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Environmental Assessment

North Heber Salvage Project

Heber-Kamas Ranger District, Uinta-Wasatch-Cache National Forest
Wasatch County, Utah

T1N and T1S, R11W; T1N, R10W, USM, T4S, R7E and R8E, SLM.

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CHAPTER 1: PURPOSE AND NEED

1.1 Document Structure

The Forest Service has prepared this environmental assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This environmental assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into six parts:

- ***Chapter 1- Purpose and Need:*** The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- ***Chapter 2: Comparison of Alternatives, including the Proposed Action:*** This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- ***Chapter 3: Affected Environment and Environmental Consequences:*** This section describes the existing conditions and environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative and proposed action alternatives. The No Action alternative provides a baseline for evaluation and comparison of the proposed action.
- ***References Cited:*** This section lists all of the references consulted in the writing of this report.
- ***Agencies and Persons Consulted:*** This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- ***Appendices:*** The appendices provide more detailed information to support the analyses presented in the environmental assessment.

1.1.1 Planning Record

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located electronically at either the Forest Supervisor's Office in South Jordan, UT or at the Heber-Kamas Ranger District in Heber City, UT.

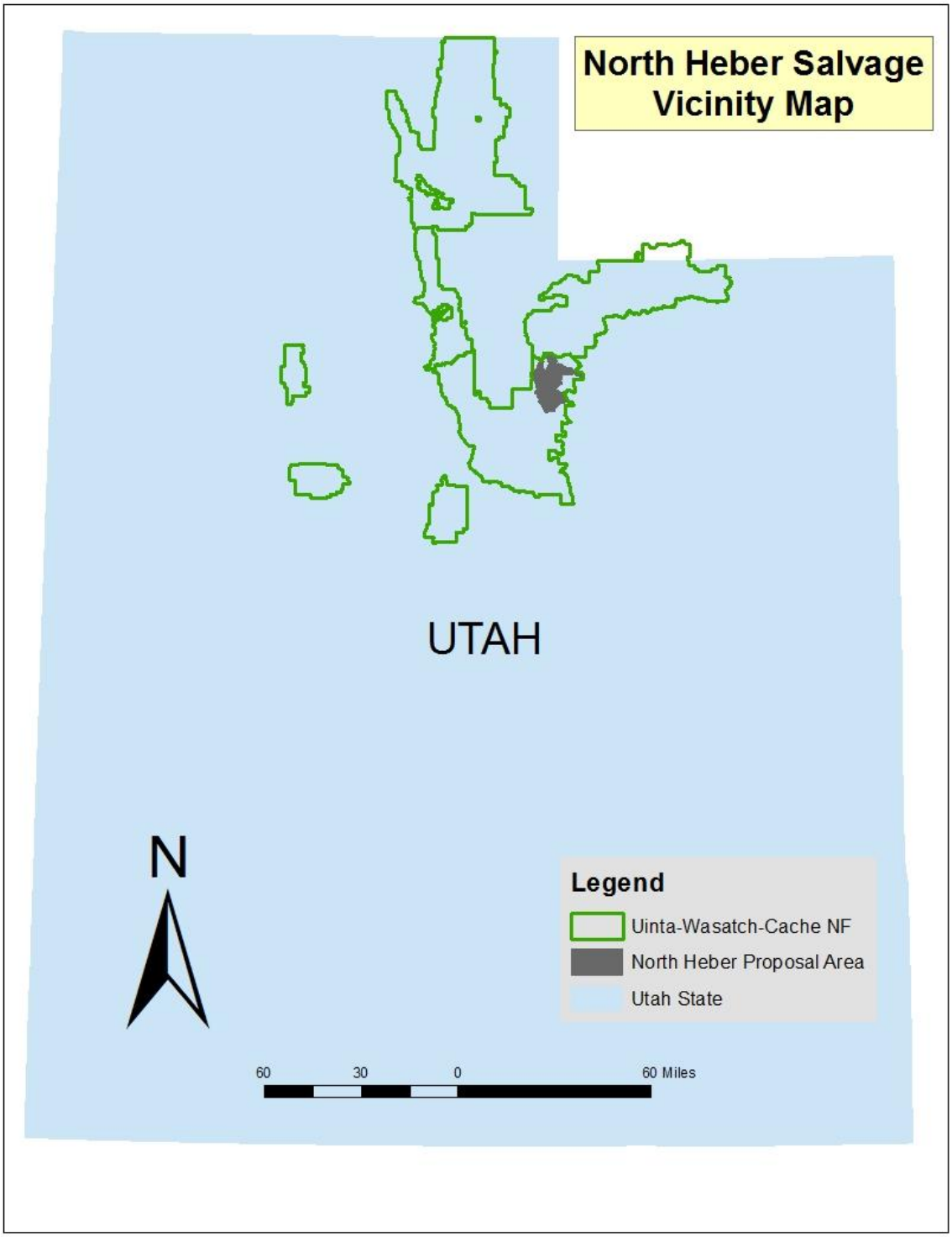
1.2 Background

The North Heber Salvage Project is located in Wasatch County, Utah, on the Uinta-Wasatch-Cache National Forest east of Heber City. The project area includes about 3,725

acres of previously harvested timber units located across a 92,260 acre portion of the Heber-Kamas Ranger District. The area is heavily used for camping, hiking, hunting, grazing and scenic driving. Winter use includes snowshoeing, skiing and snowmobiling.

