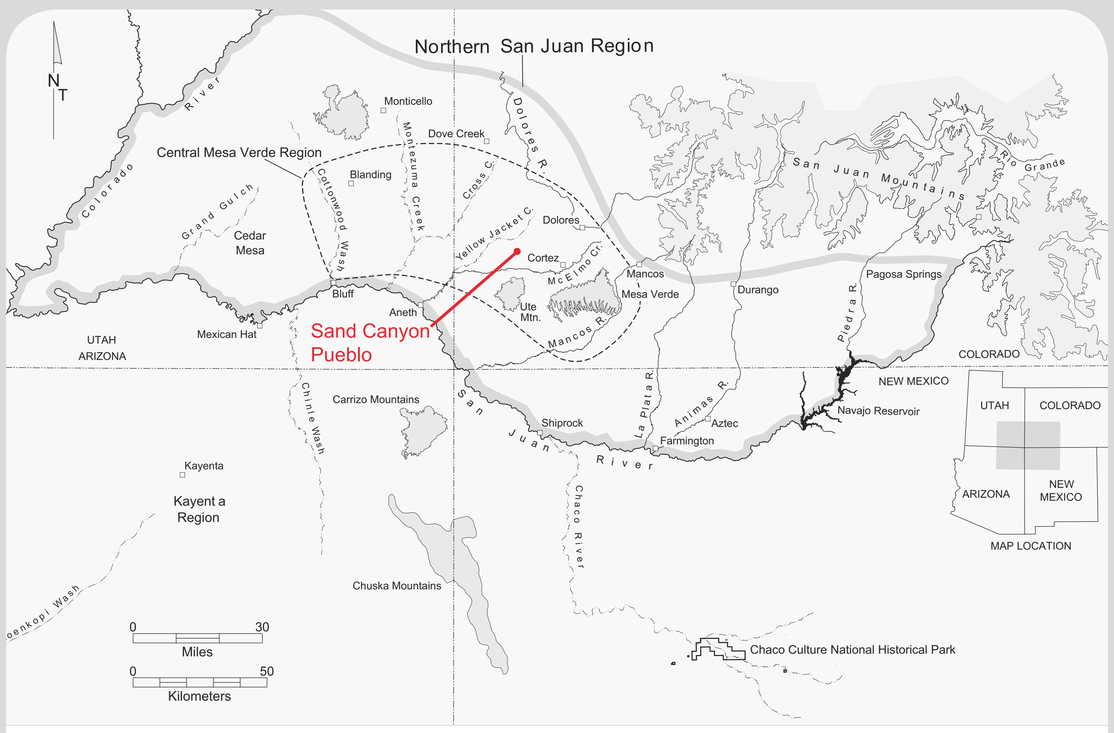
LIDAR Mapping Sand Canyon Pueblo

Technical Collaboration for Site Visualization & Reassessment

MARK D. VARIEN[1], GRANT D. COFFEY[1], GERT RIEMERSMA[2], VINCENT MACMILLAN[3], STEVE MCCORMACK[4]



