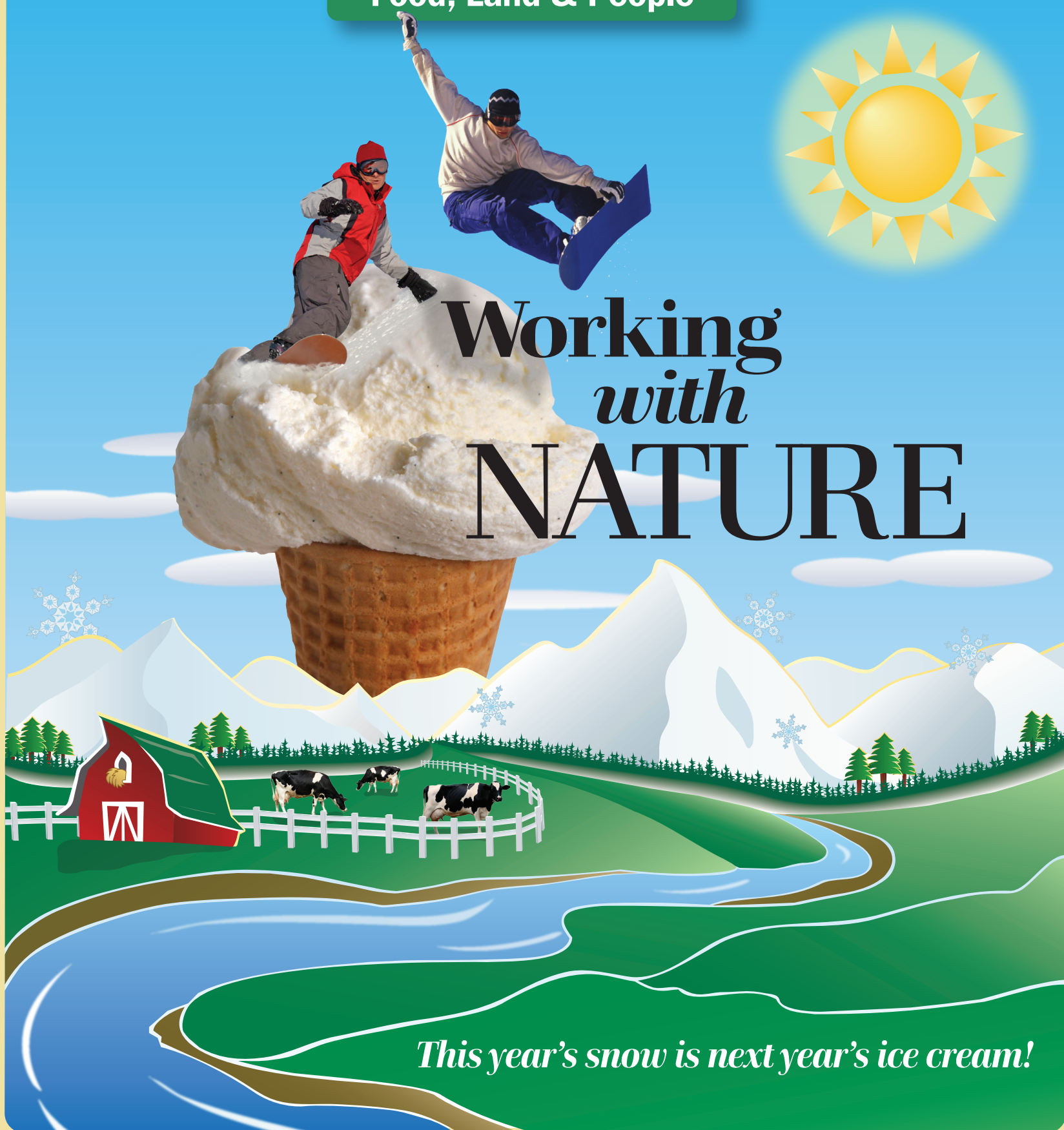


Food, Land & People



Working *with* NATURE



This year's snow is next year's ice cream!

Our Quality of Life and Our Natural Resources
Utah's Water Story
Utah Watersheds and Storage
Irrigation in Utah
Sustainable Agriculture

DESERET
Morning News

nie
newspapers in education

NOV. 13 & 14, 2007

Working with NATURE

*for a better quality of life,
and ice cream!*



No, ice cream is not made from snow and snow is not made from milk. But there is a relationship. Can you trace ice cream back to snow? Snow and rain, or precipitation, are very important to us all. Farmers and ranchers rely on precipitation. A dry year can be a disaster for a producer of crops and livestock. These agricultural producers (farmers and ranchers) work with the four seasons and hope they will get the moisture they need to produce fruits, vegetables, grains, hay, milk and meat.

Too much precipitation can also be troublesome to people who work on the land. Flooding destroys crops, causes soil loss or erosion, creates livestock health problems and causes damage to buildings. Farmers and ranchers hope for the best when it comes to the weather and find ways to

work with nature to grow crops and animals to produce the things we use every day.

What do you think the weather will be on your next birthday? How sure are you of your prediction?

Farming and ranching are risky business.

So, how does snow this winter make next year's ice cream? This winter's snow becomes next year's water for irrigation, which waters crops like hay. The hay is fed to dairy cows that then produce milk, which is made into ice cream. When you are on the slopes or just watching the snow fall this winter, remember the water will be used for our food, clothing, shelter and many other things, including ice cream!



Credits

Information for this educational section was provided by Utah Agriculture in the Classroom: Debra Spielmaker, director; Denise Stewardson, outreach coordinator; Yasuko Mitsuoka, graphic artist. The project was under the direction of Brenda Smith, Deseret Morning News Newspapers in Education manager with page design by Lou Ann Reineke, Deseret Morning News art department.

