The Project In-depth

Think About It

People use water every day, but your team members probably don't think much about how and why they use water. Whether it's directly (drinking or washing) or indirectly (manufacturing the products they use or producing energy), they have a lot of different needs for water.

Your team's Project challenge this season is to improve the way people find, transport, use, or dispose of water.

Gadise lives in a small village outside of Kemba, Ethiopia. The nearest water well is several miles away, and at certain times of the year there is very little rainfall to save for drinking, cooking and washing. Gadise and her little brother used to spend hours walking to the water well, which often kept them from attending school. Gadise's village has now installed several new towers that are each able to collect up to one hundred liters of clean drinking water directly from the air! When the people of Kemba installed these very simple towers that collect water from condensation, they allowed Gadise and her brother to spend more time in school, and less time making the long trip to other villages for water. When you are thinking about an innovative solution, don't rule something out just because it seems simple. Sometimes the simplest solution is the best solution!

Apon lives in Chittagong, a large port city in southern Bangladesh. For years, Chittagong has suffered a water crisis due to an ever-increasing population. A year ago, Apon took his mother to the hospital for treatment, but the hospital had closed because there was no water for the patients, nurses and doctors. The large number of water wells in Chittagong had used so much water that many wells were running dry. To use water from the nearby Karnaphuli River, Chittagong would need a modern water treatment plant, which has just been finished. The new plant, which can treat over 100 million liters of water a day, will not solve all of Chittagong's water problems, but it did allow many homes and businesses, including the hospital, to have a more reliable source of water. Apon's mother was finally able to get the care she needs. When you are considering an innovative solution, try to remember that some problems do require engineers to "think big"!

Samantha lives in Wichita Falls, Texas, in the United States. Her mother works at a local factory that uses up to 75 million liters of water a year making packaging products. Many families in the town, including Samantha's, rely on the factory's jobs. The only problem with this arrangement was that the factory was using expensive "potable" water, or treated water suitable for drinking, to help make their products. This process was continually raising the costs for the businesses and people of Wichita Falls. The solution to this challenge was to use filtered "wastewater" – or "used" water from homes and businesses that can be released back into the environment, but is not clean enough to drink. The city's treated wastewater replaced much of the more expensive potable water in the manufacturing process. Due to this innovation, both the citizens of Wichita Falls and the factory saved money, and helped to ensure that Samantha's mother and many others workers would continue to be able to support their families and pay their water bills. When your team is brainstorming an innovative solution, think about how joining forces with others might solve a problem!

Amahle is from Mothibistad, South Africa. Her school, a few miles north of town, did not have a reliable source of water, since the pumps and pipes that carried water to the school were often broken. This meant that some days the school had to shut down, or students would have to spend time collecting water from nearby wells. To fix this problem, the school installed a water system called the "PlayPump." The PlayPump uses a playground "merry-go-round" to pump water from a well at the school. So, during recess, Amahle and her friends get to play, while at the same time pumping water to a storage tank. This water is used to keep school in session. Engineers have learned a lot by creating the PlayPump system. They have found out that PlayPumps must be inspected and kept in good working order to be of use. They have also discovered that PlayPumps may not be the right solution for every community, since they require several people to operate, and children may not always have the time to play and pump water. However, in some places, like a schoolyard, they can be a great solution to a problem found in many parts of the world. Always remember to consider the "human factors" that might improve your approach to problem solving!

Inventor and engineer Dean Kamen has worked his whole life to try and help others. He has created medical devices, smart wheelchairs, and even founded *FIRST*® to help students around the world learn about careers in science and technology. When Dean learned about the billions of people who lacked access to safe drinking water, he set his sights on creating a machine that can make even the dirtiest water safe to drink. The result was the "SlingShot," a technology that copies nature's water cycle by evaporating and then re-condensing water. This process, called "vapor compression distillation" has a long history of providing clean water for submarines and ships, as well as delivering pure water for medical uses. The SlingShot is a simpler, small-scale version of this proven technology that can produce hundreds of gallons of water per day – enough drinking water for a school, a clinic, or a small village. The SlingShot has shown that although engineers are always trying to make the future better, they can look to the past for inspiration! Don't forget to study the inventions that are already out there. Sometimes engineers can improve on an idea that has been around for decades and still make a big difference!