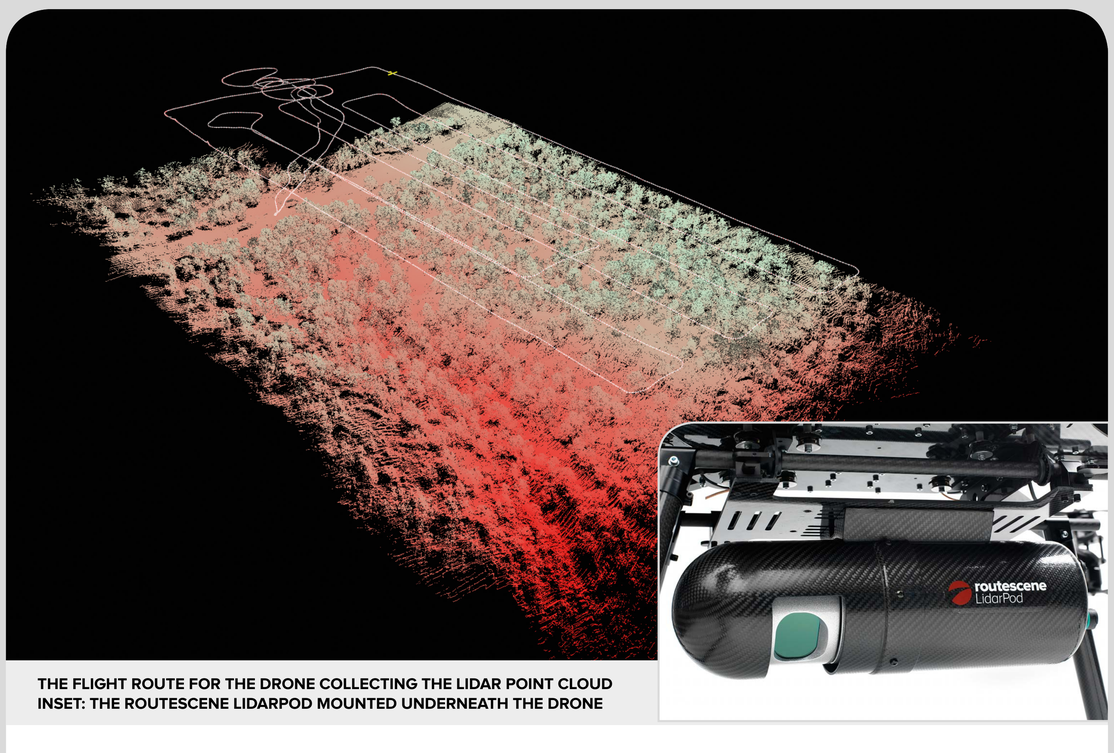
Introduction

The Research Institute at the Crow Canyon Archaeological Center collaborated with Canyons of the Ancients National Monument and two private companies - Routescene Inc. and Caddis Aerial - to conduct a LIDAR survey of Sand Canyon Pueblo (Site 5MT765) in southwestern Colorado. The project demonstrated the utility of LIDAR mapping for documenting complex sites covered by dense vegetation. The technology provided impressive results: through this new, accurate way to visualize and analyze data the team identified new structures on-site.

RECONSTRUCTION BY CROW CANYON, DENNIS HOLLOWAY AND AERIAL PHOTO BY ADRIEL HEISEY
INSET: BLOCK 500, SAND CANYON PUEBLO

Previous Research at Sand Canyon Pueblo, Crow Canyon

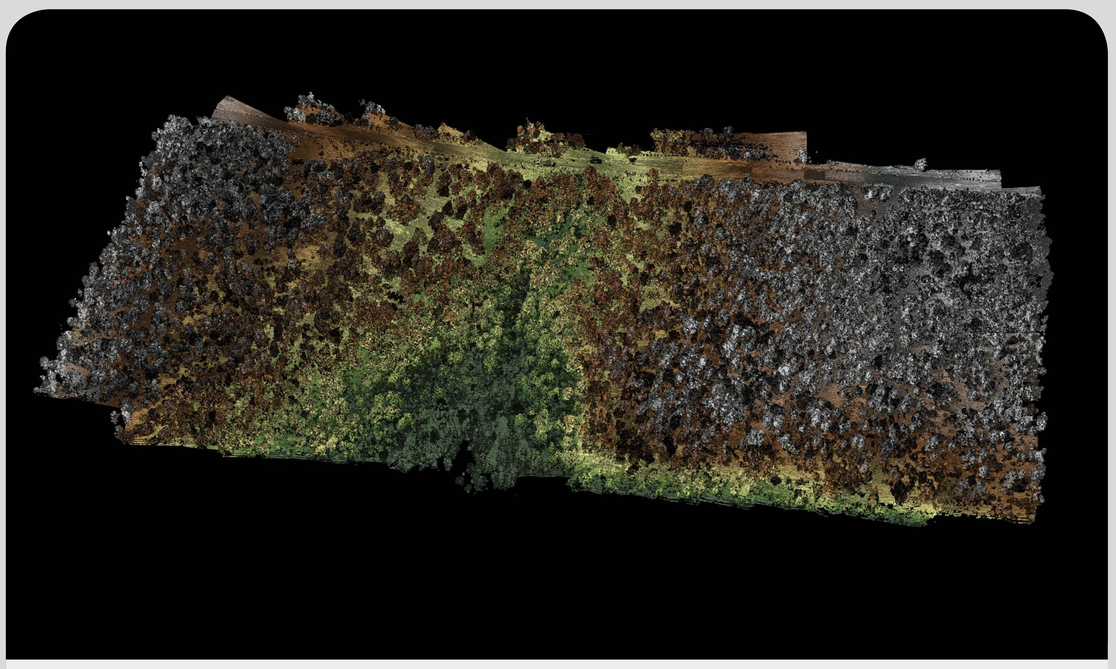
Field research undertaken between 1983 and 1992 documented 90 kivas, about 420 rooms, 14 towers, a D-shaped bi-wall structure, a great kiva and an enclosed plaza. An estimated 540 people lived at the site between about A.D. 1240 and 1285.



THE FLIGHT ROUTE FOR THE DRONE COLLECTING THE LIDAR POINT CLOUD
INSET: THE ROUTESCENE LIDARPOD MOUNTED UNDERNEATH THE DRONE

