BELVOIR RANCH TRAIL PLAN (PHASE 1) OVERVIEW

AUGUST 30, 2023

INTRODUCTION

In July 2023 the City of Cheyenne contracted with TPT Trails, LLC, to design a system of non-motorized, natural-surface trails on Belvoir Ranch. The tract is in southwest Laramie County about 15 miles west of Cheyenne. The scope of work included:

- Identifying opportunities to create a successful, sustainable trail system for mountain biking, hiking, and other nonmotorized trail uses. At a minimum, the system would include 10 miles of trail. (Ultimately, nearly 18 miles of proposed trail were identified, as described later.)
- Designing a system to accommodate users of all abilities and skill levels, ranging from very easy (ADA compliant) to expert.
- Adhering to standards promulgated by the International Mountain Biking Association (IMBA) for design and construction recommendations.
- Assessing rock and soil conditions to identify appropriate features and determining trail grades for maximum sustainability.
- Following the "stacked loop" model for the trail plan.
- Collecting sufficient data points in the field to create a preliminary map depicting the recommended trail system, trail access, trailheads, sanitation stations and other recreational amenities.
- Preparing cost estimates for trail construction and other recreational amenities.
- Marking trail corridors with tape flagging and pin flags.
- Recommending priorities for developing the initial set (Phase 1) of Belvoir Ranch trails and future expansions (Phase 2) of the system.
- After approval by City staff, creating a final Phase 1 Belvoir Ranch trail system map.

BACKGROUND

The City of Cheyenne acquired the 17,000-acre Belvoir Ranch in 2003 and the adjoining Big Hole property (1,800 acres) in 2005. The Belvoir Ranch deal included another 3,400 acres leased from the State of Wyoming.

A master plan for the ranch, issued in 2008, entailed considerable public engagement and included a proposal for developing up to 40 miles of purpose-built natural surface trails. Subsequently, the city entered into a 25-year lease agreement with Next Energy to install up to 119 wind turbines and associated infrastructure for generating electricity. Most of the wind turbine installation work is complete, although some additional installations remain.

Starting with the master plan, there has been strong community support for creating public access to the ranch and developing a natural surface trail system adhering to IMBA design standards. The type of trail design is obviously geared toward mountain biking and but also works well for hiking and trail running. Examples of nearby IMBA-style trails are located in Curt Gowdy State Park in far western Laramie County and Pilot Hill open space bordering the east side of Laramie. Several of the trails on the Pole Mountain unit of Medicine Bow National Forest in the vicinity of the I-80 summit also follow IMBA guidelines.

In conjunction with these other local trail systems, Belvoir Ranch has the potential to become a destination trail system. Trail opportunities vary at other locations, providing visitors with the variety of trail options.

Creating a destination trail system is an incentive for boosting trail-based tourism. There are several small western towns that have reinvigorated their community with mountain bike tourism; these include Moab, Utah; Downieville, Cal.; Oakridge, Ore.; and Fruita, Colo. Mountain bikers tend to spend more per capita than hikers, according to the Outdoor Industry Association, whose research found that in 2019, mountain bike tourism accounted for more than 26 billion dollars in the United States.

Focus on biking and hiking

Mountain bikers seek out professionally designed trail systems and will stay (and spend money) in communities that feature close-to-town trails. Developing a network of mountain biking and hiking trails has great potential to attract people to Cheyenne.

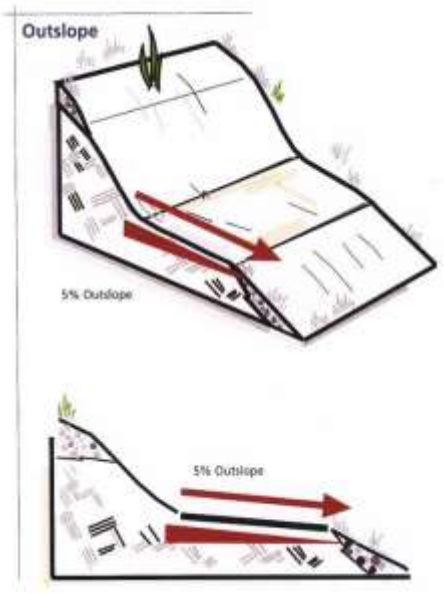
Elements of a destination rail system include the following:

- Well-constructed and maintained trails, including unique or exciting features and also perceived by users as “flowy and fun” that provide incentive for cyclists who are willing to travel.
- Loops, instead of out and back trails.
- Having loops interconnect, often referred to as stack-looped trail systems, allow trail users to vary and personalize their use.
- Design trails for different user groups and skill levels. Similar to ski areas, trails can be rated green for easy, blue for intermediate, and black for advanced.
- Enough trail length and diversity to keep a visitor occupied for at least one day. Factors include sheer mileage of trail as well as style, technicality and elevation gain; a general rule of thumb is offering at least 12 hours of trail experience.
- Using various types of media to raise awareness of the system and making it easy to locate and access.
- Descriptive trail names, with clear, easy-to-follow directional signage supplemented with easy-to-comprehend, trailside maps.
- Well-equipped trailheads, ideally with an information kiosk, trail map, adequate parking, water and regularly maintained restrooms.
- Improved roads to trailheads, with routes accommodating recreational vehicles.

