

Hydrological, Geological, and Biological Site Characterization of Breccia Pipe Uranium Deposits in Northern Arizona



Scientific Investigations Report 2010–5025

Hydrological, Geological, and Biological Site Characterization of Breccia Pipe Uranium Deposits in Northern Arizona

By Andrea E. Alpine, editor

Scientific Investigations Report 2010–5025

**U.S. Department of the Interior
U.S. Geological Survey**

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia: 2010

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment, visit <http://www.usgs.gov> or call 1-888-ASK-USGS

For an overview of USGS information products, including maps, imagery, and publications, visit <http://www.usgs.gov/pubprod>

To order this and other USGS information products, visit <http://store.usgs.gov>

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this report is in the public domain, permission must be secured from the individual copyright owners to reproduce any copyrighted materials contained within this report.

Plate and maps:

Private inholdings may exist in National or State reservations. Not all boundaries have been placed on the maps due to limitations of scale and complexity of land ownership and status. Segregation area boundaries are current as of October 2009. Segregation area boundaries are approximate.

Suggested citation:

Alpine, Andrea E., ed., 2010, Hydrological, geological, and biological site characterization of breccia pipe uranium deposits in northern Arizona: U.S. Geological Survey Scientific Investigations Report 2010–5025, 354 p., 1 pl., scale 1:375,000.

Contents

Introduction.....	1
By Andrea E. Alpine and Kristin M. Brown	
A. Uranium Resource Availability in Breccia Pipes in Northern Arizona	19
By James K. Otton and Bradley S. Van Gosen	
B. Effects of 1980s Uranium Mining in the Kanab Creek Area of Northern Arizona	43
By James K. Otton, Tanya J. Gallegos, Bradley S. Van Gosen, Robert A. Zielinski, Ray H. Johnson, Susan M. Hall, L. Rick Arnold, and Douglas B. Yager	
C. Historical and 2009 Water Chemistry of Wells, Perennial and Intermittent Streams, and Springs in Northern Arizona.....	135
By Donald J. Bills, Fred D Tillman, David W. Anning, Ronald C. Antweiler, and Thomas F. Kraemer	
D. Biological Pathways of Exposure and Ecotoxicity Values for Uranium and Associated Radionuclides.....	283
By Jo Ellen Hinck, Greg Linder, Susan Finger, Edward Little, Donald Tillitt, and Wendy Kuhne	

Plate

[In pocket]

1. Map Showing Geologic Structure, Cultural and Geographic Features,
and Geologic Cross Sections of Northwestern Arizona
By Kristin M. Brown and George H. Billingsley

