Allison De Jong

Mr. Robel

English 1 Honors

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Comment [1]: A complete heading is provided.

The Ogallala: Preserving the

Great American Desert

Comment [2]: The title is centered.

Comment [3]: Double spacing is used throughout the paper.

Long ago, the middle of the North American continent was a treeless prairie covered by tall grasses and roaming buffalo. When European settlers came, they called this area the Great American Desert. Today, this "desert" is covered with fields of wheat, corn, and alfalfa made possible by center-pivot irrigation. My grandfather used to sell center-pivot systems, and when my family drove to my grandparents' home in Nebraska, we would count how many "sprinklers" were watering each section of land. At the time, I didn't know that this water was being pumped from something called the Ogallala Aquifer, a huge underground water supply. Throughout the years, this aquifer has made the Great American Desert one of the best farming areas in the world. However, the Ogallala Aquifer's future as a valuable resource is in jeopardy, unless citizens of the Plains states reduce their water consumption.

Comment [4]: The writer states her thesis clearly at the end of her introduction.

## Background of the Problem

Comment [5]: This writer has chosen the "Problem-Solution" format. CENTERED SUBHEADINGS help the reader transition from one major section of the essay to the next.

To understand why the problem is important, it is necessary to know some basic facts about the Ogallala Aquifer. This underground reservoir covers 174,000 square miles. According to John Opie, author of *Ogallala: Water for a Dry Land*, the Ogallala was formed over the course of millions of years as the land flooded, dried out, and flooded again. As centuries passed, glaciers melted, carrying water, silt, and rocks from the Rockies down to the Great Plains to form the Ogallala. Dirt, clay, and rocks accumulated above it so that the waters of the Ogallala can

Comment [6]: The writer uses an in-text citation to identify the author and establish his credibility.

now be reached at depths of 300 feet beneath the surface (29-35). Some people think that the Ogallala is a huge underground lake, but this idea is wrong. As Erla Zwingle puts it, an aquifer such as the Ogallala is like a "gigantic underground sponge" (83). The water fills in the spaces between the sand, silt, clay, and gravel that make up the Ogallala formation. This gigantic sponge ranges in thickness from one foot to more than 1,000 feet; the average thickness, however, is about 200 feet (Zwingle 85). The aquifer reaches its deepest points under the state of Nebraska, which is not surprising because most of the Ogallala's water lies beneath this state. The rest lies under Colorado, Kansas, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (see fig. 1).


The Ogallala Aquifer is the largest "underground sponge" in the United States. It contains more than 977 trillion gallons, or three billion acre-feet of water. (An acre-foot is 325,851 gallons, or the amount of water it would take to cover an acre to the depth of one foot.) According to Jack Lewis in the *EPA Journal*, the water contained in the aquifer is enough to fill Lake Huron plus one-fifth of Lake Ontario. "If pumped out over the United States," Lewis writes, "the High Plains aquifer would cover all 50 states with one and one-half feet of water."

**Fig.1 The Ogallala Aquifer ("Aquifer Basics").**

## The Nature and Extent of the Problem

Each year, at least 7.8 trillion gallons of water are drawn up from the Ogallala Aquifer to irrigate the crops planted on the High Plains. These crops are the main food source for our entire country. However, irrigation is depleting the aquifer faster than it can replenish itself, and that is

**Comment [7]:** Because the author is named in the text, only the page number is cited in parentheses.

**Comment [8]:** The writer uses an in-text citation to identify the author and establish his credibility.

**Comment [9]:** A second centered subheading helps the reader transition to the second major section of the paper.

the problem. In fact, only the tiniest fraction of the water is ever replaced in the Ogallala Aquifer. If the water were ever fully depleted, the aquifer would need 6,000 years to refill naturally (Zwingle 83). The only way the Ogallala can be replenished is by water seeping down through the layers of soil until it reaches the aquifer. This water comes from the small amount of precipitation in the region, as well as from streams, reservoirs, canals, and irrigation (McGuire and Sharpe).

How serious is the problem? Since 1930, the aquifer's water has been reduced by 11 percent (Lewis). The volume of water has decreased because the use of irrigation has increased so much since World War II. In 1949, 2.1 million acres were under irrigation. In 1969, the amount of irrigated land rose to 9.0 million acres; and in 1978, it rose to 13 million acres (McGuire and Sharpe). The land presently under irrigation in the Texas Panhandle alone is equal to the size of New Jersey (Thorpe). All of this water is supplied by irrigation wells, and the number of wells has exploded over the decades--from just 170 in 1930, to more than 150,000 today (Nebel and Wright 279).

The biggest technological advance that has made this irrigation explosion possible is the center-pivot system irrigation system. John Opie explains the system:

> The center pivot is a 1300-foot-long pipe that is held eight feet off the ground by a row of seven or more towers on large wheels. Sprinklers are attached at regular intervals along the pipe, pointing up or down. One end of the pipe is set in the middle of a 160-acre quarter section around which the pipe and wheeled towers circle. (146)

The water pumped through the pipe triggers a mechanism that causes the system to roll in a large circle. All of the crops within the circle receive a generous amount of water (see fig. 2).

**Comment [10]:** A parenthetical citation identifies the author of the source and the page number where the information was found.

**Comment [11]:** A question serves as a transition to a new paragraph.

**Comment [12]:** A long (block) quotation is introduced.

**Comment [13]:** A long quotation (taking up 4 or more lines) must be placed in BLOCK FORMAT. Use the "Enter" key to drop the quotation down to its own line, and then hit the "Tab" key TWICE to indent the entire passage.

