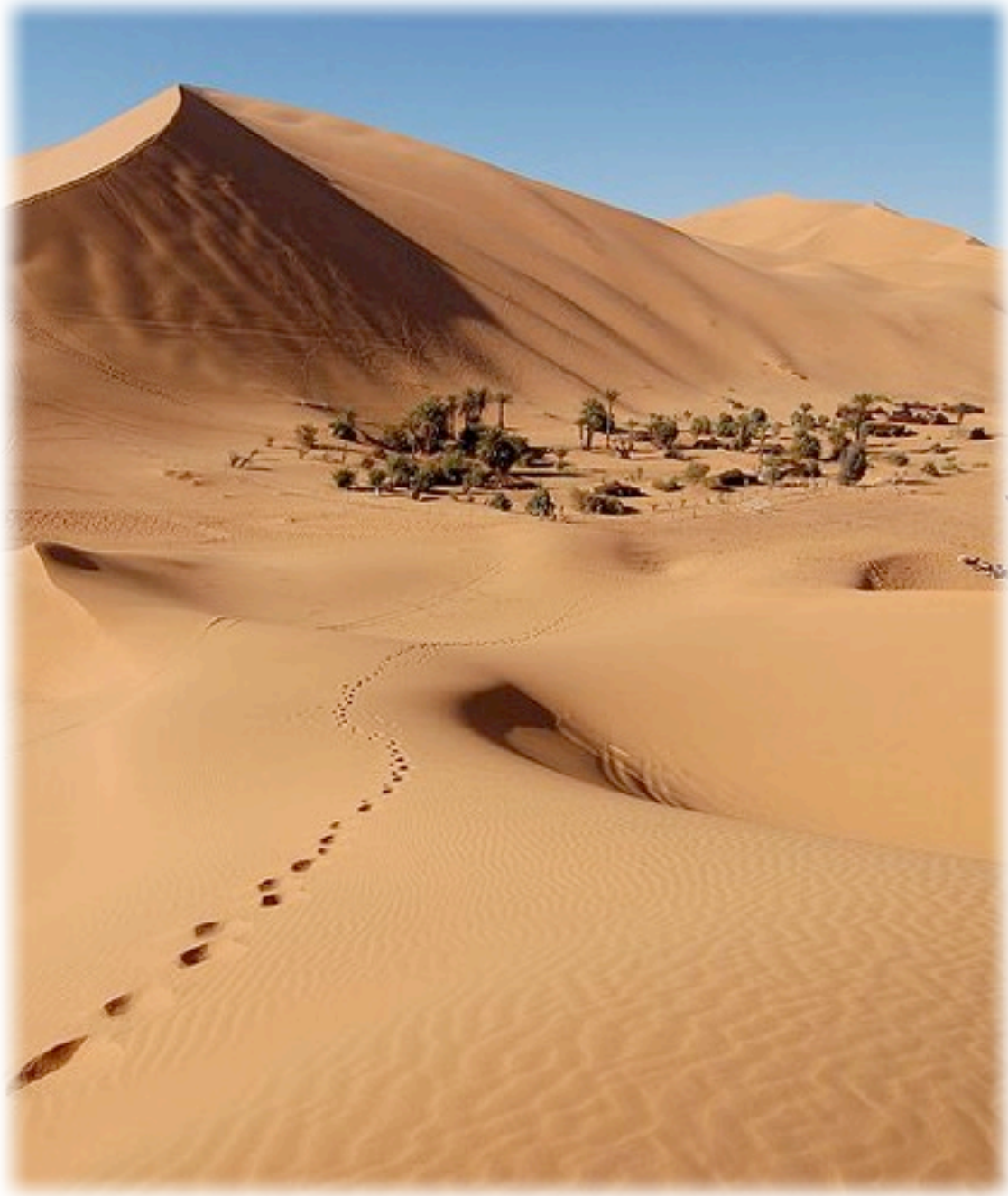


Finding Water

Module 10 • i2P • H2O Tour



We never know the worth of water till the well is dry.
~Thomas Fuller, Gnomologia, 1732

PARCHED

Ray Zahab likes to tell stories about the Sahara Desert. One of the most compelling involves an encounter he had with a little Tuareg girl he met running through a sandstorm in Niger. A big smile on her face, Ray greeted her and her family kindly, and the little girl became quite animated about a plastic water bottle he carried, indicating to Ray that she wanted it. The bottle was partly filled with water that Ray had yet to consume on his run. Believing that the little girl was excited about having a plastic water bottle - which he assumed was a novel item that she had never before seen - Ray happily handed it to her, knowing he could soon get another from his supply vehicle. Touched by her enthusiasm for the gift, he later recounted the story to a local official. "You should have seen how excited she was to get a simple plastic water bottle", he explained. The local official shook his head. "No, no..." he said with a slow smile, "it is not the plastic bottle she prized. It is the clean water of course."

