APPENDIX A

SUGARBERRY RIPARIAN MANAGEMENT OBJECTIVES ANALYSIS

In accordance with Appendix L of the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Final Environmental Impact Statement (FEIS), the Sugarberry Interdisciplinary (ID) Team determined whether proposed treatments could enhance Riparian Habitat Conservation Area (RHCA) conditions. The ID team determined that all of the Riparian Management Objectives (RMOs) described in Appendix L would be met, and that the quality of riparian ecosystem function and condition would be improved or at least not degraded for each of the proposed treatments that would occur within RHCAs in the Sugarberry project area. In some instances, there might be short- or medium-term adverse impacts on one or more RMOs, but the anticipated improvement in quality with respect to other RMOs substantially outweighed any perceived short-term adverse impacts. Details of how each project phase would affect each RMO are listed below. The project areas with potential impacts in RHCAs are:

1. Aspen stand enhancement (would occur primarily in RHCAs)
2. Aquatic and riparian ecosystem restoration
   - *Hydraulic mine site restoration*
   - *Meadow restoration*
   - *Stream crossing improvements*
   - *Streambank stability enhancement*
3. Fuel break construction (DFPZ)
   - *Hand cutting and hand piling of trees and/or shrubs, and pile burning*
   - *Mastication*
   - *Underburning*
4. Road decommissioning (unclassified road obliteration or rehabilitation)
5. Group selection and individual tree selection harvest
6. Road construction/reconstruction

Riparian Management Objectives and Potential Effects

1) Maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems. Water quality parameters that apply to these ecosystems include timing, and character of temperature, sediment, and nutrients.

Sediment: The objective is to maintain or restore erosion and sediment regimes that are within the natural range of variability and contribute to long-term water quality maintenance.

Aspen stand enhancement: No effect. Helicopter yarding and selective mark would ensure that sedimentation would be minimized. The literature supports good post-treatment water quality and low sediment loads in treated aspen stands (Shepperd et al. 2006). Studies have shown that aspen helps increase soils' Available Water Holding Capacity (AWC); that soil cover is very high in aspen stands; and that erosion rates and suspended sediment concentrations are low in streams in treated aspen stands.

Hydraulic mine site restoration: Beneficial effect. One primary objective of mine site restoration is to capture sediment from eroding pit faces and drainage diversions, in order to reduce effects of erosion and sedimentation on water quality and aquatic habitat. Short-term sediment generation would be minimized by performing work during the dry season and installing appropriate erosion controls (BMPs – see Appendix B).

Meadow restoration: Beneficial effect. Meadow restoration would involve installation of erosion control structures to capture sediment and prevent further meadow incision and erosion. Short-term sediment generation would be minimized by performing work during the dry season and installing appropriate erosion controls (BMPs).

Stream crossing improvements: Beneficial effect. Crossing improvements would be designed to replace failing or inadequate existing structures, preventing further erosion of compromised crossings. New crossings would be designed to pass the 100-year flood flow, and prevent catastrophic erosion that would occur in the event of failure as well as chronic erosion from drainage diversion. Short-term sediment generation would be minimized by performing work during the dry season and installing appropriate erosion controls (BMPs).

Streambank stability enhancement: Beneficial effect. Streambank stabilization projects would be designed to control eroding banks by installing erosion control structures and materials, and revegetating bare soil areas. Short-term sediment generation would be minimized by performing work during the dry season and installing appropriate erosion controls (BMPs).

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No effect. Hand cutting would cause minimal ground disturbance. Sufficient larger vegetation would be left to provide root strength. Hand piles would be situated an adequate distance from stream channels and wetlands to prevent localized erosion impacts. Firelines would be constructed and ignition would occur under appropriate fire weather conditions to prevent spread of fire throughout the RHCA.

Mastication: No effect. Mastication would only occur in RHCAs in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. BMPs would prevent soil disturbance from impacting the channels.

Underburning: No effect. Firelines would be constructed and ignition would occur under appropriate fire weather conditions to prevent spread of fire throughout the RHCA. Ignition would occur outside of RHCAs with backing fire prevailing, unless conditions require secondary ignition in RHCAs. If there is a need to reduce fuel loads conditions prior to underburn treatments, hand treatment would be used.

