The Shallows
Topic: Water treatment and pollution
(5th-8th 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
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 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
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 ______
PpH 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, let’s 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