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December 22, 2015

To: Jim Dunnigan, Montana Fish, Wildlife and Parks

From: Amy Sacry and Erin Belmont, Geum Environmental Consulting, Inc.

Re: Therriault Creek 2015 Maintenance and Monitoring Summary

This memo describes work completed in 2015 at the Therriault Creek restoration project site under Montana Fish, Wildlife and Parks (FWP) Task Order 16-504. This memo describes site observations; weed control, maintenance and revegetation activities completed in 2015 based on the results of site observations; and provides recommendations for continued monitoring and maintenance at the site. Table 1 describes the tasks completed under Task Order 16-504. Details on the Therriault Creek riparian revegetation project including as-built documentation; effectiveness monitoring methods and results; and the adaptive management framework for the project can be found in nine separate documents, which are included in the Reference Documents section of this memo.

2015 Site Observations

Geum visited the project site on August 6th, 2015. This site visit included making general observations of site trends, including effectiveness of previously installed treatments and maintenance needs. This section summarizes the key observations made at the site in 2015 and describes recommended maintenance and revegetation activities based on site observations. Table 2 provides a summary of the observations made in 2015 and also includes a summary of the recommendations, such as maintenance needs or continued monitoring, based on observations made during the site visit.

Table 1. Tasks completed in 2015 at the Therriault Creek restoration site under Task Order 16-504.

Task	Description and Quantity
Monitoring	
Photo documentation	Photos were taken of all treatments. Treatments include: 16 containerized planting units, 2 long term planted solarization units, 3 temporary solarization units, 2 vegetated soil lifts, 800 feet of willow fascine, 400 feet of coir log fascines, and 5 woody debris structures.
Record qualitative observations of installed treatments	Observations were recorded for all revegetation treatments, plant community development, channel conditions, and other ecological processes influencing plant community succession and site conditions.
Document maintenance needs	Maintenance needs were recorded for all treatments.
Maintenance	
Fence repair	Minor fence repairs were done in locations where deer had torn through the fabric or the fabric was sagging. Additional fence material was added where the fence crosses the channel to prevent deer from crawling under the fence.
Browse protector removal	Browse protectors were selectively removed from the largest plants inside (approx. 175) and outside (approx. 30) of the riparian protection fence in Phase III. Approximately 75 vole protectors were removed from large plants.
Revegetation Treatments	
Herbicide application	Herbicide was applied in July, September and October. All noxious weed species were targeted within the project area and select locations within the hayfield adjacent to the project area.
Coir log installation	100 feet of coir logs were installed at three locations in Phase I. Willow cuttings were installed at 1 cutting per linear foot behind the coir logs.

Weeds

The following general observations of weed infestations in the project were made in 2015:

- The target weed species continue to be: common toadflax, Canada thistle, houndstongue and reed canarygrass.
- The abundance and distribution of common toadflax has increased in the project area (Figure 1). This species used to be localized to a few small patches near the bridge at the upstream end of the project but has expanded out from the channel and downstream. As this has been a target weed for numerous years, it is not clear why it is expanding in the project. It is difficult to see when it is not in flower, so it is possible that it has been missed in previous year's treatments.
- Reed canarygrass is still widely distributed throughout the project area (Figure 2). Dense infestations are still present in the lower portion of the project where it remains the dominant species along the channel and ditches entering the project. In the upper portion of the project, isolated patches have generally been reduced and only some of the patches treated in 2013 and 2014 had re-growth. Some treated patches are being colonized by annual weeds, some by pasture grasses and others have nothing colonizing the bare ground under the dead vegetation. Reed canarygrass is still relative uncommon in the upper part of the project area but is increasing along the streambanks where it is difficult to control.
- Canada thistle within the project area has been greatly reduced but still occurs sporadically. Canada thistle is more widespread with higher densities in hayfield and drainage ditch adjacent to the project (Figure 3). This is likely due to inconsistent treatment of these areas in the past (treating this area has been a lower priority because it outside of the project area) and possibly due to drier conditions caused by the drainage ditch that lowers the water table in the hayfield.
- Other noxious weeds observed in the project area in previous years, including oxeye daisy, houndstongue, perennial pepperweed, and sulfur cinquefoil are now very uncommon in the project area.
- There are a few areas where infestations of non-target species, such as mustard (*Brassica spp.*) were present in 2015 (Figure 4). This has not occurred in the past and may be a result of 2015 drought conditions. These infestations typically do not persist long-term.
- Maintenance recommendations based on site observations included: continue to treat all occurrences of noxious weeds within the project area; continue to treat isolated clumps of reed canarygrass in the project area; rake and seed treated patches of reed canarygrass where no other grasses have colonized; and continue to treat Canada thistle in the hayfield and ditch adjacent to the project area as budget allows.

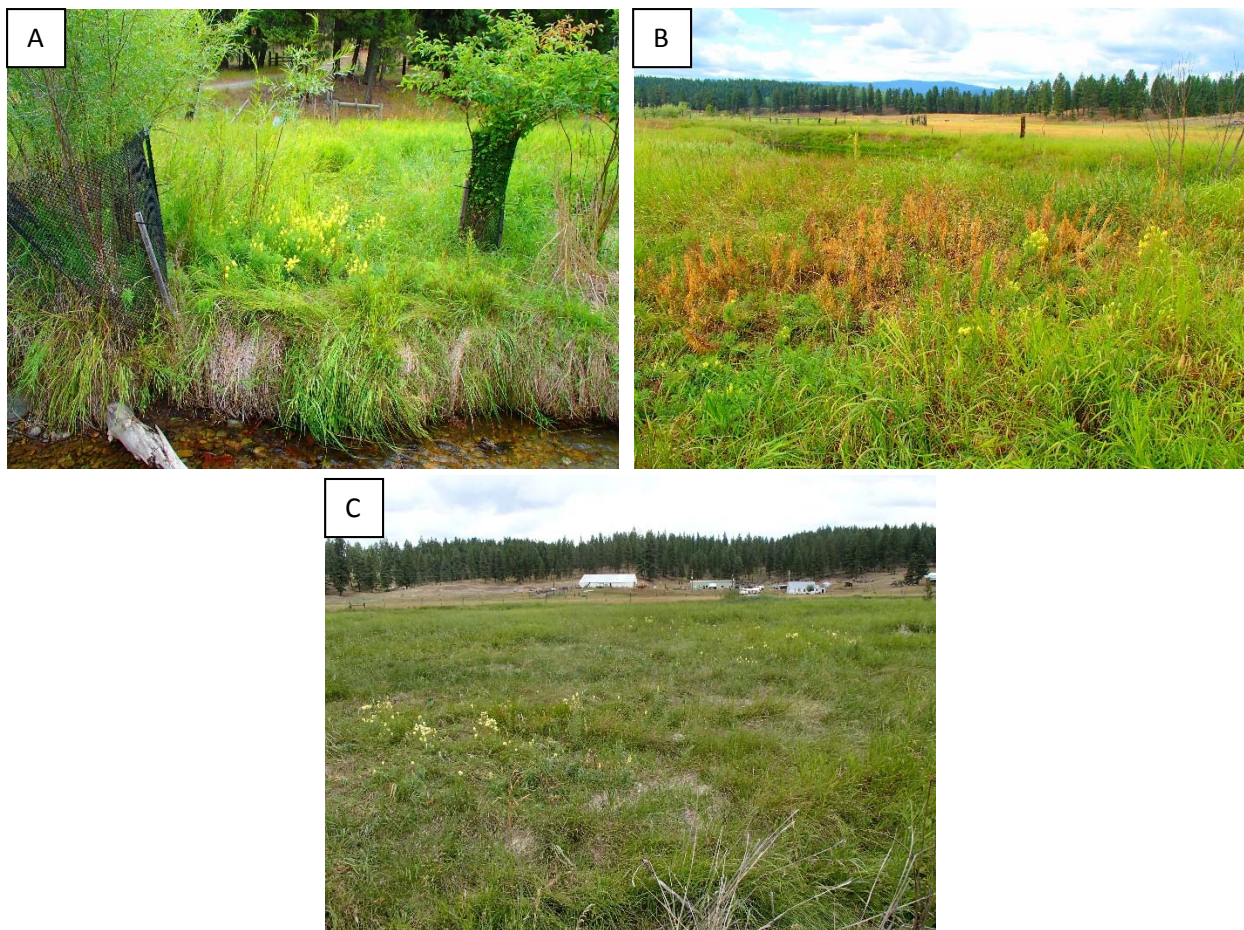


Figure 1. Common toadflax along streambanks (A), treated near the ponds at the upstream end of the project (B) and expanding out from the original infestation (C).