Spruce-fir stands located on the Heber-Kamas Ranger District have been heavily impacted by spruce bark beetle activity for several years. The result has been almost complete mortality of spruce trees larger than about 6 inches in diameter.

Figure 1.1
North Heber Salvage Project General Vicinity Map.



1.3 Purpose and Need for Action

The purpose of this project is to:

1. *Recover the economic value through removal of bark beetle killed timber while it still has economic/product value;*
2. *Supplement the existing regeneration of the spruce-fir component in the area to meet forest plan prescribed minimum stocking rates of 285 trees per acre and to promote development of early and mid seral spruce stands to move the landscapes towards Properly Functioning Condition;*
3. *Restore or improve watershed function by obliterating and re-vegetating the old road prisms, temporary roads, and skid trails that are no longer needed.*

The proposed action is needed now because the affected trees are rapidly losing their value and use as a timber product; sites that will support tree growth are becoming occupied by shrubs and grasses (due to the increase in light with the dead overstory) which will make future recruitment of natural regeneration difficult; and the old road prisms are eroding and causing sediment to accumulate in nearby streams.

1.4 Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to use commercial timber harvest (salvage sales) to remove the dead overstory, reforest with spruce seedlings where needed, and close the no longer needed roads. This would move the forestlands and watersheds toward conditions that more closely represent the historic vegetative composition and structure by creating acres of young forest (early to mid-seral structural stages) and reducing road density and erosion potential.

The proposed action was developed at the onset of the project and is based on site-specific needs and preliminary issues. It was used during the scoping process and was provided to individuals, groups, and organizations through formal notice and comment periods to review and identify additional issues. The proposed action is described in detail in Chapter 2 (Section 2.2.2).

1.5 Forest Plan Direction

The 2003 Land and Resource Management Plan for the Uinta National Forest ("Forest Plan") sets forth management direction for managing the land and resources of the Uinta planning area of the Uinta-Wasatch-Cache National Forest, and among other things, describes management goals and objectives, resource protection methods, and desired resource conditions. The Forest Plan is the result of programmatic analysis, which is addressed in the Forest Plan Final Environmental Impact Statement ("FEIS") (USDA – Forest Service, 2003b).

The North Heber Salvage Project environmental assessment is a project-level analysis; its scope is confined to addressing the relevant issues and possible environmental consequences of the project. Where appropriate, the North Heber Salvage Project

environmental analysis will tier to the Forest Plan FEIS, as encouraged by 40 CFR 1502.20.

Management Area and Management Prescriptions

The North Heber Salvage Project is within the Upper Provo, West Fork Duchesne, and Currant Creek Management Areas. Management prescriptions found within the analysis area that are identified in the Forest Plan include:

Table 1.1
Forest Plan Management Prescription Allocations for NFS Lands Within the North Heber Salvage Project

Management Prescription and Percentage of Analysis Area		
3.3	Aquatic and Terrestrial Habitat	61%
4.4	Dispersed Recreation	11%
4.5	Developed Recreation	<1%
5.1	Forested Ecosystems – Limited Development	17%
5.2	Forested Ecosystems – Vegetation Management	10%
8.2	Utility Corridor/Communication Sites	<1%
8.3	Administrative Sites	<1%

Management prescriptions found within the individual treatment units proposed for salvage harvest and road closure identified in the Forest Plan are:

Table 1.2
Forest Plan Management Prescription Allocations for NFS Lands Within the North Heber Salvage Treatment Units

Management Prescription and Percentage of Proposed Treatment Units		
3.3	Aquatic and Terrestrial Habitat	81%
4.4	Dispersed Recreation	16%
4.5	Developed Recreation	<1%
5.2	Forested Ecosystems – Vegetation Management	2%
8.2	Utility Corridor/Communication Sites	<1%

Management Prescription 3.3 - Aquatic and Terrestrial Habitat Management comprises the majority of the treatment acres (81%) as well as the analysis area (61%) overall. These areas are managed for quality habitat to contribute toward maintenance and/or recovery of plant and animal species. Resources are maintained or improved to achieve desired conditions for habitats of threatened, endangered, sensitive, and management indicator species (MIS). Vegetation management, including timber harvest, may be used to address vegetation needs for wildlife habitat, watershed improvement, and/or forest health needs.

Desired future conditions for vegetation in each of the management areas include:

Currant Creek Area: Vegetation management focuses on improving the diversity of forested and non-forested communities, with an emphasis on aspen stand regeneration and insect and disease control in conifer species. Wildlife habitat needs are considered in designing

treatment projects, but do not necessarily drive the purpose and need for treatment. Forested vegetation that is classified as capable and available is managed to provide a portion of the Forest's Allowable Sale Quantity (ASQ). Forested vegetation throughout the remainder of the management area is managed for general forest health and other forest resource needs. Timber harvest activities conducted to achieve management objectives provide opportunities for the local dependent timber industry.

Upper Provo and West Fork Duchesne Areas: Vegetation management activities are initiated primarily to maintain or improve habitat conditions for Canada lynx and other wildlife species associated with late-seral conifer forests. Vegetation management also focuses on maintaining forest health, such as reducing risks of spruce beetle epidemics.

