The Shallows

Topic: Water treatment and pollution
(5^{th}-8^{th} grade)

by Lodge

The Shallows

What's floating in your water, there Kimberly?
Just a little Iron, and some magnesium
What does that say about the quality?
How many other molecules cause disease-ium
Following standards by the EPA
Yea the concentration is acceptable – today
EPA, come measure the acidity
PH must be neutral, 7 would be beautiful
The hardness of water, that is tough to clean
Magnesium and calcium, clogging my pipes full
Coliform count more than 5%
Don't drink it down...well, do you feel real bad yet?
Hm...there's something in the water

Chorus:
Eutrophication from the fertilizer
Blocks out the light like a thick sun visor
While point source pipes dumping sludge in the water - oh
Causing this pollution
While, government government makes laws to protect "the shallows"
oh we oh oh

Now we filter water from a public lake
Screens remove the particles, branches and barnacles
Chemical added that coagulates
Sticky sticky flocs, making basins functional
Little floating globs settle down at the bottom
Are they easy to remove – oh yea, we got 'em
Filter once more using sand and gravel
Would you care to remove all of the algae and bacteria?
Add the chlorination and then stir with a paddle
Kill the microorganisms in this area
Air through the water to reduce the smell
I'll fix it up. Aeration is a-kinda swell
Hm...there's something in the water

Plant roots filter and absorb all the metals and chemicals
While bacteria can eat some oil at the time of the spill
If you reuse the water
Yea and cool the water
You can reuse the water
Gosh, I hope they will

Human human waste can really cause some disease
Cholera, cholera - it's such a follower
Treatment plants, remove all of it please
Clean it up, serve it up – give me what I prefer
Industrial waste, from factories and mines
Can cause non point source - where pollution can't be tied
Chemicals dumped cause a reaction chain
Toxic chemicals, lets be sensible
Smoke and exhaust result in acid rain
Cars and smoke stacks...emitting the dispensable
Heat pollution gets some hot hot water
And heats it up...more than southern Nicaragua
Hm...there's something in the water

Student Lyric Guide

Name:_____ Water Treatment and Pollution

The Shallows

What's floating in your water, there Kimberly?

Define concentration:_____

_____

_____

Just a little iron, and some magnesium
What does that say about the quality?

Define water quality:_____
_____
_____

List 2 harmless substances commonly found in water.
1._____
2._____

List 2 harmful substances found in drinking water.
1._____
2._____

How many other molecules could cause disease-ium
Following the standards by the EPA

What is the name of the government organization that controls water, air and land quality?

_____

The EPA was established in the year_____.

Why was the EPA established?_____

_____

_____

Yea the concentration is acceptable – today
EPA, come measure the acidity

3 factors that affect water quality
1._____
2._____
3._____

What does pH measure?_____
pH is measured on a scale from _____ to ____. Water with a low pH is very _____.
Water with a high pH is very _____.

PH must be neutral, 7 would be beautiful

Pure water has a pH of _____.

Drinking water must have a pH of _____ to _____ as set by the EPA.

The hardness of water, that is tough to clean
Magnesium and calcium, clogging my pipes full

Hardness of water is defined as the amount of _____ and _____ present in the water.

What are two drawbacks of hard water?_____

_____

_____

Coliform count more than 5%

The amount of the bacteria _____ _____ found in water is referred to as the _____ _____.

Where are E. coli found?_____

What is the EPA coliform count allowed in drinking water?_____

_____

What does a high coliform count indicate about drinking water?_____

_____

Don't drink it down…well, do you feel real bad yet?

What disease can result from drinking water with a high coliform count?_____

Hm…there's something in the water
Eutrophication from the fertilizer

Define eutrophication:_____

_____

_____

Blocks out the light like a thick sun visor

How does the use of fertilizers in farming increase the rate of eutrophication?_____

_____

_____

While point source pipes dumping sludge in the water – oh
Causing this pollution

Define water pollution:_____

_____

The substance causing the water pollution is called the _____

List two types of water pollution.
1._____
2._____

Define point source pollution:_____

_____

List two examples of point source pollution.
1._____

2._____

While, government government makes some laws to protect "the shallows"
oh we oh oh

Why does the government make laws to protect the shallows?_____

_____

Now we filter water from a public lake
Screens remove the particles, branches and barnacles

Where is our local drinking water stored before it's treated?_____

Why does water need to be treated before it is drinkable?_____

_____

The first step to treating drinking water is _____.
What happens in this step?_____

_____

Chemical added that coagulates

The second step to treating drinking water is _____.

Define coagulation:_____

_____

Sticky sticky flocs, making basins functional
A chemical, called _____, causes sticky globs called _____
to form. Particles that stick to the flocs include _____ and _____.

Little floating globs settle down at the bottom
Are they easy to remove – oh yea, we got 'em

The third step to treating drinking water is _____.