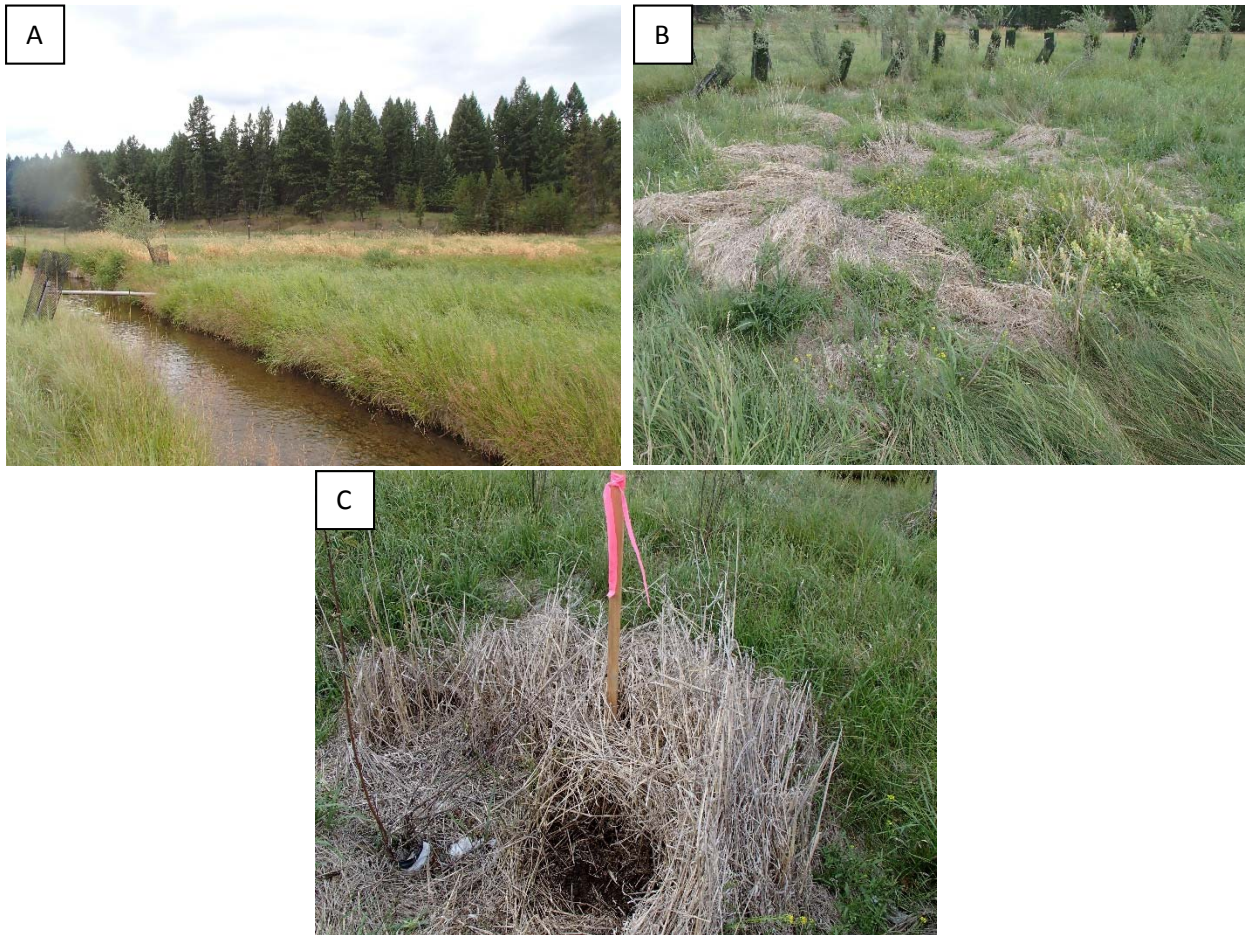


Figure 2. Large area of reed canarygrass treated in the Phase III project area (A); reed canarygrass clump previously treated and being colonized by annual weeds and pasture grasses (B); and treated clump that is not being re-colonized (C).

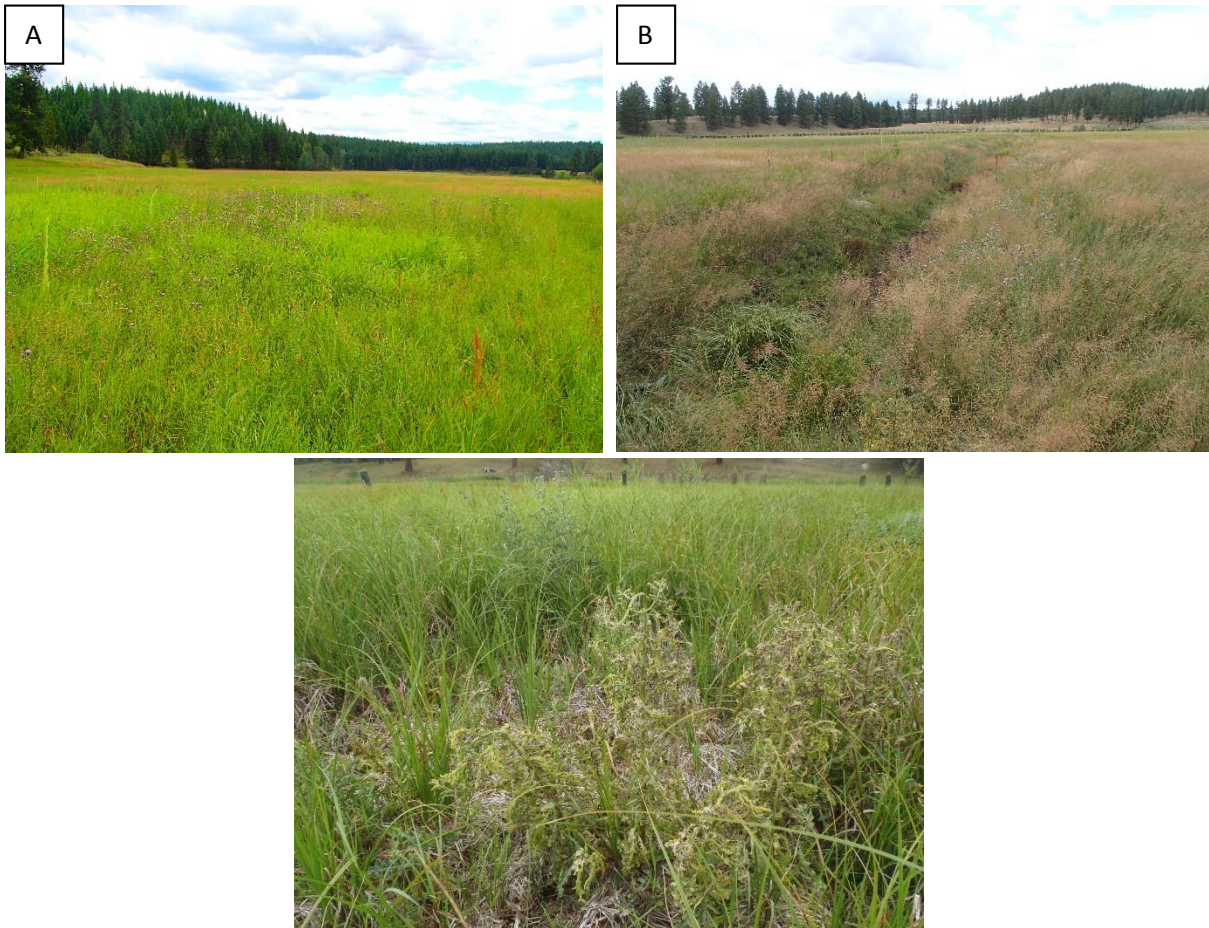


Figure 3. Canada thistle in the hayfield (A), along the ditch (B) adjacent to the project and a large plant that was treated in the proejct area (C).



