Bentrup, G. Schoeneberger, M.M., Dosskey, M.G., Wells, G., and Kellerman, T. 2005. Tool Time: Melding Watershed and Site Goals on Private Lands. In: Brooks, K.N. and Ffolliot, P.F. (eds) Moving Agroforestry into the Mainstream. Proc. 9th N. Am. Agroforest. Conf., Rochester, MN. 12-15 June 2005 [CD-ROM]. Dept. Forest Resources, Univ. Minnesota, St. Paul, MN, 8 p.

TOOL TIME: MELDING WATERSHED AND SITE GOALS ON PRIVATE LANDS

Gary Bentrup, Michele Schoeneberger, Mike Dosskey.
Gary Wells, and Todd Kellerman
USDA National Agroforestry Center
East Campus-University of Nebraska-Lincoln

ABSTRACT

Creating effective agroforestry systems with broad public support requires simultaneously addressing landowner and societal goals while paying respect to ecological processes that cross spatial and political boundaries. To meet this challenge, a variety of planning and design tools are needed that are straight-forward and flexible enough to accommodate the range of issues and the many individual decision-making processes involved. In this paper, we offer some principles that should be considered when developing planning and design tools for agroforestry. To illustrate how these principles might be used, we will present a few tools from the *Comprehensive Conservation Buffer Planning* project at the USDA National Agroforestry Center. At the regional scale, the ***Regional Atlas for Conservation Planning*** enables stakeholders to quickly review and incorporate a range of issues in their agroforestry planning effort. The landscape scale is supported by GIS-guided assessments addressing water quality, wildlife habitat, and income diversification options for landowners. The real value of these assessments is the ability to combine them to identify locations where multiple objectives can be achieved with a buffer investment. At the site scale, landowner's economic and social concerns can be addressed with ***Buffer$***, an economic analysis tool, and the ***CanVis Visual Simulation Kit***, a computer-based visualization tool for creating photo-realistic simulations of buffer alternatives. Combining information generated by these tools can help planners and landowners to meld site and watershed goals on private lands.

Keywords: Planning, GIS, Agroforestry, Buffers, Multiple Objectives, Decision-making

INTRODUCTION

"Few things disappoint a landowner more than spending money, time, and effort on a project that fails....especially one like agroforestry, where it can be years before problems become apparent" (Dosskey and Wells 2000).

Integrating agroforestry into crop and livestock operations has the potential to achieve many of the environmental, economic, and social objectives being demanded from working landscapes by landowners and society. By adding structural and functional diversity to the landscape, these tree-based practices can perform many functions that have significance far greater than the relatively small amount of land they occupy (Guo 2000; Ruark et al. 2003). Realizing this potential is, however, a multifaceted and dynamic task of determining what opportunities, limitations, and tradeoffs exist in each situation, and of designing an agroforestry system that achieves the best balance among them. When agroforestry systems are implemented, there are numerous impacts ranging from intended to non-intended and from beneficial to detrimental. In addition, these impacts will vary with time and occur both on and off-site. Simply put, agroforestry can create a complex system of interactions that should be managed for multiple

agroforestry practices (Walker and Lowes 1997). Due to each individual's unique situation, resources, and personal value system, these biophysical, economic, and social issues are weighted differently in every potential application of agroforestry. The challenge is to develop tools that capture the range of issues while maintaining the flexibility to allow for the desired assimilation of issues.

