USDA National Agroforestry Center

AGROFORESTRY NOTES

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Photo-realistic visual simulation: an agroforestry planning tool

Introduction

Planning an agroforestry project involves many steps, but perhaps the most difficult is trying to communicate planning alternatives to the decision-maker. Despite the use of plans and written descriptions, many clients still have difficulty conceptualizing what a proposed activity will look like on their landscape after it has matured. Clients often say that if they could just see a picture of the proposed action, then they could make a decision. Now, with the aid of image-editing software, you can create photo-realistic visual simulations of proposed projects to help convey practice or system alternatives.

Visual simulations graphically represent what a proposed activity would look like on the land from a particular viewpoint. Based on perspective principles, simulations range from drawings and edited photographs to complex 3-D models and computer animations. While some of these simulation methods are time consuming and difficult to learn, illustrating proposed landscape changes in digital photographs is a skill that can be acquired. The information in this Note focuses on this type of visual simulation.

What is visual simulation?

Photo-realistic simulations are created by using image-editing software. The base image of a project can be acquired from either a digital camera or a scanned slide or photograph. Proposed alternatives are created by adding or duplicating images of plants and other materials onto the base image. By using this technique, windbreaks, riparian buffers, and other conservation practices and systems can be illustrated at various stages of development, or with different species compositions or arrangements.

Existing landscape photograph

Visual simulation of proposed agroforestry system

Uses of visual simulation

Simulations communicate ideas in ways that plan drawings and words cannot, making this technology appropriate for any activity, program, or project where visualization would enhance communication. A simulation can be used as:

- A planning and design tool to present alternatives and solicit feedback
- A method of documenting and analyzing visual impacts
- A training aid to help employees visualize new concepts
- A marketing aid for new programs and activities
- A construction aid to contractors
- A post-construction evaluation tool to assess project compliance

Benefits and limitations

Simulations encourage stakeholders to invest time in the planning process and offer feedback on alternatives, facilitating the development of an agroforestry or conservation plan. This participatory process greatly increases a sense of ownership in the plan, which leads to enhanced acceptance and adoption of the proposed action. Simulations can also help shorten the time it takes to plan because decisions can be made more quickly since planning options are easier to understand.

Original image

Even though visual simulations can be an extremely useful planning tool, there are some limitations. Photo-realistic simulations tend to convey a high level of accuracy and people could assume that what they see is what they'll get. Incorrect and misleading simulations can frustrate clients if the mature projects don't resemble the simulations, which could greatly damage your organization's reputation. Consequently, you must possess the necessary skills and ethics to accurately illustrate the proposed scenario. It is important to be forthright in explaining the limitations and assumptions that go into the visualization. Don't bias decisions by inaccurately manipulating the simulations toward a preconceived choice.

This concept simulation of an alley cropping system took less than 10 minutes to produce. It is complete enough to make some preliminary decisions.

Creating photo-realistic simulations

The amount of time it takes to create a realistic simulation depends on skill level and on the type of simulation you are creating. During brainstorming or concept development, simulations can be generated in a few minutes since the concern for accuracy isn’t very high. When evaluating designs or management alternatives, a higher level of accuracy and realism is needed. A very complex alternative could take several hours to produce.

This simulation took an hour to produce. The trees were sized to be 20 feet tall and 30 feet apart in the row. Shadows were also added to create a more realistic simulation.

When creating simulations for public use, consider the following:

Is the simulation accurate?

The accuracy of a visual simulation is the similarity between the visualization and the finished project. Inaccurate simulations can mislead people who under or over-estimate the project's impact. Pay close attention to the size and the location of the simulated objects to ensure an accurate simulation.

Does the simulation look real?

To create real looking simulations you must accurately represent the colors, textures, lighting, and shadows in the image. Realism and accuracy can operate independently of each other. For example, simulations can be very accurate and yet not be realistic, and vise versa.

Is the work defensible?

The procedures used to create visual simulations directly affect their accuracy and realism. In order for a visual simulation to be defensible, the editor must be able to show how it was produced. Documenting the process by which the simulation was created is essential to establish credibility of the visualization.

How representative is the view?

The visual simulation should represent the most common or important view, conditions, and timeframes in the landscape. For instance, this may require simulating the project with leaves on and off to show the impact of deciduous vegetation.

Is the simulation sufficient for the project?

Visual simulations need to be sufficient for the type of decisions that need to be made. This will depend on the stage of development of the project. A simulation for visualizing concepts will not require as much accuracy and realism as a simulation for an environmental impact statement.

Required Skills

The skill to create accurate and truthful simulations is within the reach of most people willing to spend a modest amount of time to learn a new tool. Two types of skills are needed to create realistic simulations:

- First, you need to be able to read site plans and understand spatial relationships of proposed design features. Basic knowledge of land surveying, drafting, and construction are beneficial.
- The second skill set involves a basic understanding of art and computer graphics. This includes a working knowledge of perspective and how computers handle digital images.

If you do not possess these skills, then creating realistic simulations will initially be more difficult, since you will have to learn these skills along with the specific image editing software.

If you can't dedicate the time to develop these basic skills, you may want to train or hire an individual who can prepare simulations for your organization. In some cases, it may be more feasible to acquire visual simulation expertise on an as-need-basis from landscape architects and land planners who provide this service.

A how-to guide

The USDA National Agroforestry Center (NAC) developed a Visual Simulation Guide on how to create realistic and accurate visual simulations for agroforestry and conservation planning. This electronic guide provides detailed information on how to size and locate plant material and other objects using perspective and scaling principles.

Software

There are several commercially available software programs that can be used to create photo-realistic simulations. To assist resource planners in producing visual simulations, NAC developed *CanVis* image-editing software program. *CanVis* is an entry-level program that includes video tutorials for each editing tool. The program also includes a collection of object libraries that contain images of plants, agricultural features, people, and urban park elements that can be easily added to the base image. These existing libraries allow the novice user to quickly generate believable simulations. The user can also create their own objects that can be added to the library. *CanVis* can also add shadows and text, clone textures, and add hardscape elements like pathways and walls.

Additional Information

Visit NAC's Web site (*www.unl.edu/nac/simulation*) for more information on visual simulations and to learn about training opportunities. The Visual Simulation Guide and *CanVis* software can be ordered from the NAC Web site.

Al-kodmany, K. 1999. Using visualization techniques for enhancing public participation in planning and design: process, implementation, and evaluation. Landscape and Urban Planning 45:37-45.

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