Figure 4. Infestation of mustard in Planting Unit 16 in Phase 1.

Riparian Protection Fence

Ten foot tall riparian protection fence was installed around most of the Phase I and Phase III plantings in fall 2013. In fall 2014, significant modifications were made to the fence to keep it upright. The following general observations of fencing in the project were made in 2015:

- The 10-foot t-posts installed in fall 2014 to re-inforce the iron extensions that were used to extend the height of the existing cattle fence to exclude wildlife exclusion were all intact and supporting the fence material (Figure 5).
- Two areas were identified where deer had torn through the fabric at the downstream end of the fenced area. There was also evidence that deer were entering the fenced area at the downstream channel crossing. Although at a much reduced level, browse was observed on planted shrubs throughout the Phase I and Phase III planting units.
- Maintenance recommendations based on site observations included: reinforcement of the two areas where deer damaged the fence and installation of additional fence material at channel crossing points.



Figure 5. Ten foot tall t-posts were installed in fall 2014 to re-inforce the original fence. In 2015, deer had broken through the fence in two locations but the only other observed damage was slight sagging of fence netting. There was also signs that deer were crossing under the fence at the channel crossings.

Planting Units

The following general observations of planting units were made in 2015:

- In general, the woody plants that are still alive at the site are growing, producing seed and providing habitat for wildlife (Figure 6).
- The herbaceous understory dominated by dense non-native pasture grasses makes recruitment of new plants and regeneration of installed plants difficult because there are no available habitats for seed to germinate and new seedlings to expand into. Rhizomatous species or those that sucker easily, such as sandbar willow and red-osier dogwood, have been able to reproduce and expand to some extent. This is most noticeable in the areas where residual shrubs (shrubs planted during early revegetation efforts) were protected on the inside of meander bends. This expansion increased in 2015 in response to the riparian protection fence (Figure 7).
- Survival of planted shrubs and trees in Phase I remains variable and may have decreased slightly compared to observations made in 2014. Some planting units, such as Planting Unit 5 have very few, if any surviving shrubs (Figure 8). A few of the shrubs are re-sprouting from the base, but leaves showed signs of drought stress. Other units, such as Planting Unit 16 have high survival and shrubs that are over 15 feet tall (Figure 8). Plants in units with high survival have distorted growth forms from having individual browse protectors in place for multiple years. In general, the planting units on the west side of the channel and highest in elevation relative to the channel seem to have the lowest overall survival.
- Survival and growth of shrubs installed in Phase III planting units also remains variable. Units in the upstream portion of Phase III appear to have similar survival as observed in 2014. In these units surviving shrubs are outgrowing their individual browse protectors (Figure 9). Units in the downstream portion of Phase III appear to have lower survival compared to 2014 (Figure 9). In these units shrub growth is not as vigorous.
- Survival in Phase III Planting Unit 15, the planted solarization unit, remains high and plants have grown to 12-15 feet tall (Figure 10). This unit has the best growth compared to the other units in the downstream portion of Phase III. The planted solarization units in Phase I in comparison, have very poor survival of planted shrubs and trees (Figure 10). Plant growth and survival in Phase I planted solarization plots was initially vigorous too and it is possible that after the first couple of growing seasons the fabric actually prohibits root growth and suckering.
- The individual browse protectors restricted the growth of shrubs planted in Phase I. Most of the individual protectors in Phase I were removed in October 2014 and the shrubs are slowly expanding towards a more natural growth form (Figure 11). The lower branches of these shrubs continue to be browsed by deer. Outside of the riparian protection fence, plants continue to be browsed to the height of the individual browse protectors (Figure 11). Many of the shrubs in Phase III, both inside and outside of the fence have filled the capacity of the browse protector.
- Maintenance recommendations for planting areas based on site observations included: removal of individual protectors within the riparian protection fence, removal of select browse protectors outside of the riparian protection fence; repairs to the riparian protection fence; and removal of solarization fabric around the base of shrubs in Phase III Planting Unit 15 to allow better root growth and suckering.



Figure 6. Photograph showing red-osier dogwood in Phase I with flowers and fruits.



Figure 7. Photographs of naturally expanding sandbar willow and red-osier dogwood in Phase I as a result of installing the riparian protection fence.

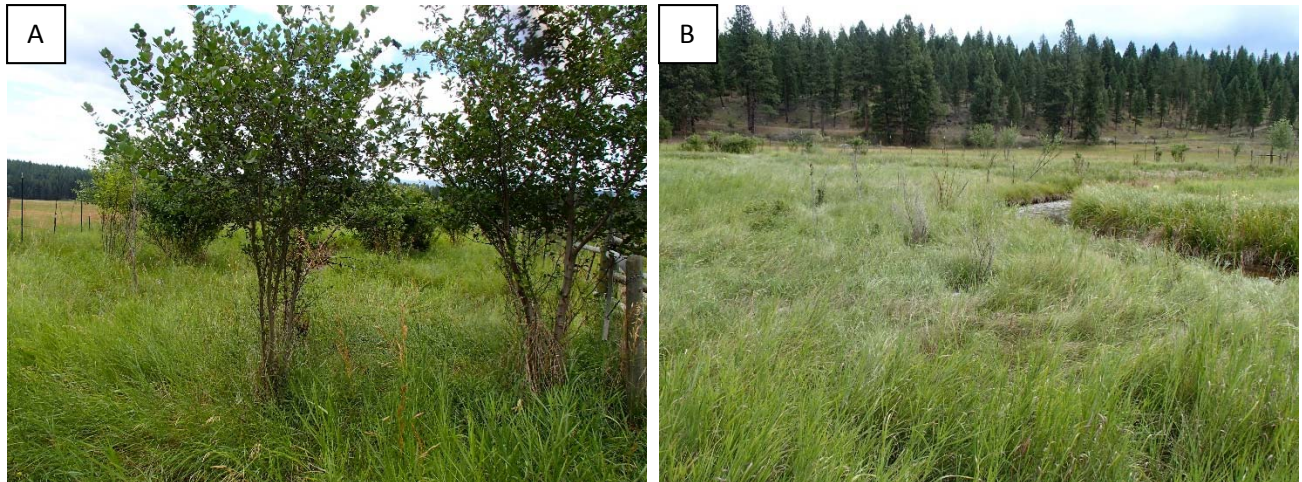


Figure 8. Photograph of variable survival in Phase I planting units, with high survival in Planting Unit 16 (A) and poor survival in Planting Unit 5 (B).



Figure 9. Photographs of Phase III planting units showing the difference in survival and growth between downstream (photograph left) and upstream (photograph right) units.



Figure 10. High survival and growth of shrubs planted in solarization Unit 15 in Phase III and poor survival of shrubs in .