User Participation

Because planning tools require a significant investment in time and resources to develop, they need to be targeted to match end-user's needs and resources (Robinson 1996). Users of agroforestry tools for planning and design are primarily landowners and resource professionals working together in partnership to develop agroforestry plans. When these end-users are not directly involved in the tool development process, the result will be ineffective tools that do not respond to their problems, needs, resources, and capabilities, creating a waste of project funds and bitter feelings between developers and users (Hoag et al. 2000; Turner and Church 1995). Tool adoption can be facilitated when the tool is based on elements, procedures, and data that are familiar to the user (i.e., the ubiquitous soil survey and soil loss equation). Tools that rely on readily available data will more likely be effectively used while tools and models requiring specialized data that are expensive and time consuming to collect will render these models worthless in most planning efforts. Even when default values are used in data-intense models, this gives the appearance of an overly complex and unwieldy tool that resource professionals will often not incorporate into their work (Goicoechea et al. 1992; Turner and Church 1995). These problems are exacerbated when tool developers also strive for more precision in their models and yet this increase in scientific precision is often of little consequence in the actual application of an agroforestry practice (Ellis et al. 2004). In essence, users need to conceptually understand the principles involved in the tool or else it is perceived as a "black box" and they will not accept and utilize the results (Hoag et al. 2000). Furthermore, it must be remembered that users do not want the decision made for them by the tool; the tool is only supporting the decision-making process (Walker and Lowes 1997).

Multiple Scales

The impact and success of agroforestry are influenced by decisions made at multiple spatial and temporal scales. Ideally, planning and design tools should be capable of funneling appropriate information into at least three critical decision-making points: national or regional scale, state, and watershed or site level (Ndubisi 2002). At the national scale, tools should provide data to guide policy and program development on the role agroforestry can play in achieving broad societal goals. At the state level, resource managers need landscape assessments to prioritize projects and resources and to develop technology transfer programs. In addition, results from these tools may provide direction for future research on agroforestry. At the site or small watershed level, the tools should yield specific information for designing and implementing agroforestry systems, including where practices *should* and *should not* go to achieve the desired objectives. Tools at this scale can also foster local cost-share and partnership projects because stakeholders can see how they are all part of the watershed and that to solve a problem requires a cooperative approach. For instance, Helenius (1995) points out the advantages of being able to plan for ecological pest management at the watershed level where "the benefits of improved

Leininger 2002). These assessments conducted at regional, state and county scales have provided support for decision making from national policy discussions to site implementation.

