

Thursday, May 3, 2012, at 9:00 a.m. (MDT) Energy and Mineral Resources will hold a joint oversight and legislative hearing entitled "Federal Geospatial Spending, Duplication and Land Inventory Management" and on H.R. 4233 (Lamborn), Map It Once, Use It Many Times Act and H.R. 1620 (Kind/Bishop of UT), Federal Land Asset Inventory Reform Act of 2011. This hearing will be held at the Pikes Peak Regional Building, 2880 International Circle, Colorado Springs, Colorado.

Mr. Chairman, I am Brian Raber, Vice President for Geospatial Solutions at Merrick & Company. Based in Aurora, Colorado Merrick provides professional services in engineering, architecture, surveying, and geospatial solutions. Our 500 employee-owners work out of 13 offices, including one here in Colorado Springs, and several abroad.

I'd like to commend you Mr. Chairman for holding this hearing and introducing H.R. 4233. Your actions demonstrate an appreciation for the importance of geospatial data and related services to our State, and to the Nation.

Colorado has become one of the leading centers for the emerging and exploding "geospatial" community.

We estimate more than 100,000 geospatial-related jobs currently exist in Colorado. In addition to traditional and high technology mapping firms, geospatial employment is also present in government agencies, universities, and serves numerous markets and industries.

According to the National Geospatial Advisory Committee, as much as 90 percent of government information, and up to 80 percent of business intelligence is connected to a specific geographic location. A study by the Center for Strategic and International Studies (CSIS) estimated that at least \$30 billion is generated by geospatial-related companies annually.

Geospatial jobs here in Colorado are in demand as they are high paying, high tech, and high quality. Your bill could help expand this profession even more in Colorado and specifically the Front Range.

As you know Mr. Chairman, geospatial data touches our everyday lives in many ways. From the electric that we use to power our businesses, to the water and food we consume in our homes, to the organizations managing the nation's critical infrastructure, Colorado geospatial firms assist in the planning, collecting, analyzing and distributing data that drive these and countless other GIS applications.

The question is – does the Federal government use geospatial data as effectively as possible? The answer is no. And your bill, the Map It Once, Use It Many Times Act, will help solve this problem by reasserting the USGS to its rightful leadership position among Federal civil agencies.

Mr. Chairman, let's look at a few of the major issues facing our nation today and how your bill will address them. From a nation-wide parcel database that could model home foreclosures, to LiDAR and remote sensing that will aid studies of biomass loss, land use change and rising sea levels to determine the alleged impact of global warming, to the health care bill that includes more than 800 provisions requiring location data, coordinated geospatial data and services are an important part of the solution. What your bill will promote is that the numerous of agencies which operate their own geospatial activities in stovepipes, resulting in waste, duplication, and inefficiency be eliminated.

Deliberate coordination not only maximizes the use and application of geospatial data, thus improving the delivery of government services, but it saves money.

An example that I have personal knowledge of is where coordination took place between 11 agencies when they mapped 30,000 square miles of prime wetlands, floodplain, and agriculture land in Nebraska, resulting in the creation of a best management approach between the collaborating agencies. Geospatial data is helping preserve the characteristics of this region having a \$25-50 million positive impact on their economy, protecting wetlands and habitat in the central waterfowl flyway, and increasing the productivity of agricultural land. We believe our nation can see great paybacks with H.R. 4322 by the USGS doing more to coordinate geospatial projects like the one I mentioned.

Geospatial data should become as common place in the process of government as word processing software. Your bill takes a giant step toward that goal by creating a more strategic approach to governance, coordination, research, exporting, and defining roles and responsibilities.

Your bill would benefit the geospatial firms in Colorado, as well as, all the people of Colorado. The result will be more private sector jobs, a smaller yet more efficient government, a more robust private sector economy, and lower cost of carrying out government programs.

Mr. Chairman, thank you for your leadership, your service to Colorado, and for sponsoring H.R. 4233.

