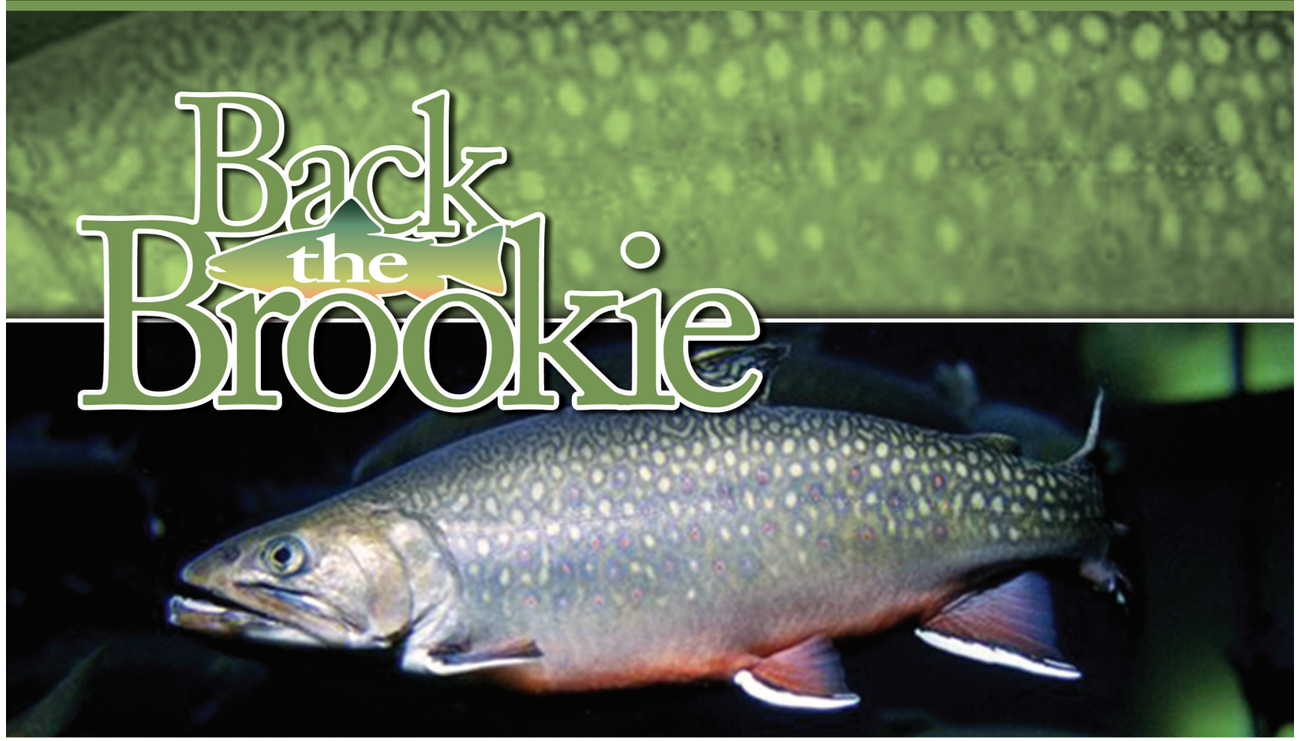


Teacher Packet for Back the Brookie Module
Lessons About Clean Air and Water

Interactive (DVD) Learning Module
Created for Teachers by Teachers
For use in Ecology, Environmental Science,
and Wildlife Classes in High Schools

Contents of this Teacher Packet include:

Optional ways to use the DVD:

1. Straight through: If you run the DVD from beginning to end, it is approximately 25 minutes in length.
2. Divide into four sections:
   - · The Brook Trout
   - · Watershed and Water Cycle
   - · Clean Air/Water, Acid Rain and
   - · Current Status

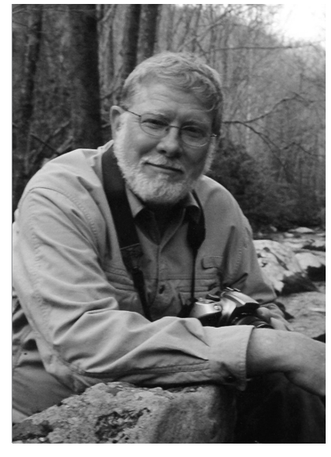
There are optional activities listed in this packet to assist you in extending the use and the amount of time it would take to cover the module. Section breaks are listed on page 2.

A Note to Ecology, Environmental Science, and Wildlife Classes Teachers

This module was created to make it easy for you to teach about clean air and water. The content is presented with emphasis on our only native trout in the Appalachian mountain range, the Southern Appalachian Brook Trout.

