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USDA • APHIS • PPQ

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For those in PPQ who work with Spatial Technologies (ST), such as GIS and remote sensing, these are exciting times. ST has been part of the scene for over two decades. However, we are finally bringing it into the fabric of daily work as a robust information management and decision support tool. In the following pages, a sampling of projects from CPHST labs demonstrate the breadth and depth of ongoing ST activities.

Each part of PPQ has an appropriate role and responsibility for ST. For example, CPHST is developing ST tools that better serve the needs of the field. We are also developing Enterprise System products: an integrated application of maps, data management, GIS data layers, and tools that solve problems across multiple programs, nationwide. Our NAPPFAST team has developed a predictive modeling tool to leverage more than a dozen pest programs. NAPPFAST risk zone maps help guide program managers to deploy field staff at the right place and time. Risk analysts also find NAPPFAST maps an excellent resource for their work.

CPHST scientists have learned a lot through fruitful engagement with our counterparts and friends in VS- Jerry Freier and the CEAH staff in Fort Collins. To enhance this synergy, Tom Kalaris plans to build ST capacity for CPHST at Fort Collins. CPHST scientists also work with other organizations such as ARS, the US Forest Service, Michigan State University, and Clark University to bring ST capability to PPQ. We are also exploring opportunities for international cooperation.

PPQ personnel have asked how to engage CPHST for support needs. The answer for small projects (three months or less) is to submit an Ad Hoc request. A short written request will trigger this process that vets and tracks the work to successful completion. For details, go to the PPQ home page, then CPHST, then click on "Work Requests."

Dr. Gordon Gordh and CPHST scientists see the benefits that ST can bring to essentially all PPQ programs. Many tangible results are already visible. However, this is only the beginning. Spatial Technology will provide the powerful means for PPQ to better fulfill the Safeguarding Mission.

CPHST Spatial Technology Virtual Team

Submitted by Dan Fieselmann

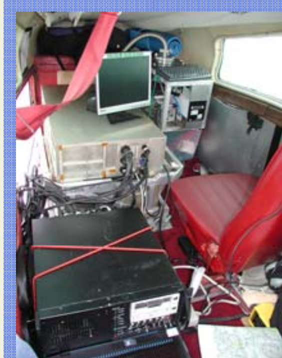
High Flying Project by CPHST Scientists Applies Hyperspectral Imaging Technology to Emerald Ash Borer Survey

March 2005

We made significant progress on remote sensing applications to emerald ash borer survey during 2004. We initiated this project in the summer of 2003 at the recommendation of the PPQ Program Management Team. The primary goal of the project is to develop maps of ash trees at risk from emerald ash borer for use by federal and state survey personnel.

SpecTIR Inc. of California collected aerial hyperspectral imagery (HSI) for us during the summer. Their HyperSpecTIR sensor simultaneously recorded reflectance from trees and other features over 227 spectral bands ranging from visible light through shortwave infrared wavelengths.

Images were collected over three flight lines in southern Michigan and three in northwestern Ohio. Individual flight lines were 2 kilometers wide and 15-40 kilometers long at ground spatial resolutions of one and two meters. Images were collected twice during the 2004 season, in early July and late August. These times represented periods of relatively low and high stress, respectively, due to beetle activity and water availability.



HyperSpecTIR imaging instrument used by SpecTIR

During the data collection flights, we were joined by several collaborators, including scientists from ITT Aerospace Sciences, Clark University, and the USDA Forest Service. These collaborations were very productive, especially in getting HSI experts to the field to observe and discuss the technical details of the data collection.

Our activities on the ground consisted primarily of the collection of spectral signatures of ash trees and other tree species using ASD spectrometers as well as the collection of ground truth data. Collection of spectral signatures employed the APHIS bucket truck so that measurements could be made above tree crowns, replicating the perspective of the airborne sensor.

Ground truth data were collected during five missions throughout 2004. Three hundred ash trees in various states of decline and over 400 trees of other species were identified under the flight lines. We were especially interested in species that are often confused with ash, such as boxelder, hickory, and walnut. Ground truth observations typically consisted of GPS locations of individual trees along with notes as to their size and condition and digital photos. Spectral signatures and ground truth data will be used to develop models for mapping ash and to validate those models.