Figure 11. Photographs showing shrubs in Phase I that have been released from individual browse protectors and are transitioning to a more natural growth form (top photographs). Some shrubs still have an umbrella shape but branches and foliage are beginning to grow along the entire length of stems and trunks. Lower branches on these shrubs continue to be browsed inside the riparian protection fence. Outside of the riparian protection fence, shrubs are still being browsed down to the height of the individual browse protectors (bottom left photograph). Unprotected plants outside of the protection have extensive browse (bottom right photograph).

Streambank Treatments

The following general observations of streambank treatments were made in 2015:

- Vegetated Soil Lift 2 is located within the riparian protection fence. This protection has reduced the amount of browse on the willows and in response willow height was significantly greater in 2015 compared to previous years and compared to Vegetated Soil Lift 1 which is located outside of the riparian protection fence (Figure 12).
- Both soil lifts provide well-rooted vegetation that provide bank stability, but the additional growth of willows on Vegetated Soil Lift 2 is providing very good cover for the stream and willows at this site are expanding into the floodplain (Figure 13).
- Surviving willow fascines showed increased growth due to the installation of the riparian protection fence (Figure 14). Dense herbaceous vegetation on the streambanks is limiting suckering and spread of willows into the floodplain.
- Willow growth has also increased on coir log structures (Figure 15). Some coir log structures had poor survival of willows for unclear reasons. In general however, the logs are still functioning to support the streambank and provide cover habitat (Figure 15). Dense herbaceous vegetation on the streambanks is limiting suckering and spread of willows into the floodplain.
- The woody debris habitat structures installed in the channel at the lower end of the project reach continue to provide cover for fish and numerous fish were observed in and around these structures. The structures also continue to influence groundwater elevations in the floodplain, but the effect is limited to the area just upstream of the structure.
- Based on site observations, no maintenance of existing streambank structures is required. The riparian protection fence is allowing for increased growth of willows installed in these structures.
- A few streambanks showed increased risk of accelerated bank erosion. In these areas, installation of coir logs were specified to increase woody vegetation on the bank. These locations are shown on the figure in Attachment B. Site 1 is located along Phase I Solarization Planting Unit 1. There was significant aggradation of the channel at this location in 2012 which led to localized bank erosion. There is also poor survival of planted shrubs at this location. Site 2 is located just downstream of Site 1 and was selected due to poor plant survival in Planting Unit 5. Site 3 is located along Phase I Solarization Planting Unit 2. This site was selected due to poor survival in the planting unit and localized bank erosion caused by loss of herbaceous vegetation on the bank.

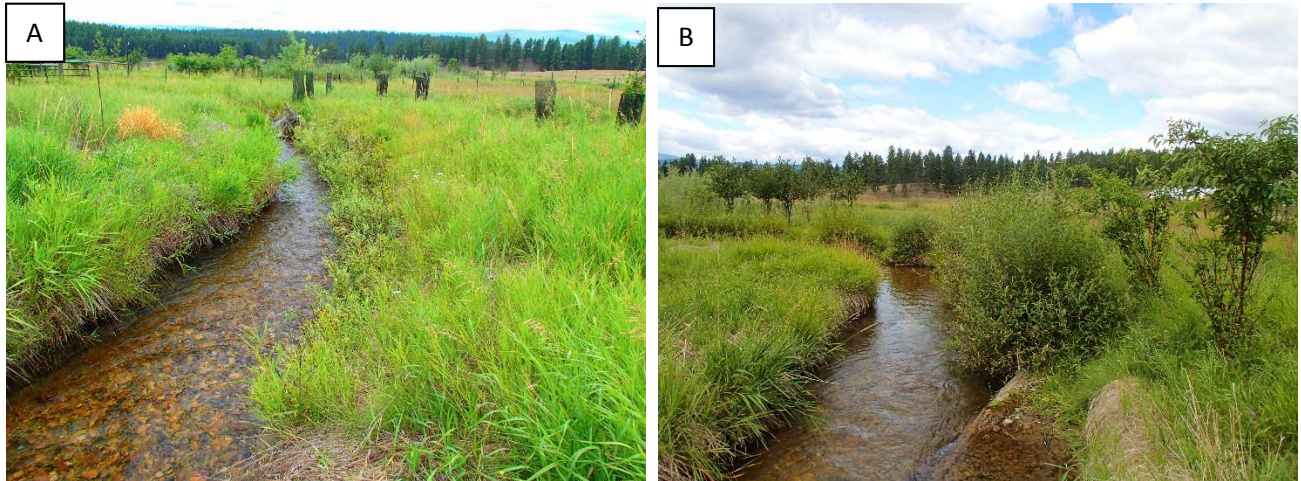


Figure 12. Photographs showing the difference between willow growth on VSL 1 (A) and VSL 2 (B). VSL 1 is located outside of the riparian protection fence and VSL 2 is located inside the riparian protection fence.



Figure 13. Vegetated Soil Lift 2 providing stream cover and shade.



Figure 14. Photographs of willow fascines installed in Phase I. Willows in many fascines grew significantly in 2015 due to the installation of the riparian protection fence and many of these structures are providing cover and shade for the stream.



Figure 15. Photographs of coir logs installed in Phase I. In some areas, coir logs have formed dense bands of willows along the stream creating diverse habitat. In other areas, where willow survival was poor, the coir logs help support undercut banks (bottom right photograph).

Overall Site Trends

The following general observations related to overall site trends were made in 2015:

- In general, conditions at the site were much drier than previous years. Early season high temperatures and lack of moisture resulted in drought conditions leading to plant stress. Many of the sedge dominated areas in the floodplain had areas of vegetation dieback in response to drought conditions (Figure 16).
- Although survival of planted shrubs and trees is variable, surviving shrubs continue to grow and expand at the site (Figure 17). Survival and growth seems to be affected by a number of things including: competition with non-native pasture grasses, variable soil conditions (numerous pockets of clay were encountered during planting which some species may not tolerate), variable hydrology conditions (too wet and too dry), variable weather conditions that affect site moisture and influence insect and parasite populations, browse and potential off-target damage from multiple years of herbicide application.

- Woody vegetation expansion is occurring primarily on the inside of meander bends where there may be better connection with the late season groundwater table. Also, vegetation expansion is occurring primarily in areas that were planted during channel construction in 2004 (i.e. where residual shrubs were protected). Phase I was not planted until 2007 so this may indicate that the Phase I and Phase III planting areas may begin to expand in the next few years.
- The dense cover of pasture grasses remains a limiting factor to woody vegetation expansion at the site. There is also a lack of natural flood disturbances at the site due to irrigation withdrawals. The competition and lack of natural flood disturbance will continue to play a major role in how quickly the site transitions towards the desired state of a mosaic of woody riparian vegetation and herbaceous wetland vegetation.
- The drainage ditch installed in the hayfield to the southeast of the project area continues to lower the water table in the hayfield resulting in a transition towards drier species (Figure 18). There was a noticeable shift towards drier vegetation in the vicinity of the ditch in 2015. Drought conditions also likely contributed to the observed shift in species composition. It is still unclear to what extent the drainage ditch may be affecting the hydrology of the floodplain and restored channel since much drier conditions were observed everywhere in the project area in 2015.



Figure 16. Photographs of sedge dominated vegetation communities within the project area where dieback of wetland vegetation was observed, likely in response to drought conditions that led to low streamflow and groundwater levels in 2015.



Figure 17. Diversity of vegetation at the upstream end of the project reach and wild turkeys observed in the riparian vegetation.



Figure 18. Drainage ditch in the hayfield southeast of the project area showing weeds colonizing the ditch and pasture grasses, rather than wetland species as the dominant vegetation adjacent to ditch.

Table 2. Summary of observations made at the site in 2015, decision pathway for making adaptive management decisions based on the results of observations, and recommended actions for each type of treatment.

