Water Sets the Limits on Exponential Growth
By Warren M. Hern
Sunday, January 20, 1982

A small stream deep in the Colorado Rockies is becoming the center of a controversy that pits owners of Aurora lawns against residents of tiny towns along the Eagle River, water engineers against backpackers, real estate developers in Colorado Springs against Arizona farmers, and economists against politicians.

The stream is Cross Creek -- not much as bodies of water go. It meanders down an exquisite valley in the Holy Cross Wilderness that the Hayden Survey of 1873 called the best example of a glaciated valley outside the Alps.

Cross Creek takes its name from the famed Mount of the Holy Cross, a National Shrine until it was unaccountably removed from this classification in 1951 by President Harry Truman.

East Cross Creek forms in the "Bowl of Tears" at the foot of the Holy Cross, tumbles down Yosemite-like falls, and finally joins Cross Creek a little north and west of the Holy Cross Mountain.

West Cross Creek is one of the most remote and wild places in Colorado, and the Cross Creek valley is one of the most beautiful. About 30 years ago, an imaginative entrepreneur named John Elliott tramped the Holy Cross wilderness not to fish, but to look for water.

He bought up the water rights to the upper Eagle River tributaries, which included Homestake Creek and Cross Creek.

After reportedly failing to sell his idea to the Denver Water Board, he convinced the cities of Aurora and Colorado Springs to buy the water rights to these streams from him

In 1967, the Homestake Reservoir was completed, damming forever the wild and beautiful Homestake Creek. The reservoir became one of the many diversion projects sending Western Slope water to Colorado thirsty Eastern Slope communities.

Homestake Reservoir was just the first step in the Aurora-Colorado Springs plan to divert Eagle River water. An extension, called "Homestake Phase II", would tunnel under Holy Cross Mountain, capture water from all three main tributaries of Cross Creek, and send it to Homestake Reservoir. Phase II would also divert the water from Fall Creek, which supplies water to some of the small towns down the Eagle.

In the summer of 1981, a group of students and scientists studied the possible impact of the Homestake Extension project on Cross Creek. They concluded that the planned diversion of 90 percent of the creek's water would fundamentally and irreversibly affect the valley's ecosystem, destroying the marshes and the wildlife that depend on them.

One cost of the Homestake Phase II project, it appears, will be the loss of one wilderness.

The monetary cost of Homestake Phase II was projected at about $67 million in a 1974 report. The current estimate is $142 million, more than double the 1974 estimate. High interest rates, inflation and the fact that the project may take a much as 11 years to build could push the final cost to over a quarter of a billion dollars.

To many who love the Holy Cross area for its wilderness characteristics, and for the communities downstream who would lose water as the result of the project, "Homestake Phase II" spells destruction. For the cities of Aurora and Colorado Springs, Homestake Phase II spells survival. More important, it spells growth, jobs, income and progress.

The 1980 census showed that Aurora had grown from 76,422 in 1970 to 159,000 in 1980. That represents a 7.6 percent rate of growth. At that rate, the population doubles every 10 years.

Aurora planning engineers, however, say that the growth rate will decline in the next few years to 2.5 percent per year and that the population will only double by the year 2000 to around 300,000.

At that rate, the Homestake water will give an important part of its water needs well into the 21st century.

That's the rub. The 21st century may be at hand before the water project is completed. If the Aurora planning engineers are right, the Homestake water will permit slow growth for decades. But what if they are wrong?

If they are wrong, Homestake Phase II would permit the city of Aurora to grow at its present rate for exactly three years, assuming the project is completed immediately.

If it is not completed until 1989, the earliest expected date, it will provide Aurora with less than 19 percent of its water supply, and by the year 2005, Homestake Phase II will account for less than 6 percent of Aurora's water supply.

The cost to Aurora taxpayers could be at least $5 million a year for interest and maintenance alone.

The Homestake diversion project is a vivid example of a problem which has faced for decades and will be with us always in the future.

Population growth along the is rapid and is not likely to decline.

The term exponential growth is something Coloradans had better learn to understand. It is like compound interest. The more something grows, the faster it grows.

It means that calculations based on a fixed number of immigrants per year, for example, will probably be wrong. What matters is the rate of growth over time, which tells us the length of time it takes for the population to double.

At a 1 percent rate of growth, for example, a population doubles in 70 years. At 2 percent, it doubles in 35 years. At 4 percent, it doubles in 18 years. At 7 ½ percent, as we have seen in Aurora, it doubles in about 10 years.