Hyperspectral imaging airplane used by SpecTIR

The data sets for each flight totaled over 150 gigabytes. Because of their sheer size, we distributed them on large external hard drives. As of early November, all data were in the hands of our collaborators, and the analysis is currently underway. Our collaborators bring many years of experience and considerable expertise to the analysis. As a result, we look forward to very productive results from our collective efforts in the early months of 2005.

Submitted by David Williams

Quality Management within Spatial Technology

March 2005

CPHST is developing a quality management system in conformance with the requirements of the International Organization of Standards (ISO). This system is recognized by 125 countries world wide and will add to the recognition and acceptance of the CPHST scientific solutions. One of the requirements of the ISO quality management system is the development of technical procedures that describe the process used to develop scientific solution. CPHST faces unique challenges in development of technical procedures because the same technology is used at multiple CPHST laboratories. Spatial technology provides one of these challenges. The solution is to develop CPHST level technical procedures that apply to all laboratories using common technology.

During the spatial technology meeting in Raleigh on February 16 and 17, 2005, **John Gallagher** presented the ISO requirements while **Lisa Kennaway** outlined an approach for development of integrated spatial technology data process that would comply with the ISO requirements and lead to common technical procedures. In addition, the Federal Geographic Data Committee requirements that must be used by government personnel as directed by Executive Order: 12906 were reviewed. Following the presentations an open discussion was conducted to obtain input from regional, CPHST, and academic scientists on the ISO system development.

Submitted by John Gallagher

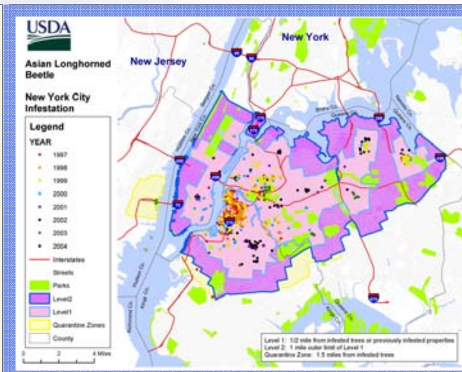
Developing GIS for Management of Asian Longhorned Beetle

March 2005

Asian Longhorned Beetle (ALB) was introduced into the United States through solid wood packing materials from China. ALB bores into many hardwood trees, such as maples, box elder, horsechestnut, buckeye, elm, ash, birch and willow. It has caused tremendous damages in the Chicago and New York area since ALB was first found in 1996.

Data Collection: Basic data, Streets and Building Footprints, were obtained from the City of New York to effectively survey ALB in the New York area. Each street block was assigned a zone and unit number, with each zone consisting of several units. All the data layers were georeferenced to State Plane NAD 1983 New York Long Island projection.

GIS project customization: Using basic data layers, PPQ officers in New York print out survey maps, update infested and host tree locations, and update Level 1 (half mile from infested trees or previously infested properties), Level 2 (1 mile outer limit of Level 1), and Quarantine Zone (1.5 miles from infested trees). In order to keep uniformity throughout all officers in the New York area and to effectively survey ALB on the ground, the GIS project was customized to meet PPQ needs. All PPQ officers are able to do the following tasks by clicking customized icons.



- Zoom into one unit
- Add infested or host tree location and associated information
- Find zip code and zoom into one user defined zip code
- Find user defined address
- Calculate the area of Level 1, Level 2 and Quarantine Zone
- Create new units from streets
- Update zone layer
- Print out survey map and zone map

Christine Markham, ALB National Program Director, comments on the value of developing GIS for management of ALB. "These functions are critical to managing the various program activities, including survey, treatment, tree removal, regulatory and public outreach. Through the use of tax maps and building footprints, all of the properties and host trees located on those properties within the ALB quarantined areas are able to be mapped. These maps are used in scheduling survey and chemical treatment field operations. The exact locations of infested trees are mapped in the system. Treatment boundaries are defined for current and future years and are set to contain and eliminate ALB infestations. Survey boundaries are set to detect and delimit the infestation. Quarantine boundaries are set to prevent the movement of regulated articles that could potentially increase the spread of the ALB infestation. The program uses maps to communicate to the private property owner and public officials yearly progress in survey, treatment, and infested trees detected and removed. Maps showing program accomplishments are critical to maintain public and political support for the program."