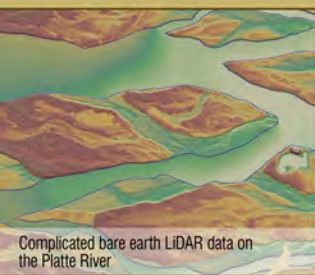
Respectfully submitted by:

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TECHNOLOGY Soars in Conservation Management



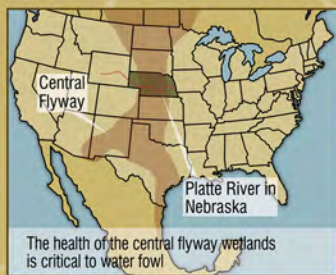
Category A: Airborne & Satellite Data Acquisition | Project: Rainwater Basin
 Client & Project Location: Natural Resources Conservation Service (NRCS), Nebraska & Kansas | Entering Firm: Merrick & Company, Aurora, Colorado



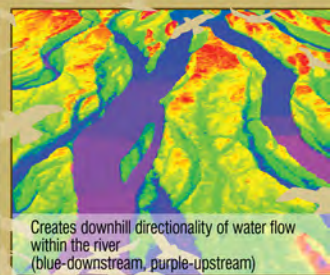
Complicated bare earth LIDAR data on the Platte River



Low impact wetland engineering & restoration



The health of the central flyway wetlands is critical to water fowl



Creates downhill directionality of water flow within the river (blue-downstream, purple-upstream)

ORIGINAL & INNOVATIVE TECHNIQUES

- Daytime and evening (24/7) LIDAR flights cut costs and helped meet aggressive schedule
- Extensive checkpoint control network used to validate precision of data
- Monotonicity workflow guarantees complex hydrology networks flow downstream for engineering modeling

FUTURE VALUE TO THE ENGINEERING & GEOSPATIAL PROFESSIONS

- Technology being used for restoration of wetlands will aid scientists and researchers to increase the amounts and quality of water fowl habitat

- Multiple agencies using the same information can share results and practices to create more effective long-term restoration solutions
- The rainwater project's success may help gain congressional support and funding for a Nationwide LIDAR program

SOCIO-ECONOMIC BENEFITS OF LIDAR APPROACH

- Conservationist and sportsman utilize data to create sustainable solutions that will perpetuate the central flyway ecosystem and increase the population of wildlife in this region
- Cooperative and best management practice of the Rainwater Basin using LIDAR has a multi-million dollar economic impact on the many small towns within the region

COMPLEXITY

- One of the largest projects completed within the US in terms of square miles, checkpoints, miles of flight lines that was submitted on time and within budget
- Managing the requirements of over 11 funding partners was worth the extra collaboration efforts
- Meeting the aggressive 12 month schedule despite adverse winter flying conditions was accomplished from a well conceived management and flight plan

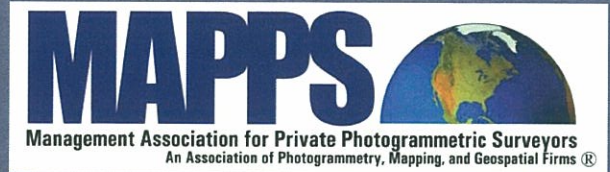
EXCEEDING CLIENT NEEDS

- Horizontal and vertical accuracy exceeded specifications which increases the reliability of scientific analysis
- On-time delivery of the data allowed end-users to meet their deadlines preparing conservation and engineering models
- Many value-added applications are now possible due to increased LIDAR accuracy and timely delivery acceptance of data



2010

Geospatial Products
and Services
Excellence Awards



MAPPS • 1856 Old Reston Avenue • Suite 205 • Reston, Virginia 20190

Official Entry Form

The firm, project, and client's/owner's name should be typed or printed as they appear on other award documents. Please furnish all the information requested below for each entry and note that both signatures (firm and client) are required.* Attach a check to this entry form in the amount of \$250.00, payable to MAPPS. If you wish to pay by credit card, please call (703) 787-6996 or email rammy@mapps.org. All materials must be received no later than August 31, 2010 to be considered for an award.