Road decommissioning: Beneficial effect. Most road decommissioning would treat short unclassified spurs well-removed from RHCAs, but would help improve overall watershed condition. Roads in riparian areas near Onion Creek Meadow are eroding and affecting stream channels. Road decommissioning in this area would be designed to alleviate this chronic sediment source, by removing culverts, re-contouring, sub-soiling, seeding and/or reforesting existing roadbeds. This would decrease compaction, increase percolation into roadbeds, increase soil stability and limit concentrated flow as well as surface erosion derived from roads. Short-term sediment generation would be minimized by performing work during the dry season and installing appropriate erosion controls (BMPs).

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Any temporary road construction that would cross RHCAs would meet all applicable erosion control requirements (BMPs), and all temporary roads would be closed or obliterated when the project is complete.

Road construction/reconstruction: No or slight beneficial effect. Minimal new road construction is proposed, and would occupy existing roadbeds. All construction or reconstruction would meet all applicable erosion control requirements (BMPs). Road surfaces and crossings that are improved as a result of the project would have better drainage and cause less road surface and cut-and-fill slope erosion.

Temperature: The objective is to maintain microclimate within RHCAs.

Aspen stand enhancement: Long-term beneficial effect. Removal of conifers would increase stream temperatures in the short term, but as aspen responds, the increased canopy would provide greater shading during the summer when stream temperature regulation is critical. (Shepperd et al. 2006).

Hydraulic mine site restoration: Beneficial or no effect. Impoundment of water in off-channel sediment ponds may slightly increase system temperatures, but revegetation of the site would provide increased shade and offset any minor temperature increases.

Meadow restoration: No effect. Removal of conifers in some areas may decrease shade, but revegetation of areas of bare ground with riparian forbs and shrubs would increase evapotranspiration and help regulate temperature.

Stream crossing improvements: No effect.

Streambank stability enhancement: Beneficial effect. Revegetation of denuded banks would provide increased shade.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No effect. Sufficient vegetative cover would be retained so that shading near the channel is not significantly reduced.

Mastication: No effect. Mastication would only occur in RHCAs in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. These areas do not contribute to flows during the summer when stream temperature regulation is critical.

Underburning: No effect. Sufficient vegetative cover would be retained so that shading near the channel is not significantly reduced.

Road decommissioning: Beneficial effect. Road surfaces and cut-and-fill slopes obliterated in near-stream sensitive areas would revegetate naturally or be seeded, regenerating canopy cover in the long term, providing shade and enhancing thermal regulation.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Minimal vegetation would be removed for any temporary road construction that would cross RHCAs, and all temporary roads would be closed or obliterated when the project is complete. Revegetation would occur as necessary.

Road construction/reconstruction: No effect. Minimal new road construction is proposed, and would occupy existing roadbeds. Any cut-and-fill associated with new or improved crossings would be revegetated as necessary.

Nutrients: The objective is to restore or maintain levels of organic nutrients and nutrient cycles that are within the natural range of variability and contribute to maintaining ecosystem diversity and function.

Aspen stand enhancement: Long-term beneficial effect. Removal of conifers would reduce nutrient inputs from needle-cast and woody debris input in the short term, but as aspen responds, deciduous leaf fall would provide equal or greater nutrient input over the long term.

Hydraulic mine site restoration: Beneficial effect. Revegetation of the site would provide increased organic input as trees mature. Organic debris may be imported to provide initial soil nutrients in areas deficient in soil or vegetative cover.

Meadow restoration: Beneficial effect. Removal of conifers in some areas would reduce nutrient inputs from needle-cast and woody debris input in the short term, but revegetation of denuded areas would provide increased organic input as the riparian meadow community increases in vigor.

Stream crossing improvements: No effect.

Streambank stability enhancement: Beneficial effect. Revegetated banks would provide increased organic input with time.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No effect. Nitrogen and other nutrients may be removed from the system temporarily, but burned materials would release nutrients to the soil and streambanks as they decompose.

Mastication: Beneficial or no effect. Mastication would only occur in RHCAs in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. As masticated materials decompose, they would add nutrients to the soil and streambanks.

Underburning: No effect. Nitrogen and other nutrients may be removed from the system temporarily, but burned materials would release nutrients to the soil and streambanks as they decompose.