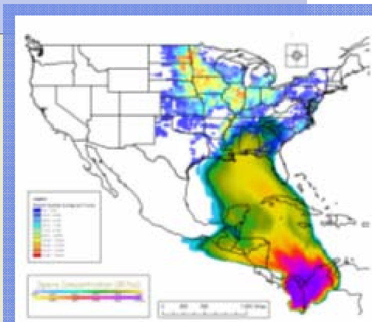
Overall maps containing information are available for ALB status update and decision making by contacting **Yu Takeuchi** (Yu.Takeuchi@aphis.usda.gov).

Submitted by Yu Takeuchi

Tracking Spread of Soybean Rust Using Spatial Technology

March 2005

CPHST-PERAL has an exciting project studying the spread of the invasive pathogen soybean rust. The project team includes **Glenn Fowler, Dan Borchert, Roger Magarey** (CPHST) and **Manuel Colunga** (MSU). The project includes North Carolina State University, Penn State University and the information technology company ZedX inc. Soybean rust was initially confined to Asia and Australia, but has been spreading to Africa and South America via atmospheric transport. Most recently it appeared in northern South America in 2004, becoming a major threat to US production areas. In its first year of funding (2003), the research group developed the Integrated Atmospheric Model System (IAMS) to track spore dispersal. The IAMS model is a three-dimensional atmospheric transport model that accounts for spore transport, survival and deposition. The model runs at 14-km^2 grid resolution. The system was used to predict the spore deposition pattern associated with the 2004 hurricane season. The model's results showed that weather conditions associated with Hurricane Ivan (September 2004) provided an opportunity for direct transport of viable rust spores into the southeastern U.S. The pattern of spore deposition predicted by the model suggested that the pathogen was widely distributed across Gulf Coast states and this was later confirmed by surveys (Figure 1). The CPHST team working with **Coanne O'Hern, Matt Royer** and **Osama El-Lissy** from the Pest Detection and Management Programs has been playing a key role in developing a coordinated framework for soybean rust for season 2005. The coordinated framework is an important USDA initiative that also includes CSREES, ARS, NPDN, Land Grant Universities, states and industry. The framework includes decision criteria, surveillance, prediction models, information delivery and outreach. As part of this effort the IAMS model will be used to provide daily updated maps of soybean rust deposition and epidemic development. These maps will be interpreted by soybean pathologists from Land Grant Universities and state Departments of Agriculture to provide stakeholders with simple warning maps of rust incidence at the county scale.



Spore dispersal from South America to US

Submitted by Roger Magarey

NAPPFAST: NCSU APHIS Plant Pest Forecast

March 2005

The North Carolina State University, APHIS, Plant Pest Forecast system (NAPPFAST) is a multipurpose tool that incorporates North American climate data with biological models to produce customized maps for pest survey or risk assessment purposes. NAPPFAST was developed through a cooperative agreement with APHIS, NCSU and ZedX Inc., a private information technology company.

NAPPFAST is accessed through the internet using Internet Explorer as the web browser. The system has two sites to provide information to interested individuals, NAPPFAST and NAPPFAST MapView.

The NAPPFAST site is a full function modeling/mapping site that allows the user to create models and maps for multiple types of plant pests. NAPPFAST can be used to create degree day models to predict when and where insect phenological events will be occurring, disease infection models to predict areas at highest risk for disease occurrence and multifunction models that can be used to develop exclusion areas. Additionally, maps can be exported as a Geo TIFF file into a GIS system, which allows for multiple types of

The NAPPFAST Team at CPHST/PERAL (Left to right) Brett Nietschke, Glenn Fowler, Roger Magarey & Dan Borchert

analysis, transferability and customization.