1.6 Incorporation by Reference and Use of Science

Some material in this document tiers to or incorporates by reference related information in order to reduce the size and degree of redundancy. Documents tiered to and materials incorporated by reference include the following:

- Material specifically cited or otherwise used in preparation of this document is hereby incorporated by reference. This includes resource specific reports.
- Information in this document tiers to the Forest Plan and FEIS.

The techniques and methodologies used in this analysis consider current and accurate science. The analysis includes a summary of the credible scientific evidence which is relevant to evaluating reasonably foreseeable impacts. The analysis also identifies methods used and references scientific sources relied on. When appropriate, the conclusions are based on the scientific analysis that shows a thorough review of relevant scientific information, a consideration of responsible opposing views, and the acknowledgment of incomplete or unavailable information. Literature reviewed and considered by specialists in the analyses is listed in Chapter 5: References and in the respective resource specialist reports (on file in the project record).

1.7 Decision Framework

In consideration of the stated purpose and need and this analysis of environmental effects, the Uinta-Wasatch-Cache National Forest supervisor, as the responsible official, will decide whether the proposed action would proceed as proposed, as modified, or not at all, and if it does proceed, decide what mitigation measures and monitoring requirements would be applied to the proposed action.

1.8 Public Involvement

The Heber-Kamas Ranger District initiated scoping concurrent with formal notice and comment on this project on September 3, 2014. The scoping document was sent to the public and other agencies listed on the Heber-Kamas Ranger District general NEPA mailing list and all documents were posted to the Uinta-Wasatch-Cache National Forest internet site at:

http://www.fs.usda.gov/project/?project=45097

These documents described the proposed actions, preliminary issues identified by an interdisciplinary team, who to contact for additional information, and how and where to send comments. The proposal was listed in the Schedule of Proposed Actions (SOPA) beginning with the October 2014 edition.

A legal notice requesting comments was published in the *Provo Daily Herald* on September 3, 2014. In response, three comment letters were received from the public. These are summarized in Appendix A.

Using the comments received from the public, other agencies, and from within, the interdisciplinary team developed a list of issues to address. These comments were also used to shape the final proposed action.

1.9 Issues

The interdisciplinary team identified driving issues to be addressed in the environmental assessment based on comments received from the public, other agencies and from within (Table 1.3). These issues guide the formulation of alternatives and provide a framework for the effects analysis to be documented in the environmental assessment.

Table 1.3
Driving Issues

Issue	Statement
Sediment Delivery to Water:	1)Road building/decommissioning activities as well as timber harvest create sediment that can get into the streams. 2) Improperly closed roads from past harvest currently are causing sediment delivery, particularly where culverts and other drainage structures have failed.
Big Game Security:	Road closure would reduce access to these areas and improve the size of refugia for big game, especially during calving and hunting seasons.
Aquatic and Threatened, Endangered, and Sensitive Species (“TES”):	TES populations can be directly impacted by harvest activities, through trampling and vehicle disturbance, if not excluded from treatment.
Access:	Future use/access of level 1 roads if they are closed and re-contoured. Administrative use and fire prevention capability would be reduced. Currently cattle trailing, foot, and horse traffic are the primary uses.

CHAPTER 2: ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 Introduction

This chapter describes and compares the alternatives considered for the North Heber Salvage Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

2.2 Alternatives Considered in Detail

2.2.1 Alternative 1: No Action

The "No action" alternative is included to meet requirements of the National Environmental Policy Act (40 CFR 1502.14 (d)) which stipulates that "in addition to the proposed action, the no action alternative shall always be fully developed and analyzed in detail." Under this alternative, none of the activities described in Alternative 2 (The Proposed Action) would occur in the project area.

2.2.2 Alternative 2: The Proposed Action – Full suite of timber and road obliteration activities

Harvest:
Use several timber sales to harvest the merchantable dead trees within the previously harvested units. Sales would be offered over a period of 4 – 6 years and each would last approximately 3 years. Mechanical tracked feller bunchers as well as hand chainsaw falling would likely be used along with rubber tired grapple skidders. Skid trails would be approved and designated by the sale administrator prior to use and would primarily follow routes used during the previous entry. Existing road prisms would be reutilized for access and then obliterated and rehabilitated following use. The following table shows the possible sales that could be organized and offered out of the proposed units. The final mix of sale packages may be grouped differently depending in part on future timber market needs and demand.

Table 2.1
Estimated Sales

Sale Name	Acres	Year (CY)
Little South	673	2015
Mill Hollow	523	2016
West Fork	984	2017
Roundy Basin	478	2018
Wolf Creek	1071	2019

Based on the riparian habitat conservation area (RHCA) information in GIS, areas that are within the buffer limits but were part of the original sale area have been removed from the proposed action. These boundaries would be observed on the ground and possibly adjusted (if wet soils or stream channels differ from the GIS) during the layout of the individual units.

Trees to be removed would be individually marked/designated by Forest Service crews or contract provision and would include all merchantable dead spruce greater than 8 inches in diameter at breast height (DBH) or dead lodgepole pine greater than 7 inches in DBH where basal area of the dead exceeds approximately 20 square feet per acre. Below this, it would not be economical to remove trees and would result in excess ground disturbance and damage to the residual stand due to long skids.

