GALLATIN WATERSHED COUNCIL

Mandeville Creek: Riparian Restoration Maintenance & Stewardship Plan

The Gallatin Watershed Council guides collaborative water stewardship in the Gallatin Valley for a healthy and productive landscape.

www.gallatinwatershedcouncil.org

1. PROJECT DESCRIPTION

Mandeville Creek is a watercourse that runs directly through the city of Bozeman, MT. Its path intersects Montana State University and runs adjacent to Bozeman High School (BHS), a location that is surrounded by infrastructure and impervious surfaces Mandeville Creek is fed by stormwater runoff and irrigation return flows from Farmers Canal before its confluence with the East Gallatin River As an urban stream, Mandeville faces various water quality issues, including pollutants carried by stormwater, high temperatures, and excess sediment. stormwater runoff that pollutes the water and harms the species living in the water. An addition of riparian vegetation will increase the amount of water storage, water temperature modicitation, sediment filtration, and nutrient treatment which will in turn limit the harmful effects that increasing impervious surfaces have on surface waters. In turn, treating this tributary will have positive impacts on the East Gallatin River, which is deemed impaired for excess nutrients and sediments.

There have been previous riparian plantings and meandering projects along the creek, near BHS. In 2014. The project included re-meandering of the creek channel creating a functional stream and floodplain, aquatic habitat elements placed in the channel, and hundreds of native plants were installed within the riparian area. Unfortunately many plants did not survive, and areas along the creek need new vegetation.

In the Fall of 2023, 75 native trees and shrubs were planted along the East and West bank portion of Mandeville starting at the junction of W Villard Street and 11th St., about a tenth of a mile downstream. This section of Mandeville lacked woody vegetation, and will now benefit from native roots controlling erosion, providing shade, and creating habitat for various species.

This site would benefit from more riparian plantings, especially larger canopy trees. The previous plantings in 2014 and 2023 have had a large impact on the watercourse, but enhancing the riparian buffer would be beneficial. It would also create an outdoor educational space for the schools in the area. Students can learn about the impacts of riparian vegetation and the importance of meandering streams. It could be a success story for the urban community of Bozeman.

This stewardship and maintenance plan focuses on the 2023 planting. This project is in partnership with Trout Unlimited Gallatin Home Rivers Initiative, and was funded by Montana Watershed Coordination Council Watershed Fund, Montana Department of Environmental Quality, and U.S. EPA.

2. MAINTENANCE OBJECTIVES

The objectives of maintenance are to ensure the survival of the newly planted trees and shrubs. Maintenance will be conducted for two years following the completion of the project.

2.1 Tree/shrub watering: Bozeman High School has irrigation drip lines that are near the planting site. To ensure survival, the irrigation lines should be moved towards the newly planted vegetation. If irrigation lines are not moved and/or not functioning, the Gallatin Watershed Council should be notified. The Gallatin Watershed Council will recruit, train, and manage volunteers to conduct weekly watering if drip lines are not properly placed/working. The Gallatin Watershed Council will also supply all materials necessary for watering. Depending on when drip lines are turned on in the spring and high, early spring temperatures, plants may require hand watering. Each of the six Quaking Aspen trees on the west bank, need 20 gallons of water per week from May to September. Volunteers can fill the tree bags with 20 gallons of water on the six aspens. Watering bags will need to be removed for the winter and placed in the spring. Smaller shrubs will need 5-10 gallons weekly from May to September.

2.2 **Additional mulching**: The plants will need an extra layer of mulch around each plant in the spring. The extra layer of mulch will assist in water retention. The layer of mulch should be 3 inch thick and 3-5 feet from the base of the plant. Ensure that mulch does not crowd the base of the plant. This will help ward off various weeds from competing with the plants.

2.3 Weed management plan: Weed management on this property falls under the maintenance staff at BHS. Noxious weeds can compete with newly planted vegetation causing the new plants to die. Trained personnel can weed spray noxious weeds. It is extremely important that herbicide, preferably Transline, be applied to only vegetated areas and not directly in or extremely close to the watercourse.

- Prevalent weeds:
    - Canada Thistle:
        - Rhyzonimous. Best to spray in fall, as this is when we get our second "green up" or wave of moisture, which sends nutrients down into the soil. July and August are the worst time to spray because the thistle has already done its thing and gone to seed.
    - Deadly nightshade - not a huge issue but it is consumptive of water and clogs up the waterway.
        - Volunteers *could* pull, but gloves would be absolutely necessary and emphasis on NOT eating the berries.

2.4 Cage & Stake Removal: In the Fall of 2025, caging, stakes, and tree straps will need to be removed. BHS donated these items to the fall 2023 planting. BHS is permitted to keep all materials. Around each shrub and tree are grain bags that were placed for weed management. These will need to be pulled in the Fall of 2025 and disposed of.

3. MONITORING OBJECTIVES

The objectives of monitoring are to qualitatively track the success of the newly planted riparian revegetation, and to capture the impact of the vegetation on the landscape. Monitoring will be

conducted before and after the plantings to capture changes in these parameters that can be associated with the project as best as possible.

3.1 Photo point monitoring: The Gallatin Watershed Council has placed three photo point monitoring stakes near the planting site. Please do not remove these, they are essential towards recordinging visual changes in vegetation to indicate qualitative impacts to wetland habitat, natural storage of water, and water quality. Photos taken subsequently from the same locations over time are intended to help qualitatively document events and changes at a project site as a result of restoration activities. Photos will be taken by GWC staff and will be structured through the use of the "Before & After" app.