Road decommissioning: Beneficial effect. Revegetated road surfaces would provide a more complete nutrient cycle as revegetation proceeds.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Minimal vegetation would be removed for any temporary road construction that would cross RHCAs. Re-invigorated growth where openings are created would renew nutrient cycling rapidly. Mitigations and contract clauses would be enforced to maintain effective soil cover. Retention of effective soil cover would reduce the potential for soil erosion and loss of nutrients during runoff events.

Road construction/reconstruction: No effect. Minimal new road construction is proposed, and would occupy existing roadbeds. Any cut-and-fill associated with new or improved crossings would be revegetated as necessary, and nutrient losses would be renewed rapidly as new growth occurs. Mitigations and contract clauses would be enforced to maintain effective soil cover. Retention of effective soil cover would reduce the potential for soil erosion and loss of nutrients during runoff events.

2) Maintain or restore the stream channel integrity, channel processes, and sediment regime under which the riparian and aquatic ecosystems developed. Elements of the sediment regime include the timing, volume, and character of sediment input and transport.

Aspen stand enhancement: Beneficial or no effect. As the aspen (upland) component of the riparian complex recovers, the water balance and ecosystem structure and function that help determine channel processes and sediment regime should likewise trend favorably with respect to this ecological community.

Hydraulic mine site restoration: Beneficial effect. Restoration of diverted drainage to stream channels and impoundment of eroded sediments would help restore natural channel processes and reduce sedimentation of streambeds.

Meadow restoration: Beneficial effect. Restoration of denuded and incised meadow surfaces and channels would reduce erosion and sedimentation and help maintain meadow riparian structure and function.

Stream crossing improvements: Beneficial effect. Replacement or repair of inadequate or failing stream crossing structures would reduce chronic erosion, reduce the likelihood of catastrophic failure, and reduce sedimentation of streambeds, thereby reducing the chronic risk of cumulative effects at degraded stream crossings.

Streambank stability enhancement: Beneficial effect. Revegetation of denuded and eroding banks would increase bank stability, reduce erosion and help restore proper stream function and condition.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No effect. Enforcement of mitigations would ensure that erosion and denudation of RHCAs is prevented.

Mastication: No effect. Mastication would only occur in RHCAs in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. BMPs would prevent soil disturbance from impacting the channels.

Underburning: No effect. BMPs and other mitigations would prevent soil disturbance from impacting the channels.

Road decommissioning: Beneficial effect. Removal of road influences on riparian areas would alleviate flow concentration and erosion that is disrupting and adversely affecting stream channel dynamics.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Mitigations and subsequent closure of temporary roads that cross RHCAs would prevent adverse effects to stream channel function and condition. Slope restrictions for mechanical activities would help ensure that sediment is not transferred from upland areas to channels.

Road construction/reconstruction: No effect. Minimal new road construction is proposed, and would occupy existing roadbeds. BMPs for road construction practices would prevent erosion and sedimentation and negate any potential impacts to stream channel function and condition.

3) Maintain or restore in-stream flow to support desired riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges.

Aspen stand enhancement: Beneficial effect. Conifer removal would reduce evapotranspiration, elevating water tables and helping to increase the duration and magnitude of stream flows influenced by the wetland-riparian complex. As the aspen ecological type is restored, the enhanced riparian community would continue to support stable functional wetlands and channels.

Hydraulic mine site restoration: Beneficial effect. Restoration of diverted drainage to stream channels and revegetation of riparian areas would enhance stream channel stability and function.

Meadow restoration: Beneficial effect. Restoration of denuded and incised meadow surfaces and channels would help stabilize channels and restore the wetland-floodplain function of meadow surfaces. Conifer removal would reduce evapotranspiration, elevating water tables and helping to increase the duration and magnitude of stream flows associated with the meadow riparian community.

Stream crossing improvements: Beneficial effect. Replacement or repair of inadequate or failing stream crossing structures would reduce the incidence of drainage diversion and streambank erosion, and provide increased capacity for flood flow passage.

Streambank stability enhancement: Beneficial effect. Revegetation of denuded and eroding banks would increase bank stability and increase channel roughness, fostering dynamic equilibrium for a variety of flow regimes and restoring proper stream function and condition.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No effect. Enforcement of mitigations would prevent detrimental effects to channels and effects to channel flow.

