


Wastewater Treatment

(ages 8 to 80)

for Youngsters



This is a simplified look at typical wastewater treatment and is designed to give the viewer a general idea of how the process works.

Go Forward

Welcome **to** **Wastewater** **Treatment** **Part-1**

Metropolitan Council



Environmental
Services

HI !

My name is Snowy and these are my friends
Drake and Froggster. We are your guides for
the MCES Wastewater Treatment Tour.

HI !

Go Forward

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Me too !

I love it,
I love it !

Tweeter tweet !
(means 'I Love Water'
in bird talk)

Me too !

We Love Water !

Me too !

Me too !

Me too !

Go Forward

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hi !

Most of my
friends live
in water

Water
is very important
to us.

It's up to all of us to preserve our earth's precious water supply.

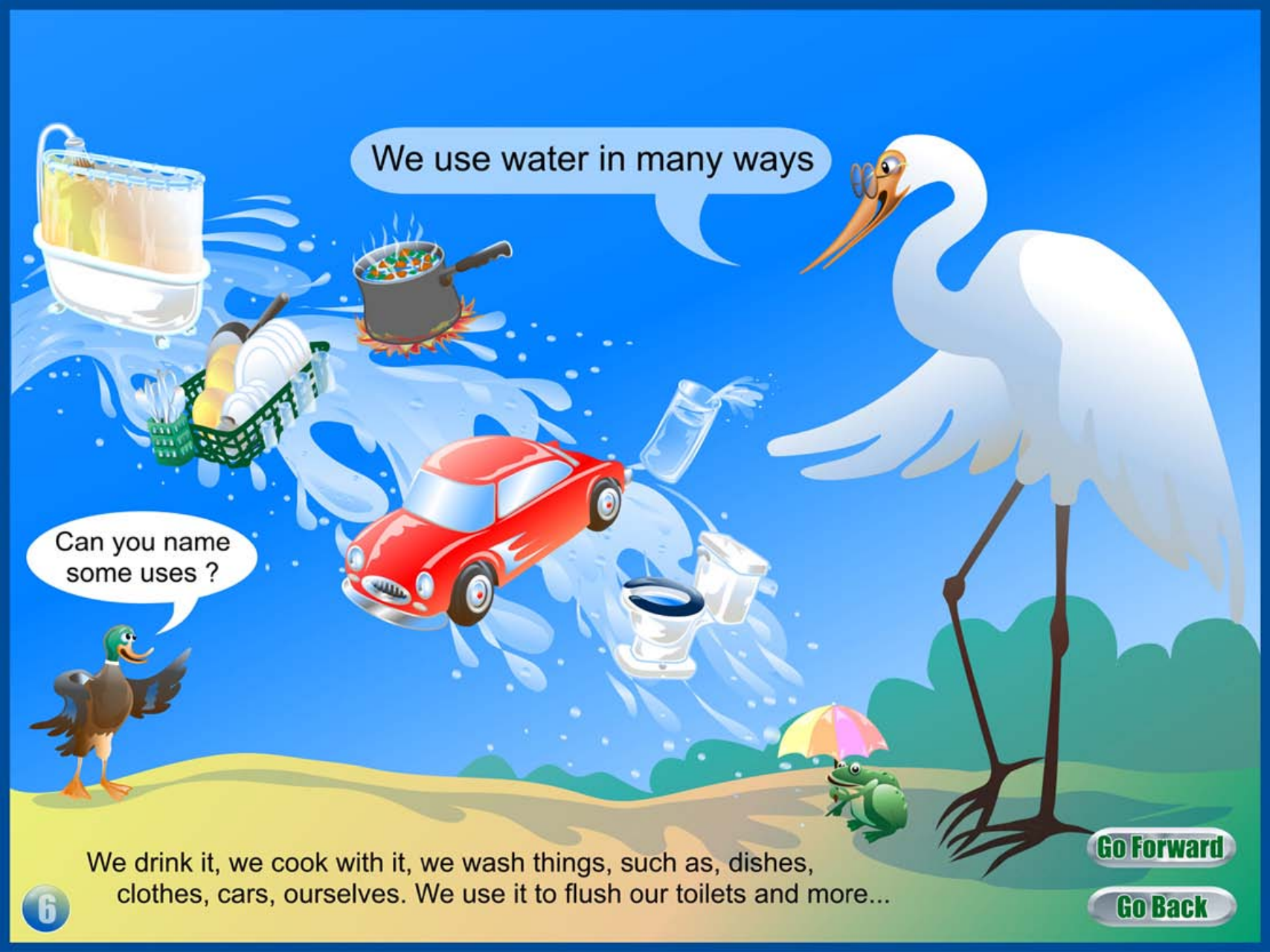
That "Froggster" is really on his toes.

That's a cool frog!

He's just taking a little spin.

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We use water in many ways

Can you name
some uses ?

We drink it, we cook with it, we wash things, such as, dishes,
clothes, cars, ourselves. We use it to flush our toilets and more...

