

Alternatives to Potable Water for Landscape Irrigation

by

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Introduction

There are a number of alternatives to using potable water for landscape irrigation. Generally speaking, these include treated sewage effluent, harvested rainwater, and raw or agricultural water. Raw or agricultural water, both “untreated” or “non-potable water supplies”, include groundwater and surface water. Most potable water, considering the enormous import of this commodity for modern life, is readily available at reasonable cost, at least in the United States. Over time, many landscape irrigation project owners or subdivision developers deferred to, or at least easily opted toward, a potable water source. The reasons were most often related to economics and basic common sense reality.

Potable water is acceptable, water quality wise, for even drip irrigation. Other key advantages are that potable water is available on demand and available year round. Most importantly, the plant investment fees and the unit water rate have most often been low enough that it was not patently obvious that alternatives should be considered. And, thinking more of the plant investment fees, there is often no additional plant investment fee if the water tap, as required for domestic needs, is used for irrigation during night time hours and not in conflict with domestic culinary needs. So, the cost of potable water for irrigation becomes a cost of paying the going unit rate that is often quite reasonable considering these inherent benefits. On the other side of the economic picture, alternative water supplies require additional infrastructure and present water quality or availability aggravations as well. So, it was, and is, easy to opt for the potable solution with landscapes.

In some areas, this situation has changed or is changing, and northern Colorado is an example. This paper is directed toward the specifics of northern Colorado but the points may be very applicable to other areas, especially states governed by prior appropriation doctrine and having irrigation mutual companies involved in raw water² delivery. The cost of the northern Colorado raw water, necessary for municipalities to meet their treatment needs³, has increased dramatically. Municipalities require raw water or “cash in lieu of” from developers which services are expanded for development. Another factor is that Colorado water rights must be put to beneficial use or risk a challenge to the right under the prior appropriation system. Yet another factor is

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² The terms “raw water”, “agricultural water”, and “non-potable” water are used interchangeably in this paper.

³ Referred to as the “raw water turnover requirement.”

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drought. Colorado is currently experiencing a drought of something of a greater magnitude than a 100-year event and the use of potable water for landscapes is currently under varying levels of restriction.

Brief History of Water and Water Rights in Colorado

Colorado was the first state to develop a system of water rights and laws that are based on the prior appropriation system⁴. The core of the system is “first in time, first in right.” So, if you were the first to divert the water from a stream, then you are the first priority on the river, and so forth. Calls on the river are satisfied according to the priority or priorities enjoyed by the water right holder. This approach, begun in the mid-1800s, has worked quite well for Colorado and other western states.

Today, 19 western states employ the prior appropriation system or a hybridization of it. This legal basis of water administration resulted in the formation of irrigation mutual companies that have successfully functioned for more than 100 years in Colorado. The actual decree and diversion right is most often vested with the irrigation mutual company and, at least within the company and the historic service area, water rights can be bought and sold freely. Shareholders who annually pay prorated expenses and enjoy the benefits of proportional ownership of the company and the water right own irrigation mutual companies. The irrigation mutual company’s share price is market driven.

In the 1960’s, the fact that groundwater is tributary to surface water became legally recognized by state statute so both groundwater and surface water are administered under the Colorado prior appropriation system. Therefore, Colorado’s raw water can come from either surface supplies or groundwater but are essentially governed in the same way.

In the 1930s in northeastern Colorado, what ultimately became known as the Northern Colorado Water Conservancy District was founded to construct a project to divert and store Western Slope water and deliver it to the Eastern Slope to supplement the native water supplies. The project itself is known as the Colorado-Big Thompson project or C-BT project. The premise of the C-BT project was to provide insurance against drier years and drought and meet the late season water requirements of the “allotees”, 90% of whom were farmers at the time the project was commissioned.