**Comment [14]:** This sentence is not indented because it is still part of the above paragraph.

If you were flying over the Great Plains between Minneapolis and Denver in the summertime, you would see thousands of green circles, showing how farmers have irrigated their land. With center-pivot irrigation, crop production on one acre increases 600 to 800 percent compared to dry-land farming (Lewis). Today, 15 percent of all of the United States' wheat, corn, and sorghum grows on Ogallala-watered land, and 40 percent of American beef cattle feed on the grain and water of the Ogallala (Nebel and Wright 279).

**Fig.2 A center-pivot irrigation system ("Center Pivots").**

Center pivot irrigation, however, has dramatically lowered the aquifer's water level. Even though farmers have known for decades that this was happening, they have continued to pump and spray as much water as they felt was necessary. When a drought hit in the mid-1970s, the water level of the Ogallala began to lower drastically in some areas because of overuse and lack of replenishment. In some parts of Texas, water levels dropped as much as 200 feet. Farmers who lived above the shallow parts of the aquifer could not pump enough water for their crops at that time.

What makes the problem worse is that much of the water pumped from the Ogallala has been wasted. With center-pivot irrigation, 50 percent of the water evaporates before hitting the ground. Some farmers also overwater their fields, thinking that more water is better. Much of this extra water filters into streams and ends up in the Gulf of Mexico, instead of seeping back into the ground to replenish the aquifer (Sheaffer and Stevens 115).

**Comment [15]:** The writer uses a lengthy paraphrase.

The problem is not just about wasteful irrigation, however. It is also about resistance to change. As Sheaffer and Stevens say in their book *Future Water*, "The real problems are attitudes. Attitudes are held by an establishment that appears unwilling to change" (116). Farmers have thought of the Ogallala's water as their private property, and it is difficult for them to give up their "rights." In some places, farmers and cities are actually fighting over use of the Ogallala water (Thorpe).

**Comment [16]:** A quotation reinforces one of the writer's main points.

**Comment [17]:** This is an Internet source, so no page number is given.

The Solution: Sustainable Farming Practices.

Because people's lives and the land itself are at stake, citizens in the Plains states need to change their attitudes about the use of this resource. The key is following what are called "sustainable farming practices." These practices promote the careful use of the aquifer so that it will serve the area indefinitely. If people accept changes in irrigation methods, water regulations, and personal consumption controls, water from the Ogallala Aquifer could serve the area for thousands of years.

**Comment [18]:** At this point, the writer begins the "My Position" section; she is no longer trying to INFORM the reader, but actually ARGUES a point or tries to PERSUADE the reader.

In the past decade, some positive changes have already taken place. In areas of the Great Plains, some farmers are giving their water to local towns. The towns use the water first, filter it, and pump it to farmers to use on their crops. In this way, the water is used twice before it drains back into the aquifer. Other farmers are working on zero depletion, which is "gradually and voluntarily pump[ing] less water according to a plan based on [a farmer's] estimated supply" (Zwingle 103). The goal of this plan is to maintain the water table at its current level so that water is preserved for future generations.

**Comment [19]:** [Brackets] indicate that a writer has added something to a quotation.

Using less water means that farmers must rethink their farming practices. For some farmers, cutting back means returning to dry-land farming. This is being done in some areas of Texas and Kansas because the water level has dropped so low that it has become too expensive

to pump water to the surface. However, choosing dry-land farming does not mean farmers use no irrigation at all. It does mean more careful use of available water. Instead of drenching their fields "just to be sure," farmers must use better irrigation methods to give their crops only the water they need.

New technologies have been developed to help farmers figure out exactly how much water to use and how to irrigate without waste. For example, some farmers bury special gypsum blocks in the soil. Two electrodes in the blocks help farmers figure out how much water the soil actually needs (see fig. 3). A second device that prevents water waste is low-energy precision application, or LEPA. In a LEPA system, the nozzles of the center-pivot sprinklers are close to the ground, rather than several feet above it. LEPA reduces evaporation by as much as 95 percent (Gerston and Mosely). Most farmers in the market for new irrigation equipment are buying LEPA systems because they are so efficient.

**Fig.3 A gypsum block ("Soil-Moisture Sensor").**

These technological advances have done much to make sure the Ogallala Aquifer has a future. Nevertheless, cooperation and having a long-term view are just as important. Although farmers have resisted in the past, they are now accepting the idea of sustainability. They are more willing to conserve water for future farmers. Because many Plains cities also use this water, state and local officials must work together to conserve municipal water supplies. In addition, people involved in processing food products or making farm equipment must accept and practice water conservation.

**Comment [20]:** A summary of new technologies adds to the readers' understanding of possible solutions.

In the end, citizens of the Plains states need to change their attitudes about their water consumption and think about the future. They must maintain the Ogallala Aquifer as a sustainable resource. The survival of this amazing underground sponge, as well as the survival of the farms and the cities of the Great American Desert, depends on it.

**Comment [21]:** The conclusion echoes the introduction and presents the challenge to act responsibly.

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**Comment [22]:** "Works Cited" is centered at the top of the final page, and the entire page is double-spaced.

**Comment [23]:** Sources are listed in alphabetical order by author's last name--or by title for sources with no author.

**Comment [24]:** If an entry takes up more than one line, indent the 2nd and 3rd lines of the entry. First hit the "Enter" key to free the 2nd line up from the 1st line, and then hit the "Tab" key once to indent each line.