This teacher packet includes a listing of the Tennessee State Competencies that are met by this module in Ecology and Environmental Science. Competencies in neighboring states are similar. This listing is found on page three.

The module was created with a primary goal of maintaining simplicity and presenting effective content. At every turn we sought ease of use. The module introduces the concepts of watersheds, the water cycle, pH scale/acid rain, and contains information on our native brook trout.



The writers and hosts listed at the end of the DVD freely gave of their time and talents. Many include volunteers from Trout Unlimited chapters in Eastern Tennessee. Funding for programming was provided from the Tennessee Council of TU. Teacher packet funding came solely from donations to the Joe Bogle Memorial Fund. Joe's life was an example of conservation efforts and love of the natural world. This packet and distribution of the module is devoted to Joe.

Outline of Module Content

- Section 1 covers the introduction to the module, brook trout, its history, biology, geographic range, and what it needs to thrive.
- Section 2 defines a watershed and the water cycle. Students can discover their home watershed to make the lesson more pertinent. (See page 8, item 2.)
- Section 3 focuses on the importance of clean air and water, both to the brook trout, and human population downstream. Students will learn about pH measurements and the effects of acid rain.
- Section 4 details the current status of the Southern Appalachian Brook Trout (SABT), what conservation organizations are doing to protect the SABT, and how the student can become involved.

Competencies

Course – Ecology

Standard: The student will investigate factors that influence and are influenced by the natural environment.
Learning Expectations: The student will
1.1 understand the structure and function of ecosystems.
1.5 understand interdependence in ecosystems.
1.6 explore factors affecting the species' vulnerability to extinction.

Standard Number 5.0 Human Interaction with the Environment
Standard: The student will trace the interaction of humans with their environment
Learning Expectations: The student will
5.1 understand causes, environmental effects, and methods for controlling pollution.
5.3 explore the relative sustainability of various practices in the areas of watershed management, agriculture, solid waste management, wastewater management, and development.

Standard Number 6.0 Personal Civic Responsibility
Standard: The student will conduct activities that illustrate environmental responsibility and stewardship.
Learning Expectations: The student will
6.1 evaluate and articulate her/her own personal views concerning the environment
6.2 recognize his/her rights and responsibilities as a citizen in maintaining a healthy environment.

Course – Environmental Science

Standard Number: 1.0 Ecological Principles
Standard: The student will investigate factors that influence and are influenced by the natural environment
Learning Expectations: The student will
1.1 understand the structure and function of ecosystems.
1.5 understand interdependence in ecosystems.
1.6 explore factors affecting the vulnerability of a species to extinction.

Standard number 5.0 Human Interaction with the Environment
Standard: The student will trace the interaction of humans with their environment.
Learning Expectations: The student will
5.1 understand the causes, environmental effects, and methods for controlling pollution.
5.3 explore the relative sustainability of various practices in the areas of watershed management, agriculture, solid waste management, wastewater management, and development.

Standard Number 6.0 Personal and Civic Responsibility
Standard: The student will understand his/her personal and civic responsibility concerning issues related to the environment.
Learning Expectations: The student will
6.1 evaluate and articulate her/her own personal views concerning the environment.
6.2 recognize his/her rights and responsibilities as a citizen in maintaining a healthy environment

Pre/Post Test

Multiple Choice —Circle the selection that best completes the following sentences:

1. The brook trout is called the "canary in a coal mine" because
   a. It is an indicator species.
   b. Water from coal mines caused problems for the brook trout.
   c. It is a keystone species.
   d. It fills a very specific niche.

2. The decline of the brook trout was due to
   a. logging
   b. sedimentation
   c. acid rain
   d. over fishing
   e. A, B, C and D
   f. A and C

3. The brook trout is really a char, a member of the _____ family of fish.
   a. trout
   b. bass
   c. bream
   d. salmon

4. The _____ is/are "native" trout to the Appalachian Mountains.
   a. brook trout
   b. rainbow trout
   c. brown trout
   d. A, B, and C

5. The eastern U.S. distribution of the brook trout has been affected by
   a. habitat degradation
   b. over fishing
   c. introduction of non-native trout
   d. A and B
   e. A, B, and C

6. The water cycle begins with
   a. transpiration
   b. evaporation
   c. condensation
   d. infiltration

7. Acidity of rain water can be measured using the
   a. pH scale
   b. dendrometer
   c. rain gauge
   d. altimeter

8. Brook trout prefer a pH between
   a. 3.5 – 4.5
   b. 4.5 – 5.5
   c. 5.5 – 6.5
   d. 6.5 – 7.5

Short Answer

9. Name three characteristics of a brook trout

10. Place these three stages of development of the brook trout in the correct order by placing the numbers 1, 2 and 3 beside the appropriate word.
    Fry
    Alevin
    Parr

