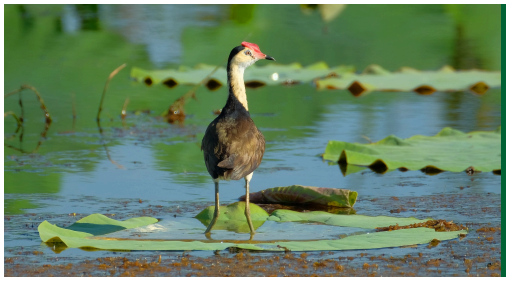
Freshwater Biomes



Grade Level: 3-5

Time Needed: See procedures (estimates)

Overview:

As is the case with all SAFE Worldwide lesson plans, there are a great many more resources here than any one teacher is likely to use. The ones with the asterisks * are ones that we use frequently because they have the proper information. Please feel free to use only what works for you.

Essential Questions:

- What do we humans need to do to preserve our fresh water for the planet and all living things?

Standards:

Next Generation Science Standards:

- **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**
  When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. *(secondary)*

- **LS2.D: Social Interactions and Group Behavior**
  Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (Note: Moved from K–2) (3-LS2-1) LS

- **LS4.C: Adaptation**
  For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3) LS4.D: Biodiversity and Humans Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)

- **LS1.A: Structure and Function**
  Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

- **LS1.D: Information Processing**
  Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)

- **ESS2.C: The Roles of Water in Earth's Surface Processes**
  Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

- **ESS3.C: Human Impacts on Earth Systems**
  Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

National Council of Social Studies:

- **D2.Geo.2.3-5**: Use maps, satellite images, photographs, and other representations to explain relationships between the locations of places and regions and their environmental characteristics.
- **D2.Geo.4.3-5**: Explain how culture influences the way people modify and adapt to their environments.

International Baccalaureate:

- PYP 1: Approaches to teaching 1.1: Teachers use inquiry-based teaching strategies and learning engagements.
- PYP 1: Approaches to teaching 1.5: Teachers facilitate student exploration of their personal interests and ideas.
- PYP 3: Approaches to teaching 3.1: Teachers ensure that there are clear examples of connections to local and global contexts in the curriculum.
- PYP 1: Teachers use flexible grouping of students to maximize learning, ensure student well-being, and provide a variety of opportunities for collaboration.

Objectives:

- Explain the importance of freshwater.
- Define a watershed.
- Explain the water cycle.
- Identify the different types of animals that live in freshwater.
- Identify problems in freshwater biomes
- Propose solutions to problems within the biome.

Materials:

Full web addresses for all materials are provided at the end of the lesson plan.

**https://media.nationalgeographic.org/assets/file/freshwater-full-teacher-guide.pdf
This booklet is a great source of information for all freshwater lessons. It has readings and activities, and also indicates grade levels suggested for each activity. If you only have time for a few lessons, this is the place to start.

Videos:

1. Earth's Fresh Water - Earth Science for Kids!
2. *Fish-Friendly Engineering
3. What's An Estuary? Now You Know.
4. Water Use in Hydraulic Fracturing

Readings:

1. Human Population Growth
2. *Freshwater Habitat
3. *Biomes-Freshwater
4. *Biodiversity in Fresh Water
5. *The Freshwater Biome
6. Freshwater Animals
7. *HEART Humane Education: Water is Life (Grades 3-5)
8. *Earth's Fresh Water: Full Teacher Guide. These chapters are organized by grade level so you can choose discussions and activities appropriate for your students.
9. *Discoveries at Willow Creek
10. Great Lakes Ecosystems | An Exploration of the Great Lakes (some of the clickables do not work properly)
11. Contemporary Issues Facing the Great Lakes

12. *Freshwater Ecology Unit
13. Fish and Shellfish in the Estuary
14. Water: Estuaries of the United States: Plants and Trees (Fusion of Biology)
15. additives in frac fluids
16. The Arizona STEM Acceleration Project
17. National Energy and Petrochemical Map (in upper right corner, click on "explore Well Locations"; click on your state to see fracking locations)
18. MD stream Health Data Sheet (every state should have these from either the Soil & Water Conservation District or the State Dept. of Natural Resources; State EPA etc.