**ANSWER
FROM PAGE 11:**
In addition to the list on page 11, there are seven other acronyms in this publication.

Resources & Sources

Utah State University Extension
Utah Agriculture in the Classroom and Water Quality
Utah State University College of Natural Resources
(www.extension.usu.edu)
Utah Department of Environmental Quality
(www.waterquality.utah.gov)
USDA (www.usda.gov)
Wikipedia (www.wikipedia.org)

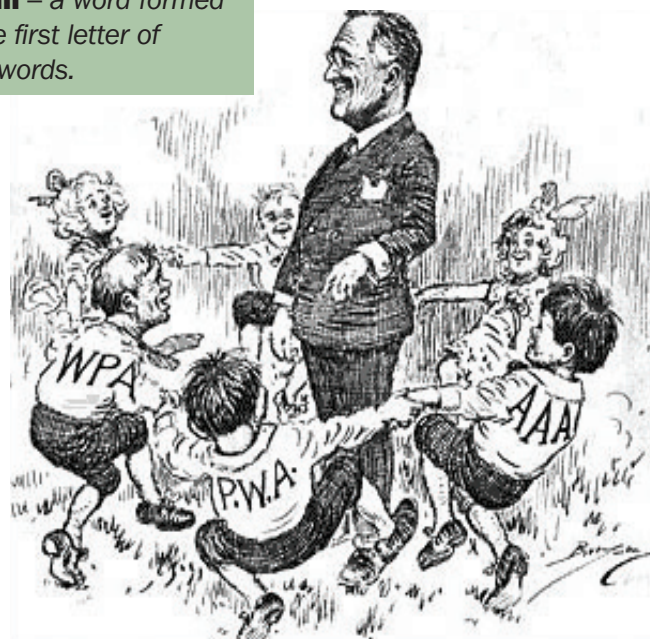
Food Timeline (www.foodtimeline.org)
Environmental Protection Agency (www.epa.gov)
Utah Division of Water Resources
(www.watereducation.utah.gov)
History of Water in Utah
(www.media.utah.edu/UHE/i/IRRIGATION.html)
Utah Water Atlas (www.neng.usu.edu/uwrl/atlas/)
Sustainable Agriculture Research and Education
(www.sare.org)

What's in a word? More than alphabet soup

What's in a word? Plenty! Knowing what words mean expands your understanding, therefore increasing what you know. So what's in an acronym? Simply, words.

Sometimes in an effort to save time, people shorten up several words to create an **acronym**. This is different from an **abbreviation**, which shortens a word. FDR or Franklin Delano Roosevelt, president of the United States from 1933-45, (the first letters of names are called **initials**) created some of the first governmental groups or agencies that used acronyms. These "alphabet soup" agencies were part of FDR's "New Deal" programs established to lift the United States out of the Depression. Several of these agencies exist today.

acronym – a word formed from the first letter of several words.



Political cartoon from 1934: FDR and the "alphabet soup" agencies.

ACTIVITY



Look at the short list of agricultural and natural resource agencies on page 11 and create a timeline using the acronyms of each agency. There are several other acronyms used in this publication; see how many you can find in addition to this list and add them to your timeline. Want to learn more? Visit each group's Web site.

The connection between our quality of life and natural resources.

THE ORIGINS OF

EVERYDAY THINGS

THE THINGS WE USE every day are either grown or mined. For example, if one thinks about our daily activities, we are nearly always using some kind of resource. You awaken in the morning on sheets made mostly of cotton, perhaps a blanket made of wool (renewable resource) or synthetic polyester (nonrenewable resource), or a comforter made of renewable cotton or synthetic polyfill. The wallpaper pasted on the wall adheres because a farmer grew wheat. And the paint contains compounds from trees. When you get out of bed, you put your feet onto a rug; it may be from the wool of a sheep, or a synthetic product from a non-renewable resource (petroleum or oil). The linoleum on the floor is made from soybean oil, the wood flooring was grown, and the nails holding it together were mined. The electricity from the lights might be from a dam (hydro-electric power—a nonexhaustible and, for the most part, renewable resource), coal, or possibly some other (nonrenewable) resource.

The soap you use in the shower might contain cottonseed oil or some other seed grown for this purpose. In the shower you notice that most of the items come from mining — tile, metal and glass. The plastic items are made from petroleum or oil products. You dry yourself with a towel made from cotton and get dressed. The shirt you've put on is made of cotton and so are your jeans. New leather (compliments of cattle) athletic shoes are very comfortable and keep your feet from sweating when worn with cotton socks. You have already used a dozen agricultural products and numerous mined resources, and you haven't even eaten yet! It is easy to see why mined and grown resources are so important to us; try to imagine a day without them! Do you think you could survive?



ACTIVITY



Seeing is believing ... try this — keep a daily log about where you went (transportation uses quite a few nonrenewable resources), what you wore and what you ate. Next, identify all the natural resources you used that required agriculture and mining. Here are some you should have on your log:

- 🌐 **Bedding:** sheets, blankets, wooden bed frames (forests are “farmed”)
- 🌐 **Metal table and desks** (mined resources)
- 🌐 **Computers and cell phones** (mined resources)
- 🌐 **Wall coverings & floorings:** paint, wallpaper, wood, linoleum, wool rugs, floor wax (grown)
- 🌐 **Personal needs:** soaps, shampoo, cosmetics, deodorants, perfumes (grown products in mined containers)
- 🌐 **Sporting goods:** leather balls, mitts, bats (some made from grown agricultural products, some products of mining)
- 🌐 **Food:** this is the easy part

With everyone using these resources nearly every day, it is easy to see how hundreds of careers that you might choose would be related to the natural resources that are managed, mined and grown. For example, Web designers for food companies need to have reasons to create Web pages. You need soil, water and milk to make and sell ice cream. You need corn to make cornflakes, and you need cotton to make blue jeans!



RENEWABLE RESOURCES

Natural resources that can be replaced by human efforts are considered renewable. These resources can be used up without proper management. **EXAMPLES:** forests, fish, wildlife, agriculture, plants, animals.

NONRENEWABLE RESOURCES

These are limited natural resources that cannot be replaced or reproduced (within a generation). We cannot manage them for renewal. Once they are gone, they are gone forever. **EXAMPLES:** oil, mineral resources (lead, iron, cobalt, zinc, etc.), soil (made so slowly, 1,000 - 500,000 years).

NONEXHAUSTIBLE RESOURCES

Natural resources that can last forever regardless of human activities. They renew themselves continuously. This does not mean that resources are not limited.

Human misuse can damage these resources. **EXAMPLES** include surface water (little can be done to affect the total amount of water), air (we can damage the air with pollution, but we cannot use it up) and sunlight (pollution can limit this resource).