Identify a Problem

Hint: The Robot Game provides many examples of the way people use water. You could ask your team to brainstorm based on the missions.

Ask your team to think about all the ways they use water. These might include everything from quenching their thirst to swimming in a pool or lake. Water might be part of the process to produce their food, energy, mobile phones, or other products. Their use of water probably even includes something as simple as flushing the toilet.

Have your team choose a part of the human water cycle that interests them and identify a specific problem they want to solve.

In the HYDRO DYNAMICS℠ Challenge, the ***human water cycle*** describes the ways people find, transport, use, and dispose of water in order to meet a specific need or desire.

Not sure where to start?

Try this process to help your team choose and explore a problem with the human water cycle:

Ask your team *to draw or create a chart that shows the human water cycle for one or more needs. This might be a need that your team members have, or it could be a need for someone else. How is water used to help fulfill this need?*

Consider questions like:

- Where does the water I use come from?
- Do I get my water from a lake or river, or from a water well?
- Does the water need to be cleaned, transported, or stored during the process? How does this happen?
- Where does water go after it is used?
- What type of professionals work to protect our water resources?
- How do people in other parts of the world get their water?
- What happens when people don't have access to clean drinking water?
- Do you notice any ways the human water cycle could be improved?

Hint: Your team may be able to use the scientific method or the engineering design process to tackle your problem. You can find out about the engineering design process at sites like this, or conduct your own research to learn more about how these approaches to problem solving can help your team.

Identify a Problem (continued)

This might be a great time for the team to interview a professional. The professional could be someone who works directly with water or researches water problems for his or her job. Can a professional help your team learn about how people use water for washing, food production, medical treatment, or entertainment?

Hint: field trips are a great way to learn about a new topic. Consider requesting a tour or interview from a local business, educational institution, or other water-related site. However, some locations may have rules restricting visitors, or they may not have someone available to give an interview. If they say "no," ask about virtual tours online or other people you could contact.

***Ask your team** to select the problem they would like to investigate and solve. You might select a problem in one of these areas (or add your own):*

- Finding potable water
- Identifying and removing contamination
- Using water to produce food
- Finding problems with pipes buried in the ground
- Transporting or storing clean water
- Disposing of wastewater
- Controlling industrial or agricultural runoff into natural waterways
- Using water responsibly in manufacturing

After your team selects a problem, the next step is to find out about the current solutions. Encourage them to research their problem using resources like:

- News articles
- Documentaries or movies
- Interviews with professionals working in the field
- Ask your local librarian
- Books
- Online videos
- Websites

***Ask your team** questions like: Why does this problem still exist? Why aren't the current solutions good enough? What could be improved?*

Design a Solution

Next, your team will design a solution to the problem. Any solution is a good start. The ultimate goal is to design an ***innovative*** solution that adds value to society by improving something that already exists, using something that exists in a new way, or inventing something totally new.

Ask your team to think about:

- What could be done better? What could be done in a new way?
- How can you reimagine the way we clean, transport, use, or dispose of our water?
- Could your solution balance the needs of people, the planet, and prosperity?

Ask your team to think of your problem like a puzzle. Brainstorm! Then turn the problem upside down and think about it in a completely different way. Imagine! Get silly! Even a "silly idea" might inspire the perfect solution. Encourage team members to try one idea (or more), but be prepared that each idea may need some improvements.

Design a Solution (continued)

Make sure your team thinks about how they could make their solution a reality. Try asking them questions like:

- Why would your solution succeed when others have failed?
- What information would you need to estimate the cost?
- Do you need any special technology to make your solution?
- Who would be able to use it?