In comparison to the NAPPFAST site, NAPPFAST MapView is a public map viewing site that allows for easy navigation, rapid retrieval and viewing of maps. Through the use of dropdown menus, previously created maps can be selected for 30 key plant pests. Within both sites it is possible to zoom in for increased map detail, add informational overlay layers, such as agricultural commodities and county boundaries, and print a custom map as a PDF with a single click.

While NAPPFAST is still a developing and evolving tool, it has proven to be quite useful to APHIS. NAPPFAST was extensively used by PDMP in the soybean rust response exercise and in emergency response efforts on soybean rust and *Phytophthora ramorum*. Additionally, NAPPFAST has been utilized to create risk maps for *Phytophthora ramorum*, soybean rust, karnal bunt, pink hibiscus mealybug, Asian Gypsy moth and the Giant African Snail. The system has also developed prediction maps to assist the survey efforts for the CAPS National target pests program. The flexibility of NAPPFAST has enabled CPHST to conduct multiple Ad-Hoc projects, such as area of potential establishment for pink hibiscus mealybug and pea leafminer, Japanese beetle emergence prediction and karnal bunt survey protocol.

In the future, NAPPFAST plans to increase its climate database to global coverage and incorporate a climate matching function to its capabilities. For additional system information and login please go to http://www.nappfast.org.

Submitted by Dan Borchert

Spatial Technology Survey Tools

March 2005

CPHST is working with several USDA and state university personnel to develop integrated survey and detection tools that capture spatial data from the field in digital form. Survey tools are being developed for phorid flies (biological control organisms for imported fire ants), non-

Survey specialist using GPS/PDA hand-held unit.

native cactus moth spread and management, and SOD nursery surveys. Currently, CPHST is using ESRI® Arc-pad software as the field data entry platform. As a handheld, MS Windows based package, ArcPad, will allow surveyors and inspectors to replace the classic (error prone) manual clipboard data entry device they now use. Using an automated handheld data entry tool such as ArcPad, if developed correctly, would significantly improve data quality, and reduce the time and level of resources necessary to collect, store and re-distribute field data. This tool should give managers of survey and inspection programs a way to monitor the quality of work performed, allowing managers to accurately set and track benchmarks identified.

Digital data collection systems that use Global Positioning Systems (GPS) and Personal Digital Assistants (PDA's) increase data quality thru standardized data collection, movement and processing. Development and integration of these technologies has tremendous potential to reduce the time it typically takes to evaluate surveys and inspections, make decisions and trigger appropriate responses to manage program activities. Financial savings are anticipated through reduced data transcription labor costs between field paper and computers and reduction in manpower costs in getting data from field locations. Further, time savings of 25-50% in transcribing records and in physically moving data between field locations and management centers are anticipated.

Submitted by Ronald D. Weeks, Jr.

Feasibility of Detecting Prickly Pear Cactus with Multi-Spectral Short-Wave Infrared Technology for a Cactus Moth Detection Program

March 2005

The detection of *Cactoblastis cactorum* in Florida in 1989 was recognized by researchers and the conservation community as a serious threat to the diverse prickly pear species of North America and to the agricultural uses of prickly pear in Mexico. With the moth's dispersal along the Atlantic coast to Bull Island, South Carolina and along the Gulf Coast to Dauphin Island, Alabama by 2004, researchers estimate *C. cactorum* will reach the Texas border by 2007 (Bloem, et.al pers. comm.). In 2004, APHIS PPQ developed a strategic plan with the Agricultural Research Service to increase detection along the Gulf Coast and test a method of mitigating or stopping the spread using the sterile insect technique. ARS and CPHST will conduct the release of sterile insects on two islands during 2005 in a validation study to determine if a barrier to westward expansion can be established.

In order to more clearly delineate the leading edge of the westward expansion of the cactus moth, knowing where prickly pear hosts are is crucial for increasing detection efforts using traps or visual surveys. This is especially important in the Southeastern US where little is known about *Opuntia* species distributions.