Activities:

1. Earth's Water Pie Chart and Questions
2. Model My Watershed
3. One World Ocean (This could also be done in the Ocean Biome)
4. *Animal Research Templates
5. Freshwater Fish of North America (blank cards with photos)
6. Amphibian Flashcards (blank cards with photos)
7. Draw The Reptiles (blank cards)
8. Oregon | Activity 8.4: Chinook Salmon - the Oregon State Fish
9. Clean Enough to Drink: Making Devices to Filter Dirty Water
10. Make a water filter
11. Water Wonders Great Lakes Biomes:
12. How Fresh are the Great Lakes? | An Exploration of the Great Lakes
13. Estuary Identification and United States Mapping (Science Geography COMBO)
14. Water: Estuary Diagrams and Biology Overview (Great COLOR Maps!)
15. Estuaries of the United States: Reptiles & Amphibians (Fusion of Biology)
16. Estuaries and Animals: Rivers Meet the Ocean (Incorporate with Water Cycle)
17. Water: Birds and Estuaries: Rivers Meet the Ocean (Incorporate with Water Cycle)
18. Harvesting Fresh Water With a Fog Catcher

19. The Food Chain Game: Florida Everglades Freshwater (requires advanced prep)
20. Water Cycle Lab FREEBIE
21. How can a dichotomous key help identify Lake Erie fish?
22. Freshwater Dolphins (54 pp. of information and activities)
23. Oregon |Activity 2.5: Crayfish in Crater Lake National Park
24. Life Cycle of a Frog
25. Animal Craft-ivity {Animal Classification FREEBIE}
26. Alligator Activity Fun (crossword puzzle)
27. Chesapeake Bay Activity Book
28. Experience Wyland National Art and Classroom Mural Challenge (this contest has expired, but the idea is still doable)

Educator Information:

1. The Environmental Impact of Fracking on Water Resources

Procedure

Hook:

1. Ask the question: Where does our water come from?
2. They may say 'the faucet" or "rain" or even water treatment plants.
3. Explain that they will be studying the freshwater biome.

Procedure 1: Where the Water Comes From

1. Show the video: Earth's FreshWater - Earth Science for Kids!
    - Discuss/answer questions
    - Distribute the worksheet: The Water Cycle (Blank) | TPT
        - Depending on the knowledge of your students, you may either do it with them or ask them to fill it out alone.
    - Optional Experiment: Water Cycle Lab FREEBIE | TPT

- **If you feel they need more practice with the water cycle, you can go to Earth's Fresh Water: Full Teacher Guide, Chapter 2 | National Geographic. There's a lot of information there, so you would need to choose what works best for your students. Pp. 37-39 specifically cover it.
- Distribute the next worksheet: Earth's Water Pie Chart and Questions |TPT
  - Discuss the questions.
  - Explain that the earth's current population is 8.2 billion people.
- Show the first diagram from: Human Population Growth
  - Explain it if necessary.
  - Show the 3rd diagram: Weight of all the vertebrate land animals on earth and explain it if necessary.

2. Ask if they can define the term watershed. Explain it if they cannot. There is more information and an activity in Freshwater Full Teacher Guide | National Geographic pp. 44- 47
   - Explain that every living being lives in a watershed. Let them find their own watershed by using: Model My Watershed
   - Where does your watershed begin? Students often get it backwards.
   - Where does it end?
3. You can also discuss groundwater: Freshwater Full Teacher Guide | National Geographic pp. 40-46
   - Interesting article you may want to share: Excessive Groundwater Extraction Causes Earth Tilt To Shift
4. Optional: One World Ocean
   - This could also be done in the Ocean Biome

Procedure 2: Freshwater Biomes Research

1. Distribute copies of each of these pages to each student: Animal Research Templates | TPT

2. Divide the class into 4 groups and give each group one of the following websites:
    - Group 1: Freshwater Habitat
    - Group 2: Biomes - Freshwater
    - Group 3: The Freshwater Biome
    - Group 4: Freshwater Animals

Let each group work together to fill out their research papers. Be sure they understand that they may not find everything on their website.

Distribute the following cards to each group. Allow them to distribute the cards within the group.

- Freshwater Fish of North America (blank cards with photos)
- Amphibian Flashcards (blank cards with photos)
- Draw The Reptiles (blank cards)

Here are some activities to occupy individuals who finish early.

- AlligatorActivity Fun (crossword puzzle)
- Chesapeake Bay Activity Book
- Life Cycle of a Frog

Once each group has finished filling out its cards, do a round-robin in which the groups trade cards in order to fill out their research sheets with whatever animals they still need.

- Discuss what fish, amphibians, and reptiles live in freshwater biomes. Ask if anyone knows if any of these animals live in freshwater around your community. If so, write them on the board.
- Optional: Freshwater Dolphins (54 pp. of information and activities)(there a few experiments and hands-on activities you might want to consider)

Procedure 3: Caring for Freshwaters

Begin the procedure with:
https://media.nationalgeographic.org/assets/file/freshwater-full-teacher-guide.pdf Chapter 4. Pp.70-89. Water Quality in Freshwater Systems, and Chapter 5. Pp.90-111 Water Concerns for Wildlife and Humans: These chapters are broken up by grade level, so you can choose activities and discussions that are appropriate for your students.

