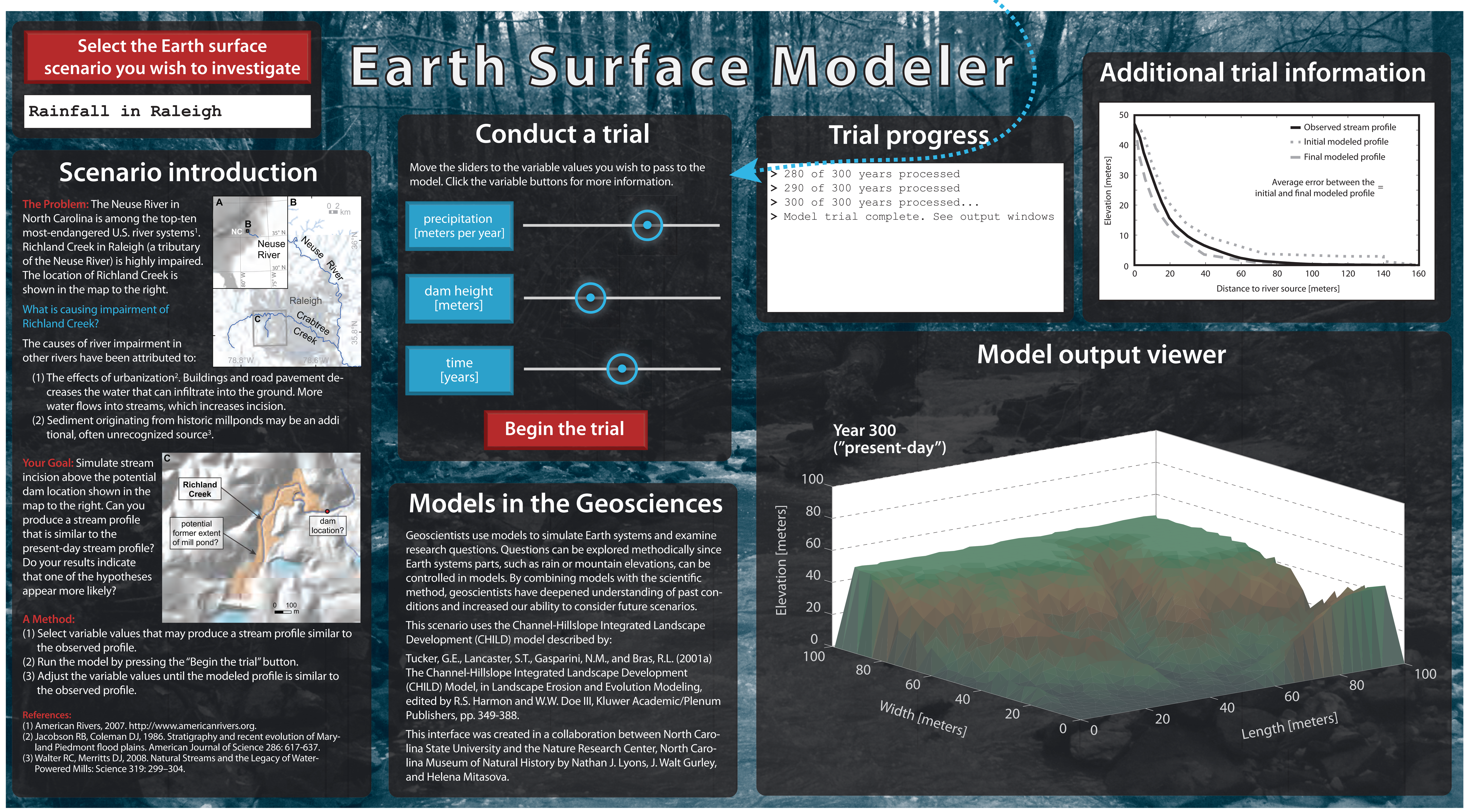


1b New scenarios can be created by educators using this window with knowledge of variable meaning and basic geomorphology.



2 Text that exaplains the scenario, how it can be investigated with the model, and how results can be evaluated.

3 Sliders limit variable values to a range that is relevant to the scenario. Pressing the blue button provides information about the variable. Model processing begins once the "Begin the trial" button is pressed.



4 After the model is completed, a time-series animation is played. In this scenario, each animation frame will display the topography every 10 years that resulted from the user's inputs.

5 Model output graphs or statistics. In this scenario, this panel provides users an evaluation of thier trial.

Upcoming Work

This program will be designed with the following characteristics to maximize its contribution:

Approachable: The python programming language is used due to its relatively simple syntax.

Expandable: Educators can devise a scenario by indicating a description, the variables users can adjust, and the range in which users can adjust variables.

Open source: The interface code will be freely available to download and modify.

Portable: Model executables will be packaged with interface files so that the program can be easily distributed.

Questions to be addressed:

How can we best simplify scenarios and models for our audiences' understanding while maintaing scientific accuracy?

What other audiences may be interested in this program? Online courses?

What models other than the CHILD model are well-suited for this program?

Program development:

Compile CHILD model MATLAB files for integration with the Earth Surface Modeler interface.

Complete Interface.

Develop scenarios.

Test the product with musuem visitors at the Visual World Investigation lab.

References

Lyons N.J., Ryker K., McConnell D., 2012. Real-time assessment of student progress in the lab: The isostasy model example. GSA National Meeting, November 4-7, 2012, Charlotte, NC.

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Tucker, G.E., Lancaster, S.T., Gasparini, N.M., and Bras, R.L., 2001. The Channel-Hillslope Integrated Landscape Development (CHILD) Model, in Landscape Erosion and Evolution Modeling, edited by R.S. Harmon and W.W. Doe III, Kluwer Academic/Plenum Publishers, pp. 349-388.