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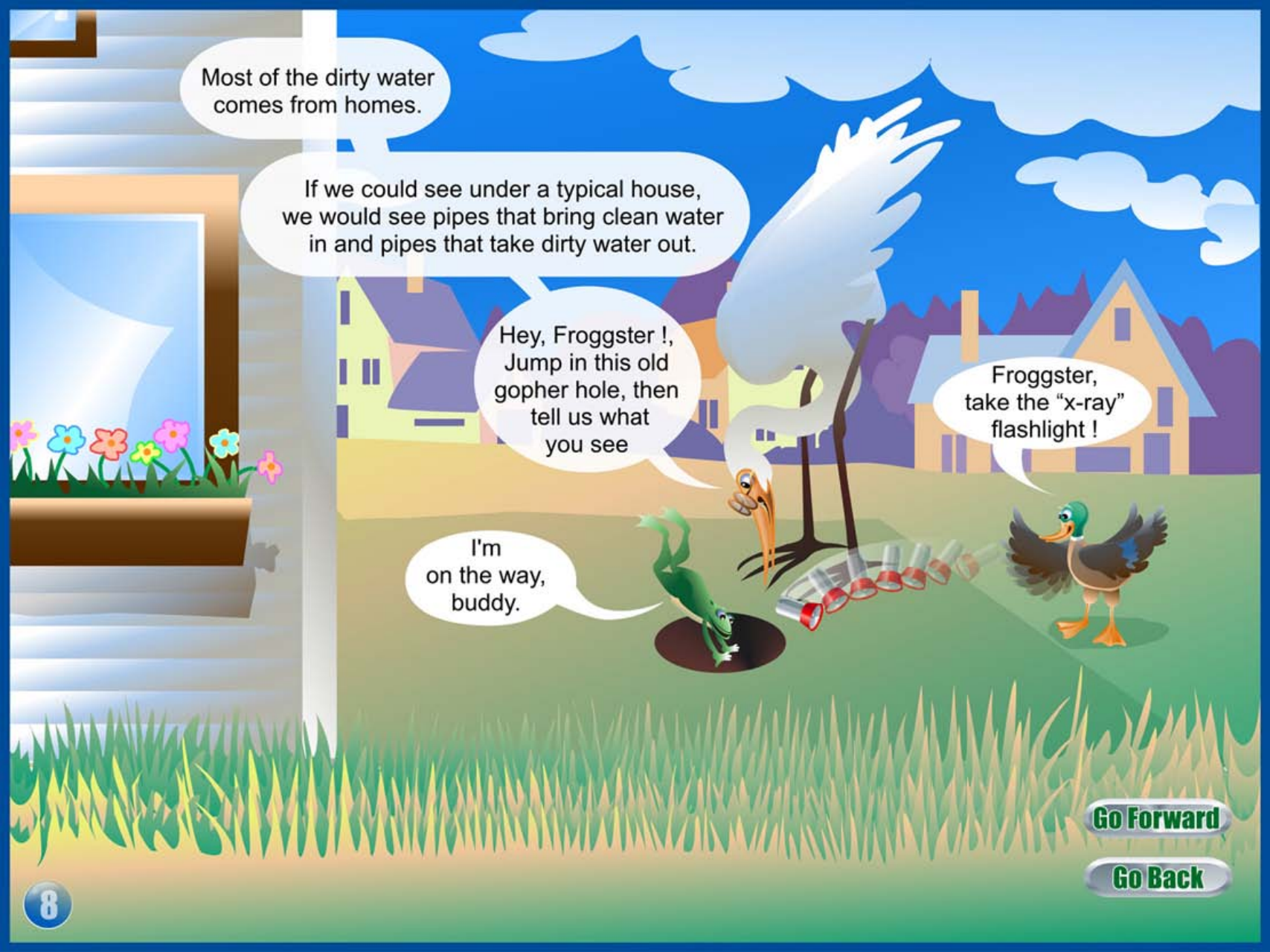
When we use
water, it gets dirty,
and when it gets dirty,
we have to clean it.

What ?
How ?

yuk
mud
toilet stuff
old food
grease
dirt
sand
soap
oils
ick

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Most of the dirty water comes from homes.

If we could see under a typical house, we would see pipes that bring clean water in and pipes that take dirty water out.

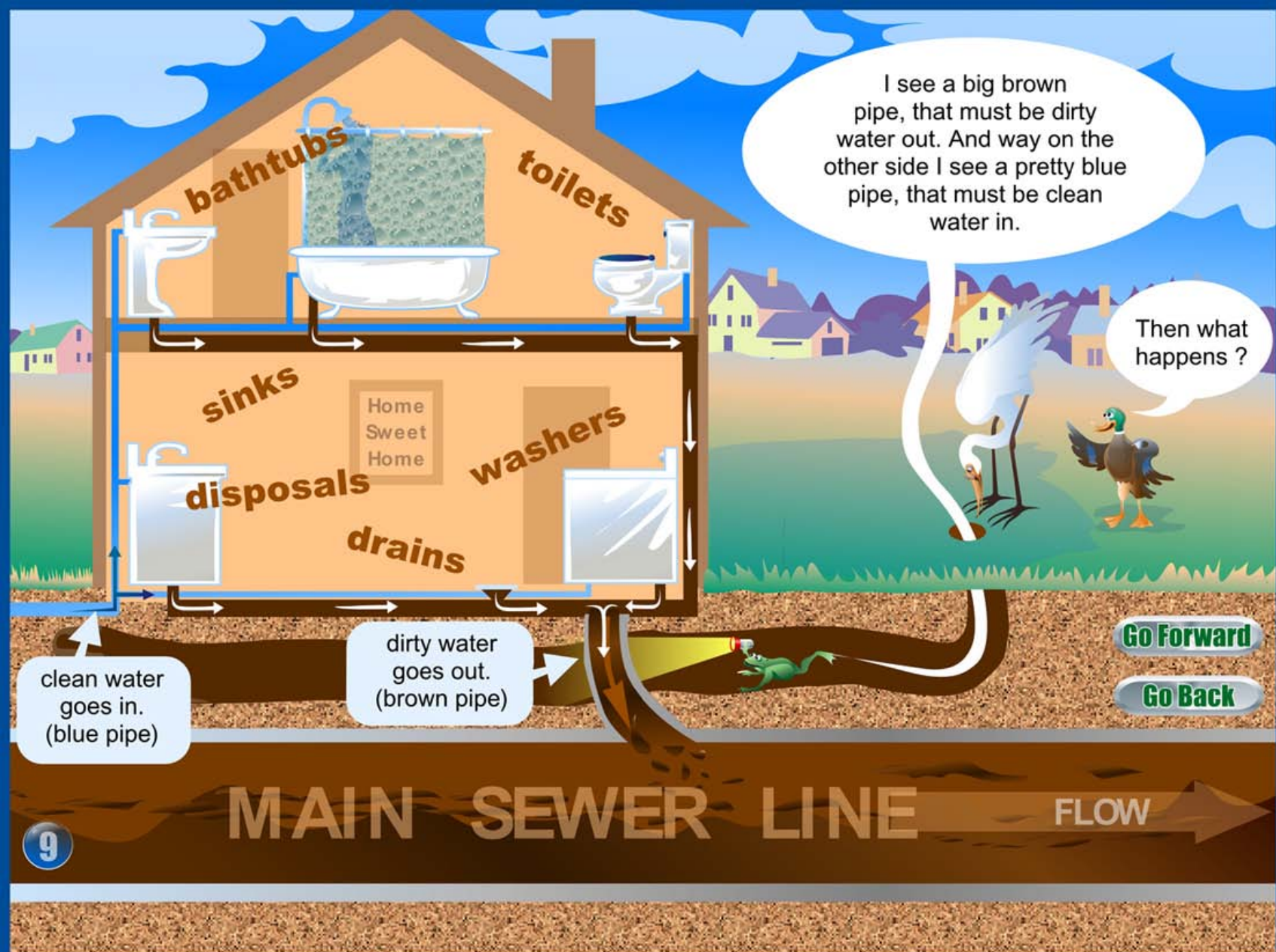
Hey, Froggster !,
Jump in this old
gopher hole, then
tell us what
you see

I'm
on the way,
buddy.

Froggster,
take the "x-ray"
flashlight !

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If we could see through the ground, we would see a network of sewer pipes connecting homes and business to a treatment plant.