- Some of the following activities are repeats of the ones in chapter 4 above, but with different methods.
- Clean Enough to Drink: Making Devices to Filter Dirty Water. This is a very long activity. It can be shortened by simply just building the filter: Make a water filter

Either distribute the following story, read it together or read it to the class:
Discoveries at Willow Creek

MD stream Health Data Sheet (every state should have these from either the St. Dept. of Natural Resources; Soil & Water Conservation District; State EPA etc.

- Discuss your results of the local stream analysis.
    - Is the water clean?
    - If it isn't, discuss who you can talk to about it.

**You can engage in similar readings, discussions, and activities about the Great Lakes if you live in the region or want to study the largest freshwater biome in the world here:

Great Lakes Biomes:
Great Lakes Ecosystems | An Exploration of the Great Lakes (some of the clickables do not work properly)

- How can a dichotomous key help identify Lake Erie fish?

- Contemporary Issues Facing the Great Lakes
- How Fresh are the Great Lakes? | An Exploration of the Great Lakes

Dams are another issue of concern in our freshwater streams: the following chapter deals with dams and the consequences of their construction. You may only want to use part of it.

Both of the following are activities concerning salmon and dams.

- Chapter 3. Changing Natural Flows of Water, pp.54-69
- Oregon | Activity 8.4: Chinook Salmon - the Oregon State Fish

The following activity/game helps students understand the problem for salmon.

- *Fish-Friendly Engineering
- *HEART Humane Education: Water is Life (Grades 3-5)

After these discussions and activities, ask students what they've noticed about how plastics are treated in your local community.

- Do they see recycling bins for plastics?
- Do grocery stores give out plastic bags?
- Do grocery stores offer incentives for people who bring their own bags?

Estuaries: these can also be covered in ocean biomes.

- What's An Estuary? Now You Know.
- Estuary Identification and United States Mapping (Science Geography COMBO)
- Water: Estuary Diagrams and Biology Overview (Great COLOR Maps!)
- Fish and Shellfish in the Estuary
- Estuaries of the United States: Reptiles & Amphibians (Fusion of Biology)
- Estuaries and Animals: Rivers Meet the Ocean (Incorporate with Water Cycle)
- Water: Birds and Estuaries: Rivers Meet the Ocean (Incorporate with Water Cycle)
- Water: Estuaries of the United States: Plants and Trees (Fusion of Biology)

Optional:
Harvesting Fresh Water With a Fog Catcher. Might be interesting if you live in a desert biome.

Fracking:
Students may or may not be aware of fracking. Ask them if they've heard of it and what they know before starting the lesson.

Show this video to give a brief introduction to how fracking works:
Water Use in Hydraulic Fracturing

- Ask students if there are any questions.
- Ask if they can predict any problems from this procedure.
- Show this list: https://en.wikipedia.org/wiki/List_of_additives_used_for_fracking
- If you have time, ask them to click on some of them to get more information.
- Ask what they think these fluids might do to drinking water. The Arizona STEM Acceleration Project
- This activity contains a much more detailed video about fracking before explaining an activity where students can start to understand its effects.
- Since this video is more detailed, ask your students if they have any more questions about it.
- Be sure every student has a cookie, a toothpick, and a handout of the paper for this activity. Follow the directions for the activity and the discussion.

National Energy and Petrochemical Map (in upper right corner, click on "explore Well Locations"; click on your state to see fracking locations)

- This is an interactive map of fossil fuel wells around the country. You can click on your own community to see the wells near you. You can also see what kinds of wells they are.

- Ask students for their opinion about their community and the wells that may be in it.
- If you have time, check some other communities, such as western PA or Weld Co. CO for a comparison.

Assessment:

There are several diverse topics in this unit. You may want to assess them individually. Here are some ideas:

1. Draw a watershed map/diagram including:
   A. a lake,
   B. a river,
   C. its tributaries,
   D. a wetland
   E. The water cycle
   F. Groundwater (this may be a separate diagram)
2. Label all of the features listed above:
3. List ____ animals that live in your local biome, and how they use the water:
   A. Example: a rainbow trout lives in the water and eats and swims in it.
   B. Example: a heron spends time in the water or wetland and eats fish, but nests in trees
   C. Example: a deer lives on land and eats plants but drinks the water.
4. List ___ ways fresh water can be polluted.
5. List ___ polluted water hurts animals and people.
6. Create a poster, brochure, comic strip, etc. on ways people can help keep freshwater clean.