Prickly pear cactus near Boca Chica Beach by the mouth of the Rio Grande, Cameron Co. Texas, 2005

Remote sensing technology may be an ideal tool to provide the data necessary to create a host distribution map without the need for extensive surveys on the ground. Everitt et al. (1991) documented the effectiveness of using a camera sensitive to the shortwave-infrared (SWIR) spectral region to differentiate prickly pear cactus from other plant species in rangeland locations. Our goal is to build further on this work using a high resolution multi-spectral camera system sensitive in the SWIR region to differentiate prickly pear cactus along the Gulf Coast.

The cactus moth program recently purchased a new higher resolution SWIR camera to use for the detection of prickly pear host plants. We will incorporate this new camera into the current multi-spectral camera system developed by Jim Everitt and the ARS remote sensing group at Weslaco, TX. Once the camera system is functional, ARS will load the system into their aircraft and we will begin conducting tests. Research sites have been determined for 2 locations in Texas. Three additional sites will be determined along the Gulf Coast close to the front of the cactus moth distribution. Research sites will be located within natural beach areas, residential areas, and inland sites to look at potential differences in the detection to prickly pear.

Submitted by David Bartels

Climate Host Mapping of *Phytopthora ramorum*, Causal Agent of Sudden Oak Death

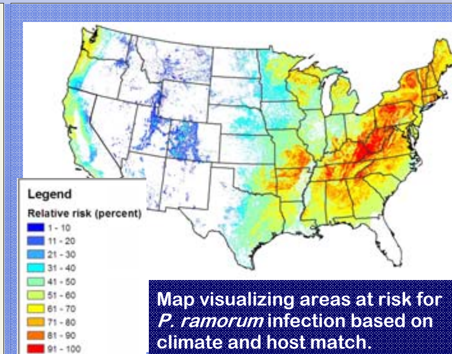
March 2005

CPHST-PERAL has been engaged in GIS mapping for the Sudden Oak Death (SOD) program since the emergency situation developed in 2004 with the nations wide shipment of infected nursery stock. SOD, caused by the fungus, *Phytopthora ramorum*, has the potential to cause substantial ecological and economic damage to US forests.

One of the GIS projects currently being conducted by CPHST-PERAL is climate and host mapping of areas in the continental US that are susceptible to the disease. The project team includes **Roger Magarey** and **Glenn Fowler** (CPHST-PERAL) and **Manuel Colunga** (Michigan State University). The purposes of the project are to 1) identify areas at risk for SOD to help mitigate potential economic and ecological damage, 2) increase the efficacy and economy of surveys for the disease, 3) assist SOD program managers in making sound regulatory decisions.

To map areas with favorable climates for *P. ramorum* infection, the NAPPFAST system was used. Models were constructed that visualize at risk areas based on temperature and leaf wetness using 10 and 30 year historical daily climatological data. Monthly and annual maps were generated. The predictive model was validated by overlaying confirmation data points with the annual climate match map. The model exhibited good predictive power, picking up greater than 90% of the SOD confirmations in the high climate match zones. A preliminary climate host map was created by overlaying and averaging the annual climate map with host distribution.

The monthly and annual maps were used in the 2004 and 2005 national survey manual for SOD. The maps have also been distributed to USFS personnel. In addition, they have been presented at numerous scientific meetings including the SOD Science panel, SOD program review and the second SOD science symposium. More



Map visualizing areas at risk for *P. ramorum* infection based on climate and host match.

advance modeling techniques for climate host mapping of areas at risk for SOD are planned. Global mapping of high risk areas for *P. ramorum* infection are also planned with the hope of helping identify where the disease originated.

Submitted by Glenn Fowler

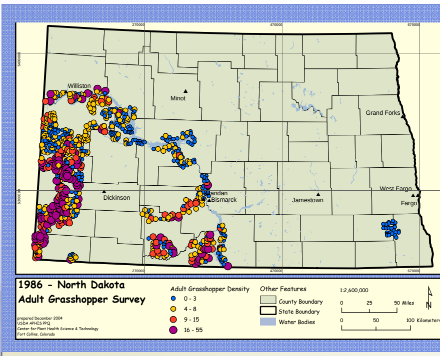
GIS and Spatial Analysis Support for Grasshopper Program

March 2005

The Fort Collins NWML's "GIS and Spatial Analysis Support for Grasshopper Program" is developing a spatial database that compiles the historic data from field surveys that PPQ has conducted across the West for the past 50 years. The data are adult grasshopper populations. Specifically, the project is locating the old paper maps and notes from grasshopper surveys, where they still exist, and digitizing the data so it can be used with a GIS system.

