

## **Moore's Law and the Synchrony of Revolutionary Advances in the Accuracy of Spatial Analysis**

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### **Abstract**

How will Moore's Law shape the future of spatial analysis? Ecologists should consider this question because the pace of revolutionary advances in the accuracy of spatial technology may soon lead to serious challenges at fundamental levels. The capabilities of spatial technologies have driven environmental sciences because of the types of questions addressable with data at ever higher resolution or larger geographic extents. However, with each step forward, a new shortcoming is recognized. In wildlife science, as one example, the advent of very-high-frequency radio telemetry created a major paradigm shift in studies of spatial behavior of animals in the 1960s. The spatial accuracy was generally measured in  $10^2 - 10^3$  m<sup>2</sup> and proved too inaccurate and thus too limiting for many questions. By combining traditional radio telemetry and GPS technology, accuracy improved in the early 2000s to 1 m<sup>2</sup>. Unfortunately, the analytical tools are still catching up with this accuracy so many of the limitations remain.

In contrast, the emergence of the field of landscape ecology drew heavily on the revolutionary shift from aerial photograph to satellite imagery. Here, the invention of analytical software outpaced the classification accuracy of the imagery and, again, inherent limitations were quickly apparent. Moore's Law suggests that these limitations and society's insatiable need for information will drive increased accuracy at an ever-increasing pace. However, as these two examples illustrate, Moore's Law does not suggest that all necessary developments will occur in synchrony. Indeed, we may be reaching a point where this lack of synchrony becomes manifest at more fundamental levels. Here we ask the question, will the quality of data and the attendant quantity we will soon be gathering overwhelm the evolutionary pace of other integral components of spatial analysis from computing power to human conceptual abilities?