In many places in the world water is very scarce and people have to be very inventive to find it. A great deal of effort can go into finding water, and for those without skill much time and energy can be wasted in the search. In a hot and arid environment wasting time and energy to find water can cost you your life.



THE WATER CRADLE

Early human beings lived by hunting animals and gathering food. It was advantageous to live where food sources were plentiful; on the migratory routes of animals and seafood, and on land that afforded a ready supply of fruit and edible plants. The population that a given area of land could support was limited by the animal and plant food produced locally. This model of sustenance limited human population growth.

Roughly 7,000 years ago a dramatic change occurred that has altered the course of human history (see: [first farms](#)) People began to develop techniques for growing plants and domesticating animals, an invention called *agriculture*. Agriculture allows for the

production of greater concentrations of foodstuff per unit of land compared to that which occurs naturally. However in order to practice agriculture certain essential ingredients are required: fertile soil, a favorable climate, and fresh water.

Early agriculture developed along prominent bodies of water; notably, the Tigris and Euphrates Rivers in the Middle East, the Nile in Africa, Yellow River in China and the Indus River in India. These rivers were essential to early agricultural societies; not only did they provide water to drink, to wash, and grow crops and livestock, but they served as a highway for transportation of goods by boat. This agricultural experiment proved very successful, supporting growing populations that by necessity pushed people onto land more remote from the life-giving rivers.

Remote from the rivers, people needed to be inventive about finding a ready source of water. An early solution was to collect water in reservoirs, and transport it in aqueducts for the purposes of irrigation and domestic use. However aqueducts function by flowing water downhill and cannot deliver water to high ground, rendering such land

inaccessible to irrigation. Consequently other sources of water were needed to support a growing population, pushed onto lands where surface water was neither plentiful nor could be brought in by gravity. In response humans began to tap into a huge source of fresh water found underground.

WHERE IS FRESH WATER

Roughly 30%, of the world's fresh water is found underground. This groundwater reserve accounts for over 90% of the world's liquid water reserves. Groundwater saturates the earth in vast areas that underlie all the continents with the exception of Antarctica (for a detailed discussion on groundwater see Module 5). Although there is some water



Figure 1: The Nile River delivers life-giving waters to its valley and delta, evidenced by the fertile green growth against a backdrop of North African desert(source: [NASA](#)).

content in virtually all the earth's outer crust, it is estimated that beneath 30% of all landmass (except Antarctica) lie important groundwater reserves. In many areas these reserves are essential to supply local drinking water, notably in North Africa and specifically in Tunisia, which relies upon the Northwestern Sahara Aquifer System (NWSAS) (see: [groundwater use](#)).

Groundwater, including that which rests below the deserts of North Africa, can be difficult to reach by conventional methods. Digging a well is costly, and a potentially dangerous activity if undertaken by hand. According to an American non-profit organization wells of 50 feet in depth or greater were traditionally dug by hand in locations such as North Africa. They are dangerous to construct and have cost many lives (see: [digging traditional wells](#)). There are now many non-profit organizations whose mandate is to oversee the safe construction of reliable wells in water stricken regions of the world. i2P has partnered with two of these organizations during the H2O Tour in order to raise money for the construction of two wells (see: [sponsor well](#)).



Figure 2: Well in the Sahara (Photo Ray Zahab).

One way to avoid needing to dig deep wells is to find water near the surface of the ground that can be safely dug by hand. One remarkable individual who has taken up this cause is retired Canadian agricultural specialist Lex Rutherford. Now 86 years old, Rutherford moved to a water-stricken region of Kenya 4 years ago and began helping local farmers find water. Armed with two pieces of wire he practices a technique called *dowsing* to locate easily accessible sources of water. His ability to locate water for thousands of drought stricken farmers has made him a local celebrity (see: [water whisperer](#)).

DOWSING

Dowsing, also known as water-witching, is the practice of holding a Y-shaped twig or two pieces of wire in outstretched hands to guide one to hidden water underground. The twig or wires are said to be pulled down toward the ground when the dowser crosses and area of groundwater. Dowsing is thought to have arisen in the 15th century and was

originally associated with the location of a wide assortment of materials including gems and precious metals. Today it is practiced in many parts of the world, to locate water. While there is limited proof (see: [dowsing studies](#)), and no definitive scientific explanation for how dowsing works, many maintain that there are individuals who possess the ability to 'divine' water. The retired agricultural specialist Lex Rutherford explains simply that his ability to douse for water lies with God whose hand moves the wires he uses to divine for water.

RECLAIMING THE OCEAN

As world population increases and pressure to find sources of fresh water mounts, an eye has been cast to the massive water

resources of the ocean, which contain 97% of the world's water. Why not simply remove the salt from seawater and you will have an endless supply of fresh water? Unfortunately the desalination of seawater requires a great deal of energy and very expensive infrastructure. Nonetheless this has not prevented a steady rise in the use of desalination to produce fresh water, particularly in the energy-rich and water-poor Middle East.