In the past, APHIS has relied on experienced field personnel to make decisions about when and where to conduct treatment programs, how large the programs should be, project costs, timing, etc. The experience gained from these programs often resides in the memory of senior PPQ staff, something that is disappearing more each year. In the words of Roeland Elliston, PPQ's Western Regional Program Manager overseeing the Grasshopper Program, "In all the Western States, Grasshoppers/Mormon Crickets have played an important development role in our past abilities to produce the necessary pasture production to supply the food necessary for our Nation's development. Being aware of our past only assists our food production industry to combat the cycling Grasshopper/Mormon Cricket outbreaks." The historical record of grasshopper populations is an important component of this knowledge and needs to be recorded. To prevent the valuable data from being lost, it is being translated into a spatial database which can be easily utilized and maintained.

Once the data are finalized, it will provide valuable historical information to both land and program managers. The data will show grasshopper populations dynamics across the West over a 50 year time period. It can be used with other data layers, like weather data, to enhance modeling population dynamics and "hot spot" prediction. The data can be directly used with existing decision support software, like Hopper and CARMA, to assist ranchers and land managers with economic models. Additionally, analysis of historical sampling efforts may shed more light on the effectiveness of various control mechanisms, and could be used in



conjunction with various threatened and endangered species (i.e. American Burying Beetle) management programs.

The potential for this dataset is vast and can serve as an example for future historical data efforts. As of February 2005, the following progress has been made: Montana, Nebraska, North Dakota and South Dakota are nearly complete; Utah, Nevada and Idaho are in progress; and all other states are waiting on data retrieval from the State Plant Health Directors Offices.

Submitted by Lisa Kennaway & Tom Kalaris

Spatial Technology Virtual Team Annual Meeting

February 16-17, 2005

The CPHST Spatial Technology Virtual Team (STVT) was born out of the idea that CPHST currently has a wealth of expertise in this emerging field, however those individuals are widely distributed geographically and communication is not easily facilitated. The CPHST STVT was developed to harness the efforts and talents of all individuals in a collaborative manner. In addition to internal collaboration, external communication with CPSHT and PPQ stakeholders is considered a fundamental philosophy of the team. Thus, STVT meetings also include stakeholders with a vested interest in spatial technology. The benefit of inviting the stakeholders is twofold. First, these individuals can learn of CPHST projects and actively participate in project discussions. Secondly, stakeholders can provide feedback and input into the meeting which will better equip CPHST to provide realistic technology for diverse program needs.

CPHST STVT members were first identified in the spring of 2004, and the first team meeting was held in Raleigh in June, 2004. This meeting was intended to be a gathering of like minds to review active projects, ensure collaboration where appropriate, and prevent duplication of efforts.

CPHST Director's Office recently hosted the second annual meeting of the STVT in Raleigh, NC. The primary goal of this meeting was to develop a team concept and design with a clear vision for a collaborative future. As such, significant time was given to discussion of current GIS and spatial technologies activities as defined by CPHST workplans and Ad-Hoc projects. In addition, there were overarching themes of Quality Management in Spatial Technologies, as well as alignment with the COTIA Spatial Technologies APHIS Strategic Plan. STVT members attending the meeting included **David Williams, Ron Weeks, Yu Takeuchi, David Prokrym, Roger Magarey, Lisa Kennaway, John Gallagher, Glenn Fowler, Daniel Fieselmann, Laura Duffié, Christina Lohs, Manuel Colunga, Brian Spears, Dan Borchert, and David Bartels.** Team leader **Tom Kalaris** and member **Alan Sawyer** were unable to attend. Stakeholders and visitors included **Deborah Millis** (COTIA), **Mark Crane** (Eastern Region), **Douglass Bopp** (Emerald Ash Borer Program), and **Don Albright** (Plum Pox Virus Program).