These low volume areas would contribute to meeting the snag requirements of 300 stems per 100 acres. In addition, islands of dense standing dead will be left in patches of about 0.25 acre. Where possible these patches would be centered on areas with live subalpine fir or spruce in order to provide both live and dead in the group. Any live spruce greater than 8 inches DBH will be left for future seed recruitment unless they need to be removed for operational safety reasons or would likely blow down. Smaller trees of any species would also be left on the site.

In many cases and where feasible and agreed to by both parties, past landings would be reused, however new landings would also be created. The following table is an estimate based on GIS mapping of the number of and location of potential landings and assumes an average size of 0.25 acre; some would be larger and some would be smaller. Landings by contract provision are agreed upon by both the purchaser and the Forest Service. Landing needs vary also between purchasers and depend on the style and scale of the logging operations. Table 2.2 shows the estimated number of landings and associated acreage, based on the GIS analysis, for each of the sale areas.

Table 2.2
Estimated Landings

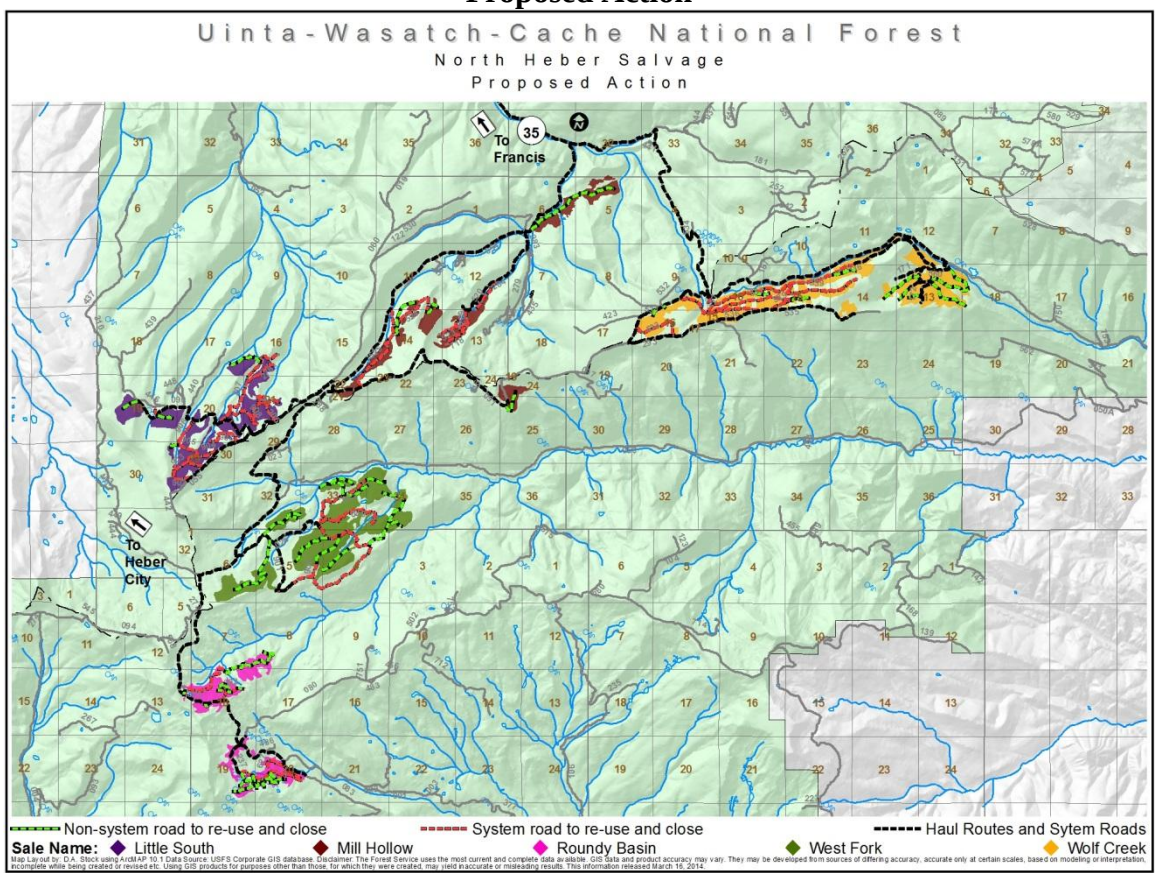
Sale Name	#Landings	Acres of Landings
Little South Fork	21	5.25
Mill Hollow	34	8.5
West Fork	36	9.0
Roundy Basin	32	8
Wolf Creek	64	16

Landing slash would be piled, and the piles burned. It can be expected that there would be some piles at each landing where any log processing occurs. Smaller landings (approximately less than 0.25 acre) where trees are only decked for loading would likely have the slash that occurs scattered. Dead spruce trees tend to lose a lot of the branches during falling and skidding and so less slash is expected than in a green sale. Larger landings where trees are topped and cull wood sorted would have machine made piles to burn. Piles should average in the 0.1-0.2 acre size range in these cases.

Following use, landings would be scarified and slash or other woody debris would be scattered across the surface. These would also be seeded using an appropriate seed mixture.

Figure 2.1 shows the proposal area. Appendix B contains more detailed maps of the individual proposed timber sale areas.

