

**Going
Green**

Using Earth's Underground Heat



by Nancy White

[Intentionally Left Blank]



Using Earth's Underground Heat



by Nancy White

Consultant: Frank Robbins, LEED AP
(Leadership in Energy and Environmental Design,
Accredited Professional)

BEARPORT
PUBLISHING

New York, New York

Credits

Cover and Title Page, © Clarence Holmes/Shutterstock; 6–7, © Yann Arthus-Bertrand/Corbis; 8, © E.J. Baumeister Jr./Alamy; 10–11, © Geo-Heat Center/DOE/National Renewable Energy Laboratory (NREL); 12, © Ann S. Lundy/DOE/National Renewable Energy Laboratory (NREL); 14–15, © Bruce Green/DOE/National Renewable Energy Laboratory (NREL); 16, © Warren Gretz/DOE/National Renewable Energy Laboratory (NREL); 17, © Warren Gretz/DOE/National Renewable Energy Laboratory (NREL); 18–19, © Baloncici/Shutterstock; 20–21, Courtesy of Department of Energy; 22–23, © Hannamariah/Shutterstock; 24, © Gimmi Gimmi/Photolibary; 25, © Sue Ashe/Shutterstock; 26L, © Frank Kovalchek; 26R, © 2009 Patrick Endres/AlaskaStock.com; 28, © Porterfield-Chickering/Photo Researchers, Inc.; 30, © Pixtal/SuperStock.

Publisher: Kenn Goin

Editorial Director: Adam Siegel

Creative Director: Spencer Brinker

Photo Researcher: Amy Dunleavy



The Going Green series is
printed on recycled paper.

Library of Congress Cataloging-in-Publication Data

White, Nancy.

Using earth's underground heat / by Nancy White.

p. cm. — (Going green)

Includes bibliographical references and index.

ISBN-13: 978-1-59716-963-9 (library binding)

ISBN-10: 1-59716-963-3 (library binding)

1. Geothermal resources—Juvenile literature. I. Title.

GB1199.5.W47 2010

333.8'8—dc22

2009015119

Copyright © 2010 Bearport Publishing Company, Inc. All rights reserved. No part of this publication may be reproduced in whole or in part, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without written permission from the publisher.

For more information, write to Bearport Publishing Company, Inc., 101 Fifth Avenue, Suite 6R, New York, New York 10003.

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

Contents

The Heat Beneath Our Feet	4
Using Earth's Heat	6
The Problem with Fossil Fuels	8
Heating for a Town.....	10
Pumping Up the Heat	12
Heat for Crops	14
Fish and Alligator Farms	16
Drying Food.....	18
Making Electricity	20
Is Geothermal the Answer?	22
Just the Facts	24
How to Help.....	30
Learn More Online	30
Glossary	31
Index	32
Bibliography	32
Read More	32
About the Author.....	32

The Heat Beneath Our Feet

Every day we use heat for cooking and washing. We heat air inside buildings to keep us warm. We even use heat to make electricity. Where does this heat come from? Most of it comes from burning **fossil fuels**—coal, oil, and gas. Some of it, however, comes from deep inside Earth.

