NBII Breaks New Ground in Data Collection and Verification

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If you ask many folks to tell you about "iPAQs" and "ArcPad," chances are your question would elicit little more than a blank stare. But posing the same question to selected scientists at Ft. Hood Military Reservation and Big Bend National Park might well evoke animated responses about their now being able to gain better environmental information faster, easier, and more cost-effectively than ever before by using iPAQs (handheld or Pocket PCs) and ArcPad (software that can deliver a variety of geographically-referenced information).

iPAQ showing a topographic map of Ft. Hood.

They doubtless would add that before iPAQs and ArcPad can deliver such impressive results, they need to be customized by someone with a ready knowledge of their capabilities as well as the scientists' needs. The task of tailoring these tools to meet Ft. Hood and Big Bend needs recently fell to geographic information system (GIS) professionals at the National Biological Information Infrastructure (NBII) Central Southwest/Gulf Cost Information Node, which is based near Houston, Texas.

Fort Hood

Established in 1942, the Fort Hood Military Reservation is the nation's foremost training facility for tank warfare. At the same time, this 340-square mile tract of land in central Texas is richly endowed with habitat for a variety of wildlife including the black-capped vireo *(Vireo atricapillus)*, an endangered species. Given these two truths, the Fort's military planners are committed to striking a balance between the need to produce battle-ready tank crews with the mandate to maintain the base's ecological integrity.

To address the second requirement, the Fort enlisted the help of The Nature Conservancy of Texas. One Conservancy goal was to ensure Army training activities didn't disturb black-capped vireo populations. The Conservancy reasoned that accurate maps of black-capped vireo habitat would allow military and civilian personnel to avoid those locations when conducting training.

The Conservancy teamed with the NBII to handle this challenge. NBII staff proposed a pilot project in which it would focus on a 10-square mile area and acquire airborne Light Detection and Ranging (LIDAR) data to map the vertical structure shrubland communities utilized by the black-capped vireo. The goal was to see how effective the LIDAR data were in helping pinpoint black-capped vireo habitat. This task was particularly challenging since this species typically nests in 1-3 meter high foliage, which often is located under a canopy of higher vegetation.

black-capped vireo (Vireo atricapillus)

The NBII classified their LIDAR data and identified numerous areas of potential habitat broken into three habitat types: classic (large, contiguous stretches of 1-3 meter high vegetation); donut (artificially generated as a result of tank training activities, typically a high tree with the 1-3 meter vegetation underneath); and linear (irregular in shape and within 4 meters of a tank trail or road). Having done that, they needed an efficient way for Conservancy scientists to go into the field and collect data to verify the classifications – "ground truth" them, in GIS parlance.

Enter iPAQs and ArcPad. In a nutshell, the NBII customized an ArcPad application to allow field personnel to efficiently ground truth potential habitat patches. These personnel could then view the patches on the iPAQ with relevant geospatial data using global positioning system

(GPS) capabilities to assist them in navigation. Plus, the NBII developed a special data form for recording vegetation composition, habitat characteristics, and vireo observation data for each patch to be ground truthed.

For those not familiar with GPS, it uses signals from 24 satellites to identify the direction, speed, and location of any object on Earth that has a GPS receiver. Conservancy scientists each had a receiver – in their iPAQs – along with the preassigned locations of the black-capped vireo habitat. The scientists then used their handy iPAQs for speedy and nearly effortless navigation to the previously identified land patches to validate the LIDAR classification, which turned out to be largely reliable although in need of modifications.

"We were delighted with how quickly this task proceeded," says Raquel Leyva of the Conservancy. "Originally, we though it would take six weeks; but with the application the NBII customized for us, it took only two weeks for actual data collection. As an added bonus, now we're developing our own applications. In the near future, we expect to use iPAQs and ArcPad to handle data collection for another important project – mapping the vegetation for the entire base."

Big Bend National Park

Big Bend National Park covers over 801,000 acres in west Texas, in the area where the Rio Grande makes a sharp turn (the "Big Bend"). Situated as it is on the border with Mexico, Big Bend is a place where countries and cultures meet as well as a place that merges natural environments, from deserts to mountains.

The National Park Service mandate to conserve and protect park natural resources has been greatly enhanced at Big Bend by the use of the same hardware and software, much of it similarly customized by the NBII. "Many Big Bend projects wouldn't be possible without this technology," says Betty Alex, the park's GIS specialist, "and all require less time, money, and manpower due to the efficiency of data collection and compilation."

She adds that these units are becoming part of "the standard backpack gear." Because of the iPAQ's light weight (less than a pound), small size (about 4" by 7"), ease of use, the ability to re-charge, and power units that use a wide range of battery and solar-powered accessories, park staff can carry a unit with them when working on projects and, sometimes in the process, document new natural and cultural resources discovered inadvertently.

Graphic showing examples of flora and fauna at Big Bend National Park.

"Let's say that while you're working on an archaeology project you find mountain lion tracks," she says. "That information can be recorded on a wildlife observation form the NBII people put together for Big Bend some months ago. You just type in the animal's name, the weather, a description of the animal and its behavior, the observer's name, and contact information. The date, time, and GPS coordinates are entered automatically."

A BIG added benefit is you can then give that new file to the wildlife biologist to investigate further. "It makes us all more efficient," she says. "When you have more than 800,000 acres to oversee and only 8 field scientists to handle it, this kind of equipment is invaluable. Plus, the coaching that the NBII folks gave us on how to customize it has been a great return on our original investment."

Maybe the biggest payoff is in the new enthusiasm Alex's staff brings to its work. She was having little success convincing one park volunteer to use a fully loaded iPAQ instead of the earlier technologies. Finally, near the end of his six-week project, he relented and took a unit with him into the field. Happily, the work the volunteer was then able to do saved her a lot of work later with mapping activities related to the project. Alex recalls his final day when she saw the unit on her desk with a note beside it from the volunteer that read, simply, "Betty, thanks for your iPAQ. I've found a new friend."

For More Information

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