Remember, your team's solution does not need to be completely new. Inventors often improve an idea that already exists or use something that exists in a new way.

Share with Others

Once the team has designed a solution, the next step is to share it!

It might be helpful for your team to share with someone who could provide real-world feedback about the solution. Getting input and improving a solution are part of the design process for any inventor. It is OK to revise an idea if the team receives some helpful feedback.

Ask your team to think about who your solution might help. How can you let them know that you have solved their problem?

- Can you present your research and solution to people who transport, clean, collect, or use water?
- Can you share with a professional or someone who helped you learn about your problem?
- Can you think of any other people who might be interested in your idea?

When your team plans their presentation, encourage them to use the talents of team members. Teams often explore creative presentation styles, but it is also important to keep the focus on your team's problem and solution. Sharing can be simple or elaborate, serious or designed to make people laugh while they learn.

No matter what presentation style your team chooses, remember to infuse fun wherever you can!

Any inventor must present their idea to people who can help them make it a reality, such as engineers, investors, or manufacturers. Like adult inventors, the Project presentation is your team's chance to share their great Project work with the Judges.

All regions require teams to prepare a Project presentation. As long as your team covers the basic Project information, they may choose any presentation style they like. Check with your tournament organizer to see if there are any size or noise restrictions in the judging rooms.

Your team's presentation may include posters, slideshows, models, multimedia clips, props, costumes, and more. Creativity in the presentation is rewarded, but covering all of the essential information is even more important.

Teams will only be eligible for Project awards if they:

- **Identify** a problem that meets this year's criteria.
- Explain their **innovative solution**.
- Describe how they **shared** with others prior to the tournament.

Presentation requirements:

- All teams must present live. The team may use media equipment (if available) only to enhance the live presentation.
- Include all team members. Each team member must participate in the Project judging session.
- Set up and complete the presentation in **five minutes** or less with no adult help.

The teams who excel at tournaments also use the Project presentation to tell the Judges about their sources of information, problem analysis, review of existing solutions, elements that make their idea innovative, and any plans or analysis related to implementation.

Glossary

Word	Definition (Terms in **bold** can be found elsewhere in the glossary.)
human water cycle	In the HYDRO DYNAMICS℠ Challenge, the *human water cycle* describes the ways people find, transport, use, and dispose of water in order to meet a specific need or desire.
water footprint	The amount of water that a person, family or other group (such as a business) uses in a day.
natural water (hydrologic) cycle	The natural process when water evaporates, condenses into clouds, and then falls back to the ground as **precipitation**. Water never completely disappears. It goes through the natural water cycle over and over.
hydrology	The branch of science that deals with the **hydrologic cycle** in the environment, including land, soil and the atmosphere.
fresh water	Water that contains very low levels of dissolved substances in it. Most people say "fresh water" to mean the water contains little or no salt.
salt water	Water that has a high concentration of dissolved salts in it. (Just like it sounds!) The Earth's oceans are filled with salt water, but salt water is not drinkable by people unless most of the salts are removed through **water treatment**.
brackish water	Water that is considered neither **freshwater** nor **salt water**, but a mixture of the two. Brackish water is usually found in estuaries, where freshwater (rivers and streams) flows into the ocean.
groundwater	Water that flows or seeps downward and saturates soil or rock, supplying springs and **water wells**.
aquifer	A source of **groundwater** in the form of soil, sand or rock below the land's surface that is saturated with water. Aquifers are capable of yielding water in sufficient quantity for human use; **water wells** are dug or drilled into aquifers.
surface water	Surface water includes all sources of the Earth's above-ground water such as streams, rivers, lakes, reservoirs and oceans.
precipitation	Water that comes from Earth's atmosphere as a result of rain, snow, hail, sleet, dew, and frost. Precipitation can be collected directly for use by humans with rooftop drains and other means, but it also recharges **surface water** and **groundwater** supplies.
runoff	Runoff is **precipitation** that flows into sewers, lakes, or other bodies of water as a result of rain, snow melt, or irrigation. Depending on conditions, runoff can carry substances that cause **contamination** in supplies of surface water and groundwater.
drought	A period of water shortage that can be brought about by either natural or human causes. Natural causes could be changes in weather or climate; human factors could include the over-use of **aquifers** or the diversion of rivers for **irrigation** or flood control.
irrigation	The use of water to assist in the growing of crops and pastures, or to maintain recreational areas such as golf courses or even yards.
water quality	Water quality describes the chemical, physical, and biological characteristics of water, usually with respect to its suitability for a particular purpose. Various forms of **water treatment** are required to achieve a particular water quality.
potable water	Water that is safe for drinking, cooking or other home uses.