Treatment ¹	Decision Pathway for Maintenance and Adaptive Management ²	2015 Site Observations	Adaptive Management, Completed Actions and Future Recommendations Based on Site Observations
<i>Residual Shrub Protection</i>	(1) If protected shrubs are greater than 3 feet above the height of the browse protector, browse protectors should be removed. If plants are less than 3 feet above the height of the browse protector, leave the protector in place. (2) If protected shrubs have filled greater than 80% of the capacity of the browse protectors, expand protector to accommodate growth. (3) If hedging of protected shrubs is occurring at the height of the browse protector, evaluate the effects on the health of the plant. If the plant appears healthy, no action is needed. If the plant appears stunted or otherwise unhealthy, additional measures for protection may need to be evaluated.	General observations of protected residual shrubs showed that the shrubs continue to grow and reproduce. Within the riparian enclosure fence, areas of residual shrub plantings have expanded and now occupy large areas of the inside meander bends.	In 2015, the remaining small enclosures located outside the riparian protection fence were moved to protect adjacent groups of residual shrubs showing signs of heavy browse. In 2016, residual shrub protection maintenance needs include: maintaining the riparian protection fence; continuing to remove any remaining individual protectors from within the fenced area and to repair, remove, install or expand browse protectors on residual shrubs as needed outside of the riparian protection fence.

Treatment ¹	Decision Pathway for Maintenance and Adaptive Management ²	2015 Site Observations	Adaptive Management, Completed Actions and Future Recommendations Based on Site Observations
<i>Containerized Planting</i>	(1) If survival of containerized shrubs in Phase III is greater than 80%, reduce the frequency of monitoring at the site. Continue to conduct annual maintenance site visits and implement necessary maintenance. (2) If survival is less than 80%, determine if additional irrigation or weed suppression measures are needed or if other site conditions are precluding growth (e.g. soils). If limitations to survival are identified, consider re-planting poor survival areas.	General observations of planting units indicate that survival is similar to previous years and may have decreased slightly in some units in Phase I and Phase III. Although the riparian protection fence has greatly reduced browse, browse and ungulate damage remain a limiting factor. The dense herbaceous understory is limiting reproduction of shrubs in some areas. There are a number of factors that likely contributed to low survival of planted shrubs and trees in some areas. Surviving shrubs are generally vigorous and many in Phase III have filled the capacity of the individual browse protectors.	In 2015, individual browse protectors were removed from the largest plants in the Phase III area. In 2016, containerized planting area maintenance needs include: maintaining the riparian protection fence; continuing to remove protectors from within the fenced area and to repair, remove, or expand protectors on shrubs as needed outside of the riparian protection fence.
<i>Solarization: Planted</i>	(1) If survival remains above 80%, reduce the frequency of monitoring at the site. Continue to conduct annual maintenance site visits and implement necessary maintenance. (2) If survival remains above 80% begin fabric removal around select shrubs in Phase I sites. Leave fabric installed in Phase III in place. (3) If survival drops below 80%, try to determine causes. Consider removing fabric and re-planting once causes are determined.	Survival in Phase III Plot 15 appears similar to the previous year. The solarization fabric has effectively killed the grass, but sediment deposition on the fabric has allowed colonization by reed canarygrass. The fabric seems to have promoted survival and growth of planted shrubs. A similar trend was observed after two years in both planted solarization plots in Phase I. Survival in both of the Phase I plots is now very low. In Plot 1, reed canarygrass and pasture grasses have recolonized the exposed substrate. In Plot 2, gravel deposition during the 2012 flood has	In 2015, patches of fabric were removed from around the base of plants in Phase III Unit 15 to prevent the downward trend in survival seen after two years of vigorous growth in planted solarization plots in Phase I. The newly exposed bare mineral soil was seeded with a native grass mix. Coir logs were installed along the streambank at both of the Phase 1 Plot 1 and Plot 2 locations to try to establish woody vegetation.

Treatment ¹	Decision Pathway for Maintenance and Adaptive Management ²	2015 Site Observations	Adaptive Management, Completed Actions and Future Recommendations Based on Site Observations
		allowed some woody species to colonize, but weeds are also colonizing this area.	In 2016, monitoring and maintenance needs include: assess the herbaceous cover in Phase III Plot 15 to determine effectiveness of seeding and ensure that undesirable species are not colonizing and dominating the site. Future actions could include re-planting Plot 1 in Phase I with containerized plants or willow cuttings. This site is now protected by the riparian protection fence which may improve woody plant survival and growth.
<i>Solarization: Temporary</i>	(1) If percent cover of seeded or other desirable species is greater than 70%, expand plots to treat additional area and continue to evaluate sites each year for maintenance needs. (2) If percent cover of seeded or other desirable species is less than 70% and undesirable species are not present or less than 10% total cover, re-seed with native species. Consider adding soil amendments such as compost or mulch if appropriate. (3) If percent cover of seeded or other desirable species is less than 70% and undesirable species are present and greater than 10% total cover, try to determine causes and consider re-	Based on general observations made in 2015, both undesirable and desirable species are present in all temporary solarization plots. Bluejoint reedgrass continues to be the dominant species in all plots, but pasture grass cover is increasing in Plot 2 and reed canarygrass cover is increasing in Plot 3. Cover of desirable vegetation still remains at 70% or higher in all plots. Willows that naturally colonized plot 1 were browsed but still alive. Survival of willow cuttings in Plot 2 and 3 was significantly less than in 2014, likely due to heavy browse. The small enclosure fences placed around these plots have collapsed and are not effectively protecting the willows.	In 2015, no additional actions were taken at these sites. In 2016, no additional monitoring is required. Future actions could include: selective herbicide treatment in plots 2 and 3 to prevent undesirable species from increasing; and installing additional willow cuttings or containerized plants in plots 2 and 3 with either individual protectors or 8 or 10-foot enclosures around each plot to protect the plants.

Treatment¹	Decision Pathway for Maintenance and Adaptive Management²	2015 Site Observations	Adaptive Management, Completed Actions and Future Recommendations Based on Site Observations
	treatment with solarization fabric or chemical control once causes have been identified.		
<i>Vegetated Soil Lift</i>	(1) If willow shoot height remains below 3 feet and overall percent cover is not increasing, apply chemical barriers to browse. (2) If willow shoot height is greater than 3 feet or density appears the same or increasing take no further action.	Based on general observations made in 2015, willow cover is near 100 percent on both soil lifts. Willows on VSL 2 (within the riparian protection fence) had limited browse and willow height increased significantly. VSL 1, located outside the riparian protection fence continued to be browsed suppressing willow height to less than 3 feet. Willows at both sites are providing bank stability and in-stream shade and cover.	In 2015, no additional actions were taken at these sites. In 2016, no monitoring or maintenance is required. No future actions are needed.
<i>Willow Fascines</i>	Take no further action.	Based on general observations made in 2015, the dense willow clumps created by willow fascines continue to grow and expand due to the increased protection from the riparian exclosure fence. Some fascines along the channel margins are providing shade and cover.	In 2015, no additional actions were taken at these sites. In 2016, no monitoring or maintenance of these structures is required. Future actions could include installing more fascines or willow stakes along the channel.
<i>Large Woody Debris Structures</i>	(1) If species composition adjacent to structures appears to have shifted, repeat transect monitoring to evaluate trend. (2) If species composition adjacent to structures appears not to	Based on general observations made in 2015, large woody debris structures are still providing good cover and habitat for fish and	In 2015, no additional actions were taken at these sites. In 2016, no monitoring or maintenance of these structures is required. Future actions