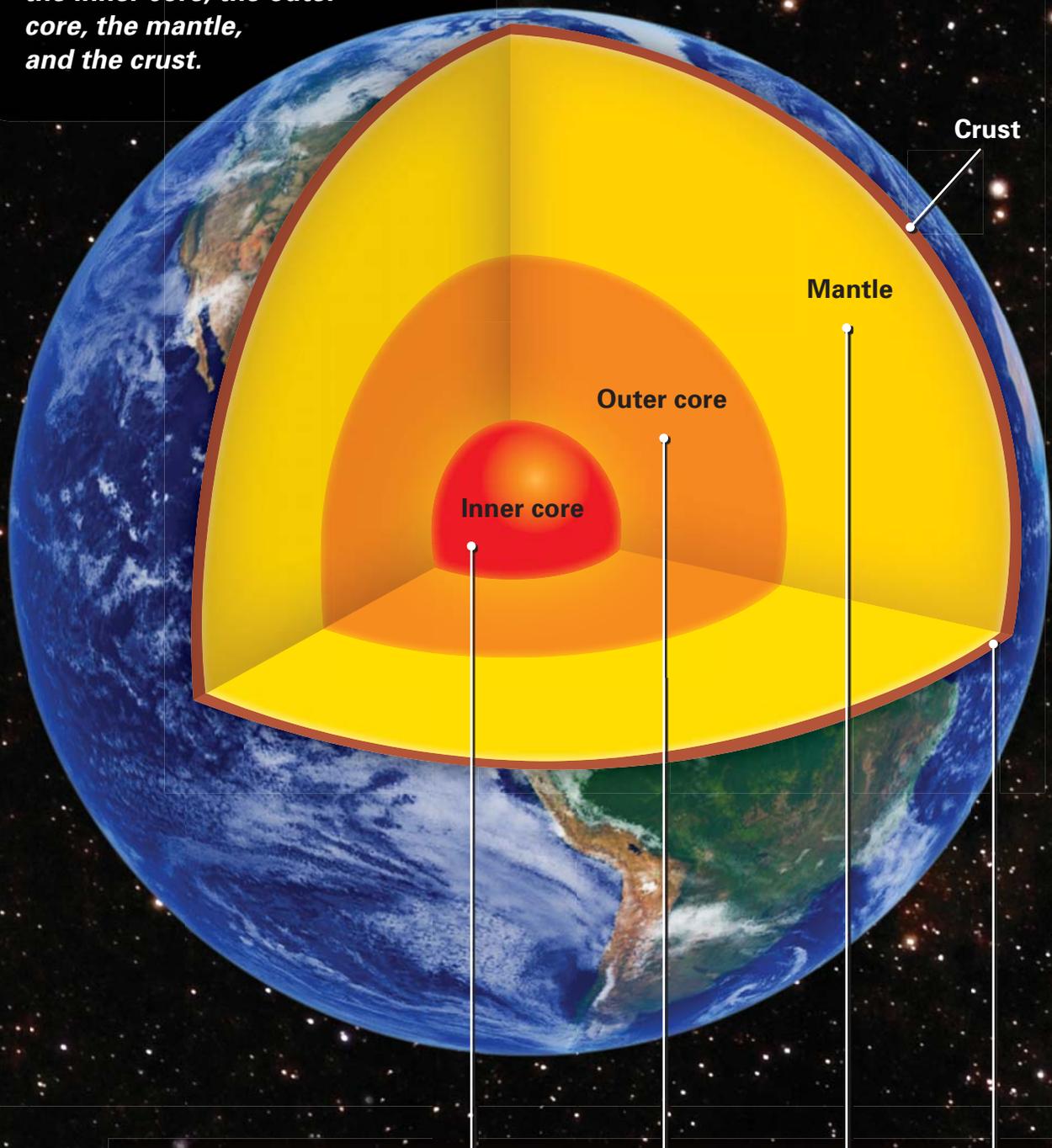
Earth's **core**, or center, is thought to be hotter than the surface of the sun. It warms the planet from the inside out. The core's heat also warms water that seeps deep into the ground from rain and melting snow. This **groundwater** can become as hot as 700°F (371°C). For thousands of years, people have been using this hot water, called **geothermal** water, in many ways.



Scientists use the term *geothermal energy* to describe Earth's underground heat. The word *geothermal* comes from the Greek words *geo*, meaning "earth," and *therme*, meaning "heat."

A Look Inside Earth

Earth is made up of four layers—the inner core, the outer core, the mantle, and the crust.



Earth is hottest at its inner core, where the temperature may reach 12,600°F (6,982°C). The inner core is made mostly of iron.

The outer core is hot melted rock, called magma.

The mantle is made up of rock and magma.

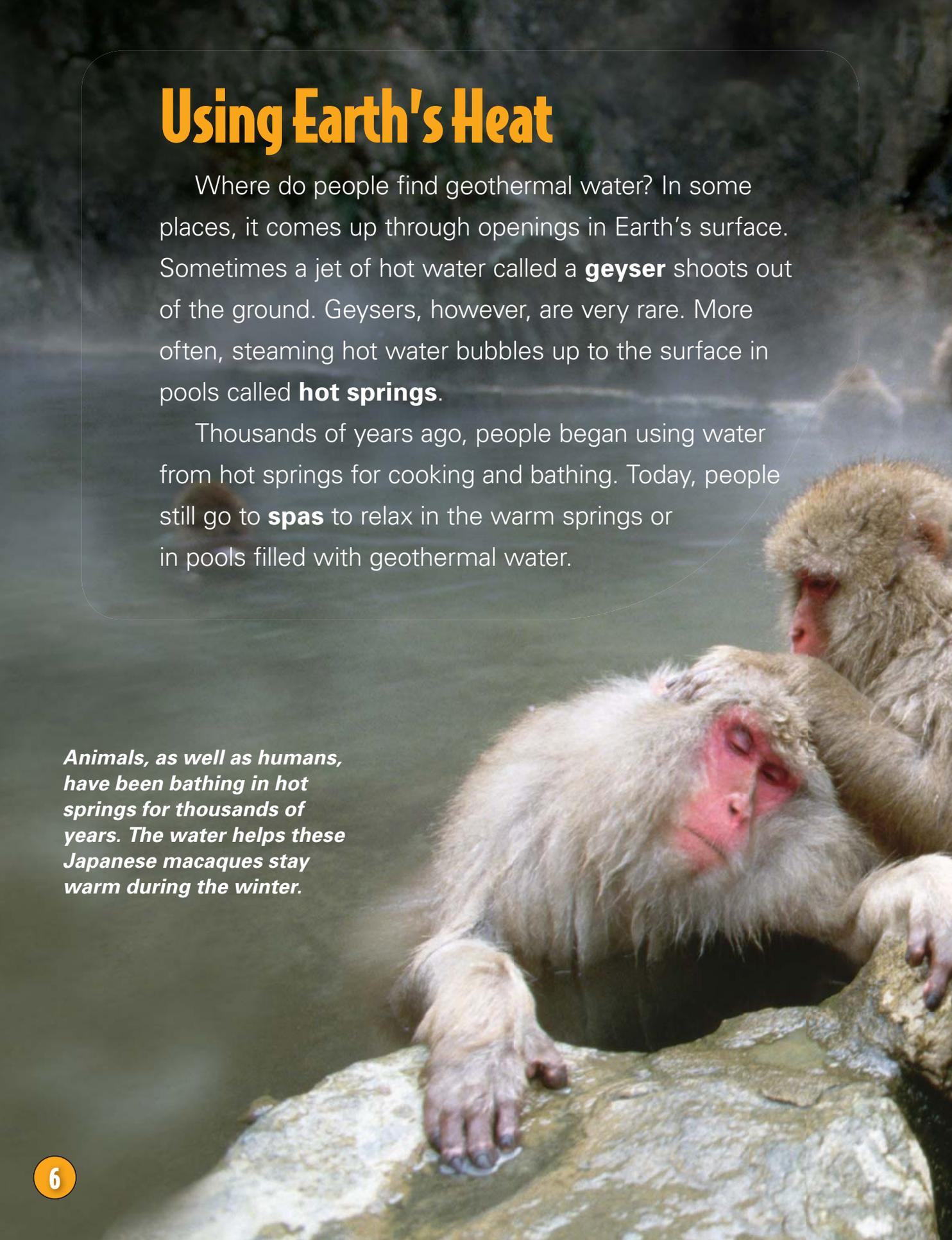
The crust is made up of rocks and soil.