WATER...

our most precious resource

We all live in a watershed — the area that drains to a common waterway, such as a stream, lake, estuary, wetland, aquifer or even the ocean — and our individual actions can directly affect our watersheds. Watersheds supply drinking water, provide recreation and respite, and sustain life. More than \$450 billion in food and fabric, manufactured goods and tourism depends on clean water and healthy watersheds. John Wesley Powell, scientist geographer, put it best when he said that a watershed is:

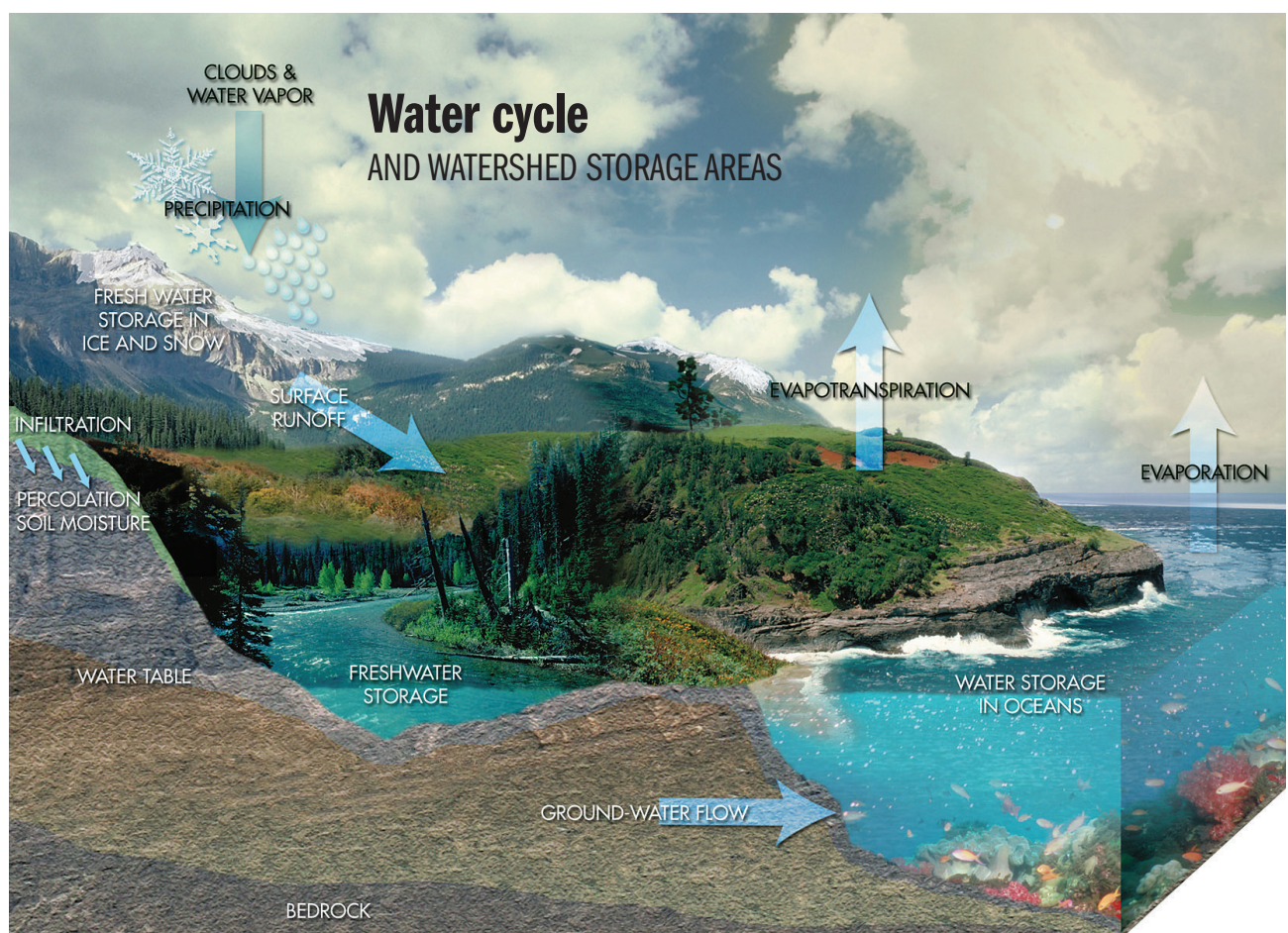
“that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community.”



contaminants. The quality of water depends on the local geology (soils and rocks) and the health of local ecosystems (a natural unit or group of plants, animals and microorganisms in an area functioning together with all the non-living physical factors of the environment).

Humans impact water quality in a variety of ways, including how they treat sewage and our land resources. Some sources of water pollutants are considered “point sources,” while others are considered “nonpoint” sources. Point-source pollution is discharged from any identifiable point, including pipes, ditches, channels and containers. Nonpoint-source pollution is discharged over a wide land area, not from one specific location. These are forms of pollution caused by sediment, nutrients, etc., carried to lakes and streams by surface runoff.

The Utah Division of Water Quality helps to protect and maintain Utah’s water quality for the health and benefit of all Utahns. This division enforces rules and regulations, monitors water quality and helps all water users with plans for water management and improvement.

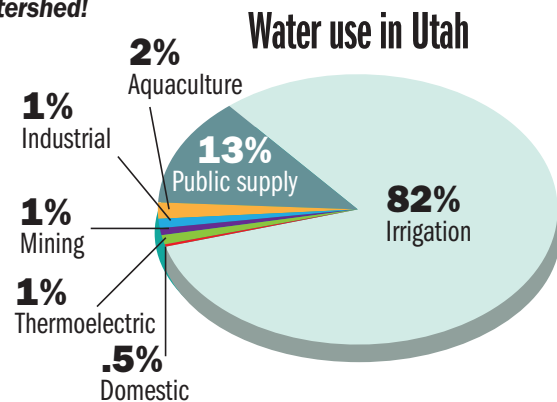


Watersheds come in all shapes and sizes. They cross county, state and national boundaries. No matter where you are, you’re in a watershed!

To learn more and view the full-size hydrologic cycle graphic, visit www.csr.utexas.edu/grace/gallery/other/misc/water_cycle_sys.html.

Water quantity doesn’t equal quality

Water quantity is how much water there is in a given location. Water quality is the physical, chemical and biological characteristics of water. Contaminants that may be in untreated water include microorganisms such as viruses and bacteria, salts and metals, pesticides and other chemical



“Healthy watersheds deliver five major results:

(1) Increased water yield to our streams, reservoirs and underground aquifers. (2) Naturally filtered pristine water free of silt, ash or salts. (3) Reduced wildland fire fuels and expanded healthy forests. (4) Enlarged forage output for livestock and wildlife. (5) Augmented critical habitat enabling sensitive species to thrive.

DNR [Department of Natural Resources] focuses on watershed health to ensure that landscapes are productive and practical for multiple use. Our goal is to manage our watersheds for maximum natural productivity.”

– MICHAEL R. STYLER
Executive director, Utah DNR



American Indians in the desert Southwest captured water in basins and created canals to irrigate their crops. Settlers who came later would use similar techniques, such as wooden check gates, to divert water to crops and livestock.

THE HISTORY OF UTAH WATER

WATER IS A PRECIOUS resource in Utah. Utah is the second-driest state in the nation with a scant 13 inches of precipitation annually, yet Utah's water use per person ranks second nationally. These seemingly contradictory facts are a result of our extensive system of storage and distribution of irrigation water — snow-melt that is trapped and used throughout the growing season.