The historic annual yield, and therefore the relative “wet water” value of shares in the mutual companies, varies between companies. Municipalities have come to demand water rights from developers that are the most predictable and solid from their standpoint. C-BT water is viewed by the municipalities and the rural domestic water purveyors to be the most desirable for their potable water needs. Subsequently, the unit price for C-BT water has quadrupled in recent years and this dynamic becomes an important motivating factor in the increasing

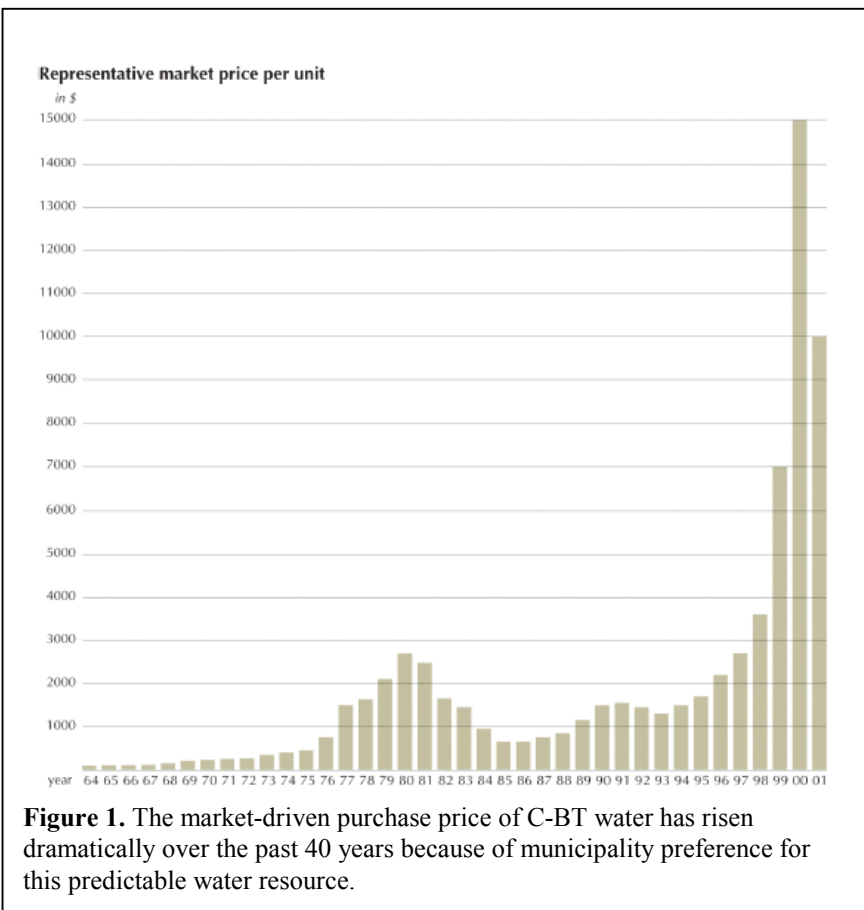
⁴ The prior appropriation system is also referred to as the “Colorado doctrine.”

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interest to utilize a raw water alternative for landscapes. See Figure 1. The 2002 market price for C-BT continues to hold at around \$10,000 per unit. One C-BT unit represents one acre-foot of water but each year a Board determination is made concerning the allotment. Dry years have a high allotment (70 to 100%) and wet years experience a low allotment (50 to 70%)⁵.



Urbanization Dynamics

Northern Colorado has experienced several significant growth spurts in the past two decades. Population increases have an important and stressing effect on water supplies and this is especially true with the current drought. Most now agree that the current drought in northern Colorado started, with hindsight view, in July of 2000 and currently exceeds a 100-year event. Low river flows in 2002 are unprecedented in the written historical river flow records. A recent tree ring study even suggests that the magnitude of the current drought can be related to drought dating back to 1703.

Approximately 40% of the present northern Colorado population has migrated into the state since 1990 and the 1990's was a period of relatively wet conditions. A significant portion of the population does not appreciate the desert environment of northern Colorado.