About 75% of the world's desalination capacity is found in the Middle East, with the world's largest plant being located in the United Arab Emirates. There are also sizable plants in operation or under construction in Europe, North Africa, North America,



Figure 3: A dowser at work (source: [wikimedia commons](#)).

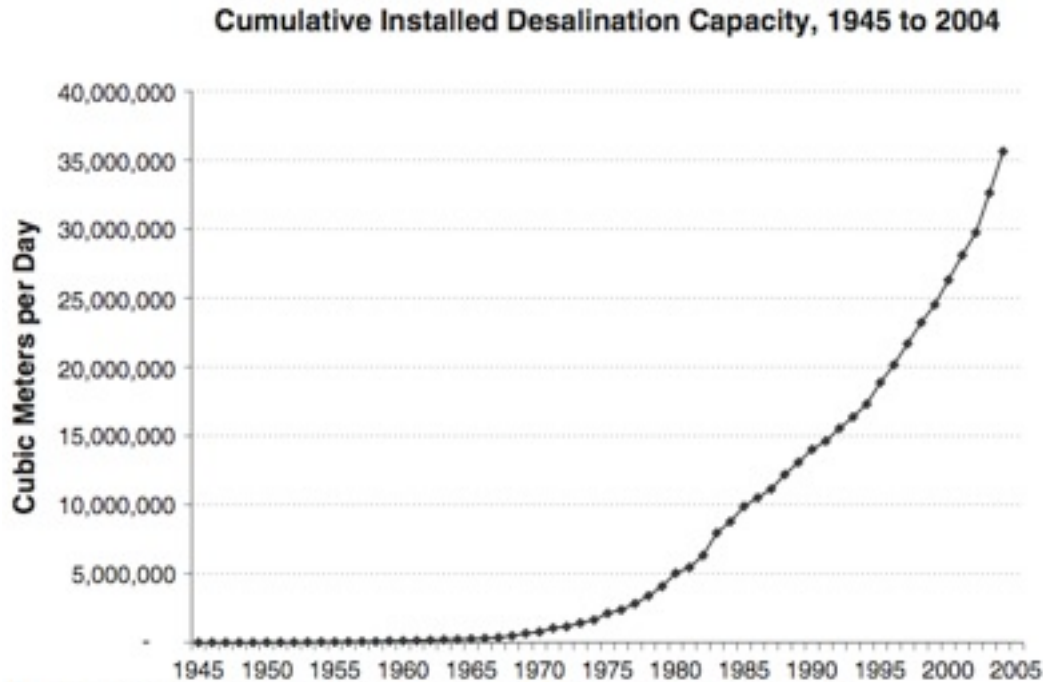


FIGURE DT 22.1 Cumulative installed desalination capacity, 1945–2004.

Figure 4: World desalination capacity (source: [Pacific Institute](#))

Australia, China and India. Growing shortages in freshwater have compelled countries to enlist desalination as a viable source of freshwater. Concern however has been raised about the long-term environmental impact of this technology, with respect to the integrity of the ocean, as well as the greenhouse gas produced as a byproduct of desalination (see: [desalination](#)).

Another criticism of desalination is that it is not an affordable solution for those in the developing world. While wealthy nations can pay for the plant and the steep operating expenses required of desalination, developing nations will simply run dry because they can't afford the cost of manufacturing fresh water from the ocean.

RAINWATER HARVESTING

A simple and inexpensive technology that has long been employed for generating fresh water is *rainwater harvesting*. This involves the use of roofs, or culverts in the ground to channel and collect rainwater. Rainwater collection is principally used to collect water for domestic and agricultural use. Rainwater collection has long been employed in India and is becoming a more common practice in many parts of

Did You Know?

That any new dwelling built in Santa Fe New Mexico must by law be fitted with Rainwater Collection equipment

the world as water shortages develop.

WATER RECYCLING & CONSERVATION

Another initiative that water shortages have promoted is the recycling of waste water. This is a process whereby sewage is treated to remove solids and impurities and then used to irrigate crops or fight fires. California and Florida are leaders in waste water recycling, and Australia, struggling through a prolonged drought is seriously considering waste water recycling programs.

If water cannot be found, it becomes essential to conserve the dwindling resource one has. Simply google the term 'water rationing' and you will see tens of thousands of links from around the world; Sacramento, Austin, Caracas, Brisbane, Singapore... the list goes on. Many municipal and national governments are implementing austerity measures to enforce water conservation. Fresh water is being rationed all over the world.



Figure 5: An Australian desert (source: [wikimedia commons](#)).

National Geographic featured a remarkable story in its April 2009 issue about the people of the Murray-Darling Basin in Australia who are witnessing the destruction of their way of life at the hands of drought. They simply cannot find enough water to support a lifestyle that has existed for hundreds of years. They are now abandoning farms and watching their once fertile district become a desert (see: [Australia](#)).

The concern is that with the progress of climate change the fate that has befallen the Murray-Darling Basin awaits many other regions in the world. Finding water is becoming more and more difficult.