Treatment ¹	Decision Pathway for Maintenance and Adaptive Management ²	2015 Site Observations	Adaptive Management, Completed Actions and Future Recommendations Based on Site Observations
	have changed, continue to make annual visual observations of treatment effectiveness.	<p>providing local increases in the water surface around the structures during base flows.</p> <p>Wood structures are creating variable channel depths and increasing substrate diversity in the channel. Some willows have colonized deposition along channel margins, but they have not increased or expanded in the last three years likely due to the dense herbaceous cover in the floodplain.</p>	could include installing willow cuttings in the banks and sediment deposition in and around these structures or installation of additional habitat structures to increase cover and diversity.
<i>Coir Logs</i>	(1) If willow shoot height remains below 3 feet and overall percent cover is not increasing, apply chemical barriers to browse to allow willows to grow and become more resistant to browse. (2) If willow shoot height is greater than 3 feet or density appears the same or increasing take no further action.	Based on general observations made in 2015, willow cover continues to be variable overall due to variable survival of willow cuttings. Where willow cutting survival was good, willow height and cover increased due to increased protection from the riparian enclosure fence. Some sites have formed continuous dense bands of willows along the channel margin. Coir logs remain structurally intact and the channel is deepening below the logs at most sites.	<p>In 2015, 100 feet of additional coir logs were installed at three locations to increase bank stability and try to establish woody vegetation in these areas. Willow cuttings were installed behind the coir logs.</p> <p>In 2016, the effectiveness of the newly installed coir logs should be observed and any re-securing of logs or replanting of willows should be done if needed. Future actions could include installing supplemental willow cuttings behind the previously installed coir logs where cover is low. The presence of the riparian protection fence may increase the chances of these cuttings surviving.</p>

Treatment ¹	Decision Pathway for Maintenance and Adaptive Management ²	2015 Site Observations	Adaptive Management, Completed Actions and Future Recommendations Based on Site Observations
<i>Herbicide Application</i>	(1) If noxious weed infestations are documented, continue to treat infestations. (2) Continue to monitor for new infestations of Canada thistle, reed canarygrass, yellow toadflax, houndstongue, sulfur cinquefoil and any new weed species.	Herbicide applications have been effective at controlling most target species within the project area. Reed canarygrass is increasing slightly along the channel in Phase I, but isolated patches have generally been suppressed. Canada thistle still occurs sporadically throughout the project area. Thistle is still abundant in the hayfield and along the ditch adjacent to the project. These areas remain a threat to thistle re-invading the project area. Most of the small infestations of houndstongue have been controlled, although a few individual plants were observed in 2015. Common toadflax has increased and is expanding in the project area which is likely due the difficulty of locating the small plants during the late July treatment window used at the site.	In 2015, treated Canada thistle, houndstongue, yellow toadflax, and isolated patches of reed canarygrass at the site. Prior to any herbicide treatment in 2016, project partners should discuss the pros and cons of continuing to treat weeds with herbicide within the restoration area. There are no remaining infestations in the project area although weeds are sporadic throughout. The project area is very large so this leads to a very labor intensive effort to locate and treat weeds. Specific objectives related to weed control should be developed. A general recommendation for 2016 would be to only target the common toadflax infestation at the upstream end of the project reach, continue to treat isolated clumps or reed canarygrass and coordinate with the landowner to treat the thistle in the adjacent hayfield and ditch.

¹ See Attachment B for treatment locations, and see previous reports for descriptions of treatments.

² From 2010 Report Adaptive Management Recommendations section.

Summary of 2015 Activities

Weed Control Summary

Weed control was conducted by Mountain River Consulting in July, September, and October 2015. The following treatments were completed:

- Approximately 40 acres were treated between July 6 and July 13 using both a backpack and 4-wheeler. Weeds were treated within the project area and adjacent hayfield. The primary treated species were Canada thistle and reed canarygrass.
- Approximately 40 acres were treated between September 15 and October 12 using both a backpack and 4-wheeler. Weeds were treated within the project area and adjacent hayfield. The primary treated species were Canada thistle and common toadflax. Some reed canarygrass was also treated.

Guidance provided to the herbicide applicator along with spray records are included in Attachment A.

Maintenance Summary

Based on the observations made at the site, the following maintenance activities were completed by Jim Griffith in November 2015:

- The entire riparian protection fence was inspected and repairs were made at two locations where deer had torn the fence fabric and were accessing the project area.
- Additional fence fabric was installed at stream crossings to prevent deer from crawling under fence at low flows.
- Small exclosures were constructed around groups of residual shrubs at the upstream end of Phase I using recycled individual browse protectors.
- Solarization fabric was removed from around the base of plants in Planting Unit 15 in Phase III. Exposed mineral soil was seeded with a seed mix consisting of slender wheatgrass and fowl mannagrass.
- Approximately 640 square feet of bare soil left after herbicide kill of isolated clumps of reed canarygrass were seeded with slender wheatgrass and fowl mannagrass. The areas were first raked to remove dead plant material.
- Individual browse protectors were removed from the largest plants in Phase III. Approximately 175 protectors were removed from within the riparian protection fence and 30 outside the riparian protection fence. Removed browse protectors were left on site along the east side of the riparian protection fence.
- Vole protectors were also removed from large plants. Approximately 50 protectors were removed and disposed of.

Revegetation Treatment Summary

Based on the observations made at the site, the following revegetation treatments were completed by Jim Griffith in November 2015:

- Installation of 100 feet of coir logs at three locations in Phase 1 (Attachment B, Figure 19). Coir logs were installed by hand and securing using duckbill earth anchors.
- Three hundred willow cuttings were collected from mature willows located at the upstream end of the project area. Cuttings measured 3 to 4 feet in length and were approximately ½-inch in diameter. Cuttings were installed at one foot spacing behind the coir logs, extending into the bank below the existing herbaceous sod mat.

