

Nicholas Tait

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The Geographic Approach, Vital for Conservation

When it comes to studying and preserving the natural world, GIS practitioners deserve a seat at the table. Jack Dangermond (2007), ESRI President, describes the importance of “the geographic approach,” a framework “that integrates geographic information into how we understand and manage our planet” (para. 5). This approach should be taken in any conservation project that includes a spatial component—nearly all of them—and GIS practitioners are key to enacting it.

I understand how important the roles of GIS practitioners are in environmental organizations. Based on personal conversations with these professionals and based on my own experience as a GIS practitioner in an environmental organization, I will show what GIS brings to the effort and prove its worth. GIS practitioners provide the technical expertise and tools needed to navigate and analyze geospatial data. We help answer research questions, build methodologies, and visualize information that can show what is already known about the data and can reveal new patterns to spark fresh queries. We offer the geographic approach through GIS, an accessible tool and science that encourages cooperation across disciplines and contributes heavily in the constant effort to study and preserve our planet.

In her article on Nature News, Aisling Irwin (2019) describes the research of Thomas Crowther, a scientist who aspires to map and estimate the planet’s total numbers of flora and fauna. GIS is key in Crowther’s research. In his work on forests, spatial analysis techniques allowed him to take millions of datasets sampled on the ground and compare them with satellite data of the canopies to make estimates on total global tree numbers. Approaching the research question of “how many trees are there in the world?” geographically led to what many consider a breakthrough in global forest modeling (Irwin, 2019).

Crowther started his research in Dr. Mark Bradford’s soils and science lab at Yale School of the Environment, where I worked as Research Assistant this past year. In my position, I served as a GIS practitioner on a collaborative project between Yale, Lawrence Livermore National Lab, and the US Department of Energy. We wanted to both estimate how improved forest management in the US could reduce emissions, as well as create new datasets on how to best increase forest carbon sequestration (*Forest Projects*). Working under the supervision of a research biologist and in collaboration with a forestry PhD student, I ran spatial analyses on several forest carbon datasets at the national, regional, and state level for the continental US to determine the areas with the highest potential for carbon storage and the most urgent need for preservation. While the rest of my team had extensive science and research experience, I provided the GIS expertise and spatial skills they needed to progress their research. Approaching

this project geographically required GIS skills to perform the analyses necessary to answer spatially motivated research questions and analyze geospatial carbon data.

GIS encourages and often requires cooperation across disciplines. The GIS practitioner facilitates this collaboration, especially in the environmental field. I discussed the role of GIS in scientific projects with my father, Alex Tait, the Geographer at National Geographic Society (NGS). Tait (personal communication, January 9, 2023) describes how he and his geographer colleagues provide the training and the expertise to the organization's conservationists and explorers on how to work with geospatial data.

As an example, he cites his involvement in NGS's 2019 expedition to Mount Everest, a two-month effort to collect extensive scientific data and better understand climate change's effect on the mountain. The project comprised of glaciologists studying the extent and changes in Everest's glaciers, meteorologists sampling the high-altitude atmosphere, biologists looking at flora and fauna, and geologists researching the rock and geomorphology of the area. This expedition was a multidisciplinary, collaborative endeavor, and who played a role on all four of these teams? Tait and his colleagues, the GIS practitioners. Using drone photography and lidar, the geographers assisted all these other scientists with data collection and geospatial analysis.

The geographic approach also plays a significant role in the management of natural resources in national parks. In my current position as a science communicator at the National Park Service (NPS), I had the opportunity to discuss GIS with Andrejs Brolis, a staff biologist at NPS's Inventory and Monitoring Division. Brolis believes GIS is hugely important in the long-term sampling his team does of forest vegetation and water quality in the parks. "All the field monitoring, all the data we collect," he says, "it's all spatial" (personal communication, January 10, 2023). In his work, GIS comes into play at the most basic level: forest plot mapping and field crew navigation. But it also serves more complex functions, helping inform staff ecologists on historic land use for data analysis or answering management questions such as which areas of parks most urgently require invasive species treatment.

At NPS, the practitioners of GIS come in different forms. There are GIS specialists and database scientists and managers, but many ecologists and biologists now have geographic training themselves. These professionals make themselves available to assist in nearly every aspect of work being done in the Inventory and Monitoring Division, from forests to water to birds to amphibians. Like with nearly all conservation organizations, GIS is a universal need.

In their paper, Wright et al. (1997) define the difference between GIS as "science" or "tool" into three distinct positions along the spectrum of science to tool. The various conservation projects I have just described in this paper all exemplify how important GIS practitioners are in the effort to provide both tool and science. These professionals are crucial in environmental work, helping conservationists prepare and analyze geospatial data, bringing different disciplines together, and taking the geographic approach to any conservation issue.

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