Using Earth's Heat

Where do people find geothermal water? In some places, it comes up through openings in Earth's surface. Sometimes a jet of hot water called a **geyser** shoots out of the ground. Geysers, however, are very rare. More often, steaming hot water bubbles up to the surface in pools called **hot springs**.

Thousands of years ago, people began using water from hot springs for cooking and bathing. Today, people still go to **spas** to relax in the warm springs or in pools filled with geothermal water.

Animals, as well as humans, have been bathing in hot springs for thousands of years. The water helps these Japanese macaques stay warm during the winter.



The water from geysers and hot springs comes up to Earth's surface naturally. Scientists and **engineers**, however, are finding ways to bring up more of this hot, underground water. Why? Geothermal water is used for more than just cooking and bathing. People also use it to heat buildings and make electricity—sometimes without burning fossil fuels!



Hot springs can be found on all continents and in many countries, including Iceland, New Zealand, Japan, and the United States.

Index

- alligator farms 16–17
- Aurora Ice Museum 26
- carbon dioxide 9, 20
- carbon footprint 30
- coal 4, 8, 20
- core 4–5
- crust 5
- drying foods 18–19, 25
- electricity 4, 7, 8, 20–21, 22, 26, 27, 30
- fish farms 16, 25
- fossil fuels 4, 7, 8–9, 20, 26, 30
- gas 4, 8
- geothermal heat pump 12–13, 22
- geyser 6–7
- global warming 9
- greenhouse gases 9, 30
- greenhouses 14–15, 16, 25, 28
- heat exchanger 10
- hot dry rock technology 29
- hot springs 6–7, 18, 24, 26
- magma 5
- mantle 5
- oil 4, 8
- pollution 8, 28
- Reykjavik, Iceland 22–23, 28
- spas 6, 28

Bibliography

Geothermal Education Office. <http://geothermal.marin.org/>

Montana Department of Commerce. <http://commerce.mt.gov/energy/geothermal/asp>

U.S. Department of Energy. www.nrel.gov/docs/fy04osti/36316.pdf

Read More

Gleason, Carrie. *Geothermal Energy: Using Earth's Furnace (Energy Revolution)*. New York: Crabtree Publishing Company (2008).

Orr, Tamra. *Geothermal Energy (Power Up!)*. Ann Arbor, MI: Cherry Lake Publishing (2008).

Saunders, Nigel. *Geothermal Energy (Energy for the Future and Global Warming)*. Pleasantville, NY: Gareth Stevens Publishing (2008).

Sherman, Josepha. *Geothermal Power*. Mankato, MN: Capstone Press (2004).

About the Author

Nancy White has written many science and nature books for children. She lives in New York's Hudson River Valley.

[Intentionally Left Blank]



Using Earth's Underground Heat

Coal, oil, and gas are burned to meet most of the world's energy needs. Unfortunately, these fossil fuels pollute the environment and are in limited supply. Are there other energy sources people can use instead—ones that won't harm the planet or run out? Yes, and one of them is right under our feet—geothermal energy! Look inside to find out how people around the world are finding creative ways to use the heat deep inside Earth to warm and cool their homes, grow food, and even make electricity!

Building Greenscrapers **Eating Green** **Making Cities Green**
Traveling Green **Using Earth's Underground Heat**

BEARPORT
PUBLISHING

www.bearportpublishing.com

ISBN-13: 978-1-59716-963-9
ISBN-10: 1-59716-963-3



9 781597 169639