Mastication: No effect. Mastication in RHCAs would only occur in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. The proposed activities would not impede snowmelt runoff.

Underburning: No effect. BMPs and other mitigations would prevent vegetation manipulation from adversely affecting channel condition and streamflow. Vegetation removal may temporarily enhance near-stream water tables and increase streamflow.

Road decommissioning: Beneficial effect. Removal of road influences on riparian areas would alleviate flow concentration, promote infiltration, and help restore natural hydrologic cycles and flow regimes.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Mitigations and subsequent closure of temporary roads that cross RHCAs would prevent adverse effects to stream channel function and condition.

Road construction/reconstruction: No or slight beneficial effect. Minimal new road construction is proposed, and would occupy existing roadbeds. BMPs for road construction practices would prevent erosion and sedimentation and negate any potential impacts to stream channel function and condition. Correction of road surface and drainage structure problems would alleviate flow concentration and help restore natural hydrologic cycles and flow regimes.

4) Maintain or restore the natural timing and variability of the water table elevation in meadows and wetlands.

Aspen stand enhancement: Beneficial effect. Conifer removal would reduce evapotranspiration, elevating water tables and enhancing the wetland-riparian complex. As the aspen ecological type is restored, the enhanced riparian community would continue to support stable functional wetlands.

Hydraulic mine site restoration: Beneficial effect. Restoration of diverted drainage to stream channels, off-channel impoundment of runoff and revegetation of riparian areas would restore natural variability to water table elevations and enhance wetland characteristics.

Meadow restoration: Beneficial effect. Restoration of denuded and incised meadow surfaces and channels would help stabilize channels, prevent dewatering of meadow surfaces and restore their wetland character.

Stream crossing improvements: No or slight beneficial effect. Replacement or repair of inadequate or failing stream crossing structures would reduce the erosion at crossings, which may help prevent erosion of near-stream riparian wetlands.

Streambank stability enhancement: Beneficial effect. Revegetation of denuded and eroding banks would increase bank stability and help prevent headward erosion or lateral migration of channels, which may affect water table elevations of upstream wetlands.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No effect. Vegetation removal may have a minor short-term impact on water tables in streamside RHCAs, but not outside the range of natural variability.

Mastication: No effect. Mastication in RHCAs would only occur in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. There may be a short-term increase in

downstream water table elevations during the short seasonal period when these channels are flowing.

Underburning: No effect. Vegetation removal may temporarily enhance near-stream water tables and increase streamflow, but not outside the range of natural variability.

Road decommissioning: No to slight beneficial effect. Removal of road influences on riparian areas would promote infiltration, reducing rapid surface runoff and slightly enhancing water table elevations.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Loss of evapotranspiration would slightly elevate water tables in the short term, but not outside the range of natural variability.

Road construction/reconstruction: No effect. Minimal new road construction is proposed, and would occupy existing roadbeds. Changes in compacted surface area would be minor and would not cause significant changes in water table elevations.

5) Maintain or restore the diversity and productive nature of native and desired non-native plant communities in the riparian zone.

Aspen stand enhancement: Beneficial effect. Conifer removal would stimulate aspen regeneration, with the objective of restoring the historic extent and vigor of this species and the associated riparian ecological complex.

Hydraulic mine site restoration: Beneficial effect. Restoration of diverted drainage to stream channels, off-channel impoundment of runoff and revegetation of riparian areas would be performed with the objective of restoring a riparian wetland community on these highly altered sites.

Meadow restoration: Beneficial effect. Conifer removal and restoration of denuded and incised meadow surfaces and channels would reverse dewatering of meadow surfaces and allow riparian and wetland plant communities to expand and increase in vigor and complexity.

Stream crossing improvements: No or slight beneficial effect. Any new cut-and-fill associated with upgraded stream crossings would be revegetated with local native vegetation as necessary.

Streambank stability enhancement: Beneficial effect. Denuded and eroding banks would be revegetated with local native vegetation to enhance bank stability and the riparian plant community.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No or slight beneficial effect. Removal of crowded small trees and brush may promote the reinvigoration of streamside riparian vegetation.

Mastication: No effect. Mastication in RHCAs would only occur in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush.

Underburning: No or slight beneficial effect. Reduction in vegetation density may promote the reinvigoration of streamside riparian vegetation.