That's great, can we go to the treatment plant to see how it works !


Wastewater Treatment Plant



Let's fly to St. Paul.
Down on the Mississippi river there is a
place called the Metro Wastewater
Treatment Plant.

That's where
most of the dirty water
in the Twin Cities
goes.

Is that where
the water will get
cleaned ?



Here we are !,
That's the Metro
Plant below us.

Where's my
clothespin ?

It's really big !

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PRELIMINARY TREATMENT

The Metro Plant was built on the lowest land in the twin cities. The sewer is mainly gravity flow.

In preliminary treatment the dirty water passes through a bar screen. The bar screen takes the large objects out of the water.


The objects are dumped onto a conveyor belt.

MAIN SEWER LINE

FLOW

Go Forward

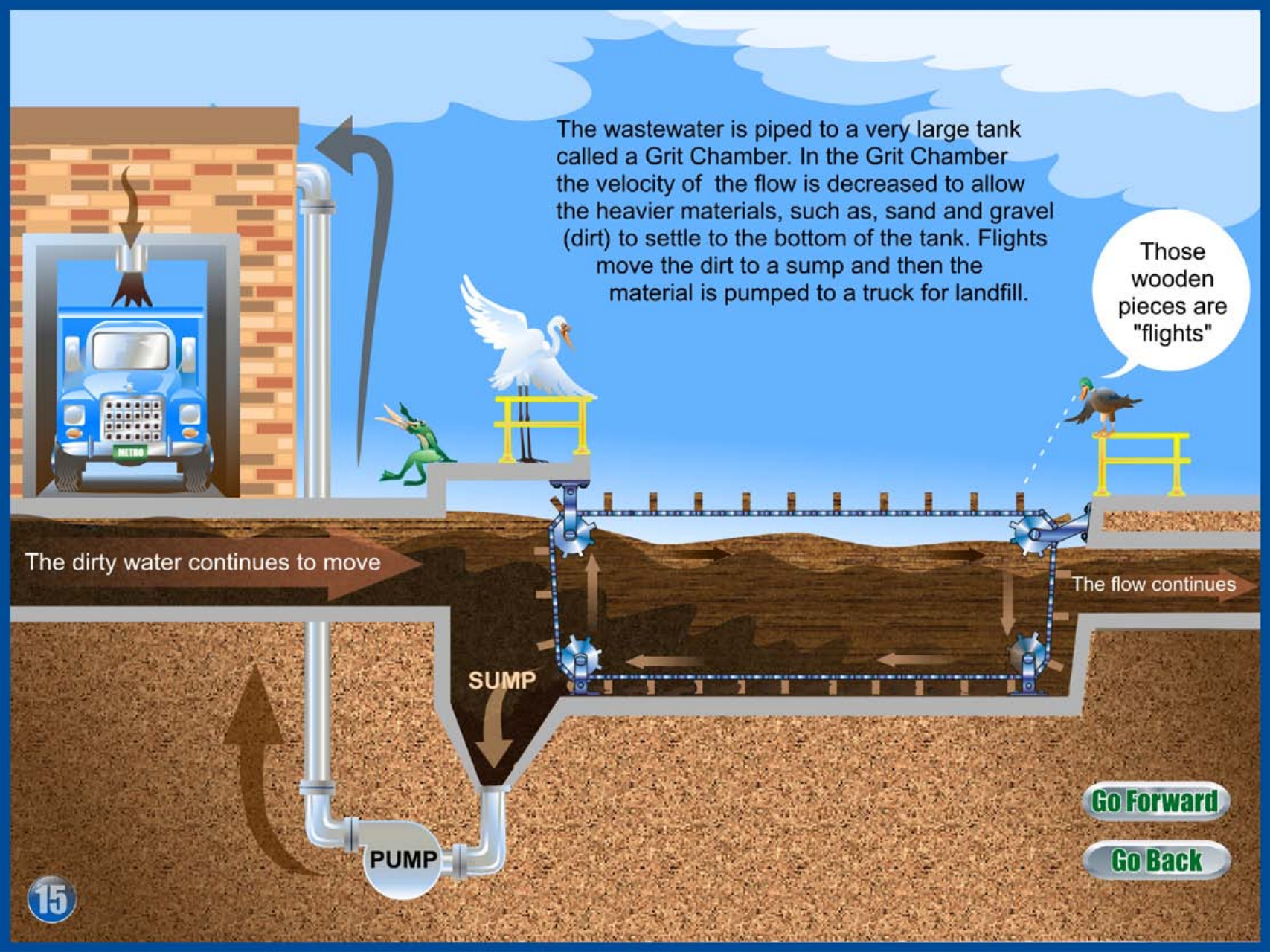
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The conveyor belt moves the waste objects to a dumpster, which is dumped at a landfill.

The dirty water continues to the next process

to a sand & grit removal tank



The wastewater is piped to a very large tank called a Grit Chamber. In the Grit Chamber the velocity of the flow is decreased to allow the heavier materials, such as, sand and gravel (dirt) to settle to the bottom of the tank. Flights move the dirt to a sump and then the material is pumped to a truck for landfill.

Those wooden pieces are "flights"

The dirty water continues to move

The flow continues

SUMP

PUMP

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Primary treatment removes about 50% of the pollutants in the wastewater.

Floatable solids such as grease and oil is skimmed from the top of the tank and pumped to incineration.

The material that was not removed by primary goes to secondary

PRIMARY TREATMENT removes solids thru sedimentation.

Primary sludge settles to the bottom of the tank and is moved by flights to a sump and then pumped out to filters, incinerators & other means of disposal.

PUMP

pump

Much of what you see coming from the stack is steam created by a scrubber system that sprays water over the smoke to knock down pollutants before they enter our atmosphere.

The sludge collected from Primary Treatment is pumped to the Dewatering & Incineration process. The remaining liquids continue to flow to the next process, Secondary Treatment.

Filtration & Incineration

When the sludge is dry enough to burn it is conveyed to large incinerator. At the Metro Plant we have six incinerators that are eight stories high and reach temperatures of 1700° F.

The sludge is pumped to a centrifuge, a cylinder that revolves at a high rate of speed. In this process the water is spun out of the sludge, dewatering it, and leaving it dry enough to be burned.