Figure 2.1
Proposed Action



Several forest system roads would be used for hauling the timber. They are primarily gravel surfaced roads. SR-35 is used as it crosses the forest, but is not a forest system road. Table 2.3 shows each road that would be utilized for hauling timber, and the associated mileage that would be directly impacted. A very rough preliminary estimate of the number of log loads over each listed route is also shown and ***should be used only for relative comparison until more developed cruise/volume information is available*.**

Each of the sales would have an associated "road package" developed by a forest engineer that would include needed work such as gravel replacement, reshaping, reconstruction, drainage structure replacement, etc. In addition, regular road maintenance including periodic grading patrols and culvert cleaning would be part of the timber sale appraisal.

Following harvest, tree seedlings would be planted in areas where regeneration is not established or sufficient to meet the 285 trees per acre prescribed by the Forest Plan. Spacing would be variable in order to account for existing trees and provide for microsite protection for the seedlings. Trees would be hand planted using augers or hoedads with 18 inch scalps to remove competing vegetation from the planting spot.

Funds would be collected from timber sale receipts to cover reforestation activities. Other area improvement activities identified in the NEPA could also be funded if revenues or other funding are available.

Road Closure:
After completion of harvest activities, roads approved for closure would be obliterated and/or rehabilitated. These roads were left in place assuming a harvest entry about every 30 years. Due to the almost complete removal of merchantable size timber during this entry, and the establishment of seedling/sapling size stands following, it is likely that future harvest would not occur in these stands for over 100 years.

The level and type of road closure will vary considerably depending on the condition of the road. Roads that are reopened and used for timber operations would be put back to original slope contour, at least at the end sections, mostly using a track hoe. Culverts would be removed and stream channels restored to the original shape and depth. Exposed soil would be seeded with an appropriate seed mix.

There are also old logging roads in the units (both level 1 and non-system) that would not be used during this removal. If a road is well vegetated (including cut and fill) and correctly sloped to prevent erosion, it would not be rehabilitated. If a road is not well vegetated, it might be rehabilitated.

Possible work items for all road closures include, but are not limited to:

1. Remove drainage structures. Reshape the channel and stream banks at crossing sites to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of stream banks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site.
2. Implement suitable measures such as ripping or pocking to promote infiltration of runoff and intercepted flow and desired vegetation growth on the road prism and other compacted areas (i.e. sub-soil prism).
3. Re-contour to original slope and stabilize cut slopes and fill material. Place woody debris and rock (if available) on the prisms to increase ground cover and reduce the likelihood of unauthorized motorized use.

2.2.3 Alternative 3 - Timber activities then roads returned to level 1 status and treated accordingly.

Harvest:
Includes the same items as the proposed action.

Road Closure:
After completion of harvest activities, all system roads would be returned to the previous level 1 status, not obliterated or reclaimed. Non-system roads used would be reclaimed as in the proposed action.

Possible work items include but are not limited to:

1. Remove drainage structures. Reshape the channel and stream banks at crossing sites to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of stream banks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site.
2. Implement suitable measures such as ripping or pocking to promote infiltration of runoff and intercepted flow and desired vegetation growth on the road prism and other compacted areas (i.e. sub-soil prism). Road prisms would be left intact for future use.
3. Implement suitable measures to effectively restrict un-authorized motor vehicle use of level 1 or rehabilitated roads. Measures could include installation of gates, rock barricades, or earthen berms.

2.2.4 Project Design Features and Mitigation for Resource Protection

In response to public comments and resource specialist on the proposal, design features and mitigation measures were developed to minimize or eliminate any potential adverse effects from the proposed action to any of the resources in the project area. Many of these are based on Forest Plan Standards and Guidelines or standard timber sale contract provisions. Design features and mitigations that apply to the project include the following:

Watershed and Soil Resources

1. Apply all National and Regional Core Best Management Practices relevant to the North Heber Salvage Project (Watershed and Soil Resource Reports 2015).
2. Ground-based skidding would be limited to slopes less than 40%.
3. Designated skid trails would be used in any material removal. Where feasible, skid trails from past harvest or other user created travel ways would be utilized to minimize surface area impacted.
4. Water bars would be installed on skid trails.

5. Skid trails, staging, and landing areas would be scarified or roughened to alleviate soil compaction where these occur on newly disturbed acres. Staging areas or landings at a trailhead parking, for example, would not be scarified.
6. As soon as possible following the completion of harvest operations, not to exceed one year, landings would be re-contoured to the original surface contour, ripped, and seeded with an approved Uinta-Wasatch-Cache National Forest native grass seed mix. Coarse woody debris would be spread on site to provide for long-term soil productivity.
7. On temporary roads, sediment-buffering devices such as silt fences or straw wattles would be installed below all fill slopes within 300 feet downhill distance of streams or drainage.
8. Soils within the project area should not be subjected to vehicle or surface disturbance when soils are extremely dry or when the soils are wet. During these periods any skidding, hauling, or use of a feller-buncher would be prohibited by provision in the timber sale contract.
9. Scatter, distribute, or spread timber/brush slash and litter over the treated areas to protect the soil surface from erosion and to maintain organic matter on site.
10. A minimum of 50 down logs per 10 acres, with a minimum 12 inch mid-point diameter and eight-foot length, would be retained across the treatment units. If the minimum size is unavailable, the largest logs available on site would be retained.
11. Burn piles should be located at least 25 feet from the outer edge of channels, springs, seeps, and waterbodies.
12. Trees adjacent to stream channels that provide bank stability or contribute to channel integrity would not be removed. Removal of hazard trees would be permitted.