What happens in settling basins?_____

_____

Filter once more using sand and gravel

The 4th step to treating drinking water is _____.

What substances filter the water in the 2nd filtration?_____

Would you care to remove all of the algae and bacteria?

What substances are removed from the water during 2nd filtration?_____

_____

Add the chlorination and then stir with a paddle
Kill the microorganisms in this area

The 5th step to treating drinking water is _____

Why is chlorine added to drinking water?_____
_____

Air through the water to reduce the smell
I'll fix it up. Aeration is a-kinda swell

The 6th step to treating drinking water is _____

Why is drinking water aerated?_____
_____

Hm…there's something in the water

Additional substances that may be added to drinking water include
1._____

2._____

Plant roots filter and absorb all the metals and chemicals

How do plants help cleanup water pollution?_____
_____

While bacteria can eat some oil at the time of a spill

How are bacteria used to clean up oil spills?_____
_____

What is the name of the largest oil spill in history?_____

How much oil was spilled?_____

If you reuse the water
Yea and cool the water
Reuse the water

How can dumping hot water into streams harm the environment?_____
_____

What is a solution to heated water pollution?_____
_____

Gosh, I hope they will
Human human waste can really cause some disease
One major source of water pollution is _____.

Cholera, cholera - it's such a follower
What is cholera?_____
_____

How is cholera spread?_____

Treatment plants, remove all of it please
Clean it up, serve it up – give me what I prefer

Two ways to treat human waste water are
1._____

2._____

Industrial waste, from factories and mines
A second major source of water pollution is _____

Can cause non point source - where pollution can't be tied

Define nonpoint source pollution:_____

_____

Chemicals dumped cause a reaction chain
Toxic chemicals, let's be sensible

One type of industrial waste water pollution is _____

List examples of chemical water pollution and label as point or nonpoint source.
1._____

2._____

Smoke and exhaust result in acid rain
Cars and smoke stacks…emitting the dispensable

A second type of industrial waste pollution is _____
What does smoke and exhaust pollution cause?_____

Why is acid rain harmful?_____

Heat pollution gets some hot hot water
And heats it up…more than southern Nicaragua

A third type of industrial waste pollution is _____
What is heat pollution?_____
Hm…there's something in the water

Teacher Key

Name: KEY

Water treatment and pollution

The Shallows

What's floating in your water, there Kimberly?

Define concentration: amount *of one substance in a certain volume of another substance*

Just a little iron, and some magnesium
What does that say about the quality?

Define water quality: *measurement of the substances in water besides water (both harmful and nonharmful)*

List 2 harmless substances commonly found in water.
1. *iron*
2. *magnesium*

List 2 harmful substances found in drinking water.
1. *chemicals*
2. *microorganisms*

How many other molecules could cause disease-ium
Following the standards by the EPA

What is the name of the government organization that controls water, air and land quality?
Environmental Protection Agency

The EPA was established in the year *1970*.

Why was the EPA established? *Established in response to growing public demand for cleaner air, water and land; clean- up current problems and devise plans to prevent future problem*

Yea the concentration is acceptable – today
EPA, come measure the acidity

3 factors that affect water quality
1. *pH*
2. *Hardness*
3. *Disease-causing organisms*

What does pH measure? *How acidic or basic the water is*
pH is measured on a scale from *0* to *14*. Water with a low pH is very acidic.

Water with a high pH is very *basic*.

PH must be neutral, 7 would be beautiful
Pure water has a pH of *7*.

Drinking water must have a pH of *6.5* to *8.5* as set by the EPA.

The hardness of water, that is tough to clean
Magnesium and calcium, clogging my pipes full

Hardness of water is defined as the amount of *Ca* and *Mg* present in the water.

What are two drawbacks of hard water? *Does not form suds well when mixed with detergent. Can form deposits in pipes which causes clogging of the pipes*

Coliform count more than 5%

The amount of the bacteria *escherichia coli* found in water is referred to as the *coliform count*.

Where are E. coli found? *Human and animal waste*

What is the EPA coliform count allowed in drinking water? *No more than 5% of samples taken in one month can be positive for e.coli*

What does a high coliform count indicate about drinking water? *There is fecal matter in the water*

Don't drink it down…well, do you feel real bad yet?