The sludge burns to a fine ash which is then used as a component in concrete, brick and other products

Thank you for viewing Wastewater Treatment Part 1,



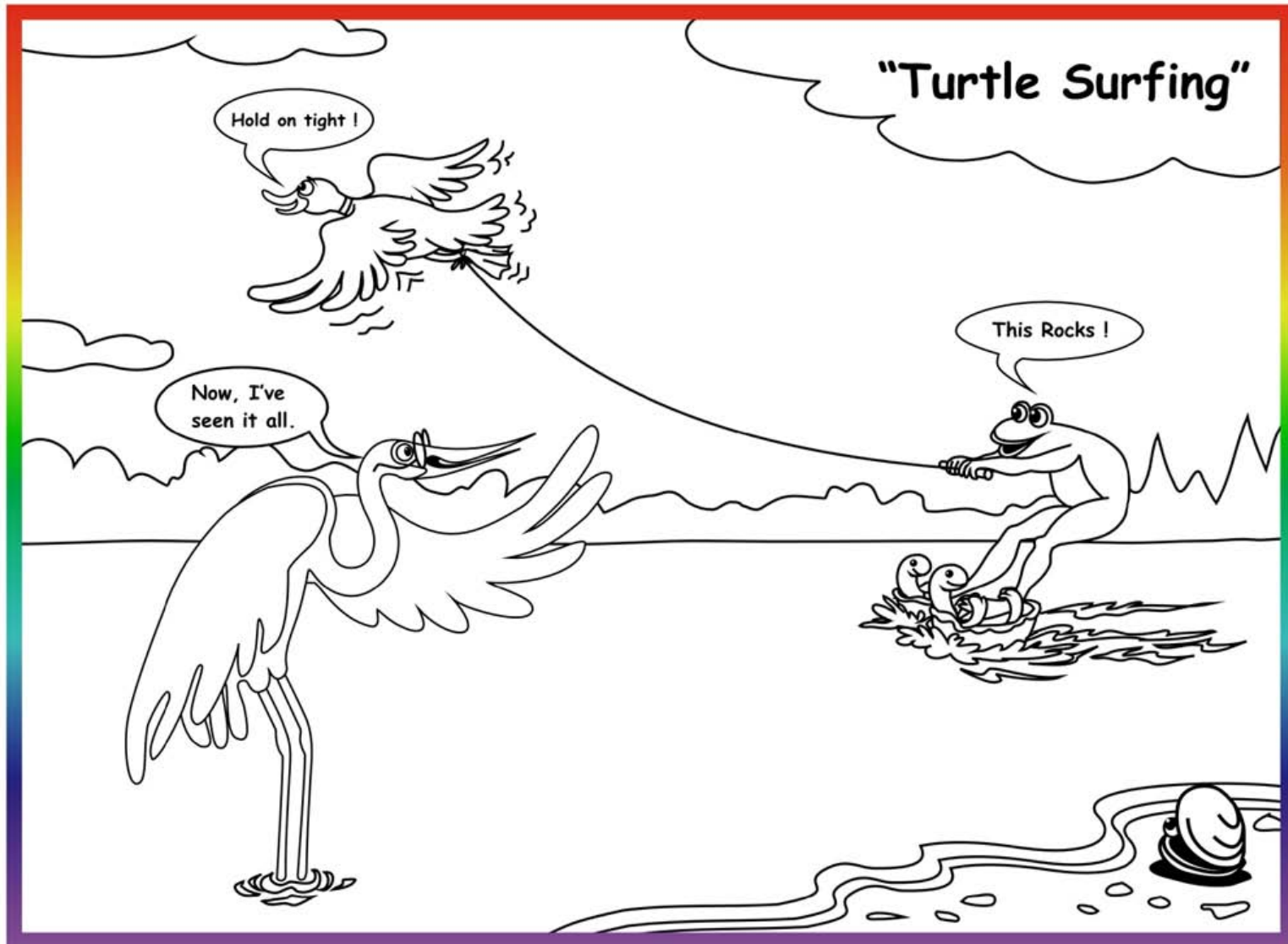
Take a break...
print the next page
and color it !

**Then continue to Part - 2,
Secondary Treatment.** (page 20)

Go Forward

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"Turtle Surfing"



This is the "I LOVE WATER" coloring page, Print it, color it, have fun !

Secondary Treatment - Part 2

In Secondary Treatment, air is pumped into the water to create an environment in which bacteria or "bugs" can live.

The "bugs" eat pollutants in the water. Then they sink to the bottom of the tank, where they are pumped out and disposed of.

They are so cute !

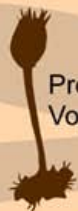
To see the "Bugs" up close, click the forward button !

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These are some of the bugs used in secondary treatment. (the cute ones.)