11. What type of food does the brook trout eat early in life? Later in life?

12. Name one difference between the Southern Appalachian Brook Trout and the Northern Brook Trout.

13. Describe or draw a watershed. Name the watershed you are in at your school.

14. What causes acid rain?

15. List two things you can do to become involved in helping maintain brook trout populations.

Pre/Post Test Answer Key

Multiple Choice

1. a. It is an indicator species.
2. e. A, B, C and D
3. d. salmon
4. a. brook trout
5. e. A, B. and C
6. b. evaporation
7. a. pH scale
8. d. 6.5 – 7.5

Short Answer

9. Any three of the following:

   Streamlined body with a large mouth that extends past the eye

   Range in adult sizes from 3 – 4 inches in small, high mountain streams to 7 – 9 inches in larger streams.

   It has white piping on the outer edges of all but the caudal (tail) fin. Immediately behind the white piping is a narrow black strip.

   Wormlike circles on its body (vermiculations)

   The white of the male abdomen is replaced by red and orange hues

   Small crimson dots surrounded by powder blue halos

   Lateral line allows sensing of vibrations

   Nasal receptors—an acute sense of smell

10. Fry – 2
    Alevin – 1
    Parr – 3

11. As fry, they feed on microscopic crustaceans and then later on small insect larvae. As par, they begin to feed on mid-sized insect larvae such as mayfly or caddis fly larvae. As juveniles they begin to include larger insect larvae. Fish such as minnows and sculpins, along with crayfish and salamanders become important in the diets of adults. Brook trout are cannibals and often eat smaller members of their own species.

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12. The southern strain brookies are usually smaller and have more speckles which are colored a brighter red. Their eyes, snout, and lower jaws are larger, and their pectoral fins are longer than those of the northern brook trout. (Karas, 1997, 88)

13. A watershed is an area of land from which surface and groundwater drain to a stream, river or other body of water. They are readily identifiable boundaries that include terrestrial, aquatic and geologic features.

14. When water falls back to the earth as precipitation in the water cycle, it absorbs gases and elements in the air and changes from its neutral state and becomes "acid." Two of the major contents of acid rain are sulfur dioxide and nitrogen oxide. When large amounts of these two chemicals enter the atmosphere, they combine with moisture to produce strong acids—sulfuric acid and nitric acid. These are very strong pollutants that can damage trees, streams, and buildings, as well as fish and human health.

15. a. Volunteer for clean water and stream enhancement projects with Trout Unlimited, Tennessee Wildlife Resources Agency.

    b. When you hear about commercial or residential development causing trees to be removed along a riverbank, call your local planning authorities. Talk about clean air and water to legislators.

Ideas for optional activities and reinforcements

1. Still Shots of the content listed below are found at the end of the DVD:

   the brook trout

   watershed

   water cycle

   pH Scale

   Note: Your school's Chemistry teacher may have suggestions and equipment for pH scale learning activities

2. Locate your watershed:

   http://cfpub.epa.gov/surf/locate/index.cfm

   This URL allows you to locate the watershed underneath your feet. If students have access to the Internet in the classroom, an enrichment activity can be built around the use of this URL. This exercise is best used at the end of Section 2.

3. Contact your local Trout Unlimited Chapter (www.tu.org) for additional services such as: guest speakers, field trips, etc. Many TU members can add interest to the aquatic insect life cycles by demonstrating fly tying techniques.

4. TU Back the Brookie website www.brookie.org

   EPA website URL ***http://www.epa.gov/airmakets/acidrain/effects/surfacewater.html***

Email Evaluation:

Send your feedback directly from the DVD to the following email of address: tnbrookie@hotmail.com

Please evaluate the module as follows:

(1-Not Useful 2-Somewhat Useful 3-Average 4-Very Useful 5-Excellent)

1. Rate the usefulness of the Back the Brookie Module in your curriculum.

   Circle One 1 2 3 4 5

2. If you used the suggested optional activities listed in Page 5 of the Teacher Packet, rate their effectiveness.

   Activity 1 – Use of the still shots at the end of the DVD

   Circle One 1 2 3 4 5

   Activity 2 – Find your own watershed

   Circle One 1 2 3 4 5

   Activity 3 – Contact Trout Unlimited

   Circle One 1 2 3 4 5

   Activity 4 – Use of the Back the Brookie website

   Circle One 1 2 3 4 5

3. Rate the overall effectiveness of this module.

   Circle One 1 2 3 4 5

If you have ideas to supplement the use of the module that you would like to pass on to other teachers, please include them in your evaluation email to tnbrookie@hotmail.com.

Thank you for your use and participation.

Your Notes:

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Your Notes:

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