Presentations from the 2005 STVT Meeting can be found at I:\cphst\Spatial Technology Virtual Team\. Those who do not have access to the CPHST I://Drive may request the presentations in CD format from Laura Duffié.

Submitted by Laura Duffié

GIS Spotlight: David Bartels

March 2005

David Bartels, a native of Las Cruces, New Mexico, received his B.S. in Agricultural Biology from New Mexico State University. He received his M.S. and Ph.D. in Entomology from the University of Minnesota. He joined the USDA APHIS Pest Detection, Diagnostic, and Management Laboratory in Edinburg, Texas in 1999. Within APHIS, he provides scientific support for Domestic and Emergency Programs by developing geographic information system and remote sensing products for tracking insect and disease pests. David was recently stationed at Michigan State University for 10 months working with Computational Ecology & Visualization Laboratory and Center for Global Change & Earth Observation personnel to learn advanced spatial analysis and image analysis methodology to support Plant Protection & Quarantine programs. Current work involves using remote sensing technology for survey work on the Emerald Ash Borer program and detecting prickly pear along the Gulf Coast for the Cactus Moth program.

When David isn't traveling around the country for APHIS, he can be found on his own small piece of Texas which he shares with his wife Barbara, daughters Rachel and Sarah, 2 horses, 2 cats, and 1 dog. In the rare moments of free time, David likes to dabble in woodworking, gardening, hunting, and fishing.

GIS Spotlight: Lisa Kennaway

March 2005

Lisa Kennaway joined the National Weed Management Lab (NWML) in Fort Collins, CO as a GIS Analyst in April 2004, working under a cooperative agreement with Colorado State University's (CSU) Department of Bioagricultural Sciences and Pest Management. Her current project's focus is on the investigation of new remote sensing technologies for assessing phytosanity efforts, the development of a historical grasshopper database, and the implementation of International Standards Organization (ISO) for spatial technologies within CPHST.

Prior to working with CPHST, she worked for a research unit at CSU funded by the Department of Defense and provided scientific support to the Integrated Training Area Management program. Her specific duties focused on providing spatial technology advancement to military installations across the United States.

Lisa earned her M.S. in Rural Geography and Public Planning from Northern Arizona University in 1998 where she studied the application of GIS and GPS to human impact monitoring in wilderness areas. Her research provided much needed data and analysis to help protect precious rock art resources within the Kanab Creek Wilderness Area.

Lisa, her husband, and their two dogs enjoy spending time hiking, biking, and skiing the mountains of Colorado and beyond. In addition, she loves visiting tropical destinations where she can explore new environments and cultures.

GIS Spotlight: Tom Kalaris

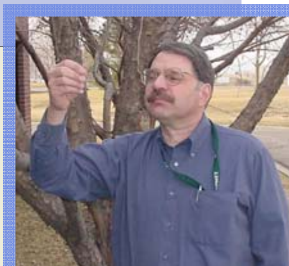
March 2004

Tom Kalaris received a Masters degree in Mathematics and Statistics from Montana State University in 1986. After graduating he went to work for the ARS Rangeland Insect Lab in Bozeman, Montana. Among the projects he worked on were population dynamics of rangeland grasshoppers, phenology modeling, and spatial statistics. His work included some of the first applications of geostatistics to biological problems.

He began working with GIS systems in 1989 with an abysmal software package called SPANS. Over the years he has also worked with ArcInfo, ERDAS, Idrisi, Mapinfo, GRASS, AtlasGIS, and others. ArcInfo soon became his main GIS tool.

Much of his work with ARS involved cooperating with and supporting the grasshopper work of the PPQ state offices. For several years he produced the annual grasshopper forecast map for PPQ, using field data and geostatistics.

Tom came to work fulltime for PPQ CPHST in 1999. Since then he has been involved with risk based staffing models, port risk analysis, sampling strategies and statistical models, and GIS. He has authored or co-authored several CPHST reports including The Statistical Basis for AQIM, The FMD Report, Mexican Border Risk Analysis, and The Risk Determination Tool.