Protozoa:
Vorticella



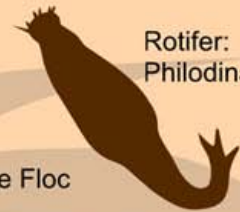
Protozoa:
Paramecium



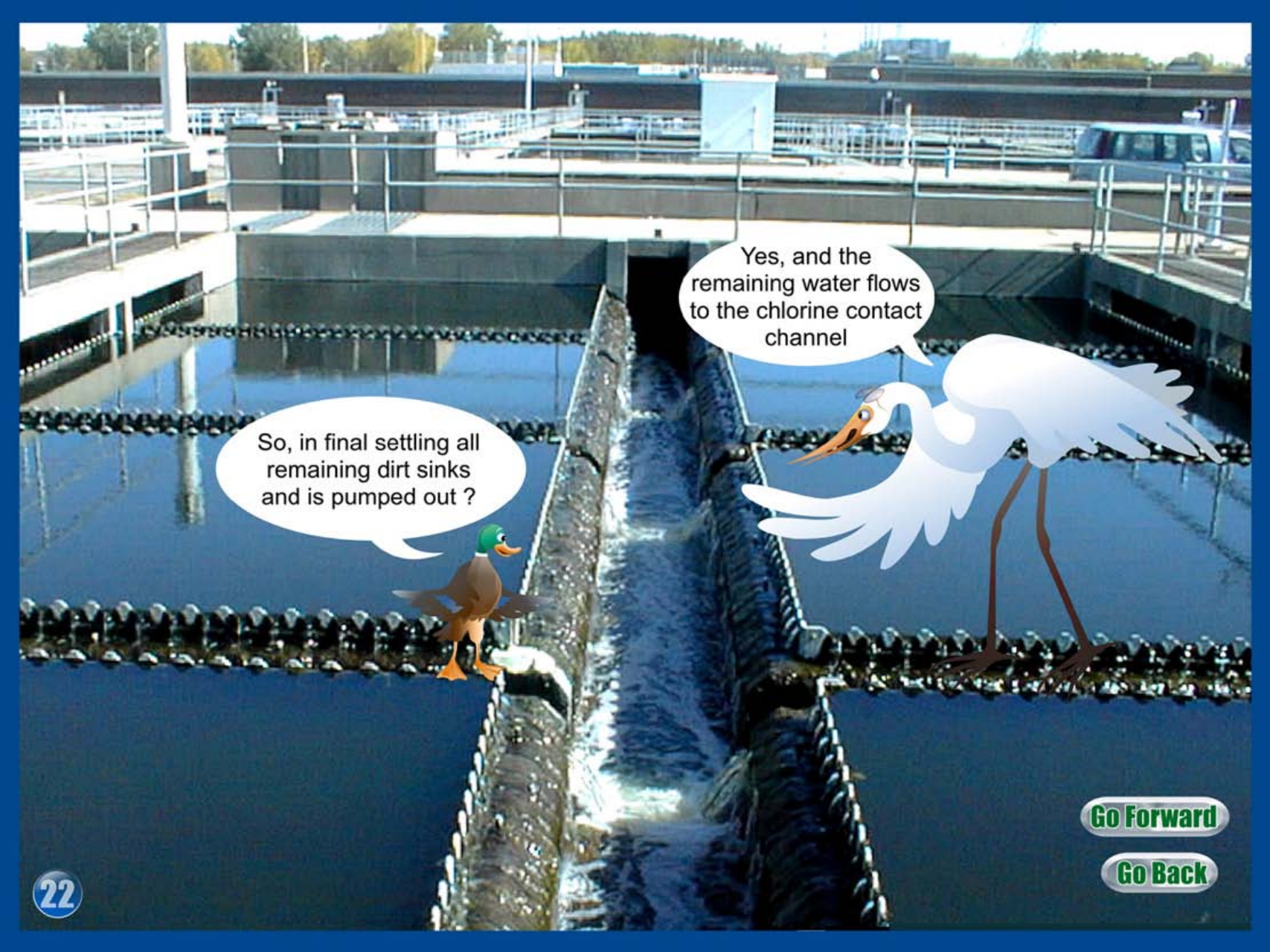
Protozoa:
Tokophrya



Activated Sludge Floc

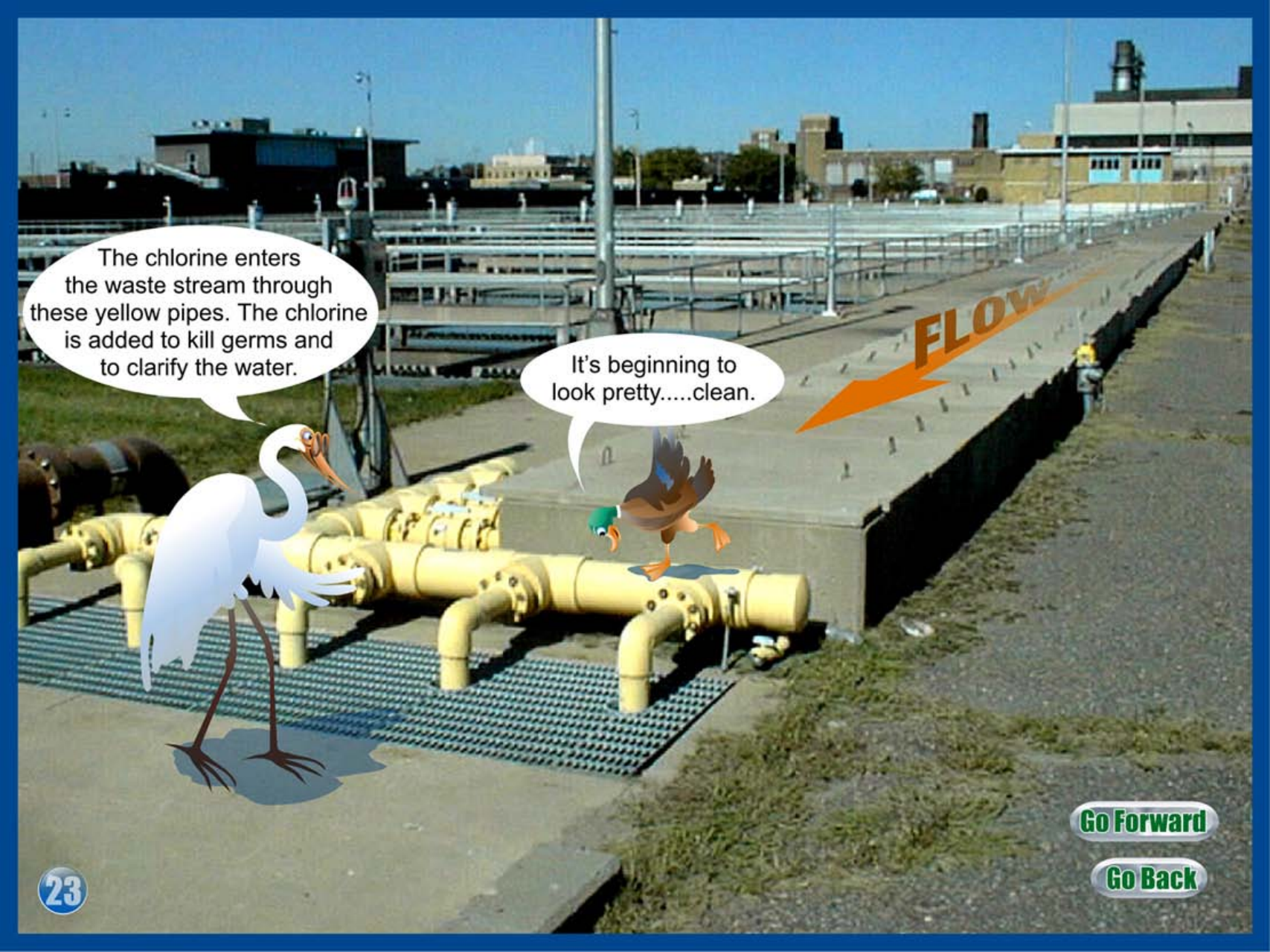


Rotifer:
Philodina

A photograph of a wastewater treatment plant. In the foreground, there is a long, narrow channel of water with a series of black, rounded baffles. Water is flowing through the channel, creating a small waterfall effect. In the background, there are various structures of the treatment plant, including walkways, railings, and a blue building. Two cartoon birds are overlaid on the image. A brown duck with a green head is on the left, and a white egret is on the right. Both have speech bubbles.

So, in final settling all remaining dirt sinks and is pumped out ?

Yes, and the remaining water flows to the chlorine contact channel




The chlorine enters the waste stream through these yellow pipes. The chlorine is added to kill germs and to clarify the water.

It's beginning to look pretty.....clean.


FLOW

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These are the gates
that control the flow of
the cleaned (treated) water
being channeled to the
Mississippi river.



It looks beautiful,
Can I swim in it ?
Can I drink it ?

OUTFALL GATES



Yes, it's
safe for all
of us !