water well	A water well is a human-made hole dug in the ground for the purpose of withdrawing **groundwater**. Wells are often bored or drilled with machines to reach deep **aquifers**. Depending on the quality of the water, water collected from water wells may or may not undergo water treatment before use.
surface water intake	Intakes are structures or devices designed to collect **surface water** for human use. Ideally, surface water undergoes some type of **water treatment** before it is used by humans because it is often more likely than **groundwater** to contain harmful **contaminants**.
water distribution system	A water distribution system is a set of devices, such as **water pumps**, **water towers**, and **water pipes** that move water from one place to another for human use.
water pump	A water pump is a machine designed to transport water by putting it under pressure. Different types of water pumps use a variety of mechanisms to move water, and they can be powered by hand, electricity, wind or other sources of energy.
water tower	Part of an urban or suburban **potable water** distribution system that includes a tower supporting an elevated water tank, whose height creates the pressure required to distribute the water through **water pipes** to homes and businesses.
water pipes	A water pipe is a tube that moves water through a **water distribution system**. Water pipes can be made of a variety of materials including plastic, copper, iron, lead, concrete or even “fired” clay.
contamination	The presence of unwanted or unsafe materials in a substance. Contamination of water may include harmful bacteria, parasites, chemicals, or other materials which may hurt humans or the environment.
turbidity	Turbidity is a measure of the amount of solid particles that are suspended in water. Water that is very turbid causes light rays shining through the water to scatter, making the water cloudy or even opaque in extreme cases. The turbidity of water is one important measure of **water quality**.
water treatment	Water treatment is the process of making water suitable for a particular purpose, such as drinking water, water for industrial uses or even purifying **wastewater** so that it can be returned to lakes and rivers to re-enter the **hydrologic cycle**. Some type of water treatment is also often required before **groundwater** or **surface water** is fit for human use.
chlorination	Chlorination is a type of **water treatment** where chlorine is added to a **potable water** supply primarily for the purpose of killing harmful organisms.
fluoridation	Fluoridation is a type of **water treatment** where fluoride is added to a **potable water** supply to reduce tooth decay.
wastewater	Water that has been used in homes, industries, and businesses that is not normally for reuse unless it undergoes **water treatment**.
blackwater	Blackwater is **wastewater** that is contaminated by human, animal or food waste.
greywater	Greywater is **wastewater** from clothes washing machines, showers, bathtubs, and sinks. In some instances, if it is not too contaminated, greywater can be reused for activities like flushing a toilet, or irrigating plants.