Cultural Resources

1. If previously unknown cultural resources are uncovered during management activities, work would be suspended until USFS archaeologists evaluate the findings.
2. If any historic properties are identified within the area of potential effect (APE), the Heber-Kamas Ranger District has agreed to place a 100-foot buffer (or less as agreed upon by USFS archeologist and timber sale administrator) around the identified boundary of the property and mitigate effects through avoidance. There may also be situations where it is beneficial to the resource to remove dead trees within the 100-foot buffer as agreed on by the archeologist and sale administrator.

Fisheries

1. To ensure natural and beneficial volumes of large woody debris, downed dead trees should not be removed from fish-bearing streams.
2. Required buffers for the operation of heavy equipment in RHCAs are implemented to maintain ground cover in order to limit erosion and runoff into streams.

3. Operation, storage, and fueling of chainsaws and heavy equipment would occur outside RHCAs in accordance with all applicable Forest Plan Standards and Guidelines.
4. Minimize disturbance of riparian areas in known occupied boreal toad habitat during the active breeding season (4-5 weeks following snowmelt).

Recreation

1. Minimize or halt treatment activity, and prohibit hauling during major holiday and opening weekends of general deer and elk hunts.
2. Accomplish treatment activity in a way that lessens the impacts on the dispersed camp sites and trails.
3. Remove all debris and slash piles away from snowmobile or hiking trails at least 25 feet.
4. Following harvest activities the upper .37 miles of the Little South Fork Trail, which currently follows an old logging road prism will be returned to a trail prism in place of the existing logging road prism.
5. Attempt to lessen the expansion of new or existing dispersed campsites by placing physical barriers near the existing boundaries of campsites and/or new areas within 150 feet of Forest Service system roads within the project area.
6. Traffic controls (signing) shall be in place on single lane road corridors where vehicles are incapable of passing during active treatments. These will follow MUTCD or EM 7100-15 criteria and will be included in the timber sale "road package".
7. Prohibit snow plowing on haul routes from November 15th through May 15th to allow for snow trail grooming and recreational winter trail use. Hauling will also be prohibited when it would cause excessive damage (rutting) to the road surface as defined in the timber sale contract.
8. Stumps should be no higher than 12 inches.
9. Inform and educate the public of the purpose of these treatments through press releases, social media, and informative signs on site.

    a. Ensure that proper and permanent closure of temporary roads is implemented after project completion to prevent illegal vehicle and ATV activity. Temporary roads should be monitored during logging activity.
    b. Conduct log hauling activity during weekdays, not including holidays throughout the summer months
    c. Minimize or halt log hauling activity during weekends of general deer and elk hunts.
    d. Accomplish logging activity in a way that lessens the impacts on the dispersed camp sites.
    e. Attempt to lessen the expansion of new or existing dispersed campsites by placing physical barriers near the existing boundaries of campsites and/or new areas within 150' of Forest Service system roads within the project area.
    f. Traffic controls should be in place on single lane road corridors where vehicles are incapable of passing oncoming logging trucks.

g. If snow removal during shoulder seasons occurs, coordination would need to occur with the Utah Department of State Parks as this area is within their groomed snowmobile path.
h. Existing designated snowmobile trails would need to be cleared of hazards prior to end-of-season operations.

Wildlife

1. In order to minimize conflicts with migratory birds, activities will not be performed between April 1 and June 30 each operating season.
2. If any wildlife nesting trees are found, the appropriate buffer and timing restrictions will be established and protected.
3. Active Northern Goshawk nests would be evaluated by August 15. If the birds have fledged and left the area, and at the discretion of the district biologist, timber operations may occur.

Noxious Weeds Management

1. Avoid driving, walking, skidding, landing, and/or hauling through noxious weeds.
2. Minimize soil disturbance during forest management operations and seeding skid trails, landings, and other disturbed sites.
3. Monitor for noxious weeds after sale activity and treat noxious weeds as needed.
4. Equipment and vehicles used for project work shall be cleaned prior to entry onto National Forest System Lands. Where logging activity on planned or existing timber sales may contribute to the encroachment of noxious weeds, consider Sale Area Improvement (KV) collections to control or prevent the encroachment of noxious weeds within sale areas.

Engineering / Roads

1. Timber sale packages would include work items to complete road maintenance sufficient to protect the forest system road network. Items would include blading, shaping, gravel placement, drainage structures and other tasks as suggested by the forest engineering staff via the contract road package.

2.3 Alternatives Considered but Eliminated from Detail Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative actions. Some of these alternatives may have been outside the scope of the project, duplicative of the alternatives considered in detail, or determined to not achieve the purpose and need.

2.3.1 Road Closure Only

The interdisciplinary team considered the alternative of road closure only, without any harvest treatments. This was eliminated from consideration. With full analysis of the no action, harvest, and road closure alternatives, there would be sufficient information for the decision maker to select any or all of the separate pieces of the proposal. A no harvest decision could in fact be selected out of the analysis without full consideration of this as an alternative.