Tom's projects currently include the collection and archiving of historic grasshopper survey data, integration of GIS applications with ISIS, and remote sensing applications to detect Tamarisk and monitor the release and spread of biocontrol agents. He currently has two titles: Acting Lab Director for the CPHST National Weed Management Lab and head of the CPHST Spatial Technologies Virtual Team.

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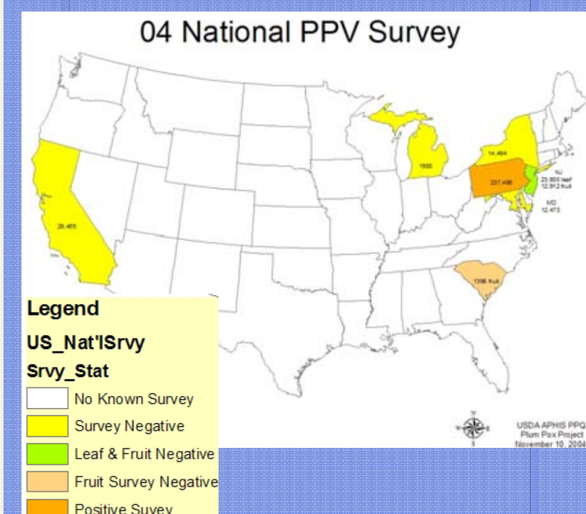
Stakeholder Philosophy: GIS Use in the Field

Don Albright, National Plum Pox Virus Operations Director for USDA APHIS PPQ, shares his thoughts on GIS use in the field.

GIS has been an integral part of the Plum Pox Virus Eradication Project since PPV was discovered in Pennsylvania in 1999. When PPV was discovered there were no records of who owned host orchards, where these orchards were located, or how many acres were involved. The Pennsylvania Department of Agriculture (PDA) took the lead in setting up a GIS database and worked with programmers from Penn State University to develop scripts to simplify ArcView 3.X's operating system for data collection and orchard block mapping. PDA also gathered needed data layers of municipalities, roads, and worked with Penn State University to get the needed digital orthoquads (i.e. aerial photographs) to help define orchard blocks. Over the years, the GIS application was refined and errors corrected using GPS's to locate blocks.

The first year of survey included 2000 properties in core infected areas. As the project grew, more and more field data were collected with GIS equipped PDAs and hand held computers. The 2004 homeowner survey involved visiting 58,000 properties and collecting 43,000 samples from 18,000 properties over a 400 square mile area. Using GIS, one was able to quickly locate where the one positive barcoded homeowner sample was collected to initiate removal of the infected tree and any host material within 500 meters of that tree.

GIS has been an invaluable tool used in the management of this project. Using GIS enables project administrators to plan surveys and project personnel needs in the field and lab because of the ability to accurately project the number of samples that will be generated from a survey area. Quarantine changes are easier to establish and track using GIS, along with the affect these changes will have on the designated areas, including the number of growers, acreages, and regulated establishments. The revised maps are published directly from the software. Work progress tracking and alternate planning are easily visualized using the maps generated by the software and the data collected in the field using PDA's is synchronized directly into the GIS database allowing immediate access to this information and updates to the maps. Using defined survey areas and parcel layers from county assessment offices, the project has been able to notify property owners about planned surveys.



Is GIS worth the investment? It is for anyone that wants to be able to quickly visualize what is happening with a given field project. It enables one to run what if scenarios while planning project operations or regulatory changes. It allows for better shifting of assets as situations change in the field. It replaces notebooks full of data and hand drawn maps by linking all of that data to features on an accurate map that can quickly be retrieved by doing an electronic search or selecting a feature. Collecting data electronically in the field eliminates data entry from paper at the office and eliminates data entry errors. Using ArcPad enables taking that data and maps from the office to the field, allowing navigation to a location by unfamiliar personnel and having needed information about that location in hand to add to or change as needed once there.

What is lacking in PPQ is direction as to what base data is essential for use at the national and regional levels for all programs when collecting GIS data in the field and what format that data needs to be in. Each individual project or program would have additional data requirements that could be added to the base knowledge and used as needed.

Submitted by Don Albright