*Client/Owner information and signature not applicable for Category F entries

Project Details

Project Name: LIDAR Technology Soars in Conservation Management

Category (check one):

- A. Airborne and Satellite Data Acquisition
- B. Photogrammetry/Elevation Data Generation
- C. Remote Sensing
- D. GIS/IT
- E. Small Projects
- F. Technology Innovation

Project Location: 18,000 square miles in the Rainwater Basin, Nebraska and Kansas

Completion Dates/Fee:

Scheduled: December 29, 2009 Actual: December 9, 2009

Budgeted Fee: \$2,551,000 Actual Fee: \$2,551,000

Firm Details

Entering Firm: Merrick & Company

Address: 2450 South Peoria Street City: Aurora State: CO Zip: 80014

Project Manager Name: Doug Jacoby, CMS, GISP

Phone: 303-353-3903 Fax: 303-745-0965 Email: doug.jacoby@merrick.com

Contact Name: Brian Raber, CMS, GISP, GLS

Phone: 303-353-3900 Fax: 303-745-0965 Email: brian.raber@merrick.com

I hereby authorize submission of this project into the MAPPS 2010 Geospatial Products and Services Excellence Awards competition. I am an Officer within my firm.

Signature: [Signature] Title: Vice President Date: August 20, 2010

If my firm wins an award, we will want a duplicate award for our client at an additional fee.

Client / Owner Details (Does Not Apply to Category F Entries)

Client/Owner(s): Natural Resource Conservation Service (NRCS)

I currently believe that the work performed by this firm meets the intended uses and expectations for this project and grant permission to enter this project into the MAPPS 2010 Geospatial Products and Services Excellence Awards competition. I confirm that the project was substantially completed and ready for use between January 1, 2009 and December 31, 2009 and authorize publication of the project's details with respect to its complexity, innovative application of technology or techniques, and value to the geospatial profession and the public.

Client/Owner Representative: Ms. Shandy Bittle

Title: State GIS Specialist Signature: [Signature] Date: August 20, 2010

Address: 100 Centennial Mall N., Suite 152 City: Lincoln State: NE Zip: 68508

Phone: 402-437-4020 Fax: 402-437-5490 Email: Shandy.Bittle@ne.usda.gov

Deadline August 31, 2010



Natural Resources Conservation Service
Nebraska State Office
Federal Building, Room 152
100 Centennial Mall North
Lincoln, NE 68508-3866
(402) 437-5300

<http://www.ne.nrcs.usda.gov>

August 17, 2010

Management Association for Private Photogrammetric Surveyors (MAPPS)

Attn: Tammy Johnson

1856 Old Reston Avenue, Suite 205

Reston, Virginia 20190

Subject: Client Letter for the 2010 MAPPS Geospatial Excellence Award

Dear MAPPS Geospatial Award Selection Committee:

As the Project Manager for the Natural Resource Conservation Service (NRCS) on the Rainwater Basin LiDAR Project I have first-hand knowledge of the work that Merrick & Company (Merrick) performed on this contract. The contract was with the U.S. Army Corps of Engineers St. Louis District and included collecting Light Detection and Ranging (LiDAR) data over a 17,677-square-mile area in Nebraska and Kansas (the project area covers almost all of south central Nebraska and four counties in north central Kansas).

As a result of Merrick delivering the project within budget, very close to the original aggressive schedule, as well as, meeting the technical specifications, the digital elevation model is currently being used in many important applications including natural resources analysis, agricultural planning and management, and to update the flood maps in the project area. More specifically, the elevation data will serve as an essential part of the wetland restoration index, a tool that is being used to prioritize habitat protection and restoration activities to achieve the greatest wetland biological return for the habitat investment dollar and for stream restoration on the Platte River as part of the Platte River Recovery Implementation Program.

Included within is my office telephone and email contact information (402-437-4020 or Shandy.Bittle@ne.usda.gov). Please feel free to contact me if the selection committee requires additional information concerning this application.

Sincerely,

A handwritten signature in black ink that reads "Shandy Bittle".