Road decommissioning: Beneficial effect. Removal of road surfaces in riparian areas would reduce the area of compacted soils, promoting riparian plant community productivity.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. The possibility of noxious weed introduction to newly created opening exists, but upland species would be the major concern.

Road construction/reconstruction: No effect. Minimal new road construction is proposed, and would occupy existing roadbeds. Any stream crossing clearing would be minimal, and would be revegetated with native species as necessary.

6) Maintain or restore riparian vegetation to provide an amount and distribution of large woody debris characteristics of natural aquatic riparian ecosystems.

Aspen stand enhancement: Short-term slight adverse to no effect, long-term beneficial effect.. Conifer removal would reduce the amount of large woody debris available for recruitment; however, with the exception of one streamside unit (SBA-5), none of the proposed treatment areas are in a landscape position to provide wood for in-stream habitat structure. Units would be marked by the IDT in order to preserve trees necessary for ecological functions such as woody debris recruitment. In the long term, aspen regeneration would provide woody debris that is naturally characteristic of the aspen riparian ecological complex.

Hydraulic mine site restoration: Beneficial effect. Restoration of riparian vegetation communities to these highly altered sites would increase the amount of available organic matter in various size classes. Trees would be planted and nurtured in upland areas that in the long term would provide large woody debris input.

Meadow restoration: No effect. Conifer removal would reduce the large woody debris input to these systems; however, large wood is not a natural characteristic of meadow ecological types.

Stream crossing improvements: No or slight beneficial effect. Few if any large trees would be removed to improve stream crossings. Where possible, crossings would be enlarged to improve flood flow capacity, allowing larger wood to pass through or over the top of crossing structures.

Streambank stability enhancement: No or slight beneficial effect. Denuded and eroding banks would be stabilized, reducing the possibility that lateral channel migration would topple trees.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No or slight beneficial effect. Removal of crowded small trees and brush may promote more rapid growth of larger forest trees, enhancing the size class of wood available for recruitment.

Mastication: No effect. Mastication in RHCAs would only occur in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. Removal of crowded small trees and brush could promote more rapid growth of larger forest trees, enhancing the size class of wood available for recruitment. However, it is probably uncommon that large trees are transported from these areas to portions of the channel system where they would provide suitable aquatic habitat structure.

Underburning: No or slight beneficial effect. Reduction in vegetation density may promote more rapid growth of larger forest trees, enhancing the size class of wood available for recruitment.

Road decommissioning: No to slight beneficial effect. Removal of road surfaces in riparian areas would reduce the area of compacted soils, promoting riparian plant community productivity. However, the impact on large tree growth and availability for recruitment would likely be minimal, except that competition would be slightly reduced.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Because the RHCAs are designed to span site potential tree heights, activities in upland areas would not impact wood availability in riparian areas.

Road construction/reconstruction: No effect. Minimal new road construction is proposed and would occupy existing roadbeds.. Any stream crossing clearing would be minimal, and few if any large trees would be removed during crossing construction or upgrades.

7) Maintain or restore habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian plant communities.

Aspen stand enhancement: Beneficial effect. Aspen regeneration would enhance the viability of this locally rare and regionally declining ecological complex, the riparian-upland vegetation community and associated species.

Hydraulic mine site restoration: Beneficial effect. Restoration of riparian vegetation communities to these highly altered sites would increase available habitat for riparian-associated species.

Meadow restoration: Beneficial effect. Restoration of dewatered meadow surfaces and incised channels would enhance habitat for wetland and riparian-associated species.

Stream crossing improvements: Beneficial effect. Restoration of degraded crossings would allow organisms to pass through crossing structures, and prevent erosion that locally degrades habitat for riparian and aquatic species.

Streambank stability enhancement: Beneficial effect. Denuded and eroding banks would be revegetated with local native vegetation to enhance bank stability, the riparian plant community and associated species.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: Beneficial effect. Removal of crowded small trees and brush may promote the reinvigoration of streamside riparian vegetation and associated species. Firelines would be constructed and ignition would occur under appropriate fire weather conditions to prevent fire from spreading throughout the RHCA and damaging riparian ecological communities. Appropriate mitigations, such as hand pile placement away from streams and differential lighting of piles, would be enforced to prevent effects to sensitive species such as mountain yellow-legged frogs.