2.4 Cumulative Effects

This section provides a listing of all other known past, present or foreseeable actions within the analysis area that are considered in the analysis. For future actions, listing on the forest's Schedule of Proposed Actions (SOPA) or current NEPA decision defines a foreseeable action. Section 3.1 describes these in more detail.

1. Past Timber Harvest – as per the GIS layer in the project geo database
2. Ongoing firewood harvest by the public, primarily along roadsides
3. Ongoing hazard tree removals in Mill Hollow Campground and around Granite Ed Center – includes pile burning
4. Ongoing Grazing and routine maintenance of fences, troughs, etc…
5. Dispersed Camping and recreation (hunting, snowmobiling, etc…)
6. Ongoing road maintenance including gravel placement, grading and in-kind culvert replacements
7. Invasive species treatments
8. Vat Diversion tunnel
9. Uinta Express Pipeline

2.5 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2.4
Comparison of Alternatives

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
Fisheries	In the absence of ground-disturbing activity, there are no direct effects of a 'No Action' alternative on aquatic resources.	Timber harvest activities would have little or no direct or indirect effects on fish, amphibians, or their habitats because other than hazard trees, no harvest or removal of vegetation would occur in Riparian Habitat Conservation Areas (RHCAs). Road construction, rehabilitation, maintenance, and culvert installation or removal may have some direct or indirect effects to fish, amphibians, or their habitats because of sediment delivery to nearby streams or wetlands, but the effects would be temporary and in many cases short-term (<1 year).	Timber harvest activities would have little or no direct or indirect effects on fish, amphibians, or their habitats because other than hazard trees, no harvest or removal of vegetation would occur in Riparian Habitat Conservation Areas (RHCAs). For non-system roads, the long-term benefits from this alternative are the same as Alternative 2, but would likely be at a reduced level for Level 1 roads. If culverts are left in place there would be a risk of failure, and although efforts to promote infiltration of runoff are made they may not be as effective as re-contouring the road. Maintaining the road prism may also lead inadvertent unauthorized use.

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
Hydrology	Water quality, watershed function, road densities, and vegetation composition would remain unchanged from the existing conditions because no treatments would be implemented. The potential for detrimental effects to watershed resources and water quality would remain unchanged.	As a result of RHCA establishment around sensitive features, there would be no direct effects to water resources from the proposed mechanical timber harvest and removal as all treatments would occur outside of sensitive areas. Considering research and existing vegetation conditions (extensive conifer mortality), no measurable increases in water yield are projected to result from implementation of this alternative. Direct positive effect to watershed function through a reduction in existing road densities and stream crossings within the analysis sub watersheds.	As a result of RHCA establishment around sensitive features, there would be no direct effects to water resources from the proposed mechanical timber harvest and removal as all treatments would occur outside of sensitive areas. Considering research and existing vegetation conditions (extensive conifer mortality), no measurable increases in water yield are projected to result from implementation of this alternative. The direct effects to water resources that would result from the proposed road obliteration and administrative closure work proposed under Alternative 3 would be similar to those effects previously discussed under Alternative 2. This is due to the fact that direct impacts to water resources from activities under this alternative would be mitigated through removal and restoration of all stream crossings. However, maintaining the Level 1 roads on the landscape would result indirect effects to watershed function. Many of the level 1 roads have re-vegetated since their last use. In order to be used for log hauling they would have to be brushed and bladed. This work combined with the heavy truck traffic would compact soils and eliminate any natural recovery that has occurred since the roads were last used. Leaving the roads on the landscape would also result in higher sub watershed road densities than would occur under Alternative 2.

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
Soil Disturbance	No new disturbance.	The effects of the temporary road construction and landings would be short-term as these would be reclaimed by the end of the project. Proposed harvest activities within units could also result in increased bare ground and increased soil erosion rates.	The effects of the temporary road construction and landings would be short-term as these would be reclaimed by the end of the project. Proposed harvest activities within units could also result in increased bare ground and increased soil erosion rates.
Landings created	0	46.75 acres	46.75 acres
Detrimental disturbance	0	373 acres	373 acres
Temporary roads upgraded	0	47 miles	47 miles
Temporary roads restored	0	47 miles / 68-114 acres	18 miles / 26-44 acres
Range Management	There would be little change in the management of grazing on these allotments. Livestock would continue to be herded to get the needed distribution with little to light use within old timbers sales. Range improvements would continue to be maintained and reconstructed and movement of livestock within the allotment would remain the same.		
Invase Species / Weeds	There would be little change in the control, treatment and spread of invasive plants.	The removal of the overstory would allow more sunlight to reach the ground and logging equipment would scarify the soil so that there becomes a good seed bed. This potential is reduced by adherence to the Forest Plan Standard and Guidelines such as cleaning all equipment prior to coming on to the project areas.	The removal of the overstory would allow more sunlight to reach the ground and logging equipment would scarify the soil so that there becomes a good seed bed. This potential is reduced by adherence to the Forest Plan Standard and Guidelines such as cleaning all equipment prior to coming on to the project areas.