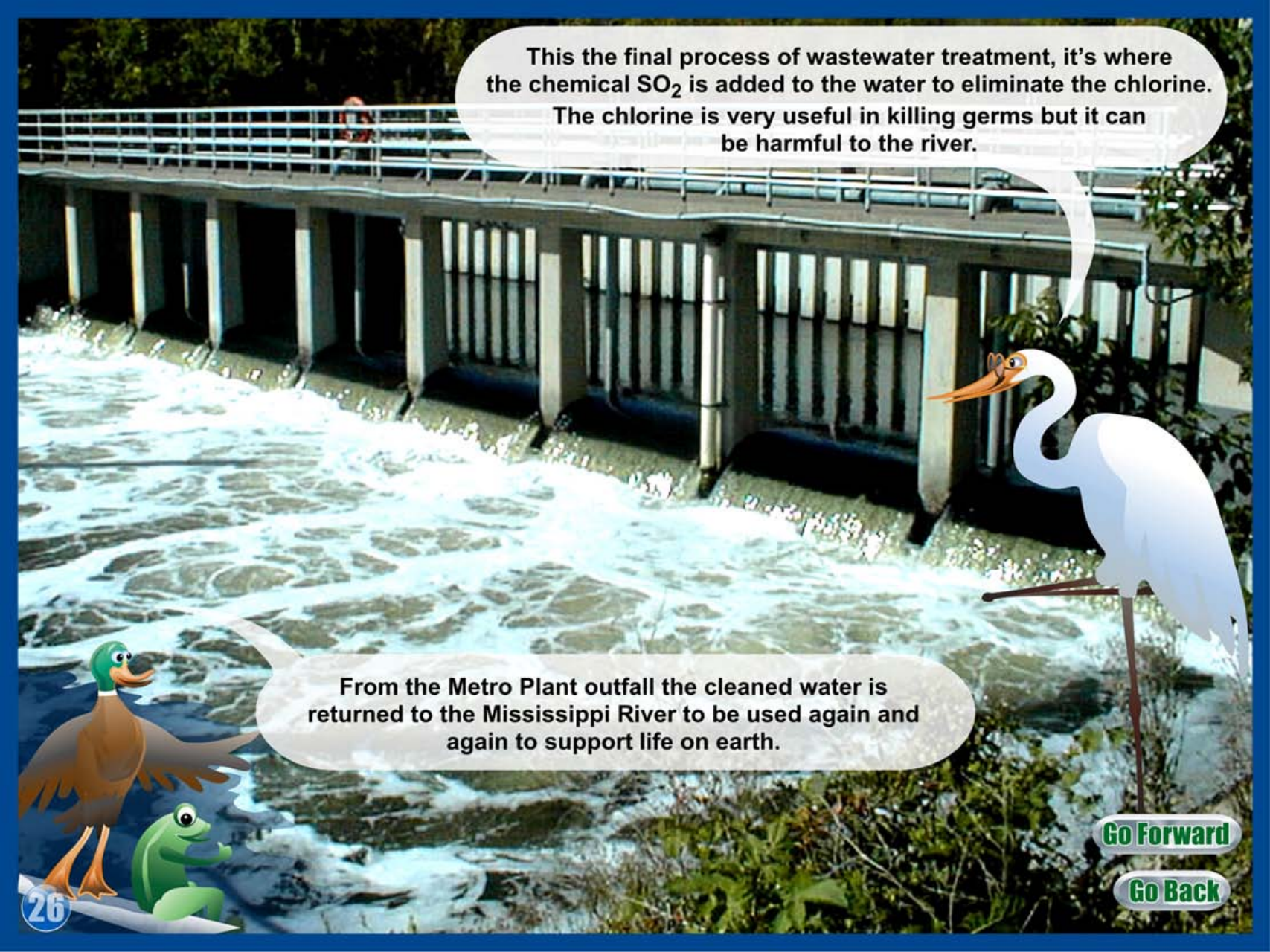
Hey look
I'm flying like
Drake !




Weeeeeeeee!

This is the outfall channel, It is used to mix the chlorine with the water.

This water is wonderful !



This the final process of wastewater treatment, it's where the chemical SO_2 is added to the water to eliminate the chlorine. The chlorine is very useful in killing germs but it can be harmful to the river.




From the Metro Plant outfall the cleaned water is returned to the Mississippi River to be used again and again to support life on earth.



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The Environmental Services division of the Metropolitan Council is responsible for treating wastewater in the seven county metro area, serves 104 communities with eight treatment plants and cleans 300 million gallons of wastewater 24/7/365.

Environmental Services removes

98.9 %

of the pollutants in wastewater

That's the end of our tour, we hope that you enjoyed it and have learned a little about wastewater treatment.

Thank you !

please come back anytime and be sure to e-mail us with your comments or questions at: ILW@metc.state.mn.us

or by snail mail: ILW

2400 Childs Road
St. Paul, Minnesota 55106

Bye !

See-ya !

for more info
about "water"
please continue.

"Thanks" to all the people that work
to keep the environment clean -
You are our Heros !

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more about water...



Another
look at
WWT
page 30

What are
those bugs ?
page 31

How does the
Hydrologic
cycle work ?
page 33

What is a
watershed ?
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Is there
life after
WWT ?
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Wastewater treatment made easy

Another
look at
WWT

PRELIMINARY TREATMENT

BAR SCREENS

remove large objects cans, rags, wood, etc.



SCREENINGS

are conveyed to a dumpster and then are landfilled



GRIT REMOVAL

heavier materials (sand & gravel) settle and are pumped out.



GRIT

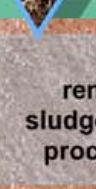


PRIMARY TREATMENT

removes solids through sedimentation



SLUDGE



SECONDARY TREATMENT

air is pumped into the waste stream to support microbes that consume pollutants



AIR

FINAL SEDIMENTATION

microbes form a sludge that settles and is pumped to dewatering



SLUDGE



DISINFECTION

Chlorine is added to kill harmful bacteria and then removed.



Chlorine

De-chlorine

Clean water is returned to the environment

DEWATERING
removes the water from the sludge so it can be incinerated or processed for land application

Incinerated sludge is reduced to ash which is used for construction materials and soil conditioners



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What are those bugs ?

Were Back !

Whoopi !



What is that bug ?

