

High-Resolution Satellite Imagery and the Destruction
of Cultural Artifacts in Nakhchivan, Azerbaijan

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Contact

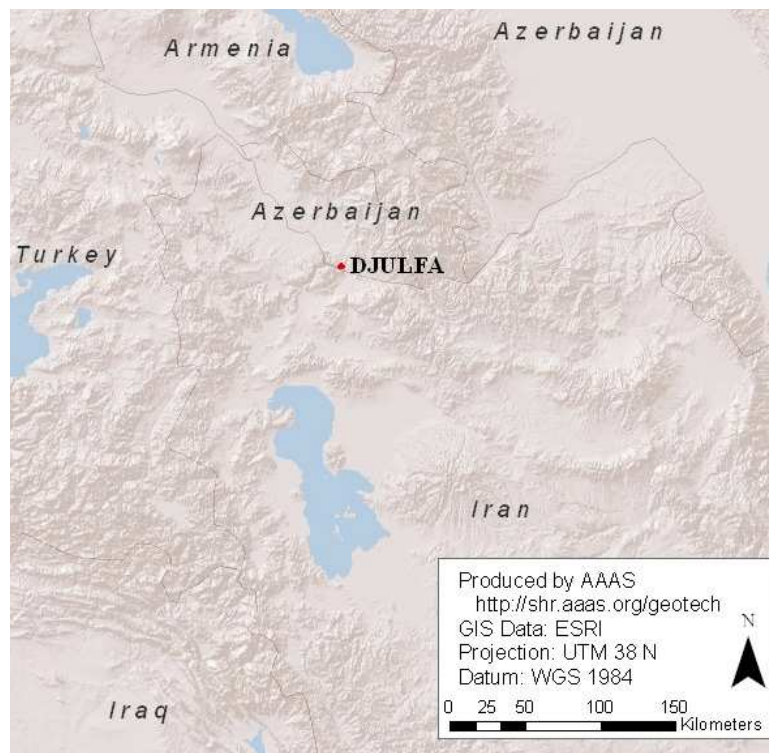
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I. Introduction

The Science and Human Rights Program of the American Association for the Advancement of Science (AAAS), with funding from the Oak Foundation, investigated reports of the destruction of Armenian cultural artifacts by Azerbaijan that occurred between 1998 and 2005. Using high-resolution satellite imagery, AAAS documented the phased destruction of a medieval Armenian cemetery in the Djulfa region of Nakhchivan, Azerbaijan (Figure One) that housed intricate 15th and 16th century burial monuments known as khachkars (Figure Two). The destruction in Djulfa has been a focus of UNESCO and the European Parliament, the latter of which was denied entry to the region to conduct a fact-finding mission.¹ The International Council on Monuments and Sites (ICOMOS) documented this phased destruction in reports published in 2003² and in 2006-2007³. Given that Azerbaijan has barred on-site investigation by outside groups, AAAS acquired and analyzed high-resolution satellite imagery to assess whether damage to the artifacts occurred. Based on the assessment of satellite images from 2003 and 2009, AAAS found evidence that the cemetery area was likely destroyed and later leveled by earth-moving equipment.

Figure One: Map of Djulfa, Azerbaijan and Surrounding Areas



¹ <http://www.independent.co.uk/news/world/europe/azerbaijan-flattened-sacred-armenian-site-480272.html>

² <http://www.international.icomos.org/risk/2002/azerbaijan2002.htm>

³ http://www.international.icomos.org/risk/world_report/2006-2007/pdf/H@R_2006-2007_09_National_Report_Azerbaijan.pdf

Figure Two: Khachkar Burial Monuments



The images above depict khachkars in the Djulfa cemetery. Khachkars are medieval burial monuments that are approximately one meter wide and up to two and a half meters high. Source: <http://www.djulfa.com/photos/before>