3.1.1 Photo Point Setup: The photo points are marked with a wooden stake and pink flagging, and labeled with the LocationID in black sharpie. Photo points are identified using numbers, and include a sub-letter if more than one photo is taken from the same locations (1a, 1b, 2, 3…).

3.1.2 Photo Guidelines:

Before photos: Prior to the planting events, photos will be taken at the three photo point stakes (***Attachment A: Photo Point Map)***. Each site will be labeled by stake number and a sub-letter to indicate direction (in counterclockwise order). Some sites may have up to 3 photos, while others have just one. All photos will be taken with a smartphone landscape orientation. All image files will be labeled using the following naming convention: SiteID_LocationID_YYMMDD.

After photos:

- Supplies:
    - Smart phone
    - Before & After App
    - Clipboard
    - Copy of the Photo Point Monitoring Plan
    - Photo Point Map
- Procedure:
    - Download the before photos from the album in Google Photos titled "GCRP Photo Monitoring: Before" and make sure that the labels are attached with the photo description (i.e. 1A, 1B, etc.).
    - Head to GCRP and open the Before & After app, starting with the photos from site 1.
    - Using the Before & After app, click the symbol of the square with the flower inside of it and upload the picture labeled "1A". Then, in the "A" (after) frame, line up the current imagery with the previously uploaded photo to make it match as best as possible. *Note: If portrait orientation is locked on your phone, you will not be able to take landscape photos in the Before & After app; unlock to use.

        - After taking the photo, first click the symbol on the right that represents a triangle with three dots. Choose “Save 2 Images” and save both images separately. Upload and file/label accordingly.
        - Next, click the symbol of the bottom of the screen that represents two panels. The app will stack the before and after photos on top of one another. Save the combined images to your phone by clicking the three dots at the bottom of the screen.
    - Repeat for each monitoring location.
    - Upload all stacked before-and-after photo to the “GCRP: Before and After Photos” album in Google Photos, and label them as “SiteID__LocationID_BeforeAfter”

3.2. Vegetation monitoring: Assess success of plantings, as well as maintenance needs.

- *Cohort Monitoring*: With a specialist (an arborist or additional plant specialist), the Gallatin Watershed Council will conduct field checks on the groups of trees that were planted at the same time (a cohort). Dead or dying trees will be identified and flagged for replanting.
    - Vegetation assessment tips:
        - If the bark of a branch is black, it is dead.
        - If you can’t quite assess the health of the bark by look, scratch it with your fingernail. Green = health, Brown = unhealthy/dead.
        - Other indicators of health: supple and soft buds, bendy branches
- *Vegetation Survival Rate*: Used to indicate success in species choice, proper planting techniques, monitoring techniques, etc. Vegetation survival rate will be calculated by dividing the number of individuals alive at the end of the census period, by the number of individuals alive at the beginning. Survival rates will be calculated annually for at least two years after planting.Survival rates will be assessed by planting zone (riparian zone and bench zone), as well as by species. This project aims to achieve at least 80% planted tree survival within the first two years of the project.

4. MAINTENANCE & MONITORING SCHEDULE 2023 - 2025

All maintenance and monitoring activities will be conducted for two seasons after the planting events (2023 - 2025). The schedule of maintenance and monitoring activities is based on plant needs for survival and capturing tree health and growth while in a leafed out state.

Table 1. Monitoring Schedule

Monitoring Activity	Date	Event
Tree Watering	September 2023 - September	Weekly from May 2024 - September 2024 Biweekly from May 2025 - September 2025

	2025	
Photo Point	Late September 2023	Project site pre-planting
Photo Point	Late September 2023	Immediately after planting event, compare with pre-planting photos
Vegetation Survival/Mortality Monitoring	Spring 2024	GWC will assess vegetation survival rate. If Golden currants do not bud in the spring, contact Blake Nursery for reimbursement/replacement.
Vegetation Maintenance	April 2024 - May 2024	Apply an extra layer of mulch to assist with water retention.
General Weed Management	Aug-Sep 2024	BHS should be spraying weeds in the fall
Volunteer Weed Pulls	April - May 2024	GWC host one (or two, if necessary) weed pulls* *if BHS maintenance team finds appropriate
Tree watering	May 2024 - September 2024	If drip lines are not in operation: Biweekly/weekly watering by GWC volunteers
Photo Point	Late June / early July 2024	Capture trees after they have leafed out, compare with the 2023 before photos
Remove Tree Watering Bags	September 2024 & 2025	Remove tree watering bags from the aspens at the end of the watering season. Put bags back at the beginning of the watering season.
Cage & Stake Removal	September 2025	GWC will recruit volunteers to remove all stakes from larger trees, and cages from smaller trees and shrubs
Vegetation Survival/Mortality Monitoring	September 2025	GWC will assess vegetation survival rate
Vegetation Maintenance	April 2025 - May 2025	Apply extra layer of mulch to assist with water retention

General Weed Management	April-May 2025	BHS should spray weeds in the fall
Volunteer Weed Pulls	April - May 2025	GWC host one (or two, if necessary) weed pulls* *if BHS maintenance team finds appropriate
Vegetation Survival/Mortality Monitoring	May 2026	GWC will assess plant survival after plants have began to bud
Vegetation Survival/Mortality Monitoring	September 2026	GWC will assess vegetation survival rate