sediment	Solid material, often sand, silt or clay, moved or suspended in water. Water high in sediment content will usually have **high turbidity**.
septic system	A method of **water treatment** for household **wastewater** that uses a settling (septic) tank. Septic systems allow solids to sink or stay trapped in the settling tank, and liquids to be distributed to a drain field for soil absorption.
sanitary sewer	A sanitary sewer is a system of underground pipes that carries **wastewater** from homes, factories and businesses to a wastewater treatment plant where it is filtered, treated and discharged.
storm sewer	A storm sewer carries **runoff** such as street wash and snow melt from the land to a discharge point. In a separate storm sewer system, storm sewers are completely isolated from **sanitary sewers**, and discharge into lakes, rivers, streams, or the ocean. However, some cities and towns send the water from storm sewers to a water treatment plant to protect the environment from harmful **runoff** that might come from **contamination**, such as motor oil on roads, or fertilizers in gardens.
manhole cover	A removable plate or lid that allows access to a **sanitary sewer** system for maintenance and inspection. Manhole covers are usually located in streets and made of heavy cast iron.
infiltration	The process in which water enters the soil. This could be from **precipitation**, **runoff**, **irrigation**, or other sources. Infiltration is also a term that describes when runoff enters a sanitary sewer by accident, potentially overwhelming the sewer system, and resulting in sewage **contamination** in the environment.
water treatment plant	A facility designed to improve the quality of water. The most common types of water treatment plants are those used to make **groundwater** and **surface water** suitable for use in homes and businesses (making **potable water**), and those used to make **wastewater** clean enough to be returned to the environment. **Wastewater** treatment usually involves a series of steps, most commonly **filtration**, **aeration** and **sedimentation**.
filtration	Filtration is the process of removing solid **contamination** from water, most often through the use of screens, sand filters and activated charcoal.
aeration	Aeration is the process of adding oxygen back to **wastewater** to return it to a more natural state.
sedimentation	Sedimentation is the process of using gravity or chemicals to settle-out large solid **contaminants** during the water treatment process in order to reduce its **turbidity**.
sewage sludge	A thick mixture of solids and liquid that is a by-product of a wastewater **treatment plant** or a **septic system**. Sewage sludge is the solid matter that has been separated from the **wastewater**, it can contain **contamination**, and is usually disposed of through incineration or by spreading it over land or burying it in landfills.
desalination	Desalination is the removal of salts from **salt water** to provide **fresh water**. This method is becoming a popular way of providing fresh water to populations with a ready supply of salt water, but it can be expensive and current methods require a large amount of energy.
reverse osmosis	A type of desalination that removes salts from **salt water** using a membrane. With reverse osmosis, salt water is forced through a fine membrane that traps dissolved salts, and the salt waste (or brine) is removed and disposed.

Resources

FIRST® does not control or endorse the content of these external websites. They are provided as optional references only. Please preview all resources based on the maturity level of your team.

Video

National Science Foundation
Environmental Engineer: Profiles of Scientists and Engineers
https://www.youtube.com/watch?v=k2epvAUEdCI

The University of Maryland, Baltimore County (UMBC)
What do Environmental Engineers do?
https://www.youtube.com/watch?v=MUT8zya53Vg

The Open University: Fresh Water Filtration:
Water Supply and Treatment in the UK
https://www.youtube.com/watch?v=dtHw5_5z51w

The Open University: Waste Water Filtration:
Water Supply and Treatment in the UK
https://www.youtube.com/watch?v=5J7Cysnluv0&list=PL361A68D81AAB6162&index=7

City of Winnipeg
Virtual Tour of a Drinking Water Treatment Plant
https://www.youtube.com/watch?v=20VvpASC2sU

City of Grand Island, Nebraska
Wastewater Treatment Plant Tour - "Flush to Finish"
https://www.youtube.com/watch?v=pRaptzcp9G4

The Water Project – YouTube Channel
https://www.youtube.com/thewaterproject

water.org® – YouTube Channel
https://www.youtube.com/water

National Science Foundation Science 360
Transformational Building Design Energizes Water Recycling.
https://news.science360.gov/obj/video/b515996a-6699-44a1-babd-8e94dffe714d/transformational-building-design-energizes-water-recycling-literally

A chemist testing for water quality

Websites and Articles

Aquapedia
Check out the Aquapedia or Water Topics sections of the Water Education Foundation website to learn about water topics in California, USA and beyond.
http://www.watereducation.org/water-topics

Calculate Your Water Footprint
Answer some questions to estimate how much water you really use every day (and learn some fun facts along the way). You might be surprised by what you discover!
http://www.gracelinks.org/1408/water-footprint-calculator