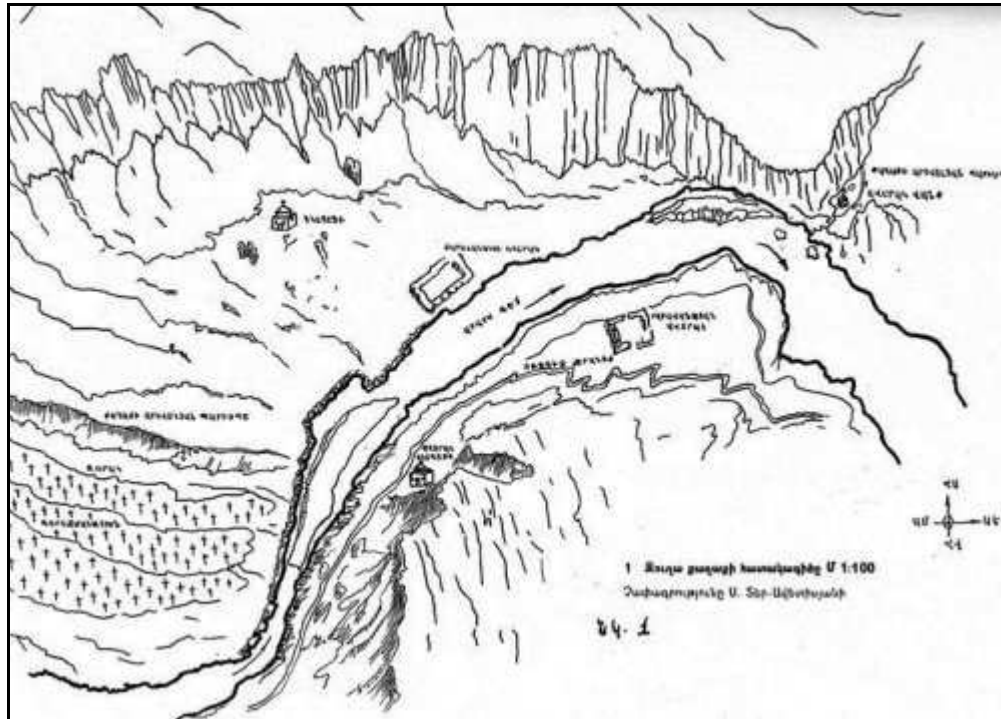


The above image shows a ground-level view of the cemetery before its reported destruction. Image © ICOMOS

II. Methods and Technologies

AAAS analyzed two high-resolution satellite images of the Djulfa cemetery based on reports of demolitions taking place in 1998, 2002, and 2005. The first multispectral image from September 23, 2003 was taken by DigitalGlobe's QuickBird satellite. The second image obtained by AAAS was taken May 28, 2009, also by QuickBird. To determine the precise location of the cemetery, AAAS utilized a hand-drawn map produced by those with local knowledge of the area (Figure Three). The cemetery, indicated by crosses, can be seen in the lower-left hand portion of the map.

Figure Three: Map of Djulfa



Source: <http://www.djulfa.com/maps>

III. Results

The assessment utilized two images, the first from September 23, 2003 and the second from May 28, 2009. A visual comparison of the cemetery was conducted using ERDAS Imagine and ESRI's ArcMap software. A side-by-side analysis of the images using these tools allowed for the identification of changing terrain and removed or destroyed monuments. Analysis of the cemetery revealed significant destruction and changes in the grade of the terrain. Figure Four shows an overview of the area, with the cemetery visible among the three ridges to the left of the Araxes River, which forms the border between Azerbaijan and Iran.

Figure Four: Cemetery Overview



September 23, 2003: Consistent with eyewitness reports, the central area of the Djulfa graveyard (outlined in red) appears to have sustained significant damage, presumably from the reported 1998 and 2002 phases of destruction, but the areas to the northeast and southwest remain largely intact. (38.974 N, 45.565 E) Image © 2009 DigitalGlobe, Inc.



May 28, 2009: In this more recent image, the entire area has been graded flat, possibly by earth moving equipment as evidenced by the dirt roads that traverse the area. (38.974 N, 45.565 E) Image © 2009 DigitalGlobe, Inc.

Figures Five and Six focus on the cemetery area and reveal changes to the terrain. In the 2003 image, the terrain appears rocky and uneven, probably due to the presence of the khachkars and the shadows they would cast, given their height and width. The disappearance of these shadows and the smoother terrain in the 2009 image suggest that the khachkars were either removed or destroyed.

Figure Five: Southwestern area



September 23, 2003: This detailed view shows areas of uneven terrain and the distinct pattern resulting from the khachkars' shadows and varying sizes, which is also visible in ground-level images in Figure Two. Image © 2009 DigitalGlobe, Inc.



May 28, 2009: This later image shows a much flatter terrain, with the shadows and the uneven terrain created by the monuments in the earlier image no longer visible. Image © 2009 DigitalGlobe, Inc.

Figure Six: Northern area



September 23, 2003: Pock-marked areas are again noticeable in this detailed view of the northern area of the cemetery. Image © 2009 DigitalGlobe, Inc.



May 28, 2009: The straight lines running northwest to southeast in this image suggest earth-moving equipment was used to level the cemetery and demolish the burial monuments. Reports from ICOMOS also suggest the area has since been converted for military use⁴. Image © 2009 DigitalGlobe, Inc.

IV. Conclusion

Based on images from 2003 and 2009, AAAS found significant evidence of destruction to Armenian cultural artifacts in the Djulfa cemetery of Nakhchivan, Azerbaijan. The shadows cast by the khachkar burial monuments in the 2003 image were no longer apparent in the 2009 image, revealing their probable destruction amid the demolition. In addition, changes in the grade of the terrain between the image dates suggest that heavy machinery was likely used in the demolition of the area. Taken together, the satellite evidence is consistent with reports by observers on the ground who have reported the destruction of Armenian artifacts in the Djulfa cemetery.

⁴ http://www.international.icomos.org/risk/world_report/2006-2007/pdf/H@R_2006-2007_09_National_Report_Azerbaijan.pdf