Mastication: No effect. Mastication in RHCAs would only occur in two limited areas (proposed treatment proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush.

Underburning: No or slight beneficial effect. Reduction in vegetation density may promote the reinvigoration of streamside riparian vegetation and associated ecological communities. Firelines would be constructed and ignition would occur under appropriate fire weather conditions to prevent spread of fire throughout the RHCA. Ignition would occur outside of RHCAs with backing fire prevailing, unless conditions necessitate secondary ignition in RHCAs. If there is a need to reduce fuel loads conditions prior to underburn treatments, hand treatment would be used. Limited operating periods would be enforced to prevent effects to sensitive species such as mountain yellow-legged frogs. Sufficient ground cover and organic material would be retained to provide food for macro-invertebrate shredders and contributes to the integrity of the stream ecosystem.

Road decommissioning: Beneficial effect. Removal of road surfaces in riparian areas would reduce the area of compacted soils, promoting riparian ecological community productivity and viability.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. The possibility of noxious weed introduction to newly created opening exists, but upland species would be the major concern.

Road construction/reconstruction: No effect. Minimal new road construction is proposed and would occupy existing roadbeds.. Any stream crossing clearing would be minimal, and would be revegetated with native species as necessary.

8) Maintain or restore riparian vegetation to provide adequate summer and winter thermal regulation within the riparian and aquatic zones.

Aspen stand enhancement: Long-term beneficial effect. Removal of conifers would compromise stream temperatures in the short term, but as aspen responds, the increased canopy would provide greater shading during the summer when stream temperature regulation is critical. (Shepperd et al. 2006).

Hydraulic mine site restoration: No or beneficial effect. Impoundment of water in off-channel sediment ponds may slightly increase system temperatures, but revegetation of the site would provide increased shade and offset any minor temperature increases.

Meadow restoration: No effect. Removal of conifers in some areas may decrease shade, but revegetation of denuded areas would increase evapotranspiration and help regulate temperature.

Stream crossing improvements: No effect.

Streambank stability enhancement: Beneficial effect. Revegetation of banks deficient in vegetative cover would provide increased shade and evapotranspiration, assisting with critical summer temperature regulation.

Hand cutting and hand piling of trees and/or shrubs, and pile burning No effect. Sufficient vegetative cover would be retained so that shading near the channel is not significantly reduced.

Mastication: No effect. Mastication would only occur in RHCAs in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics

and are choked with small trees and dead brush. These areas do not contribute to flows during the summer when stream temperature regulation is critical.

Underburning: No effect. Sufficient vegetative cover would be retained so that shading near the channel is not significantly reduced.

Road decommissioning: Beneficial effect. Road surfaces and cut-and-fill slopes obliterated in near-stream sensitive areas would revegetate naturally or be seeded, regenerating canopy cover in the long term, providing shade and enhancing thermal regulation. Regeneration of native riparian vegetation at stream crossings would be encouraged.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Minimal vegetation would be removed for any temporary road construction that would cross RHCAs, and all temporary roads would be closed or obliterated when the project is complete. Revegetation would occur as necessary, and thermal regulation would be maintained.

Road construction/reconstruction: No effect. Minimal new road construction is proposed and would occupy existing roadbeds.. Any cut-and-fill associated with new or improved crossings would be revegetated as necessary, and thermal regulation would be maintained.

9) Maintain or restore vegetation to help achieve rates of surface erosion, bank erosion, and channel migration characteristics of those under which the desired communities developed.

Aspen stand enhancement: Long-term beneficial effect. As the aspen (upland) component of the riparian complex recovers, channel processes and erosion rates would reflect the hydrologic conditions under which these communities developed. In the short term, helicopter yarding and selective mark would ensure that erosion and channel damage are prevented.

Hydraulic mine site restoration: Beneficial effect. Restoration of diverted drainage to stream channels and impoundment of eroded sediments would help restore natural channel processes and erosion rates. Erosion control structures would be installed as appropriate to stabilize features in the short term.

Meadow restoration: Beneficial effect. Restoration of denuded and incised meadow surfaces and channels would reduce erosion and help maintain proper channel function and condition for meadow ecological types.

Stream crossing improvements: Beneficial effect. Replacement or repair of inadequate or failing stream crossing structures would reduce chronic erosion, reduce the likelihood of catastrophic failure, and reduce destabilization of streambeds, thereby reducing the chronic risk of cumulative effects and channel degradation associated with stream crossings.