SHANDY BITTLE
State GIS Specialist

Helping People Help the Land

An Equal Opportunity Provider and Employer



TECHNOLOGY SOARS IN CONSERVATION MANAGEMENT

Role of Consultant

Merrick & Company along with key agencies in the Rainwater Basin began discussing a jointly funded Light Detection and Ranging (LiDAR) project in 2007. During the formation stages, Merrick provided the team with professional guidance to understand LiDAR capabilities, technical alternatives, and to help justify the needs and requirements for this very large LiDAR project. Merrick's role was to lead the project and assist in the development of the scope of work, coordinate and perform the airborne acquisition of LiDAR and surveying supported by two partners, and implement a unique production workflow process for all of the deliverable products for the many participating agencies.

Role of Other Consultants in the Project

Several consultants assisted to make this project one of the most successful LiDAR projects completed during 2009 in the geospatial profession. Dewberry of Fairfax, VA finalized the technical specifications and provided an independent quality assessment of the vast amount of LiDAR and survey data. Optimal Geomatics of Huntsville, AL provided LiDAR acquisition support in Kansas and provided the contract vehicle with USACE, St. Louis District. The Minority Business Enterprise (MBE) firm of Midland Surveying of Maryville, MO supported a portion of the surveying, and Woman Business Enterprise (WBE) firm of AeroSystems of Eire, CO was contracted for Merrick's aircraft logistics.

Role of the Client

Since 1935, the USDA's Natural Resources Conservation Service (NRCS, formally called the Soil Conservation Service) has partnered with America's private land owners and managers to help conserve their soil, water, and other natural resources. Today, NRCS provides technical assistance based on sound science to promote and support habitat restoration, plus many other services. NRCS looks for new technologies for their scientists and agents satisfy for a customer's specific needs. As part of the Rainwater project, NRCS (with other agencies) used LiDAR data to develop the wetland restoration index and to delineate watershed boundaries. NRCS and others were also instrumental in obtaining funding from partnerships, grants, and trusts that made this very large project possible.

Introduction

The Rainwater Basin landscape was formed at the end of the last ice age, when glacial winds carved thousands of shallow, bowl-shaped depressions that are now fed only by rainwater and melting snow. This region of south central Nebraska and north central Kansas features thousands of shallow lakes, marshes, and wetlands; and has significant interest to conservationist, environmentalists, sportsman, and agriculturalists. This area is also the narrowest portion of the bird and water fowl migration route known as the Central Flyway. (Figure 1)



Figure 1. Central Flyway

These migratory birds include three to six million snow geese, four million mallards, 900,000 white-fronted geese, 900,000 pintails, plus millions of other migrating birds. Because of its ornithological significance (the study of birds, including their physiology, classification, ecology, and behavior), the Rainwater Basin has been named a “Landscape of Hemispheric Importance” for shorebirds by the Western Hemisphere Shorebird Reserve Network.

During the 20th century, wetlands were drained for farming, bisected by roads (such as Interstate 80), and silted-in by erosion from development until only about ten percent of the original Rainwater Basin wetlands remained. Presently, the drained bowl-shaped depressions, which help support the bird habitat, are only fed by rainwater and melting snow; which creates a complicated drainage system requiring a detailed elevation dataset for managers and engineers to use.

To address these problems, the Rainwater Basin Joint Venture was formed in 1992. It is comprised of multiple agencies including the NRCS, US Fish & Wildlife Service, the US Geological Survey, Platte River Recovery Implementation Program, the states of Nebraska and Kansas, and numerous local entities. The venture’s goal is to restore and permanently protect the high-quality wetlands and associated uplands with adequate water and distribution to meet the habitat needs of waterfowl and other migratory birds.

In 2008, NRCS using the USACE contract retained Merrick’s team to collect LiDAR data over a 17,677 square mile area in Nebraska and Kansas. (Figure 2) LiDAR uses a beam of light projected from an aircraft to the surface of the earth to create highly accurate elevation information of natural landforms and man-made objects. After a rigid and unique process the digital elevation model was used to update the floodplain maps in the region, as well as numerous other applications by the many agencies involved.