Utah's precipitation varies from 5 inches in the arid desert areas to 60 inches in some of the high mountain regions. The mountain watershed regions collect large amounts of precipitation in the form of snow, which in turn feeds the state's natural and human-designed water storage systems. Utah's water supply is scarce in some parts of the state, while other areas have adequate supplies. The total supply does not change over long periods of time although climatic factors can increase or decrease the amount available in the short term.

As might be expected, agriculture (our source of food, clothing, shelter and more) uses most of the state's water and has done so since the settlement of Utah. In the past several decades, however, there have been significant increases in the amount of water used for industrial and municipal purposes.

"To write about the development of irrigation in Utah is to write the history of Utah" (McCool, 1995). When the first settlers took up residence in what is now the state of Utah, they understood little about living in a desert. They were anxious to learn about the climate and water of the area as these two factors would determine their ability to sus-



tain themselves and meet their basic needs of food, clothing and shelter.

Mormon settlers made a crude dam on City Creek in late July of 1847 to irrigate newly planted potatoes. They knew that they would have to supplement rainfall with irrigation and that canyon streams would be the sources of water. The pioneers had no idea how many people a given stream would support, how much land a particular stream might irrigate or what kind of "rationing" schemes might be needed to alleviate potential problems of water shortage. With a very scant database, the settlers began to build and develop. Most of the communities still exist today.

In this early period of irrigation development, settlements were based upon cooperative construction of irrigation systems and common enclosure of pastures and fields. Irrigation projects were focused upon self-sufficiency and

the development of a local community. In the early years, only the low-lying lands near streams were irrigated, and excavation of shallow ditches to convey water to land near the creeks or rivers was the common scene. Sometimes, small wooden flumes were used to divert the water over ravines. Simple check gates and turnouts of wooden construction were the principal makeup of the water control structures.

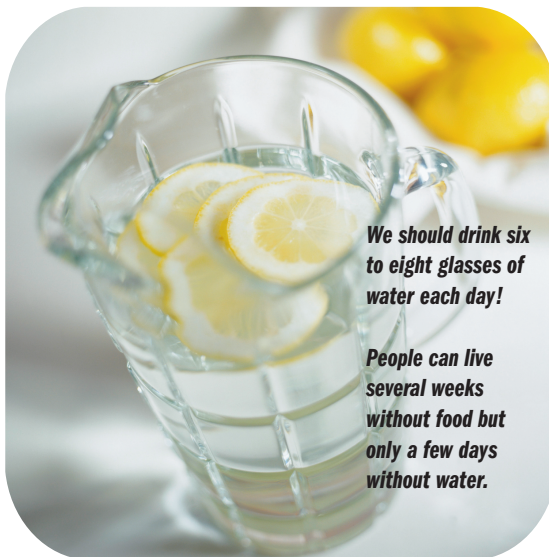
The Mormons' development of irrigation was not, however, the first such attempt to



irrigate land in western North America. Long before the discovery of the New World by Europeans, Indians of the American Southwest diverted water to their crops. In the 1760s, Spanish settlers at the mission of San Diego constructed canals to irrigate their crops. Several years prior to the arrival of the Mormons in the Great Salt Lake Valley, some of the first American settlers in Oregon had dug small ditches to water their crops. While the Mormon settlement of the Great Salt Lake Valley was developing, Indians in southern Utah were raising crops, as they had done for hundreds of years, with the aid of irrigation.

"The settlers' water evolved into much more than just a resource; it became the lifeblood of community, a thread that held together the fabric of society. Out of necessity, the construction of irrigation canals was one of the first group efforts of the Mormon immigrants representing one of the first forms of community planning. With water flowing across a field of crops, the settlers made a future for themselves in an otherwise inhospitable setting." (McCool, 1995)

Utah has a very high growth rate, primarily in urban areas. As our population increases, many water-related issues will need to be addressed: How will water that has been used traditionally for our agricultural needs be used in the future? How will the water needs of urban populations be met? Is there a need to build more water reservoirs, and is the public willing to pay that cost? How does water conservation fit into this picture?



We should drink six to eight glasses of water each day!

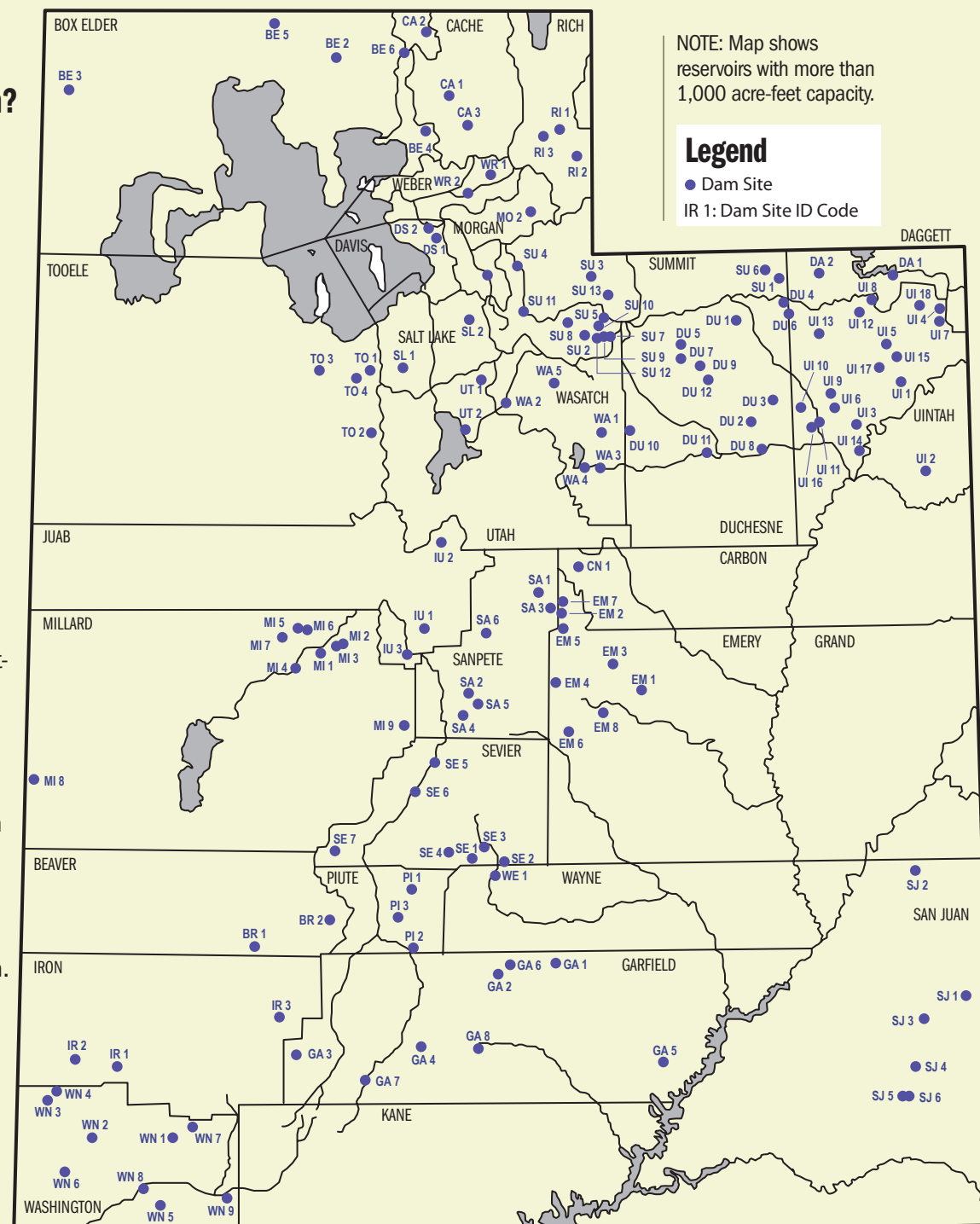
People can live several weeks without food but only a few days without water.

