INTRODUCTION

Upon accession, the Assyrian king Sennacherib (704-681 BC) moved the imperial capital to a new location at Nineveh (modern Mosul, Iraq). Within the city, he built a massive new palace with walls covered with carved reliefs, many parks and gardens, and encompassed it all in a city wall enclosing 750 hectares. His engineers planned and constructed a series of irrigation canal systems in his hinterland (Fig. 1), which were adorned with carved reliefs of the king in the presence of the gods of Assyria.

This project’s goals were to map systematically the surviving traces of this irrigation system and to place them within the larger framework of the Assyrian economy (Ur 2005, Wilkinson et al. 2005).

PREVIOUS RESEARCH

Before this project, the canal system had been reactivated from two sources:

1. The inscriptions of the king himself, found written in cuneiform texts on clay tablets and on the irrigation features themselves;
2. The remnants of canals, walls and aqueducts, visited by archaeologists since the 1850’s.

The British archaeologist Austen Henry Layard was the first scholar to visit the canal head at Khisors in 1851 (Fig. 2). In the 1930’s, a team from the University of Chicago excavated an aqueduct along the Khisors canal (Fig. 3) and prepared a report (Jacobsen and Lloyd 1935). Other elements were briefly visited by David Oates and Julian Reade in the 1950’s to 1970’s (Oates 1968, Reade 1976). Reade (2000) put together the various features and added cuneiform sources to propose a four-stage developmental sequence from 702 BC to 688 BC.

After over a century, the scholarly consensus was that the network of canal systems was primarily in-service, including irrigation luxury parks and gardens within the city of Nineveh, and to a lesser extent, to irrigate orchards and cereal fields in the immediate hinterland of the capital (Bagn 2000, Reade 1976).

METHODS

Since archaeological fieldwork by foreign researchers in Iraq has been suspended since 1990, this reassessment relied on remote sensing data in a GIS framework. Two datasets proved to be useful:

1. Recently declassified CORONA and KH-7 intelligence satellite photographs taken by the US in the 1960’s and early 1970’s (Fig. 4). These recently available sources are powerful tools for archaeologists working in regions where low-level aerial photographs have traditionally been denied to foreign researchers (Freiber 2006).
2. Low level aerial photographs acquired by a private firm in the late 1990’s (Fig. 5).

These datasets were of high enough resolution (2 m or better) to resolve archaeological phenomena. Furthermore, they have the advantage of age: they provide the agricultural intensification and the expansion of towns and cities that has destroyed or obscured much of the archaeological record in the last half-century. These images were georeferenced in ERDAS Imagine 8.7 with control points derived from orthorectified pan-chromatic SPOT imagery. The output CORONA and aerial photographs are 2 m resolution.

Potential ancient canals were located visually. The sign of a canal was signified as a linear feature at known locations where canals had been identified on the ground. Other areas of northern Assyria were surveyed and mapped using the latter methods (Figs. 6, 7).

RESULTS

All remnants of Sennacherib’s canals previously identified on the ground were recognized and accurately mapped on CORONA and aerial photographs. Furthermore, a range of new irrigation canals could be recognized in the 1970’s, Julian Reade (1976) noted that all known (at the time) canal traces were associated with canals rock reliefs, and proposed that other known reliefs might have unrecognized canal traces nearby. This remote sensing-based assessment verifies Reade’s proposition. Sennacherib’s canal system were composed of two primary canal forms:

1. Major cross-walled earthworks. The largest and most impressive was recognized on the ground below Bandawli in the 1950’s (Oates 1968: Fig. 8). It was excavated 20 m into the earthwork’s two drainage basins, and carried water from the Red Bandawli to the Red Mish. Two similar but previously unrecognized earthworks can be found beneath Mafra (Fig. 8).

2. Minor cross-walled earthworks. The largest and most impressive was recognized on the ground below Bandawli in the 1950’s (Oates 1968: Fig. 8). It was excavated 20 m into the earthwork’s two drainage basins, and carried water from the Red Bandawli to the Red Mish. Two similar but previously unrecognized earthworks can be found beneath Mafra (Fig. 8).

In total, the canals recognized via remote sensing sources run for over 100 km, and represent an enormous investment in manpower (Table 1).

FIGURES

Fig. 1. Topography of Northern Assyria (modern northern Iraq).

Fig. 2. Austen Henry Layard being lowered by ladder through aroche to inspect the canal head at Khisors in 1851.

Fig. 3. Excavations of the aqueduct at Jerwan. The aqueduct spanned a pool (seasonally flowing channel). The construction of the canal can be seen as a dark line running toward the top of the image.

Fig. 4. KH-7 image of the Mosul-Nineveh area. DSSR4/1950/00104, 20 May 1954.

Fig. 5. Canal in the northern Nineveh plain. DSSR4/1950/00104, 20 May 1954.

Fig. 6. The Durr_USA federal canal near Bandawli. CORONA 115B-12050107 (Dec. 1958).

Fig. 7. Earthwork below Mafra (CORONA 115B-12050107, Dec 1958).

Fig. 8. Earthwork below Tell Ushak (aerial photograph taken Spring 1955).

Fig. 9. Small canal on the south side of the Jalahl al-Qosh. Note that the course of the canal is drastically altered by the topography. Spring 1995 aerial photograph.

Fig. 10. Assyrian palace relief showing a garden with an irrigation channel flowing over an aqueduct.

Fig. 11. Offsets for local irrigation along the Khissors canal near Jerwan. Aerial photograph, 1955.

Fig. 12. Early Bronze Age mudbrick (left) and Neolithic or early Uruk (right) pottery on the site of Bandawli.

Fig. 13. Assyrian palace relief of canal reliefs being deposited. Aerial photograph, 1955.

CONCLUSIONS

To understand the function of, and motivations behind, the irrigation systems and settlement patterns as reconstructed by this study, they must be put into their historico-cultural context. The Bible and Sennacherib’s own inscriptions describe his policies of deporting the populations of captured towns and regions as he expanded the Assyrian empire (Fig. 13 see Oded 1979). These depictions were often realized elsewhere in the empire, but the majority were brought back to Nineveh and the surrounding region. It is possible that we are seeing the settlement footprint of such policies in the systematic distribution of human settlements in the region around the capital as documented around Hammaruk and Tell al-Hawa (Ur 2005, Wilkinson and Barbanes 2000, Wilkinson et al. 2005).

The agricultural productivity of these resettled peoples would have been maximized by the presence of reliable irrigation water supplies. It is now clear that a broad area of northern Assyria benefited from the state irrigation systems, and that this area has included resettled depurates. The combination of reliable water supplies and efficiently distributed labor would have enabled the great agricultural surpluses required by the new imperial capital at Nineveh.

The landscape of the Assyrian heartland thus appears to have been highly planed, from the deliberate reorganization of its hydrology to the imposed patterns of settlement.

ACKNOWLEDGEMENTS

The aerial photography used in this research appears courtesy of the USGS and is now held by the University of Chicago Oriental Institute’s Center for the Archaeology of the Middle East (CAM). The aerial photographs are used by kind permission of the British School of Archaeology in Iraq.

BIBLIOGRAPHY