Complexity

Besides the sheer volume of data collected for the 18,000 square mile project area, numerous project challenges were successfully navigated by Merrick, its teammates, and NRCS partnering agencies. To produce data for a project of this magnitude; 14,000 flight line miles (that’s almost six flights from Los Angeles to New York) and almost 200 flight hours were required to complete the LiDAR acquisition.

Stakeholders - One challenge dealt with the administrative coordination of a multitude of organizations. Merrick understands and believes that private and public organizations can benefit by combining financial and technical resources to make the best use of fixed budgets for geospatial data. But coordinating with a multitude of agencies within the NRCS team added to the complexity of the project. Although it took extra effort to collaborate, coordinate, and communicate with eleven local, state, and federal organizations that jointly funded this project, the economic and technical benefits far outweighed the project management complexities.

Flat as a Platte – Most of the project is characterized as having very little change in elevation along the corridor of the Platte River. The term “platte,” used by French traders, means “flat or shallow.” The LiDAR elevation information collected helped to identify the man-made

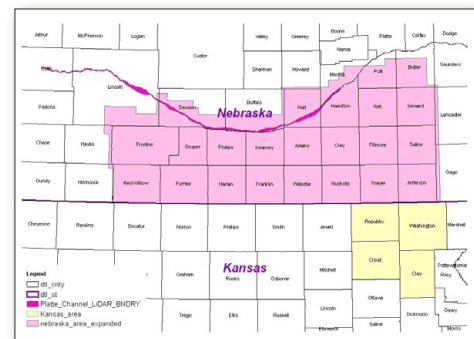


Figure 2. Project Boundary Map

and natural hydrologic modifications that impair a wetland's ability to collect and drain, delineate wetland and watershed boundaries (which could only be identified using LiDAR technology). Therefore, the flight plan was modified over the main river channel to increase the number of elevation points in this area so that landforms and micro-drainages could be detected.

Acquisition Timing – The timing to collect the LiDAR had to be synchronized with several agencies and “mother nature.” Strict coordination was required for the acquisition downstream from the J2 Canal outlet (located on the Platte River) as it was necessary to collect the LiDAR data at the lowest water flow in order to maximize the technology's benefit to this area's specific morphology. Additionally, the client desired all of the crops to be harvested prior to collection. Furthermore, the project area was to be free of snow and significant runoff or pooled water. In all cases, Merrick's well-designed acquisition plan accomplished these objectives.

Original and Innovative Techniques

Many original and innovative techniques were used in order to meet the client's budget, technical requirements, and schedule demands, including the following.

Defining Accuracy – In order to validate and report the absolute positional accuracy of the data, Merrick established an evenly spaced, high-accuracy geodetic reference network consisting of approximately 50 points. Midland and Merrick also carefully traversed the sensitive project areas to survey almost 1,200 check point positions (*Figure 3*). These survey points were then statistically compared to the LiDAR elevations and were summarized in a report to the client, which showed that the vertical accuracy met or exceeded the 9.2 centimeter (4") specification and the horizontal accuracy met or exceeded the 0.6 meter (29") requirements.

Flying 24/7 - Merrick's LiDAR acquisition plan specified using two aircraft over a span of four months. To lower the overall cost of this portion of the project, data was acquired during daylight and evening hours, seven days a week. With proper safety measures in place, Merrick's plan maximized the use of the people, aircraft, and sensors. Flying more than 25% of the missions at night kept this phase on schedule, in spite of many poor weather days, which could have delayed the overall completion of the project.