Significant market demand exists for lush irrigated landscapes, for both private and public landscapes, and a shift in the public's desire in this regard is not likely any time soon.

There is much to be said about opportunity to change public opinion through policy or economics, but right now, most homeowners prefer bluegrass as a primary ground cover and landscape aesthetic. Bluegrass is a significant water consumer in the landscape, but ironically, is also quite drought tolerant. But the demand is for

⁵ This is a reversal from what you would normally think but the allotment is governed in consideration of storing and delivering water to meet the dry year, late season needs.

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lush and manicured bluegrass, not stressed blue-gray or dried out bluegrass. Until the demand for the green lushness of bluegrass is quelled by either water cost or water availability (restrictions on landscape irrigation), bluegrass will continue to be the landscape turf and landscape plant of choice.

As area cities expand, it is common for farms to be acquired by developers, along with the water rights, and then developed into residential properties, streetscapes, parks, golf courses, and open space. The native water rights become an interesting factor in the equation. The rights may be entirely suitable for agriculture but questionable from the municipal water purveyor's viewpoint if they are not predictable enough to satisfy the city.

As mentioned earlier, urbanization has created a significant, market-driven cost increase for the water demanded by local municipalities for development. The requirements vary significantly between different purveyors but some amount of raw water must be turned over to the city or rural domestic for the provision of potable water into perpetuity. More or less 40% of the developed property will be landscaped and irrigated. Water for irrigation must come from the potable system, or alternatively, from a raw water system if such is available.

So, the opportunity to utilize raw water for landscape irrigation is enhanced by the market-driven price of the preferred water rights. Briefly stated, the developer can consider turning over C-BT water to meet the raw water turnover requirement of the water purveyor and keep other water rights with the project for landscape irrigation. There is a non-trivial cost for the raw water infrastructure, but all of this works economically if the potable water purveyor recognizes the value of the raw water system and therefore adjusts the raw water turnover requirement downward. Some purveyors will reduce the water turnover requirement by 50% recognizing that half the annual potable water requirement, namely that going to irrigation, has been eliminated.

The Role of Irrigation Mutual Companies in Landscape Irrigation

The implementation of raw water systems, also called secondary supply or "dual" systems, can occur in several ways and the ultimate ownership, management, and replacement are very important factors in project success. The developer can implement the secondary supply system and turn the system over to the homeowner's association (HOA). However, HOA's are typically geared to routine maintenance operations and not to infrastructure management, upkeep, and replacement. Some developers have created metropolitan improvement districts to own the systems and others have retained ownership with the idea of generating cash flow and a payback of the investment.⁶

In Utah and Idaho, the irrigation mutual companies or districts have gotten involved in the provision of raw water. Interestingly, this began more than a decade ago and mutual companies are now actively involved in secondary supply. One irrigation mutual company in Utah has 40,000 urban accounts in their service area. If you

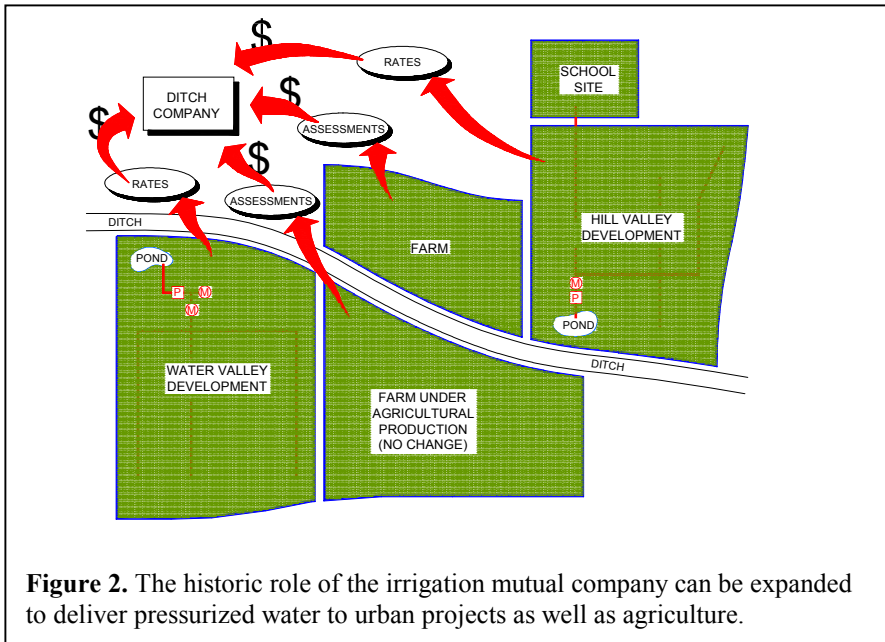
⁶ This can create a circumstance where the developer is looking for a faster payback than a non-profit entity would be. Ironically, the unit cost of raw water for irrigation can be higher to the homeowner than the unit cost of the potable water.