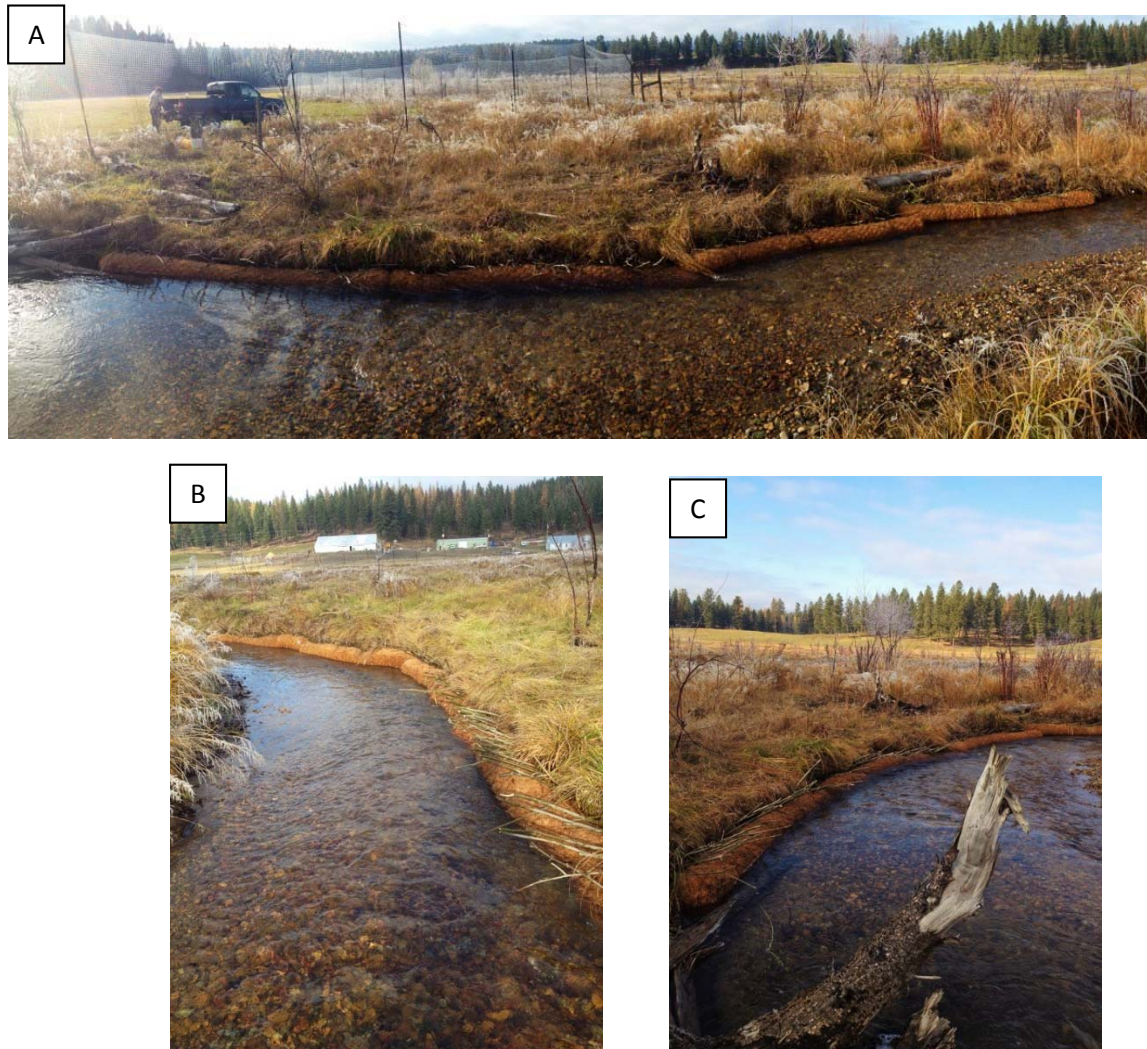


Figure 19. Photographs showing the 2015 coir log sites immediately after installation in November 2015. Photograph A is Coir Log Site 1. Photograph B is Coir Log Site 2. Photograph C is Coir Log Site 3.

Future Project Needs

This section summarizes recommendations for continued monitoring, maintenance and revegetation activities at the Therriault Creek restoration project site. The Therriault Creek project has been monitored since 2008 and monitoring results and general observations indicate that the project is moving toward meeting goals and objectives (Table 2, Geum Environmental Consulting 2014). The streambanks have woody vegetation that is providing cover for the stream, habitat for birds and small mammals, and promoting the development of a native riparian vegetation community. The site is generally converting to a higher percentage of wetland plants and planted shrubs and trees continue to grow and expand. Observations of wildlife use in the project area continue to increase each year. Pasture grasses and a lack of natural flood disturbance continue to influence the rate of woody vegetation expansion, but treatment to address those issues at a large-scale would be expensive and not justifiable. The site will continue to transition to desired vegetation over time. Below is a summary of future project needs:

- Most treatments have been in place for a number of years and no longer require maintenance or annual monitoring. Newer treatments, such as those installed in Phase III, coir logs installed in 2015 and the riparian protection fence may still require some annual maintenance.
- Continued weed control should be discussed with project partners and specific weed control criteria developed. In general, weed control within the project area should be reduced to more selective application and a lower frequency. Within the project area, weed cover is very low. Spot spraying of common toadflax in the upper end of the project area should be done if the application can be timed specifically to target this species. It is very important that weed control in the adjacent hayfield is coordinated with the landowner to ensure that the existing Canada thistle infestations do not expand and repopulate the project area.
- The riparian protection fence should continue to be inspected following snow-melt each year. Anticipated maintenance needs include: repairing any tears or sagging of the fence fabric and re-enforcing any locations where deer may find access through the fence
- All individual browse protectors that remain within the riparian protection fence should be removed to prevent damage to expanding shrubs.
- Coir logs installed in 2015 should be inspected and necessary repairs made or additional willow cuttings added as necessary.
- Individual browse protectors should be removed from shrubs outside the riparian protection fence if the shrub has completely filled the capacity of the browse protector.
- Management options that will create a more natural hydrograph through the project reach should be considered.
- Coordination with the landowner should occur to ensure that the hayfield drainage ditch is filled or fit with an outlet control structure to ensure no further drawdown of the water table in the project area occurs.

Reference Documents

Geum Environmental Consulting, Inc. 2007a. Therriault Creek Riparian Revegetation Plan. Internal report prepared for Kootenai River Network, Libby, Montana.

Geum Environmental Consulting, Inc. 2007b. Therriault Creek Revegetation Plan Implementation Report. Internal report prepared for Montana Fish, Wildlife and Parks, Libby, Montana. Contract #080067.

Geum Environmental Consulting, Inc. 2008. Therriault Creek Riparian Revegetation Monitoring Report Contract #0803. Internal Report prepared for Kootenai River Network, Libby, Montana.

Geum Environmental Consulting, Inc. 2009. Therriault Creek Riparian Revegetation Maintenance and Monitoring 2009 Report Contract #0709. Internal Report prepared for Kootenai River Network, Libby, Montana.

Geum Environmental Consulting, Inc. 2010. Therriault Creek Riparian Revegetation Maintenance and Monitoring 2010 Report Contract #110032. Internal Report prepared for Montana Fish, Wildlife and Parks, Libby Montana.

Geum Environmental Consulting, Inc. 2011. Therriault Creek Riparian Revegetation Maintenance and Monitoring 2011 Report Contract #12001. Internal Report prepared for Montana Fish, Wildlife and Parks, Libby Montana.

Geum Environmental Consulting, Inc. 2012. Therriault Creek Riparian Revegetation Maintenance and Monitoring 2012 Report Contract #130013. Internal Report prepared for Montana Fish, Wildlife and Parks, Libby Montana.

Geum Environmental Consulting, Inc. 2013. Therriault Creek Riparian Revegetation 2013 Monitoring and Maintenance Report Contract #140025. Internal Report prepared for Montana Fish, Wildlife and Parks, Libby Montana.

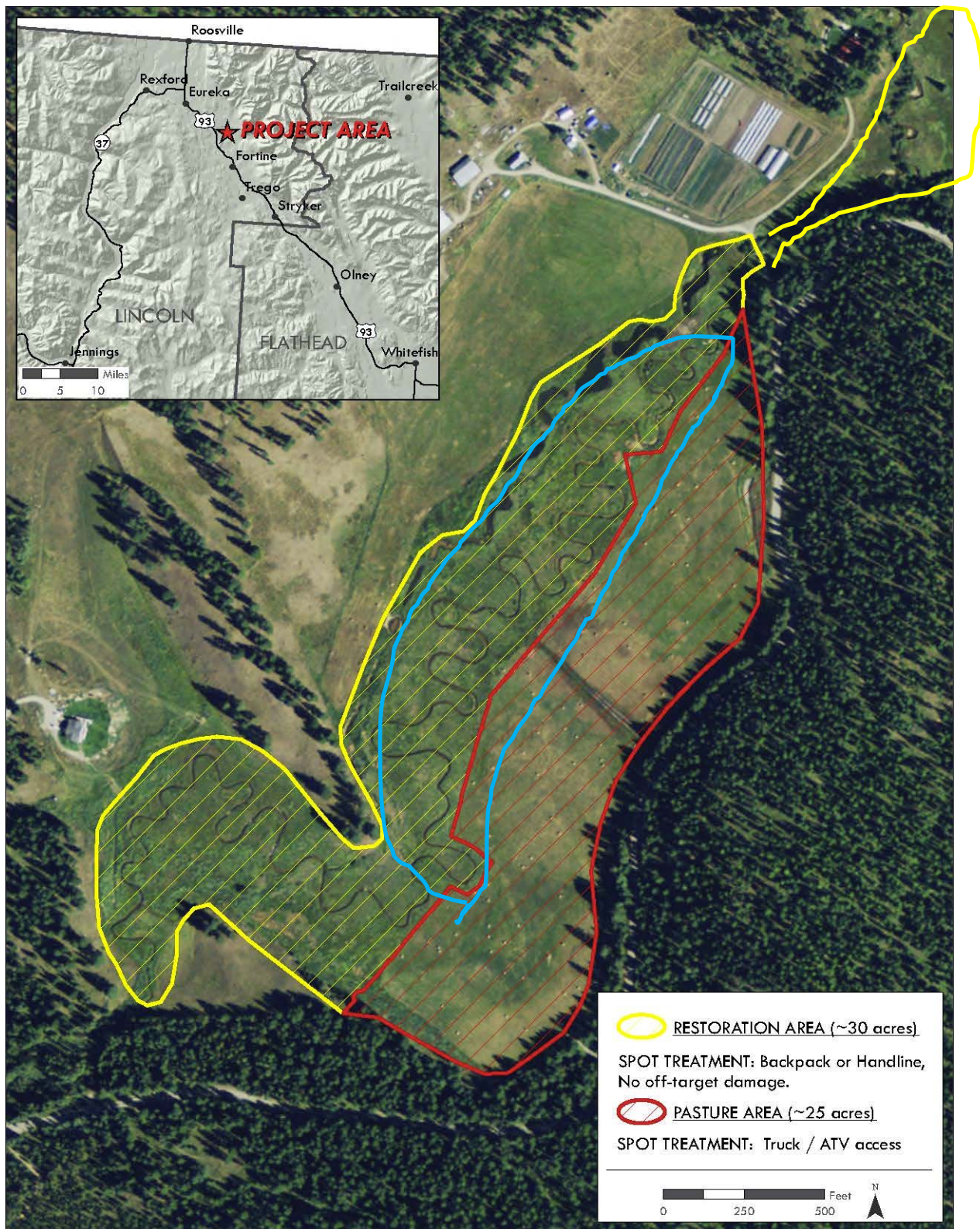
Attachment A: Weed Control Guidance and Spray Records