Streambank stability enhancement: Beneficial effect. Revegetation of denuded and eroding banks would increase bank stability, reduce erosion and help restore proper stream function and condition.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No effect. Enforcement of mitigations would ensure that erosion of RHCAs and associated channel damage is prevented.

Mastication: No effect. Mastication would only occur in RHCAs in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. BMPs would prevent soil disturbance from impacting the channels.

Underburning: No effect. BMPs and other mitigations would prevent soil disturbance from impacting the channels.

Road decommissioning: Beneficial effect. Removal of road influences on riparian areas would alleviate flow concentration and erosion that is disrupting and adversely affecting stream channel dynamics.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Mitigations and subsequent closure of temporary roads that cross RHCAs would prevent adverse effects to stream channel function and condition. Slope restrictions for mechanical activities would help ensure that sediment is not transferred from upland areas to channels.

Road construction/reconstruction: No effect. Minimal new road construction is proposed and would occupy existing roadbeds.. BMPs for road construction practices would prevent erosion and sedimentation and negate any potential impacts to stream channel function and condition.

10) Maintain and restore riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic ecoregion.

No known populations of genetically unique fish stocks occur within the Sugarberry project or CWE analysis area. Rainbow trout found throughout the Slate and Canyon Creek systems are an introduced species.

Aspen stand enhancement: No effect. Only one 1-acre streamside unit is proposed for treatment (SBA-5). Selective marking and BMPs would prevent adverse impacts to RHCAs and channels in this unit, and allow continued large woody debris recruitment.

Hydraulic mine site restoration: Beneficial effect. Reduction in erosion following construction of off-channel settling ponds would reduce the impacts of fine sediment infiltration on spawning and rearing habitats and on macroinvertebrate populations.

Meadow restoration: Beneficial effect. Restoration incised channels and eroding meadow surfaces would reduce the impacts of fine sediment infiltration on spawning and rearing habitat, and channel restoration may provide more suitable habitat in some areas.

Stream crossing improvements: Beneficial effect. Restoration of degraded crossings would allow fish to pass through crossing structures, and prevent erosion that locally degrades fish and macroinvertebrate habitat.

Streambank stability enhancement: Beneficial effect. Erosion control and revegetation would reduce fine sediment loading, increase shade and provide material for habitat structure in the long term.

Hand cutting and hand piling of trees and/or shrubs, and pile burning: No effect. Firelines would be constructed and ignition would occur under appropriate fire weather conditions to prevent fire from spreading throughout the RHCA and increasing erosion and fine sediment delivery.

Mastication: No effect. Mastication in RHCAs would only occur in two limited areas (proposed treatment units 904 and 907a) where ephemeral snowmelt channels lack riparian characteristics and are choked with small trees and dead brush. No increased downstream sedimentation is anticipated form masticating these areas.

Underburning: No effect. Firelines would be constructed and ignition would occur under appropriate fire weather conditions to prevent spread of fire throughout the RHCA that might increase erosion and fine sediment delivery. Ignition would occur outside of RHCAs with backing fire prevailing, unless conditions necessitate secondary ignition in RHCAs. If there is a need to reduce fuel loads conditions prior to underburn treatments, hand treatment would be used. Sufficient ground cover and organic material would be retained to provide food for macro-invertebrate shredders and contributes to the integrity of the stream ecosystem. Sufficient vegetative cover would be retained so that shading near the channel is not significantly reduced.

Road decommissioning: Beneficial effect. Removal of road surfaces in riparian areas would reduce rapid runoff and associated erosion and fine sediment delivery.

Group selection and individual tree selection harvest: No effect. These activities would occur outside of RHCAs. Adequate buffer strip width (one or two site potential tree heights) and BMPs would prevent erosion and sedimentation from affecting aquatic habitat and organisms.

Road construction/reconstruction: No or beneficial effect. Minimal new road construction is proposed and would occupy existing roadbeds. Any stream crossing construction or reconstruction would follow BMPs to prevent adverse effects to aquatic habitat or organisms. Any fish located near crossings would be temporarily relocated to prevent attrition. Road improvements may reduce erosion and sedimentation and associated impacts to aquatic habitat.