Why are healthy watersheds important? How does a healthy watershed affect your quality of life? What does a watershed provide?

Water storage reservoirs in Utah

CAPACITY IN ACRE-FEET

One acre-foot is enough water to cover one acre, a football field, with one foot of water.
One acre-foot of water is 325,851 gallons.



NOTE: Map shows
reservoirs with more than
1,000 acre-feet capacity.

Legend

● Dam Site

IR 1: Dam Site ID Code

1. What watershed do you live in?

- ___ Bear River
- ___ Beaver River
- ___ Great Salt Lake
- ___ Jordan River
- ___ Lower Colorado
- ___ Sevier River
- ___ Southeast Colorado River
- ___ Uinta Basin
- ___ Weber River
- ___ West Colorado River

2. Compare the Utah watershed satellite map with a map of Utah and identify the national forest in your watershed.

3. Compare the Utah Watershed satellite map with a map of Utah and identify the major rivers in your watershed.

4. Use the maps to identify the reservoirs in your drainage basin.



ACTIVITY

ACTIVITY

Surf your watershed

Mapping your watershed: Find your watershed with this EPA (Environmental Protection Agency) interactive map. Once you have found your watershed, you will be able to find citizen-based groups that are active in your watershed and learn more about your drinking water and the state's water quality.
cfpub.epa.gov/surf/locate/index.cfm

Explore your local watershed by visiting the “Science in Your Watershed” Web site.
water.usgs.gov/wsc/watersheds.html

Test your knowledge about watersheds by playing the “Watershed Game.”
www.bellmuseum.org/distancelearning/watershed/watershed2.html

1. How many reservoirs are in your county?

2. What is the total capacity of the reservoirs in your county?

3. Which reservoir is the largest in the state?

4. Which county has the most reservoirs?

5. Which county has the most water storage capacity?

6. Why do you think there are more reservoirs in northern Utah than the rest of the state?

Water storage reservoirs in Utah

CAPACITY IN ACRE-FEET

BEAVER COUNTY

BR 1 Rocky Ford (21,000)
BR 2 Three Creeks (24,000)

BOX ELDER COUNTY

BE 1 Willard Bay (215,000)
BE 2 Blue Creek (2,185)
BE 3 Etna (1,471)
BE 4 Mantua (7,560)
BE 5 Sandarosa (3,750)
BE 6 Cutler (26,5480)

CACHE COUNTY

CA 1 Hyrum (18,800)
CA 2 Newton (5,620)
CA 3 Porcupine (12,800)

CARBON COUNTY

CN 1 Scofield (73,600)

DAGGETT COUNTY

DA 1 Flaming Gorge (3,789,000)
DA 2 Long Park (13,700)

DAVIS COUNTY

DS 1 Adams (1,030)
DS 2 Hobbs (1,162)

DUCHESE COUNTY

DU 1 Atwood Lake (3,600)
DU 2 Big Sand Wash (12,050)
DU 3 Brown's Draw (6,750)
DU 4 Chepeta Lake (2,812)
DU 5 Clement Lake (1,627)
DU 6 Cliff Lake (1,086)
DU 7 Kidney Lake (3,725)
DU 8 Midview (5,800)
DU 9 Moon Lake (49,500)
DU 10 Red Creek (5,700)
DU 11 Starvation (167,500)
DU 12 Twin Pots (4,050)

EMERY COUNTY

EM 1 Buckhorn (2,002)
EM 2 Cleveland (5,340)
EM 3 Huntington North (5,420)
EM 4 Joes Valley (62,500)
EM 5 Miller Flat (5,560)
EM 6 Millsite (18,000)
EM 7 Electric Lake (31,500)
EM 8 Hunter (2,000)

GARFIELD COUNTY

GA 1 Bown's (Lower 3,500)
GA 2 Jacob's Valley (1,967)
GA 3 Panguitch Lake (23,730)
GA 4 Pine Lake (1,000)
GA 5 Shooting Canyon (1,000)
GA 6 Spectacle Lake (1,348)
GA 7 Tropic (1,850)
GA 8 Wide Hollow (2,324)

GRAND COUNTY

No reservoirs larger than 1,000 acre feet

IRON COUNTY

IR 1 Newcastle (5,290)
IR 2 Ranchers Exploration (1,470)
IR 3 Red Creek (1,360)

JUAB COUNTY

JU 1 Juab Lake (2,000)
JU 2 Mona (19,190)
JU 3 Sevier Bridge (236,145)

KANE COUNTY

No reservoirs larger than 1,000 acre-feet

MILLARD COUNTY

MI 1 DMAD (7,500)
MI 2 Fool Creek No. 1 (17,781)
MI 3 Fool Creek No. 2 (5,217)
MI 4 Gunnison Bend (5,000)
MI 5 Intermountain Power Bottom Ash Basins (3,000)
MI 6 Intermountain Power Evaporation Ponds (3,225)
MI 7 Intermountain Power Storage Basin (1,800)
MI 8 Pruess (11,803)
MI 9 Scipio Lake (10,400)

MORGAN COUNTY

MO 1 East Canyon (51,200)
MO 2 Lost Creek (22,500)

PIUTE COUNTY

PI 1 Beaver Creek (Upper, 1,401)
PI 2 Otter Creek (52,662)
PI 3 Piute (71,826)