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think about it, mutual company involvement makes a lot of sense. The company represents an established organization dedicated to the business of managing a water right or rights, delivering water to users, and maintaining a ditch. The future can be bright and exciting with a simple repackaging of the mutual company's historic role.



Approach

From the technical perspective, there are several nuances of how to approach landscape irrigation with raw water. Most of these issues will be addressed in a complementary paper. The primary questions to answer relative to water rights are:

- Are the water rights suitable to the mature landscape needs in quantity, quality, and seasonal availability?
- Is water storage necessary?

- Are there local standards or imposed practices to the approach or the equipment?
- Who will construct, manage, maintain, and ultimately replace the raw water system?
- Will potable water hose bibs be allowed on the structures?

The primary questions related to delivery infrastructure are:

- Will the water be metered?
- Will the piping be located at the front of lot or back of lot? If front of lot, will it be in the street?
- Are offsets from other utilities required?
- Is the pipe network to be below frost line?

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Legal Issues

There are some perceived and real water right issues connected with using water that was historically used for agricultural irrigation and moving the application toward landscape irrigation. Most often the decree is worded such that the water right is associated with “irrigation” and irrigation is irrigation whether used for agricultural crops or landscapes. Some urban projects are built on land that may not have been irrigated previously or that was only partially irrigated previously. Bringing new ground under irrigation is most likely an issue and, in all likelihood a Colorado Water Court issue, that can be lengthy and costly in process.

Benefits and Economics

The gratifying aspect of this topic, raw water for landscape irrigation, is that everyone comes out ahead and benefits from this approach. The housing developer saves money that can be potentially realized in lower cost housing. The potable water purveyor can delay, even indefinitely delay, expansion of water treatment facilities⁷. The homeowner pays a lower unit rate for raw water for irrigation than they would if they used potable water. The State of Colorado benefits through the strengthening of the water right and the beneficial use criteria associated with the accumulated State of Colorado water rights. When irrigation mutual companies are involved, the provision of raw water to landscapes can offset annual costs of operation and allow assessments on the agricultural water to be stabilized or even reduced.

Summary

In northern Colorado, urbanization has created a rather dramatic market-driven increase in the price of the Colorado-Big Thompson (C-BT) project water that is desired by the municipalities. Developers are required to turn over C-BT water to the municipality to meet the treated potable water needs. Landscape irrigation is a significant (more or less half) component of the annual potable water demand unless a secondary supply of raw water is provided for landscapes. Municipalities, developers, homeowners, and the State of Colorado can all benefit if landscape irrigation is accomplished using the native water supplies that were associated with the land when it was farmed. The irrigation mutual companies that have played a role in Colorado water delivery for more than 100 years may have a potential expanded roll as urbanization occurs in the future. The pros and cons, the organizations, concepts, management, and the technical aspects of implementing raw water for landscape irrigation are an interesting current dynamic in Colorado water.

⁷ A common rule of thumb suggests that it costs \$1 million to expand an existing water treatment facility by one million gallons per day of treatment.