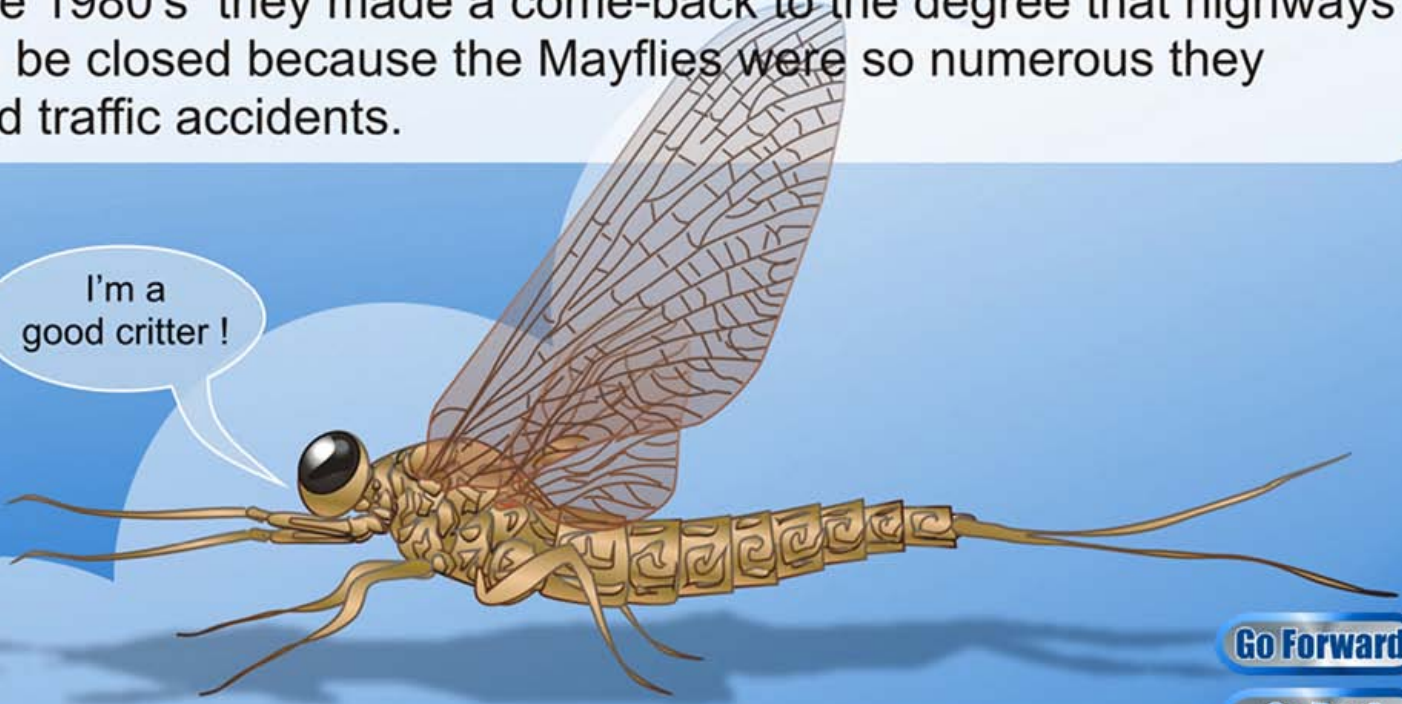


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It's a MAYFLY

Mayflies are short-lived insects that only hatch in clean, unpolluted water. There was a time in the Twin Cities area when it was very difficult to find any Mayflies near our great Mississippi River. But in the late 1980's they made a come-back to the degree that highways had to be closed because the Mayflies were so numerous they caused traffic accidents.

A detailed illustration of a mayfly, shown from a side profile. It has a segmented, light brown body with a darker, patterned thorax. Its wings are large, transparent, and intricately veined. It has long, thin antennae and legs. The mayfly is positioned as if it has just emerged from the water, with a blue wave-like shape behind it. A speech bubble points to its head.

I'm a
good critter !

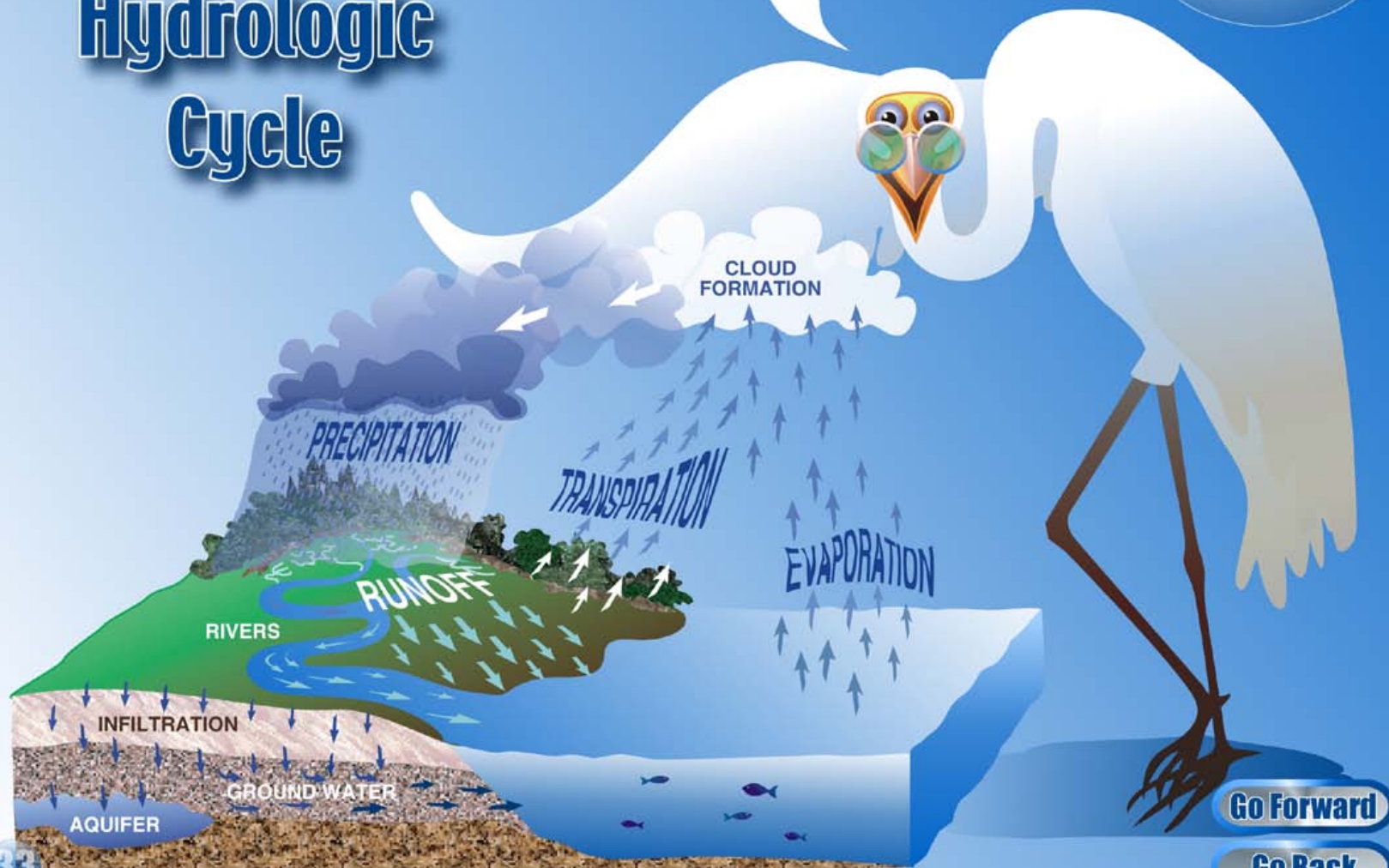
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Our Hydrologic Cycle

Understanding how the hydrologic cycle works, can help us to protect our beautiful water system.