RICH COUNTY

RI 1 Birch Creek No. 2 (2,256)
RI 2 Deseret (Neponset, 6,216)
RI 3 Woodruff Creek (4,350)

SALT LAKE COUNTY

SL 1 Kennecott Bingham Creek (1,560)
SL 2 Mountain Dell (3,086)

SAN JUAN COUNTY

SJ 1 Iron Springs (1,200)
SJ 2 Ken's Lake (2,820)
SJ 3 Lloyds Lake (Monticello, 3,500)
SJ 4 Recapture Creek (9,319)
SJ 5 White Mesa Tailings (No. 2, 1,100)
SJ 6 White Mesa Tailings (No. 3, 1,400)

SANPETE COUNTY

SA 1 Fairview Lake (1,949)
SA 2 Gunnison (18,218)
SA 3 Huntington (2,625)
SA 4 Ninemile (3,500)
SA 5 Palisades Lake (1,050)
SA 6 Wales (1,450)

SEVIER COUNTY

SE 1 Fishlake Diversion (3,910)
SE 2 Forsythe (3,640)
SE 3 Johnson (10,350)
SE 4 Koosharem (3,858)
SE 5 Redmond (1,080)
SE 6 Rocky Ford (1,700)
SE 7 Three Creeks (1,000)

WAYNE COUNTY

WE 1 Mill Meadow (5,232)

WEBER COUNTY

WR 1 Causey (7,870)
WR 2 Pineview (110,000)

SUMMIT COUNTY

SU 1 Beaver Meadow (2,461)
SU 2 Big Elk Lake (1,006)
SU 3 Boyer Lake (1,200)
SU 4 Echo (73,900)
SU 5 Fish Lake (1,142)
SU 6 Hoop Lake (3,925)
SU 7 Lost Lake (1,000)
SU 8 Smith & Morehouse (7,900)
SU 9 Trial Lake (2,450)
SU 10 Wall Lake (3,140)
SU 11 Wanship (62,100)
SU 12 Washington Lake (3,309)
SU 13 Whitney (4,700)

TOOELE COUNTY

TO 1 Anaconda (3,919)
TO 2 Barrick Mercur Tailings Pond (6,626)
TO 3 Grantsville (3,370)
TO 4 Settlement Canyon (1,168)

UINTAH COUNTY

UI 1 Ashley Valley Wastewater (2,350)
UI 2 Bonanza Power North Evaporation Pond (1,473)
UI 3 Brough (4,000)
UI 4 Calder (Zelph, 2,254)
UI 5 Chevron Chemical No. 2 (2,100)
UI 6 Cottonwood (6,126)
UI 7 Crouse (1,086)
UI 8 East Park (2,650)
UI 9 Lapoint (1,700)
UI 10 Montes Creek (1,220)
UI 11 North Bottle Hollow (11,100)
UI 12 Oaks Park (6,249)
UI 13 Paradise Park (3,135)
UI 14 Pelican Lake (11,850)
UI 15 Red Fleet (26,170)
UI 16 South Bottle Hollow (11,100)
UI 17 Steinaker (38,100)
UI 18 Warner (Matt, 2,214)

UTAH COUNTY

UT 1 North Utah County (Silver Lake Flat, 1,040)
UT 2 U.S. Steel Corp. (2,775)

WASATCH COUNTY

WA 1 Currant Creek (15,670)
WA 2 Deer Creek (152,500)
WA 3 Soldier Creek (1,107,000)
WA 4 Strawberry Reservoir (1,106,500)
WA 5 Witt Lake (1,226)

WASHINGTON COUNTY

WN 1 Ash Creek (6,625)
WN 2 Baker (1,160)
WN 3 Enterprise (Lower, 1,672)
WN 4 Enterprise (Upper, 9,850)
WN 5 Frog Hollow (1,450)
WN 6 Gunlock (10,884)
WN 7 Kolob Creek (5,586)
WN 8 Quail Creek (40,325)
WN 9 South Creek (1,580)

To view a precipitation map of Utah, visit this Web site www.nationalatlas.gov/printable.html

Plants need water to survive in Utah.

An irrigation system is a method of providing water to plants.

Irrigation systems usually include storage reservoirs, pipes, sprinklers, ditches and canals.



Why Do We Need Irrigation?

In July 1847, Utah's pioneers arrived in the arid West from their rainy roots in the East. One of their initial tasks was to divert water from the Salt Lake Valley streams for irrigation use. They realized that irrigation systems were the key to growing crops and surviving in this desert land. As additional people arrived in the harsh climate, scouts were sent out to survey undeveloped land and identify potential water sources before new areas could be settled. Once it was determined that there was water for irrigation, people established self-sufficient agricultural communities and set up "water rights."

What is a water right?

All waters in the state are declared to be public. A water right is the right to the use of water based upon quantity, priority date, source, point of diversion, nature of use, and the beneficial uses made of the water.

Under the Doctrine of Prior Appropriation, water rights are administered: "first in time are first in right." This means those water rights with the earliest priority dates receive their full allotment of water before others with later priority dates can divert water.

How Do We Irrigate in Utah?

An irrigation system must include a **water source**, a conveyance system and some way to distribute the water to the crops. The source of water may be a reservoir, pond, well, stream or river. A reservoir or pond is a more reliable source of water because it can be managed to retain a desired amount of water. Rivers and streams are more susceptible to fluctuations in weather patterns. In the western United States, there is usually plenty of water running in streams and rivers during the spring, but not nearly enough for crops in the summer and fall. If an irrigation system has some storage capacity, such as a reservoir, crops may be more easily watered throughout the season.

A **conveyance system** allows water to be transferred from a water source to the fields. This can be achieved with canals, ditches and pipes or any combination of these. Ditches and canals are open to the air and are more susceptible to seepage (leaking) and evaporation than pipes.

A ditch or canal can be lined or unlined. Unlined means that a trench has been dug to direct or carry the water. Lined canals and ditches can have concrete, clay or impermeable membrane linings on their bottom and sides. Lined canals are much more efficient than unlined canals because they prevent water from seeping into the earth.

Irrigation systems for crops are necessary in Utah and the rest of the arid West. It is common for farmers to join and create an irrigation system, such as a canal that runs along the top of all their fields, because it saves them the cost, energy and time of doing it themselves. This is usually called an irrigation company. There are roughly 1,500 irrigation companies located throughout Utah.



Canal system



Lined ditch

“Agriculture is always trying to do more with less; increase production with less water and land. This is farmer and rancher conservation!”