Materials:

Videos:

1. Earth's Fresh Water - Earth Science for Kids!
   https://www.youtube.com/watch?v=Gx vvAa 9MQ

Videos (Continued):

2. Fish-Friendly Engineering
   https://www.teachengineering.org/activities/view/cub_dams_lesson06_activity1
3. What's An Estuary? Now You Know.
   https://www.youtube.com/watch?v=XLumSN4G5P4
4. Water Use in Hydraulic Fracturing
   https://www.youtube.com/watch?v=DZY9kJzrF-E

Readings:

1. Human Population Growth
   https://populationmatters.org/lp-the-facts/?msclkid=8bcd56d624241c4428ab3197cb117029&utm_source=bing&utm_medium=cpc&utm_campaign=Population%20Facts&utm_term=latest%20world%20population&utm_content=Population%20Graphs%20and%20Data%20-%20Phrase
2. Freshwater Habitat
   https://kids.nationalgeographic.com/nature/habitats/article/freshwater
3. Biomes-Freshwater
   https://www.ducksters.com/science/ecosystems/freshwater_biome.php
4. Biodiversity in Fresh Water
   https://media.nationalgeographic.org/assets/file/Freshwater_chapter1_v2.pdf
5. The Freshwater Biome
   https://www.activewild.com/freshwater-biome/
6. Freshwater Animals
   https://www.activewild.com/freshwater-animals/
7. HEART Humane Education: Water is Life (Grades 3-5)
   https://www.teacherspayteachers.com/Product/HEART-Humane-Education-Water-is-Life-Grades-3-5-3452624

Readings (Continued):

8. Earth's Fresh Water: Full Teacher Guide. Chapters are organized by grade level. https://media.nationalgeographic.org/assets/file/freshwater-full-teacher-guide.pdf
9. Discoveries at Willow Creek https://www.globe.gov/documents/348830/55942515/Hydro_book_FINAL2017.pdf/ac8723a7-cbf9-47fb-b481-d3436e7016fb
10. Great Lakes Ecosystems | An Exploration of the Great Lakes (some of the clickables do not work properly) https://static.pbslearningmedia.org/media/media_files/16e22b98-3ed6-404b-b444-dc7d9abd14e5.pdf
11. Contemporary Issues Facing the Great Lakes https://static.pbslearningmedia.org/media/media_files/75b66e3b-737a-4bb5-96b8-131ef263f3d7.pdf
12. Freshwater Ecology https://stroudcenter.org/wp-content/uploads/freshwater-ecology-unit.pdf
13. Fish and Shellfish in the Estuary https://www.teacherspayteachers.com/Product/Fish-and-Shellfish-in-the-Estuary-Pairs-Great-With-Water-Cycle-1796571
14. Water: Estuaries of the United States: Plants and Trees (Fusion of Biology) https://www.teacherspayteachers.com/Product/Water-Estuaries-of-the-United-States-Plants-and-Trees-Fusion-of-Biology-1799166
15. Additives in frac fluids https://en.wikipedia.org/wiki/List_of_additives_used_for_fracking
16. The Arizona STEM Acceleration Project https://docs.google.com/presentation/d/1g1XIHcgHJos7Jv8vOGGV2_jkbVVGX-XH/edit#slide=id.p3
17. National Energy and Petrochemical Map (in upper right corner, click on "explore Well Locations"; click on your state to see fracking locations) https://experience.arcgis.com/experience/b5608246b8ef4b1fa3463eede0b54ed9/

Readings (Continued):

18. MD stream Health Data Sheet (every state should have these from either the Soil & Water Conservation District or the State Dept. of Natural Resources; State EPA etc. https://dnr.maryland.gov/education/Documents/StudentDataSheet.pdf

Activities

1. Earth's Water Pie Chart and Questions https://www.teacherspayteachers.com/Product/Earths-Water-Pie-Chart-Questions-433521
2. Model My Watershed https://modelmywatershed.org/draw
3. One World Ocean (This could also be done in the Ocean Biome) https://www.teachengineering.org/activities/view/cub_earth_lesson2_activity2
4. Animal Research Templates https://www.teacherspayteachers.com/Product/Animal-Research-Templates-7523641
5. Freshwater Fish of North America (blank cards with photos) https://www.teacherspayteachers.com/Product/Freshwater-Fish-of-North-America-3-Part-Cards-6970540
6. Amphibian Flashcards (blank cards with photos) https://www.teacherspayteachers.com/Product/Amphibians-Flashcards-9273417
7. Draw The Reptiles (blank cards) https://www.teacherspayteachers.com/Product/Draw-the-Reptiles-6405659
8. Oregon | Activity 8.4: Chinook Salmon - the Oregon State Fish https://ideastream.pbslearningmedia.org/resource/great-states-oregon-8.4/activity/
9. Clean Enough to Drink: Making Devices to Filter Dirty Water https://www.teachengineering.org/activities/view/uoh_cleandrink_activity1
10. Make a water filter https://kids.nationalgeographic.com/books/article/water-wonders