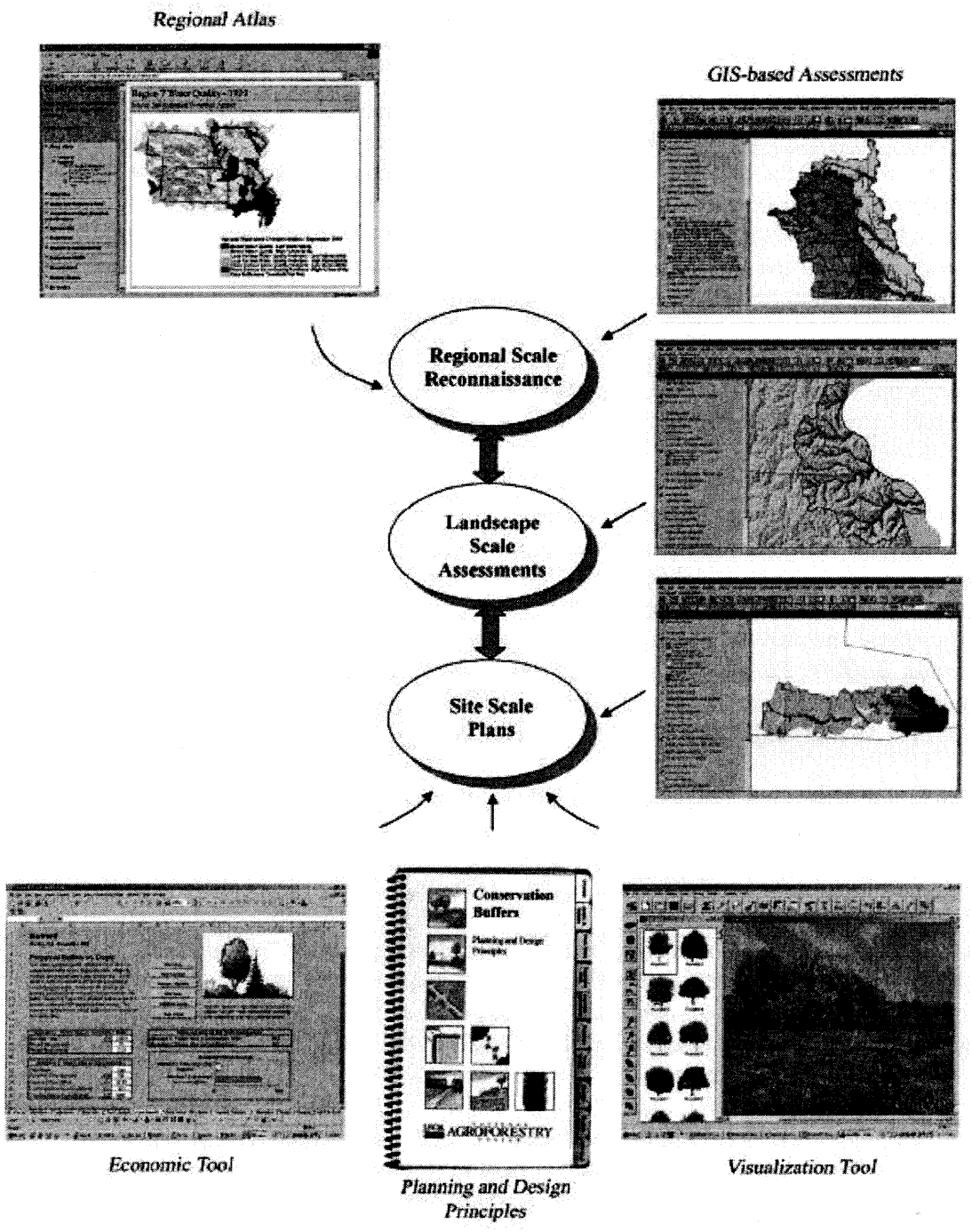

Figure 1. A suite of multiscale tools being developed for planning and designing multi-objective conservation buffers.

time, windbreaks, riparian buffers, and other agroforestry practices can be illustrated at various stages of development, compositions, and arrangements on the landscape. By readily translating ideas into real life pictures, simulations encourage public participation in the planning and design process, instilling a sense of ownership and increasing the adoption of agroforestry.

CONCLUSION

"Products of science are best assessed not on their intrinsic interest or popularity in the scientific literature, but on the impact they have on the planning and management of real landscapes" (Hobbs 1997).

Melding landowner and societal goals with agroforestry depends upon pulling together diverse sources of information in a manner that responds to stakeholders' needs, capabilities, and resources. Planning and design tools that accommodate these tasks can greatly facilitate the decision-making process resulting in the positive management of working landscapes. As resources professionals, we have a mandate to create tools that satisfy these requirements. We provided a few ideas to consider when developing these tools, no doubt there are other key principles in addition to the ones we discussed. When we develop appropriate tools for planning and designing agroforestry systems, we must be cautious not to become too infatuated with new technology just for technology's sake. New technology can offer new and exciting opportunities but we need to measure it against the impact it will have on the management of real landscapes. We must also be careful not to view the tools as the ends but just as a means to assist decision-making. Most importantly, Nassauer et al. (2001) say we must go beyond providing tools that only address the ecological and economic aspects of sustainability and provide those which also enhance the cultural sustainability of agroforestry systems; that is, it must elicit sustained human attention over time or else benefits may be compromised as land ownership changes, as development pressure increases, or as different political viewpoints arise.

REFERENCES

Bentrup, G., and T. Kellerman. 2004. Where should buffers go?—modeling riparian habitat connectivity in northeast Kansas. *Journal of Soil and Water Conservation* 59:209-213.

Bentrup, G., and T. Leininger. 2002. Agroforestry: Mapping the way with GIS. *Journal of Soil and Water Conservation* 57:148a-153a.

Dosskey, M., and G. Wells. 2000. Planning agroforestry practices. Agroforestry Notes #20. USDA National Agroforestry Center. 4 pgs.

Ellis, E. A., G. Bentrup, and M. M. Schoeneberger. 2004. Computer-based tools for decision support in agroforestry: current state and future needs. *Agroforestry Systems* 61:401-421.

Goicocehea, A., E. Z. Stakhiv, and F. Li. 1992. Experimental evaluation of multiple criteria decision models for application to water resources planning. *Water Resources Bulletin* 28:89-102.