TRAIL DESIGN AND CONSTRUCTION

Trail Design and Sustainability

The specific alignment of trail tread should be built to accommodate mountain bikers, as this user group obtains speeds greater than a hiker or runner. Comprehensive trail design and construction guidance can be found in *Trail Solutions: IMBA's Guide to Building Sweet Singletrack, Managing Mountain Biking: IMBA's Guide to Providing Great Riding and Bike Parks: IMBA's Guide to New School Trails.* (IMBA is the acronym for International Mountain Biking Association.) Below are some basic trail design sustainability guidelines as described in the above-mentioned publications.



When describing a trail, there are four major components to remember. The *tread* is the relatively flat surface that the user travels upon. The *critical edge* is the outer or downhill edge of the trail tread. The *backslope* is the area immediately uphill from the tread. The *hinge* is the intersection of the tread and the backslope.

A sustainable trail sheds water off of the trail while keeping users on the tread. Trail location, alignment, grade, drainage and soil texture are the most important factors affecting sustainability. One of the most sustainable trail designs is *rolling contour*, characterized by a sidehill location, a gentle trail grade, grade reversals, and an out-sloped tread that tilts slightly toward the critical edge. When applied collectively, the eight following principles result in sustainable trails that are low maintenance, fun to use, and more likely to manage risk, environmental impact, and user conflicts.

- The best location for trails is on sidehills, as opposed to flatter terrain like meadows, or valley floors.
- Trails should gently traverse the slope, rather than traveling directly up or down it. Trails that directly ascend the hillside are known as "fall-line" trials.
- To ensure a sustainable alignment, a trail's grade should never exceed half of the grade of the sidehill it is located on. This is known as the "half rule."
- The average slope of the trail should not exceed 8%. This average may be lower depending on the soil texture.
- A grade reversal is a spot at which a trail briefly changes elevation, dropping subtly before rising again. This change in grade forces water to exit the trail at the low point of the grade reversal, before it can gain more volume, momentum, and erosive power.
- The critical edge of the trail should tilt slightly down and away from the hinge, this is called the "out-slope." Proper out-slope will cause water to sheet across and off of the trail in a gentle, non-erosive manner instead of funneling down the trail's center, this known as "sheet wash." Most trails should be built with a 2% - 3% out-slope.
- Proper trail design with gentle grades and sidehill location can minimize soil displacement. In areas with loose soils or high traffic, consistent flow, in-sloped turns, and tread armoring (embedding stone) are also frequently necessary.

As in design, it is recommended that a trail building professional play a significant role in the design and construction, and improvements of the natural surface trails. It is also recommended that the consultant/contractor understand the specific needs, materials and techniques associated with trail building.

The use of contractors primarily experienced in road or general construction is ***not*** recommended, as these firms and individuals are typically not familiar in the needs of trail users.

To create local skills, there are excellent trail building resources available for community volunteers interested in trail building and maintenance. For a modest annual investment, there is also the potential for the city to fund a seasonal trail maintenance position, which could then help manage and train volunteers.

Trail Flow

With good trail flow, the speed at which a rider travels on the trail should be consistent, with the rider not having to brake and accelerate frequently. Transitions between faster and slower flow will need to be gradual, with progressively increasing and decreasing turn radii and frequent uphill segments to reduce speed where needed. Downhill grades should not come right before tight turns. Adjusting in-slope and out-slope (camber) of the trail tread to match the flow also helps riders stay on the trail and allows for higher speeds.

Local Conditions – Soils and Geology

Understanding local soils and bedrock formations is critical to trail design and construction.

The ranch has three primary exposures of rock: Casper Formation red sandstone, Casper Formation sandy limestone and Casper Formation dolomite limestone. These formations were uplifted 75-40 million years ago during the Laramide Orogenic event.

Immediately west of the ranch is the start of the Sherman Granite. The Sherman Granite is the prevalent rock formation until you get to the western exposure of the Casper Formation sandstones and limestones found east of Laramie.

The Casper sandstone can be in large slabs suitable for locating trails; however, the sandstone is also encountered in broken chunks which is not so good for trails. The sandy limestone is generally in broken chunks and also poor for trails. The dolomite limestone tends to be in slabs that are suitable for trails.

There are four soil types prevalent on the ranch. Evanston ipson and loam, Tyzak, Red Thayne and Catherine-Boyle.

The Evanston and Catherine-Boyle soils, which support surface vegetation (primarily prairie grasses) are good for trail building and can sustain higher running grades as much as 8%.

The Tyzak and Red Thayne soils are poor for trail construction and can be identified by the surface vegetation of Mahogany shrubs. Trails on these soils should be kept to shallower grades less than 5%.

Wherever possible, trails on the ranch should be located on grassy areas. Anywhere trail grades exceed recommended maximums, additional drainage features, typically in the form of grade reversals, should be incorporated during construction.