Learn About Water
The US Environmental Protection Agency provides resources to learn about bodies of water, drinking water, wastewater, and water quality.
https://www.epa.gov/learn-issues/learn-about-water

Water Science Glossary of Terms
The United State Geological Service (USGS) has a list of water-related terms that might help you understand our water resources.
https://water.usgs.gov/edu/dictionary.html

Melbourne Water
Melbourne (Australia) Water has numerous resources that describe the water supply, infrastructure and resources.
https://www.melbournewater.com.au/Pages/home.aspx

The World Bank's Water Global Practice
Launched in 2014, the World Bank's Water Global Practice site discusses the knowledge and implementation of water projects from around the world.
http://www.worldbank.org/en/topic/water

The UN and Water
This United Nations sites explores the global crisis caused by insufficient water supply to satisfy basic human needs and growing demands on the world's water resources to meet human, commercial and agricultural needs.
http://www.un.org/en/sections/issues-depth/water/index.html

National Geographic's Environment: Freshwater Site
This site includes numerous case studies from around the world to help you understand the global challenges faced in finding and protecting water for human use.
http://environment.nationalgeographic.com/environment/freshwater/

Websites and Articles (continued)

The Water Sustainability and Climate Project (WSC) at the University of Wisconsin-Madison
The Water Sustainability and Climate Project (WSC) at the University of Wisconsin-Madison is an integrated effort to understand how water and the many other benefits people derive from nature could change over time.
The project is focused on the Yahara Watershed in southern Wisconsin, but has many scenarios and case studies that are useful for exploring a variety of water issues.
https://wsc.limnology.wisc.edu/

What is an Environmental Engineer?
EnvironmentalScience.org's site contains information about environmental science education and careers, as well as vetted research on water and other environmental issues.
http://www.environmentalscience.org/

Water Resources Research Center, University of Arizona
A research and extension unit of the College of Agriculture and Life Sciences, the WRRC is the designated state water resources research center for Arizona established under the 1964 Federal Water Resources Research Act. The site has a wealth of resources for teachers and students on all types of water resource issues.
http://wrrc.arizona.edu/

National Academy of Engineering (NAE)
The NAE has compiled a list of fourteen "Grand Challenges for Engineering." Providing access to clean water for the one out of every six people living today who do not have adequate access to water, and the one out of every three who lack basic sanitation, for which water is needed, has been designated as a "grand challenge." This site contains resources and videos that describe the global nature of these issues.
http://engineeringchallenges.org/

US Environmental Protection Agency (EPA)
The water topics page of the US EPA site provides detailed information on preventing water contamination, water treatment and water conservation.
https://www.epa.gov/environmental-topics/water-topics

The Water Project
The Water Project is an organization that tries to find solutions to the local water problems in Africa. Their web site contains information about the challenges faced by many African communities, and the innovative way that these challenges are being met.
https://thewaterproject.org/

The Water Project: Teaching Tools & Resources
This Water Project site has numerous lesson plans for grade K-12 students. The topics include water scarcity, contamination and the local solutions used by people in Africa to solve these difficulties.
https://thewaterproject.org/resources/

water.org ®
water.org is a non-profit dedicated to finding clean water and sanitation solutions for communities in Africa, Asia, Latin America and the Caribbean. This site has case studies and other resources that detail the struggle to maintain a reliable source of clean drinking water in many parts of the world.
http://water.org/

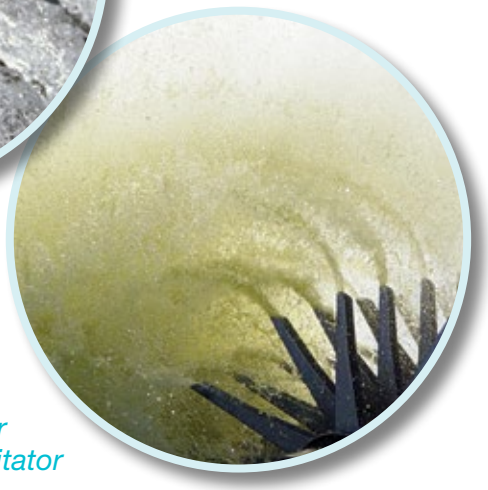
Books

How Did That Get to My House? Water
By Nancy Robinson Masters, Cherry Lake Publishing (2014)