Monotonicity (def: never increasing or decreasing values) - The flat and heavily braided Platte River with multiple channels presented Merrick a unique challenge, which was solved using Merrick's distinctive understanding of LiDAR data, plus a software program the company invented called MARS® (Merrick Advanced Remote Sensing). In order to ensure that water flows in the correct direction in the final LiDAR data and that engineering modeling can be accomplished correctly, Merrick created a software tool that allows the terrain analyst to interact to the LiDAR data. During the supervised data interpretation, Merrick's analysts created breaklines along the shoreline of the major channels while the software ensured that elevation points along that breakline always flowed downstream, thus allowing for the hydrologic model to work correctly. Figures 4 and 5 depict a representative

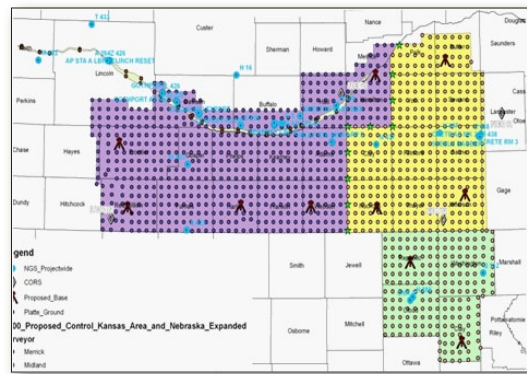


Figure 3. Illustrates the approximate locations of the survey points used to validate and report the accuracy of the LiDAR data

slice of the complex river channel where monotonicity was critical.

Future Value to the Geospatial Profession

As conservationists, planners, and engineers integrate LiDAR into their business processes, decision makers can now review multiple technical solutions for a given scenario “cheaper, better, and



Figure 4. Photograph of the braided river channel.

Credit: Dr. Graf University of South Carolina research project.

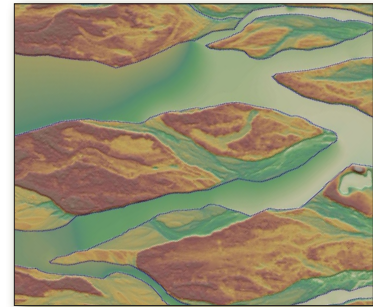


Figure 5. Illustrates bare earth LiDAR data of the braided river channel.

faster.” Shandy Bittle, Nebraska GIS Specialist for NRCS (one of the key stakeholders for the project) stated, “completing a project like the Rainwater Basin with such an expansive geography would have been cost prohibited using traditional methods.”

Combine the cost benefit using LiDAR with the advantage of multiple agencies sharing costs, this important natural resource area will see many improvements long into the future because different agencies will be analyzing exactly the same data, which increases collaborative decision making. Bittle continues, “the LiDAR data will help us do our jobs more effectively; such as when completing the review of a development application for slope, runoff, sediment control or wetlands mitigation; the goal for our partnering agencies is to provide valuable input in the sustainable planning, design, and engineering processes.” Merrick, NRCS, and other members of the consortium believe that with successful projects like Rainwater, policy makers in Washington DC can see the wide array of multi-use benefits for funding the pending National LiDAR Dataset.

An often overlooked socio-economic benefit of properly managing the Rainwater wetlands is the positive financial impact that bird watching and research enthusiasts bring to the region. Many bird species are viewed in this region most of the year, with the spring and fall attracting most of the tourists to many small towns in central Nebraska. Because the wildlife management and waterfowl production areas are small and spread out throughout this region, visitors regularly come to these small towns to participate in bird inventories, sportsman activities, species research, and habitat improvement projects, helping the economy of these small towns. In fact, a report submitted to the US Environmental Protection Agency stated, “the consumer surplus for bird watching ranged between \$2.8 million and \$4.4 million and the total value of wildlife watching along the Platte River ranged between \$27.9 million and \$57.5 million” (Platte River nature recreation study: The economic impact of wildlife watching on the Platte River in Nebraska).

Client Satisfaction

It is often difficult for a client from a federal or government agency to discuss the success of a project without sounding like an endorsement for the private company who effectively completed the work. However, Mrs. Bittle stated, “due to the timeliness of delivering the data within the desired accuracy specifications, many applications to support wetlands restoration efforts are now available to funding partners to take full advantage of the LiDAR data.” These applications (and many others) are only available because of Merrick’s creativity to design a project that allows its LiDAR technology to “soar” for the benefit of conservation planning, design, and engineering.