– LEONARD BLACKHAM, Utah commissioner of agriculture and food



Furrow flooding



Surge irrigation



Gated pipe



Low-flow

How Are Crops Irrigated?

There are two basic types of agricultural irrigation systems: flood and sprinkler.

Surface flood (or flooded border) irrigation consists of releasing water over the surface of the land to flood the fields. Flood irrigation is the oldest form of irrigation and can be used for any crop. Ideally, the land is slightly sloped and level enough for the water to distribute evenly over the surface. The more level the land, the more efficient the flooding. Efficiency in irrigation is measured by how much of the water spreads to the roots of the plant. If too much water is applied, the water can soak below the roots and be wasted. Too much water also affects the plant's health. On average, flood irrigation systems in Utah have efficiencies of roughly 35 to 55 percent. (These efficiencies take into account the reservoirs, canals and ditches that transport the water to the field, and not just the time when the water is soaking into the plant roots. Most of the inefficiencies in the flood irrigation systems come from evaporation loss and water soaking into the soil in canals and ditches.) Of course, there is a wide range in efficiencies, and some high-tech, laser-leveled fields may achieve up to 99 percent efficiency!

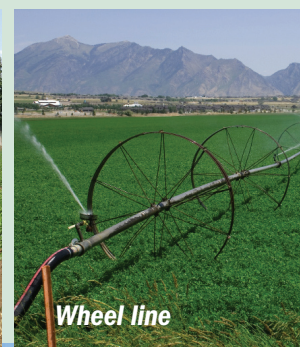
Another form of flood irrigation is called **furrow flooding**. Gated pipes, canals and ditches can all be used to supply water to small ditches formed in-between rows of crops where the water is channeled. This method may be used if the field is not level in all directions. It allows the water to flow more evenly instead of forming puddles in uneven areas.

In both furrow flooding and surface flooding an efficiency-improving technique is **surge irrigation**. This involves quickly releasing large amounts of water at timed intervals, thus allowing the first surge of water to soak in before the second surge is released. When the second surge of water is released, it will travel over the already saturated ground instead of soaking in. This allows the water to travel farther along the length of the field in less time.

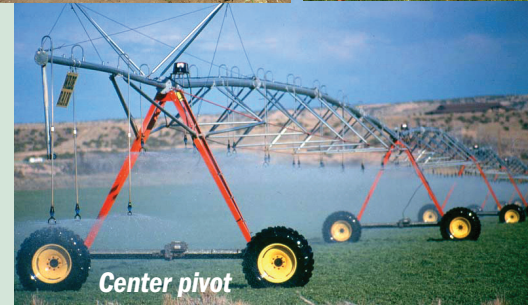
TYPES OF SPRINKLER IRRIGATION



Solid set



Wheel line



Center pivot

Sprinkler irrigation systems utilize pipes and sprinkler heads to distribute water to the plants. Three common types of sprinkler systems are solid set, continuous move and periodic move. Sprinkler irrigation systems are usually more efficient than flood irrigation systems. On average, agricultural sprinkler systems in Utah are about 60 percent efficient. Of course, they are more susceptible to wind than flood systems are and can have much lower efficiencies in windy conditions.

Solid set sprinklers are permanently set in the ground and cannot be moved around the field. Typically, the agricultural applications include orchards, vineyards and other perennial plants that are not plowed.

Periodic move sprinkler systems are not continuous in their movement and must be manually moved to a new location.

Pressurized wheel line (or side-roll) sprinkler systems are motorized but require somebody to manually adjust the position of the sprinkler line. Farmers will water one area until it is fully saturated, then move the line to the next area. A hand line does not have wheels and is not motorized. Each part of this sprinkler system must be disassembled and moved by hand to water the next section of field.

Low-flow irrigation systems — including drip and trickle — use small-diameter tubes placed above or below the field's surface. Frequent, slow applications of water are applied to soil through small holes or emitters. The emitters are supplied by a network of small plastic pipes. Water is dispensed directly to the root zone, which provides a deep soaking and minimizes evaporation. Low-flow systems are generally reserved for perennial crops, such as orchard products and vineyards or other high-valued vegetable crops.

Want to eat in the future? Then think about sustainable agriculture!



AROUND THE WORLD, farmers and ranchers are experimenting with a different form of agriculture, a more sustainable way of producing and distributing food, clothing and shelter.

Sustainable agriculture encompasses broad goals, and farmers and ranchers develop specific ways or strategies for achieving these goals. The primary goals of sustainable agriculture include:

- **Providing a more profitable farm income**
- **Promoting environmental stewardship, including:**
 - Protecting and improving soil quality
 - Reducing dependence on nonrenewable resources, such as fuel and synthetic fertilizers and pesticides, and
 - Minimizing adverse impacts on safety, wildlife, water quality and other environmental resources
- **Promoting stable, prosperous farm families and communities**

“There are two spiritual dangers in not owning a farm. One is the danger of supposing that breakfast comes from the grocery, and the other that heat comes from the furnace.”

– ALDO LEOPOLD, conservationist

Some examples of sustainable agriculture:



A cattle rancher might divide his rangeland into subsections for his herd to graze in a rotational method to better manage natural resources like streams and soil while improving animal productivity. A field crop farmer might

plant different crops each season – and include “cover crops,” non-cash crops grown for their benefit to the soil and ability to suppress weeds – to break up pest cycles, improve soil fertility and cut costs. A fruit and vegetable grower might try a new approach to selling his or her harvest, such as directly selling to restaurants in a nearby city to gain a larger share of the consumer food dollar. No single practice works in every field. No one recipe works on every farm. There are thousands of ways to farm more sustainably. In a typical year, working with the seasons, farmers leave some crop residue – dead, decaying roots, stems and leaves to enrich the soil. Healthy soil is aerated by earthworms and contains beneficial (helpful) fungi and bacteria. Not all fungi and bacteria are beneficial; some kill the plants we are trying to grow. The crops and livestock are cared for until the harvest. Crops are irrigated and managed for pests (insects and disease) and weeds. IPM, or integrated pest management, is used in a sustainable agricultural system.

IPM is a method that seeks to suppress or reduce pest populations and, at the same time,

minimize pest control costs and environmental disruption. IPM attempts to integrate numerous pest-control tactics, such as planting to interrupt insect life cycles (cultural); tractor cultivation of weeds (mechanical); predatory insects, such as ladybugs that eat aphids (biological); and sprays (chemical) that can control a variety of non-beneficial bacteria, fungi, weeds and insects. Treatment decisions are based on costs, the type of pest and the weather.

The harvested crop such as an apple may be ready to eat or may need some processing.