Signage and Wayfinding

Establishing a trail network requires development of a comprehensive system of signs for the network as well as branding. Signs are the most important communication tool between land managers and trail users. A well-implemented and maintained signage system enhances the user experience, helps visitors navigate the trail network, and provides information about the area.

A variety of signs can be created to help users identify trails and their location, select routes, remain confident in their trail choices, guide users to destinations and key points of interest, provide information on regulations and allowed uses, learn about responsible recreation and trail etiquette, learn about resource protection, and reduce risk and hazards. Signs can be informational/directional, regulatory/warning, and educational/interpretative.

Directional signs provide navigational information, from a simple blaze to elaborate maps. Informational signs, usually positioned at the trailhead, provide details such as trail length and difficulty. These include trailhead identification signs, signs at a trailhead kiosk (to include a complete map and description of nearby trails and facilities, local regulations, emergency contact information, and educational messages), trail intersection signs, waymarks, difficulty rating signs, allowed activities, road/trail intersections, and emergency signs.

Regulatory signs delineate rules, such as prohibited activities, direction of travel, or other restrictions. Warning signs are used to caution trail users of upcoming hazards or risks. These include visitor rules and regulation signs, allowed activities, road/trail intersections, and emergency signs.

Educational signs provide guidelines for responsible recreation and trail etiquette. Interpretative signs describe natural or cultural resources. These include education/responsible use signs, and interpretative signs.

Also useful are postings on online trail map utilities, such as Trailforks, MTB Project and Hiking Project. These sites are popular among recreationists and are a good opportunity to present information, including photos and user reviews. They can also serve as elements in a marketing program for the town.

MAPPING and PROPOSED TRAILS

TPT Trails worked with City of Cheyenne GIS staff to collect data using QuickCapture. The data was then entered and manipulated in ESRI ArcGIS Pro. Data entry also included information about soil types, geology, trail difficulty, and related trail features. Proposed trails were assigned provisional names to allow for easier identification on the maps.

Trail Segments and Mileage

Big Canyon to Little Canyon outer loop (4.81)
Cross Country (2.69)
State Connector (1.81)
Lower Connector (1.28)
Red Ridge & Lower/Upper Dolomite Ridge (1.17)
West Ridge (1.16)
Universal Access (1.05)
Slab Ridge (1.00)
Upper Loop at Little Canyon (.82)
Newman Reservoir link (.58)
Internal Connector (.51)
Universal Access connector (.48).
Flow trail (.25)
Dolomite B line (.23)

TOTAL **17.84** miles (includes 2.53 miles on state-owned property)

Trail Features

Trailheads: 2	Berms: 23	Rock features: 58
Trail signs: 18	Climbing turns: 4	Stone retaining walls: 9
Vista points: 18	Culverts: 20	Wood features: 3

COST ESTIMATES

The following is a per-lineal-foot cost estimate, presented in three components:

- Trail segments on Evanston and Catherine-Boyle soils,
- Trail segments on Tyzak and Red Thayne soils,
- Trail features.

No cost estimates were developed for the trail heads since those could vary considerably in size and amenities.

Approximately 58,608 feet of trail is proposed on Evanston and Catherine-Boyle soils. At $5-6 per lineal foot, the cost would range from $293,040 to $351,648.

Approximately 35,587 feet of trail is proposed on Tyzak and Red Thayne soils. At $7-9 per lineal foot, the cost would range from $249,109 to $320,283.

Types and locations of trail features would vary and a force account of $100,000 is recommended for this category.

The overall cost estimate, exclusive of trail heads, ranges from ***$642,000*** to ***$772,000***.

EQUESTRIANS

The 2008 master plan proposed developing an equestrian trailhead and trail system at the original ranch headquarters near Borie. This proposal would have required rebuilding the Borie bridge over the Union Pacific railroad tracks.

During Phase 2, an equestrian trailhead could be situated at the Warren Interchange (Exit 345) on I-80. The interchange features easy on and off access for horse trailers, and Next Energy has leveled a large area ideal for an equestrian trailhead. There are multiple square miles of rolling open grassland prairie and the Lone Tree Creek valley ideal for riding. The city would not need to construct equestrian trails, but could instead provide open riding and mark corridors with posts and signs.

NEWMAN RESERVOIR

The Newman #1 Stock Reservoir is on the western edge of the ranch and could be ideal for fishing, picnicking and other family outings. The reservoir was constructed in 1978 on a tributary of Sand Creek. The reservoir needs repair and does not currently appear to contain fish. The Laramie County Conservation District has a proposal to upgrade the reservoir and improve fishing and useability. Driving to the reservoir requires crossing private land and the city only has administrative access. If public access is developed to the reservoir, it could also serve as a trail head. The trail proposal does have a trail connecting to the reservoir.

HUNTER MANAGEMENT AREA and CATTLE GRAZING

Belvoir Ranch has a designated hunter management area, as well as cattle grazing, a traditional use which continues. These activities will likely impact trail system development, but more information is required before the scope of that effect is known.