Worse than that, everything else doubles, too, including water needs. The water supply, however, is not doubling. It has been pretty much the same for thousands of years.

In some years, it is much lower than usual, and if that condition persists for several years, it is called a "drought".

About 750 years ago, the people living in southwestern Colorado were forced to leave the area because of a drought that lasted for 25 years.

The ruins of their communities are now tourist attractions. What if a drought like that should happen 10 or 20 years from now, after the population of Aurora -- or the rest of the Front Range -- has doubled or quadrupled?

For one thing, we won't be able to get water from wells. The Oglala Aquifer is going dry from irrigated faming in order to grow wheat, much of which is exported to the rest of the world.

"Carrying capacity" is a term used by ecologists to describe the capacity of a given environment to support life, or a particular species of life. Most creatures are limited by their habits, physical needs, and biological "adaptations" to their environments. Their populations cannot exceed the "carrying capacity" without the disaster of mass starvation or extinction

The human species, however, is different from most creatures. Humans can temporarily exceed the "carrying capacity" of their local environment by means of a peculiarly human invention – culture.

Culture is the process by which human beings extend their individual and collective capacities beyond themselves. Examples of culture are language, social customs, religious ideas, politics, money and economic system, forms of government and types of housing

A "cultural adaptation" is a society's response to survival needs. Most cultural adaptations permit humans to survive in climates or environments where survival might not be possible otherwise.

Some examples of cultural adaptations that allow us to survive the cold winters and dry summers of Colorado are heating systems and community water supplies.

Transmountain water diversion projects like the Big Thompson, Roberts Tunnel and Homestake Reservoir are cultural adaptations to what is basically an arid climate.

In other words, humans passed the natural "carrying capacity" of the Front Range area of Colorado many decades ago. Building dams and diversion projects mean that Front Range residents are now competing with Western Slope residents for survival.

What is the "natural" rate of growth for cities like Aurora?

If the rate of growth is, for example, 7.6 percent per year, what does that mean for water diversion projects along the whole Front Range?

It could mean, for example, that Aurora will need to build the equivalent of another Homestake Phase I and II water diversion project at a cost of up to $1 billion every five years by the year 2000. And that's only one town.

What will that do to the Western Slope by the year 2005 or 2025? Just how salty can the Colorado River get and still flow into Utah?

The Colorado River now ends in a puddle in Arizona before it can flow into the Gulf of California.

Claims on its water exceed its annual average flow by 20 percent. At this rate, Arizona will go back to desert and farming will end on the Western Slope of Colorado within 50 years. And the Colorado River will never get out of Colorado.

Where do all these facts and trends lead us?

For one thing, they show that uncontrolled growth of the kind experienced by Aurora cannot be sustained for the foreseeable future. It will either stop by rational policy decision or it will be stopped by the limits of the environment. There is only so much water.

For another thing, they show that building more and more diversion projects to ship water from the Western Slope to the Eastern Slope lawns is an exercise in futility in the long run, aside from the enormous expense. Our cultural adaptations, which look successful and "permanent" to us, are very temporary advantages in terms of human history and geologic time.

They show that people living in Colorado, particularly those in the Front Range, must make a complete re-evaluation of their water needs.

How important is it to have lawns? How important is it to wash the car every Saturday, or at all? How important is it to have a golf course? How important is it to have a valley like Homestake or Cross Creek, astonishing and limitless in its natural beauty, vital in its own way to maintenance of the global climate, and probably to our own survival?

In 1980, the Environmental Defense Fund published a study by CU Professor John Morris showing that conservation is the cheapest source of water for Denver for the next 20 to 30 years. Professor Morris showed that conservation measures such as full metering cost far less than any other water development resource. The most expensive is the massive Eagle-Piney water diversion project, which will also invade a pristine Colorado wilderness

Professor Morris and his associates said that programs such as recycling water will be necessary in the future and must be explored now.

The Denver Water Board rejected the report, calling its assumptions wrong and its calculations inaccurate. But the Water Board also agreed with the conclusion that conservation is the cheapest route to more water. Unfortunately, the board also noted that Colorado water laws encourage waste to protect water rights rather than encouraging conservation.

It is clear that all Colorado communities, especially in the Front Range, must carefully evaluate real patterns of growth, essential water needs and strenuous water conservation measures. Some of Colorado's growth may be beyond its control, but unless vigorous controls on both growth and water use are exerted now, the result may be economic collapse and social chaos within a few decades.