Weed Control Guidance Provided to Herbicide Applicator

Implement weed treatments targeting Canada thistle, yellow toadflax, houndstongue, oxeye daisy, sulfur cinquefoil, other noxious weeds as identified, and discrete patches of reed canarygrass within the Therriault Creek Restoration Project area and hay field and ditch east of the project area. Canada thistle is the primary target species. Attachment C shows the locations of weed treatment areas. There are two general areas: Riparian Restoration Area (approximately 30 acres) and Hay Pasture (approximately 25 acres). Within the Riparian Restoration Area, only backpack or hand line application is permitted to prevent off-target damage to planted shrubs and trees. Attachment D shows the location of restoration treatments and planting units. Great care should be taken when spraying in and around treatment areas. Within the Hay Pasture, where no restoration work has occurred, broader application is permitted. Within the Hay Pasture area only the large infestation of thistle near the middle of the area, the infestation along the ditch near the road, and a buffer along the riparian restoration area fence should be targeted. Treating all weeds within the Riparian Restoration Area is the highest priority and as budget allows, treatment should occur within the Hay Pasture. Broadleaf noxious weeds and patches of reed canarygrass shall be targeted as soon as possible. Attachment C shows the location within the Riparian Restoration Area where isolated reed canarygrass clumps should be treated. Avoid treatment where it occurs immediately on the streambanks. If conditions in July do not allow for effective treatment, follow up applications should occur during the re-green in the fall as budget allows.

A copy of the Bonneville Power Administration (BPA) HIP III Herbicide Handbook was provided to the contractor via e-mail on 6/25/2015.

Attachment C: Areas for 2015 Weed Treatment. Blue circled area indicates the portion of the Restoration Area where isolated clumps of reed canarygrass should be treated.



Daily Herbicide Application Record - Spring 2015

Applicator			Customer Information			
Mountain River Consulting			Name:	Vredenburg Property		
Todd Butts			Address:	Therriault Creek		
P.O. Box 84			City:	Eureka		
Trego, MT 59934			Phone:	Contact - Geum		
(406) 882-4752			Address of Application:	Same		
Applicator License # 104007-12			County:	Lincoln	Flathead	Other:
Site: Pasture/range			Roadside	Timberland	Other	
Equipment Used:			Backpack	4-wheeler	Rhino	
Date of Application			7/6 thru 7/13	Temp	Wind Spd	
Time Start:				Time End;	Wind: SW	
Chemicals Used in Application			Other			
Trade Name	E-2	Milestone	Basecamp	Transline	Metcel	Veng
Manufacturer		Dow	Wilbur-E	Dow	Agsurf	Plus
EPA regis #	627-19-6	62719-519	71368-1-2935	62719-259	352-439-85588	
Oz per Acre	48oz/ac	4-5-6-7	1pt - 2pts	8-16-24-32	1	32oz/ac
Gal of water/ac	20	20	20	20	20	
Surfactant	Syltact 4oz	Syltac 4oz	Syltac 4oz	Syltac 4oz		Syltac
	Bronc Max 12oz/ac	Accord 32oz/ac + MSO 12oz/ac + Bronc 12oz				
Total chemical used:			108 gallons			
Area/Acres/Miles Treated:			40 acres			
Main Pest/Weed treated for:			Canadian Thistle & Reed Canary Grass			
Comments:			7/6: Treated enclosure & pasture for weeds, mostly C. Thistle & RCG.			
50 gallons Transline/Base Mix + 8 gallons Accord. 45-70F Wind 0-5mph, East.						
7/10: Treated RCG & weeds on the downstream end of the enclosure & above bridge.						
20 gal Accord, 5 gal Transline/Base. 65-80F, Wind 3-10mph East.						
7/13: Treated weeds on the ditch bank and RCG on the far downstream end of the enclosure						
20 gallon Accord, 5 gallon Transline/Base. 60-80F Wind 0-5mph SW.						

Daily Herbicide Application Record

Applicator		Customer Information				
Mountain River Consulting		Name:	Vredenburg Property			
Todd Butts		Address:	Therriault Creek			
P.O. Box 84		City:	Eureka			
Trego, MT 59934		Phone:	Contact - Geum			
(406) 882-4752		Address of Application:	Same			
Applicator License # 104007-12		County:	Lincoln	Flathead	Other:	
Site: Pasture/range		Roadside	Timberland	Other		
Equipment Used:	Backpack	4-wheeler	Rhino			
Date of Application	9/15 thru 10/12	Temp		Wind Spd		
Time Start:		Time End:		Wind:	SW	
Chemicals Used in Application						Other
Trade Name	E-2	Milestone	Basecamp	Transline	Metcel	Veng
Manufacturer		Dow	Wilbur-E	Dow	Agsurf	Plus
EPA regis #	627-19-6	62719-519	71368-1-2935	62719-259	352-439-85588	
Oz per Acre	48oz/ac	4-5-6-7	1pt - 2pts	8-16-24-32	1	32oz/ac
Gal of water/ac	20	20	20	20	20	
Surfactant	Syltact 4oz	Syltact 4oz	Syltact 4oz	Syltact 4oz		Syltact
Bronc Max 12oz/ac		Accord 32oz/ac + MSO 12oz/ac + Bronc 12oz				
Total chemical used:	85 gallons					
Area/Acres/Miles Treated:	40 acres					
Main Pest/Weed treated for:	Variety					
Comments:	9/15: Treated exclosure for weeds (mostly C. Thistle & Y. Toadflax)					
12 gallons Vengeance Plus + 8 gallons Accord. 45-60F Wind 0-5mph, East.						
9/28: Treated RCG on the downstream end of the exclosure and weeds upstream from the						
bridge. 40-55F, Wind 3-7mph NW. 20 gallons Accord + MSO.						
10/12: Treated weeds in the pasture and ditch bank, and made one more pass for weeds						
in the exclosure. 40-50F Wind 2-5mph SW. 45 gallons E-2 + Syltact + Bronc Max						

Attachment B: Overview of Revegetation Treatments

