Our progress in wildlife GIS studies is over 10 years behind its potential: It's time to focus on improved management of land, water rights, and global wealth

by Falk Huettmann

One of the leaders in the GIS field recently published "*GIS Best Practices: GIS in Wildlife Conservation*" (http://www.esri.com/library/bestpractices/wildlife-conservation.pdf). Neatly available online as a PDF and stacked with classic glossy maps of charismatic wildlife species and proud field investigators showing off handled study animals, this shiny publication of 47 pages lacks not only a TWS endorsement but deeper scientific substance or a peer-review. This portrayal of "best practices" unfortunately represents state-of-the-art prior to 1990, not today. Modern adaptive management is not served by such portrayals. Thus, this technology (and marketing campaign that comes with it) fails to provide us with TRUE progress for wildlife and habitat, society, or global sustainability.

For the GIS insider, this does not come as much of a surprise. For years software quality has stagnated and we have seen a counter-productive overcapitalization of technology while policy decisions often suffer from lack of consideration of GIS products and lack of open access to data for mapping.

Here I briefly outline some of the key flaws in the "Best Practices" document; they occur as well in many of the current wildlife applications, mapping philosophies, contracts, and funding proposals.

GIS map overlays without research design considerations: Overlaying GIS layers, e.g. wildlife point data (surveys, GPS or telemetry) with a classified habitat and elevation layer often presents the 'dream' for many wildlife practitioners and managers. However, for most generalizations in the wildlife discipline this cannot be done with data that are opportunistically collected, merged from various sources, without a proper research design, or from data that lack sound descriptions. Using only a handful of GIS layers ignores the remaining 30 or more that we now have readily at our fingertips and that are needed for capturing ecological realities. Findings from such approaches are often flawed and rarely carry statistical and biological confidence.

Home range subjectivity: For decades we have seen research projects that try to outline home ranges. For example, our literature is overwhelmed with papers on local deer, moose, wolf, and bear home ranges. Different techniques present different results and conclusions. The application of kernels improved this situation, but often they still lack a sound justification of cut-offs. Accuracy assessment of these home range maps is rarely given, nor considerations of the overall population context.

Spaghetti graphs are misleading: Another classic and equally misleading map shows how animals with telemetry transmitters move through the land- and sea-scape. In addition to very low sample sizes, and drugged up animals, findings are probably biased due to the 'duty cycle' filtering and the transmitter package the animal carries. Usually, only modeled findings corrected for such biases can produce valid results. Spaghetti graphs can have biological value for hypothesis testing but less so for generalizations and sound management. In wildlife management we usually need the latter two items.

Lack of state-of-the-art statistical and certified software applications for management and policy: Software applications (notably the open code "R") have 'exploded' in recent years. providing us with powerful tools that can automate calculations and predict complex results. However, the wildlife community still lacks a certified set of software tools we can trust to provide consistent and objective results that would hold up in court for sound decision-making.

Many software applications are so crucial for decision-making these days that they are basically part of policy, although few are really hard-wired in legal text and procedures.

Missing support for Open Source GIS, Open Access Data, publication initiatives, and metadata: GIS means primarily software as well as data publication. Data management is one of THE topics in most funding programs, with Open Access gaining in popularity. However, most wildlifers and telemetry projects do NOT share their data. This topic is rarely mentioned in publications. Wildlifers love to obtain free satellite images, but they do not contribute much raw data to the public in exchange. There is a huge loss of potential for synergy when data are not shared with the global village. The widely experienced lack of metadata for most wildlife species is in full support of this argument.

Classified landcover concepts provide for incomplete habitat information: Another misleading dream of the techno-fix era is classified satellite images. It frequently occurs that proprietary decisions are driven by the remote sensing companies or contractors. Classification accuracy is often <95% (our usual standard) and poorly described and assessed. As demonstrated in the "Best Practices" paper, valid and creative spatial habitat concepts (such as those brought forward by landscape ecology, fragmentation metrics, or socio-economics) are frequently ignored.

Computing for cumulative impact models, spatial Population Viability Analysis (sPVA), and automated Environmental Impact Studies (EIS) are lacking: Assessing the cumulative impacts is a legal base requirement when economic development is proposed. Together with PVAs that consider spatial issues (sPVA), these techniques are key for evaluating sustainable development proposals.

Funders use GIS and wildlife for marketing and pseudo-progress: Publications like this "Best Practices" are full of examples of aggressive funding promotion campaigns and how GIS is used as a techno-fix to present the public with pseudo-progress in wildlife management where there actually is none. Globally, we continue to lose species and habitats. GIS studies for sustainability are a crisis discipline where not much has been won—at least yet. Wildlife is a public, global resource. It must not be driven by self-centered economic-marketing campaigns or monopolistic views of software companies obsessed with selling techno-fixes that make things worse or are not pertinent to the world's survival.

In conclusion: The classic rift between field biologists and the (GIS) computing community is apparently still not resolved. Potential remains large though and, when realized, will aid sustainability world-wide. In the meantime, our beloved wildlife remains poorly managed and faces excessive threats. We can do better than what the "Best Practices" industry document outlined and should always strive for excellence. It should be in our best interest to provide sustainable wildlife leadership on this issue and move progressively forward instead of just presenting shiny maps and concepts that are financially motivated and over a decade old.