What disease can result from drinking water with a high coliform count? cholera

Hm…there's something in the water
Eutrophication from the fertilizer

Define eutrophication: *the process by which nutrients in a lake build up over time, causing an increase in the growth of algae*

Blocks out the light like a thick sun visor

How does the use of fertilizers in farming increase the rate of eutrophication? *Excess fertilizer runs off into ponds increasing the amount of nutrients in the pond which causes the growth of more algae; can ultimately block out sunlight and kill the pond*

While point source pipes dumping sludge in the water – oh
Causing this pollution

Define water pollution: *the addition of any substance to water that has a negative affect on water or living things that depend on the water*

The substance causing the water pollution is called the *pollutant*

List two types of water pollution.
1. *point source*
2. *nonpoint source*

Define point source pollution: *pollution from a specific source that can be identified*

List two examples of point source pollution.
1. *pipe gushing polluted water into a stream*
2. *chemical sludge dumped into a lake*

While, government government makes some laws to protect "the shallows"
oh we oh oh

Why does the government make laws to protect the shallows? *To protect organisms living in or near the shallows*

Now we filter water from a public lake
Screens remove the particles, branches and barnacles

Where is our local drinking water stored before it's treated? *Falls Lake*

Why does water need to be treated before it is drinkable? *To ensure that it is clean and safe to drink; get out dirt and disease causing organisms;*

The first step to treating drinking water is *first filtration*.
What happens in this step? *Water is filtered through large screens to remove fish, leaves and trash*

Chemical added that coagulates
The second step to treating drinking water is *coagulation*.

Define coagulation: *particles in liquid clump together to form blobs*

Sticky sticky flocs, making basins functional
A chemical, called *alum*, causes sticky globs called *flocs* to form. Particles that stick to the flocs include *mud* and *bacteria*

Little floating globs settle down at the bottom
Are they easy to remove – oh yea, we got 'em

The third step to treating drinking water is *settling basin*.

What happens in settling basins? *Flocs sink to the bottom so they are easier to remove*

Filter once more using sand and gravel

The 4th step to treating drinking water is *Second filtration*.

What substances filter the water in the 2nd filtration? *Sand and gravel*

Would you care to remove all of the algae and bacteria?

What substances are removed from the water during 2nd filtration?
Algae, bacteria, some chemicals

Add the chlorination and then stir with a paddle
Kill the microorganisms in this area

The 5th step to treating drinking water is *chlorination*

Why is chlorine added to drinking water? *To kill any remaining microorganisms*

Air through the water to reduce the smell
I'll fix it up. Aeration is a-kinda swell

The 6th step to treating drinking water is *aeration; forcing air through the water*

Why is drinking water aerated? *To reduce unpleasant tastes and odors in the water*

Hm…there's something in the water

Additional substances that may be added to drinking water include
1. *sodium or lime to soften hard water*
2. *fluoride to prevent tooth decay*

Plant roots filter and absorb all the metals and chemicals

How do plants help cleanup water pollution? *Plant roots filter large particles from the water; some plants absorb metals and chemicals*

While bacteria can eat some oil at the time of a spill

How are bacteria used to clean up oil spills? *Some bacteria 'eat' oil*

What is the name of the largest oil spill in history? *Exxon Valdez*

How much oil was spilled? *10.8 million gallons*

If you reuse the water
Yea and cool the water
Reuse the water

How can dumping hot water into streams harm the environment? *Many organisms live in a narrow range of temperatures, so the hot water released by factories can kill many organisms living in the stream*

What is a solution to heated water pollution? *Cool the water before releasing it into the stream; or cool and reuse the water and don't release it into the stream at all*

Gosh, I hope they will
Human human waste can really cause some disease
One major source of water pollution is *human waste*.

Cholera, cholera - it's such a follower
What is cholera? *Disease caused by bacteria that live in human waste; results in uncontrolled diarrhea that can result in dehydration to the point of death*
How is cholera spread? *Consuming water contaminated with human or animal fecal matter*

Treatment plants, remove all of it please
Clean it up, serve it up – give me what I prefer

Two ways to treat human waste water are
1. *sewage treatment plants*
2. *septic systems*

Industrial waste, from factories and mines
A second major source of water pollution is *Industrial waste*

Can cause non point source - where pollution can't be tied

Define nonpoint source pollution: *a widely spread source of pollution that can't be tied to a specific origin*

Chemicals dumped cause a reaction chain
Toxic chemicals, lets be sensible

One type of industrial waste water pollution is *factories dumping toxic chemicals into water*

List examples of chemical water pollution and label as point or nonpoint source.
1. *gushing pipe polluted with chemicals – point source*
2. *leaking underground storage containers seeping into soil and groundwater - nonpoint*

Smoke and exhaust result in acid rain
Cars and smoke stacks…emitting the dispensable

A second type of industrial waste pollution is *smoke and exhaust*
What does smoke and exhaust pollution cause? *Acid rain*

Why is acid rain harmful? *Causes water in lakes and ponds to become so acidic that organisms die; can harm some trees and building structures*

Heat pollution gets some hot hot water
And heats it up…more than southern Nicaragua

A third type of industrial waste pollution is *heat pollution*
What is heat pollution? *Factories dump hot water into lakes, rivers, streams*

Hm…there's something in the water

Music Video Extension Activity

1. Hand out or project the lyrics and read them out loud and discuss their meaning
2. Play the song for the students, multiple times, encouraging them to sing along
3. Use the student lyric guide in place of, or to supplement class notes
4. Allow students class time, in small groups, to “act” out a portion of the song
5. Film the student groups singing/acting out the song