How does the Hydrologic cycle work ?



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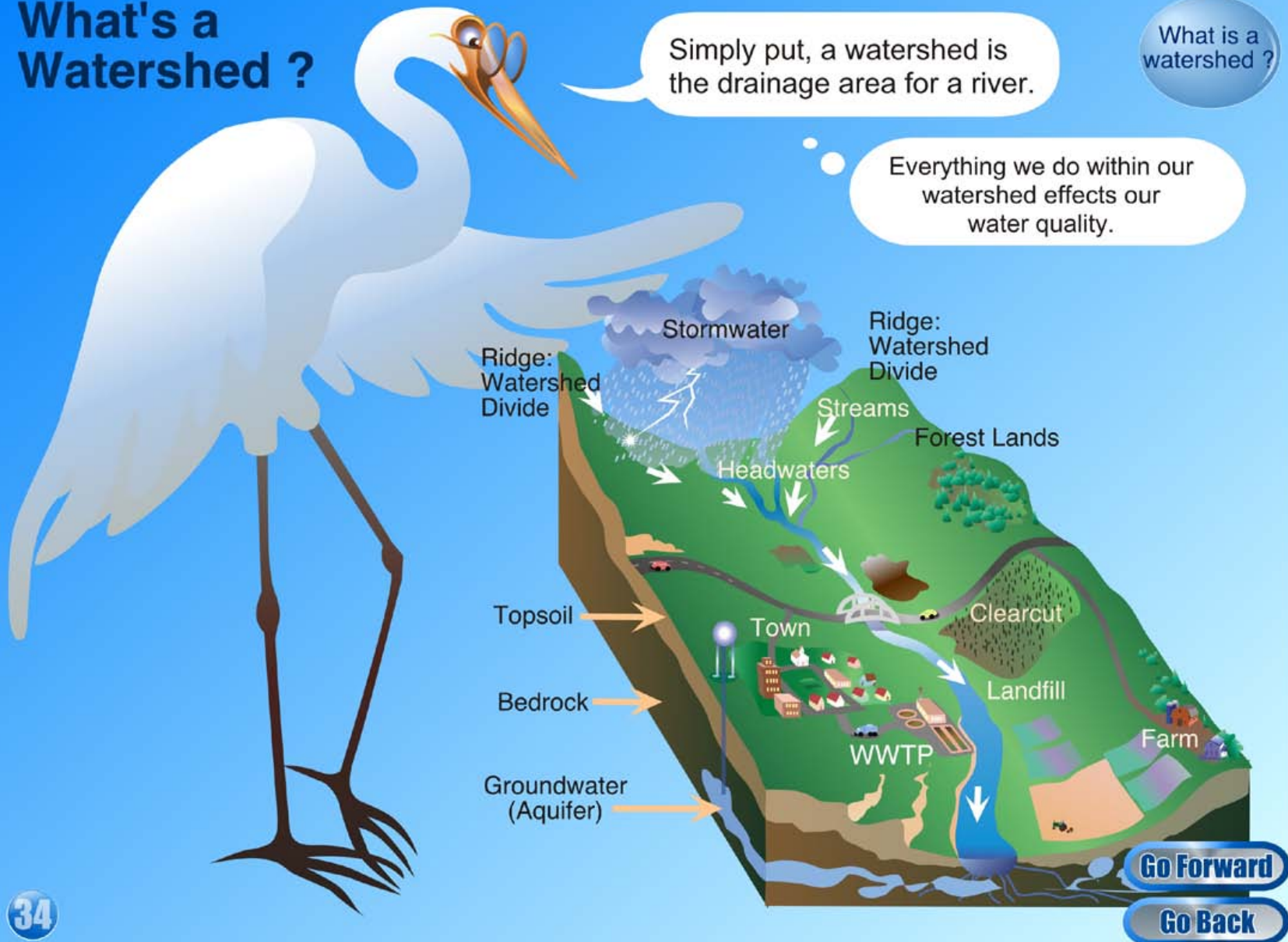
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What's a Watershed ?

Simply put, a watershed is the drainage area for a river.

What is a watershed ?

Everything we do within our watershed effects our water quality.



Is there
life after
WWT ?

Yes ! In fact the Metro plant outfall is teeming with life, from millions of minnows to game fish, from ducks to eagles, the treated water coming from the plant is fit for living creatures of all types. It's not unusual to find employees practicing catch & release during their lunch breaks.

What appears to
be waving seaweed
is actually millions of
emerald shiners
(minnows)



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GLOSSARY

- Atmosphere** — The gaseous mass or envelope surrounding the earth, air.
- Bar Screen** — A mechanical device used for separating objects from the wastewater stream.
- Conveyor** — A mechanical device with a continuous moving belt, that transports objects.
- Dewatering** — The removal of water from a particular substance.
- Dumpster** — A large container that holds trash
- Effluent** — An outflow or discharge of waste as from a sewer.
- Gravity flow** — A process which uses the earth's gravitational pull to move material (sewage).
- Filtration** — A process used for the removal of one substance from another, as in solid material from water.
- Landfill** — An area of land that trash & waste material is dumped on to.
- Pollutants** — A waste material that dirties air, soil or water.
- Precious** — Of great worth, valuable.
- Primary** — The first phase of the wastewater treatment cleaning process.
- Incineration** — To consume by burning, burn up.
- Influent** — Something that flows in or into.
- Secondary** — The second phase of wastewater treatment cleaning process.
- Sedimentation** — The material that settles to the bottom of a liquid.
- Twin Cities** — St. Paul and Minneapolis, Minnesota, USA
- Wastewater** — Any liquid or solid that when used is put into a sewer.
- WWT** — Wastewater Treatment



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"I LOVE WATER" was made possible by

The

Metropolitan Council Environmental Services

Twin Cities Area - Minnesota



CREATED WITH
CANVAS

Drawings & words by Gare R. Frick

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