What's Up® With Conserving Water
Channing Bete Company

National Geographic Kids: Water
Melissa Stewart, National Geographic Society (2014)

A sewage water treatment plant



A wastewater treatment agitator

Ask a Professional

Talking with professionals (people who work in the field of this year's Challenge theme) is a great way for your team to:

- Learn more about this season's theme.
- Find ideas for your HYDRO DYNAMICS℠ problem.
- Discover resources that might help with your research.
- Get feedback on your innovative solution.

Examples of Professionals

Consider contacting people who work in the following professions. See if your team can brainstorm any other jobs to add to the list. Many company, professional association, government, and university websites include contact information for professionals.

Job	What they do	Where they may work
environmental engineer	Environmental engineers use engineering, soil science, biology, and chemistry to develop solutions to environmental and natural resource problems.	government offices, private companies that must ensure compliance with laws and regulations
civil engineer	Civil engineers design, build, supervise, operate, and maintain large-scale infrastructure projects including dams, bridges, and systems for water supply and sewage treatment.	government offices, private companies
environmental compliance specialist	Environmental compliance specialists help ensure that companies and governments follow laws and regulations designed to protect water, the environment and natural resources. Most compliance specialists work for governments, but there are many who also work for private companies.	government offices, departments of public health, private companies that must ensure compliance with laws and regulations
water treatment plant manager	Water treatment plant managers run facilities designed to improve the quality of water. Water treatment plants generally fall into two broad categories: those that make potable water for distribution to homes and businesses, and those that treat wastewater before it is returned to the environment.	Usually local government offices, or water/wastewater districts that represent several cities or towns
public utilities director or manager	Utilities directors oversee the distribution of potable water, the collection of wastewater, and water treatment systems for a city or region.	Usually local government offices, or water/wastewater districts that represent several cities or towns
hydrologist	A hydrologist is a scientist who studies how water flows and interacts with the Earth.	Government agencies, universities, environmental consulting companies

Who Do You Know?

Use the list of professionals above to help you brainstorm ideas. Think about the people who study, transport, clean, or use water in their jobs. Think about the technology that people use to manage water. Who makes that technology?

One of the best recruiting tools for your Project is your own team. Think about it. Who do you know? Chances are good that someone on your team knows a professional who works with water in some way. Ask your team members to think about family, friends, or mentors who work in a job that involves water.

Make a list of people your team might want to interview.

How Should You Ask?

As a team, talk about your list of professionals and choose one or more who you think could help your team learn about how people use water. Have the team do a little research about each professional. Find out how the person works with this year's theme and think about what questions the team might want to ask in an interview.

Next, work with team members to contact the professional you chose. Explain a little about *FIRST*® LEGO® League. Tell the professional about the team's research goals and ask if they can interview him or her.

What Should You Ask?

Have the team prepare a list of questions for the interview. When you think about questions to ask:

- Use the research the team has already done to brainstorm questions about the professional's area of expertise. It's important to ask questions that the person can answer.
- Keep the team's Project goal in mind. Ask questions that will help the team learn more about their topic and design an innovative solution.
- Keep questions short and specific. The more direct team members can be, the more likely they are to receive a useful answer.
- Do NOT ask the professional to design an innovative solution for your team. The team's solution must be the work of team members. If they already have an innovative solution though, it is ok for the professional to provide feedback on the idea.

At the end of the interview, ask the professional if your team may contact him or her again. They might think of more questions later. Maybe the person would be willing to meet with your team again or give you a tour. Don't be afraid to ask.

And finally, make sure your team shows *Gracious Professionalism*® during the interview and thanks the professional for his or her time!