UAV (Unmanned Aerial Vehicle) LiDAR Mapping

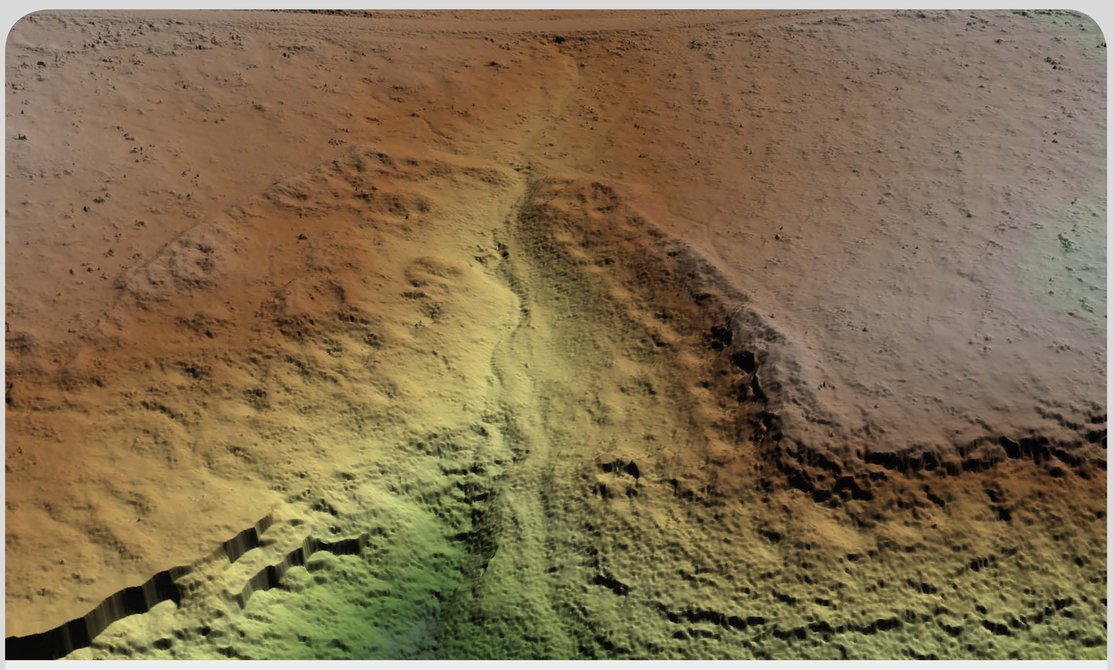
A dense pinyon and juniper woodland covers the site, making traditional mapping challenging, time consuming, and prone to error. In contrast, the project team conducted the LIDAR survey on a drone in about four hours. The Routescene LidarPod scans at up to 1.4 million points per second from 32 lasers. Over 3.2 billion points were collected with a final output of 400pts/m^2.



THE LIDAR POINT CLOUD INCLUDING ALL THE WOODLAND AND VEGETATION

Data Processing

The data was downloaded to Routescene's LidarViewer software. By applying various filters, including the Bare Earth tool, the high resolution of the data was maintained to create a Digital Terrain Model (DTM) by digitally removing all the trees and vegetation.



DIGITAL TERRAIN MODEL SHOWING ARCHAEOLOGICAL FEATURES

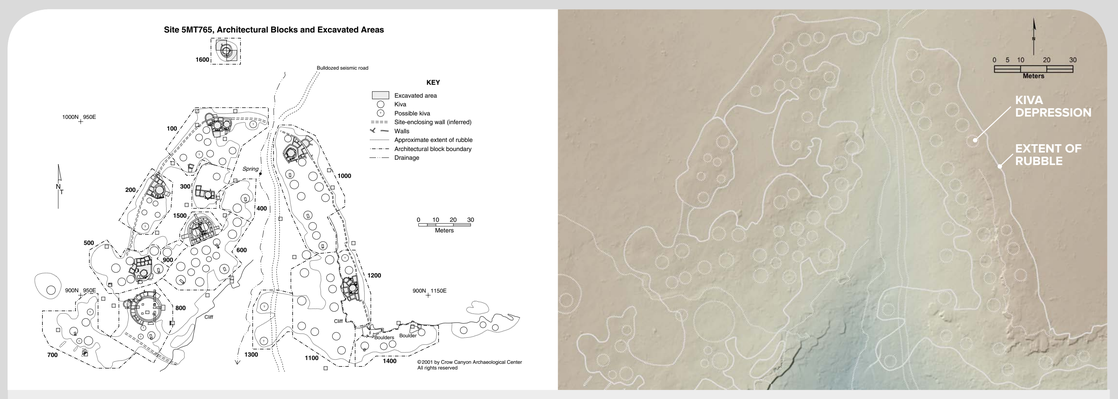
Discussion and Future Work

The impressive results accelerates understanding of the Pueblo area, allows Canyons of the Ancients to plan future preservation, and provides Crow Canyon with interesting avenues for future research.

Results

Our success at Sand Canyon Pueblo illustrates the impact of high-resolution LiDAR visualization and analysis. This approach, particularly when utilized at complex and environmentally sensitive archaeological sites covered by dense vegetation, can quickly provide results.

The highly accurate DTM allowed the archaeologists to visualize the site with unprecedented precision, impossible to achieve with traditional survey techniques and legacy maps.



LEFT: PLAN MAP OF MAJOR CULTURAL UNITS AT SAND CANYON PUEBLO
RIGHT: PLAN MAP OVERLAID ON THE DIGITAL TERRAIN MODEL

For more information visit
www.routescene.com

[1] THE RESEARCH INSTITUTE AT CROW CANYON
[2] ROUTESCENE INC.
[3] CANYONS OF THE ANCIENTS NATIONAL MONUMENT
[4] CADDIS AERIAL, LLC