Activities (Continued):

11. Water Wonders Great Lakes Biomes: https://www.globe.gov/documents/348830/55942515/WaterWonders_27July2018_FINAL.pdf/96d35143-d3e5-4661-bf56-5ec42716342c
12. How Fresh are the Great Lakes? | An Exploration of the Great Lakes https://ideastream.pbslearningmedia.org/resource/bd180e7a-0e9f-4fb4-b80f-01e388a8468d/how-fresh-are-the-great-lakes-the-geography-of-the-great-lakes/
13. Estuary Identification and United States Mapping (Science Geography COMBO) https://www.teacherspayteachers.com/Product/Estuary-Identification-and-United-States-Mapping-Science-Geography-COMBO-1799067
14. Water: Estuary Diagrams and Biology Overview (Great COLOR Maps!) https://www.teacherspayteachers.com/Product/Water-Estuary-Diagrams-and-Biology-Overview-Great-COLOR-Maps-1799116
15. Estuaries of the United States: Reptiles & Amphibians (Fusion of Biology) https://www.teacherspayteachers.com/Product/Estuaries-of-the-United-States-Reptiles-Amphibians-Fusion-of-Biology-1799195
16. Estuaries and Animals: Rivers Meet the Ocean (Incorporate with Water Cycle) https://www.teacherspayteachers.com/Product/Estuaries-and-Animals-Rivers-Meet-the-Ocean-Incorporate-with-Water-Cycle-1785753
17. Water: Birds and Estuaries: Rivers Meet the Ocean (Incorporate with Water Cycle) https://www.teacherspayteachers.com/Product/Water-Birds-and-Estuaries-Rivers-Meet-the-Ocean-Incorporate-with-Water-Cycle-1795964
18. Harvesting Fresh Water With a Fog Catcher https://www.sciencebuddies.org/science-fair-projects/project-ideas/EnvSci_p068/environmental-science/fog-catcher-mesh-material
19. The Food Chain Game: Florida Everglades Freshwater (requires advanced prep) https://www.teacherspayteachers.com/Product/The-Food-Chain-Game-Florida-Everglades-Freshwater-9944532

Activities (Continued):

20. Water Cycle Lab FREEBIE
    https://www.teacherspayteachers.com/Product/Water-Cycle-Lab-FREEBIE-1765803
21. How can a dichotomous key help identify Lake Erie fish?
    https://www.teacherspayteachers.com/Product/How-can-a-dichotomous-key-help-identify-Lake-Erie-fish-9887553
22. Freshwater Dolphins (54 pp. of information and activities)
    https://files.worldwildlife.org/wwfcmsprod/files/EducatorsToolkitFile/file/38hkd1dday_24_1889_WC_Toolkit_Update_FW_Dolphins_FULL_TOOLKIT_061724.pdf
23. Oregon |Activity 2.5: Crayfish in Crater Lake National Park
    https://ideastream.pbslearningmedia.org/resource/great-states-oregon-2.5/activity/
24. Life Cycle of a Frog
    https://www.teacherspayteachers.com/Product/Life-Cycle-of-a-Frog-2318586
25. Animal Craft-ivity {Animal Classification FREEBIE}
    https://www.teacherspayteachers.com/Product/Animal-Craft-ivity-Animal-Classification-FREEBIE-1060961
26. Alligator Activity Fun (crossword puzzle)
    https://www.teacherspayteachers.com/Product/Alligators-Activity-Fun-1345258
27. Chesapeake Bay Activity Book
    https://repository.library.noaa.gov/view/noaa/1732
28. Experience Wyland National Art and Classroom Mural Challenge (this contest has expired, but the idea is still doable)
    https://wylandfoundation.org/programs/wyland-art-contests-for-kids/

Educator Information:

1. The Environmental Impact of Fracking on Water Resources
   https://www.landgate.com/news/the-environmental-impact-of-fracking-on-water-resources?gad_source=2&gclid=CjwKCAiA9IC6BhA3EiwAsbltOPP7KspOEdcI86yHiEl0mTBXHbJgRt-o_o1n5acyIZ_4yLgeuP4CwhoCD9gQAvD_BwE