Wheat seeds are processed or ground and made into flour. If the farmer or rancher raises animals, he makes sure their health needs are met. Animals must be fed or allowed to graze and have water every day. Some animals are raised for their meat (cattle, sheep, chickens, pigs, goats) while other breeds of the animals are raised for milk (dairy cows, goats), wool (sheep) or eggs (chickens).



"ALPHABET SOUP"

ARS (Agricultural Research Service)

The Agricultural Research Service, established in 1953, is the USDA's chief scientific research agency. Its job is to find solutions to agricultural problems that affect Americans every day, from field to table. (www.ars.usda.gov)

BLM (Bureau of Land Management)

Established in 1946, the BLM is responsible for carrying out a variety of programs for the management and conservation of land and minerals. These public lands make up about 13 percent of the total land surface of the United States. (www.blm.gov)

BOR (Bureau of Reclamation)

Established in 1902, the Bureau of Reclamation is best known for the dams, power plants and canals it constructed in the 17 Western states. These water projects led to homesteading and promoted the economic development of the West. Reclamation has constructed more than 600 dams and reservoirs, including Hoover Dam on the Colorado River and Grand Coulee Dam on the Columbia River. These water projects bring water to more than 31 million people and irrigate 10 million acres of farmland that produce 60% of the nation's vegetables and 25% of its fruits and nuts. BOR is also the second-largest producer of hydroelectric power in the western United States. Fifty-eight power plants annually provide enough electricity to serve 6 million homes. (www.usbr.gov)

EPA (Environmental Protection Agency)

Established in 1970 to enforce clean air and water standards nationwide. (www.epa.gov)

NRCS (Natural Resources Conservation Service)

USDA's lead agency for conservation and technical assistance.

USDA (United States Department of Agriculture)

Established in 1862 by President Lincoln, who called the department "the people's department." USDA develops and executes policy on farming, agriculture and food. It aims to meet the needs of farmers and ranchers, promote agricultural trade and production, work to assure food safety, protect natural resources, foster rural communities and end hunger in America and abroad.



ACTIVITY

How many other acronyms can you find in this publication? _____

(See the answer at the bottom of page 2)

Waterwise words

Acre-foot: The volume of water it takes to cover one acre of land (a football field is about 1.3 acres) with one foot of water; 43,560 cubic feet or 325,851 gallons. One acre-foot is approximately the amount of water needed to supply a family of four with enough water for one year.

Aquifer: A geologic formation that stores and/or transmits water. A confined aquifer is bound above and below by formations of impermeable or relatively impermeable material. An unconfined aquifer is made up of loose material, such as sand or gravel, that has not undergone settling and is not confined on top by an impermeable layer.

Beneficial use: Use of water for one or more of the following purposes including, but not limited to, domestic, municipal, irrigation, hydropower generation, industrial, commercial, recreation, fish propagation and stock watering; the basis, measure and limit of a water right.

Conservation: To protect a resource so that it can be used forever, being careful to avoid waste.

Consumptive use: Consumption of water for residential, commercial, institutional, industrial, agricultural, power generation and recreational purposes. Naturally occurring vegetation and wildlife also consumptively use water.

Culinary water or drinking water: See "potable water."

Evapotranspiration: The scientific term that collectively describes the natural processes of evaporation and transpiration. Evaporation is the process of releasing vapor into the atmosphere through the soil or from an open water body. Transpiration is the process of releasing vapor into the atmosphere through the pores of the skin or the stomata of plant tissue. Both are part of the water cycle.

Groundwater: Water that is contained in the saturated portions of soil or rock beneath the land surface. It excludes soil moisture that refers to water held by capillary action in the upper layers of soil.

Municipal and industrial (M&I) use: This term is used to include residential, commercial, institutional and industrial uses of water.

Potable water: Water meeting all applicable safe drinking water requirements for residential, commercial and institutional uses. This is also known as culinary or drinking water.

Public water supply: Water supplied to a group through a public or private water system. This includes residential, commercial, institutional and industrial purposes, including irrigation of publicly and privately owned open areas.

Riparian areas: Land areas adjacent to rivers, streams, springs, bogs, lakes and ponds. They are ecosystems composed of plant and animal species highly dependent on water.

Secondary water system: Pressurized or open ditch water delivery system of untreated water for irrigation of privately or publicly owned lawns, gardens, parks, cemeteries, golf courses and other open areas. These are sometimes called "dual" water systems.

Watershed: The land above a given point on a waterway that contributes runoff water to the flow at that point; a drainage basin or a major subdivision of a drainage basin.

Think food costs too much?

Consider this ...



Who pays the least for food?

PERCENT OF DISPOSABLE INCOME SPENT ON FOOD ANNUALLY

Indonesia 55%

Philippines 38%

China 26%

France 15%

Japan 14%

United States 10%

Source: USDA

TODAY U.S. CONSUMERS spend just 10 percent of their disposable income on food each year. Consumers in other countries spend much more.

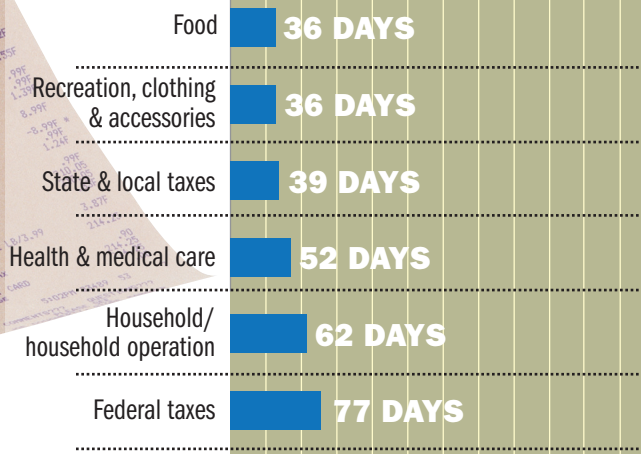
Most of us don't think about where our next meal will come from because our agricultural system works so well. Yet, fewer than a hundred years ago, most Americans lived on farms or ranches and raised much of the food they ate.

- **Why have so many Americans stopped growing and raising their own food?**
- **How important has agriculture been to the growth of America?**
- **Why do Americans today have so little understanding of the role of agriculture in our nation?**

Even with America's inexpensive food, there are still millions of Americans who go hungry. If food is so cheap in America, why are there still hungry Americans? Take a look at the chart below; what are some other expenses that might keep people from getting food?

How many days does the average American work to pay for their family's food each year?

MONTHS OF THE YEAR



Source: USDA

NOTE: The U.S. figure is from food consumed at home AND away from home. Figures for all other countries are for food consumed at home. As food consumed at home is less expensive, the gap between these countries and the United States would be even greater if food consumed away from home was added.



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