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
TES / Botany	There is no suitable habitat within the project area for threatened and endangered plants, [Ute ladies'-tresses (*Spiranthes diluvialis*)], therefore this alternative would have no effect on threatened and/or endangered plants if implemented. Change over time with the dead and dying trees and ongoing activities most likely would result in changes to habitat for Dainty and Slender moonworts.	There would be no direct, indirect or cumulative effects to any threatened or endangered species or their habitat from the North Heber Salvage Sale Project. There is no suitable habitat within the project area for Ute ladies'-tresses (*Spiranthes diluvialis*). There would be no direct or indirect impacts and therefore no cumulative effects to Forest Service R4 sensitive plant species, with the potential exception of Slender moonwort and undetected sites of Dainty moonwort, for which a determination is made of "May impact individuals or habitat, but would not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species".	There would be no direct, indirect or cumulative effects to any threatened or endangered species or their habitat from the North Heber Salvage Sale Project. There is no suitable habitat within the project area for Ute ladies'-tresses (*Spiranthes diluvialis*). There would be no direct or indirect impacts and therefore no cumulative effects to Forest Service R4 sensitive plant species, with the potential exception of Slender moonwort and undetected sites of Dainty moonwort, for which a determination is made of "May impact individuals or habitat, but would not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species".

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
Wildlife Deer, Moose and Elk	Big game species would continue to lose hiding/thermal cover as the trees continue to lose their needles and fall to the ground. Ungulates may have a hard time navigating through all the down trees to reach the new growth. Without any road closures, the hunting pressure would remain constant.	Removing the dead timber would return the forest to an earlier seral stage that would produce more forage for these ungulates. Planting seedlings would provide thermoregulation and hiding cover in the long term. Re-opening the old road prism during implementation of the sale may contribute to added hunting pressure. After each sale is complete, the roads would be obliterated and rehabilitated to a natural state. Returning the road prism to a natural contour may hinder illegal off road travel	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.

Table 2.4: Comparison of Alternatives			
	Alternative 1 No Action	**Alternative 2 Harvest– Obliterate Roads**	**Alternative 3 Harvest – Level 1 Roads**
lynx	The reduction of conifer needles has lowered the quality of year round habitat for lynx and their primary prey, the snowshoe hare. Prey species may disperse from the area until the minimum vegetation height returns. Without the planted seedlings, areas that lack a sufficient seed source would take longer to reach this minimum height (above average snow depth). Without any road closure, competition between lynx and other predators would remain constant. Snowmobiles compact the snow, which allows other predators to access higher elevation areas to hunt.	All of these large conifer trees have already lost their needles. This reduces the dense cover which lynx and their prey prefer. The ¼ acre patches of dense standing dead that are left would eventually fall, creating potential denning areas for lynx. Planting tree seedlings would provide indirect beneficial effects by stimulating the growth of conifer trees in areas that are scarce. Long term effects on these treatments would provide dense, understory vegetation that lynx and their prey can utilize year round (10-30 years).	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
American Beaver	Beaver would continue to use suitable habitat in the project area to build colonies. The beetle-killed trees that fall across streams may be used by beaver as a foundation to build dams. The reduction of conifer density may allow other tree species, such as aspen to re-establish. Aspen, along with willows, are a preferred food source. Illegal off-road use or disperse camping near the streams may reduce habitat for beaver.	The proposed action may slightly benefit beaver by promoting food and dam building materials near streams. Hunting pressure may be reduced since streams may become less accessible.	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.
Northern Goshawk	As large, mature conifer trees lose their needles and begin to fall, predatory birds may move out of the area to seek better nesting habitat	Northern goshawk territories may be degraded due to the reduction of canopy cover, Nesting habitat would still be available in the aspen/conifer stands and in the patches of dead/live conifer trees that meet this requirement. Prey species may disperse due to the lack of available cover. Planting tree seedlings would provide indirect beneficial effects by stimulating the growth of foraging and hiding cover for goshawk prey. After these trees mature, they would provide potential nesting habitat	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.

Table 2.4: Comparison of Alternatives			
	Alternative 1 No Action	**Alternative 2 Harvest– Obliterate Roads**	**Alternative 3 Harvest – Level 1 Roads**
Flammulated Owl	As large, mature conifer trees lose their needles and begin to fall, predatory birds may move out of the area to seek better nesting habitat	Flammulated owls nest in cavities created by other species. Nesting habitat would be lost as the dead trees are removed. However, nesting trees would still be available within the units as snags trees and islands of ¼ acre dead/live trees would be left.	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.
Three Toed Woodpecker	Cavity nesters would have nesting habitat until forage in the area dwindles or the trees finally fall.	The proposed action is focused on salvage of already dead or dying trees, which provide minimal spruce larvae for three-toed woodpeckers because the food resource is largely gone. Nesting habitat would be lost as the dead trees are removed. Nesting trees would still be available within the units as snags trees and islands of ¼ patches of dead trees would be left. would remove up to 3,085 acres (17% of the scope of analysis area) of three-toed woodpecker habitat.	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
Cassin's Finch	Cassin's finch would use the remaining live conifer trees to nest in. The understory would become denser between the standing dead. This species would utilize the area to foraging on buds, seeds, fruits, and insects. Since restocking efforts would not happen in this alternative, the advancement in the seral stages may take longer, especially in areas that lack a sufficient seed source.	Nesting habitat has been lost where trees stand bare. As the understory vegetates, Cassin's finch would be able to utilize these areas to foraging on buds, seeds, fruits, and insects. Planting of the tree seedlings would provide this species with nesting trees in the future. Foraging habitat would increase as the road prisms are removed and rehabilitated.	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.
Willow FlyCatcher	Willow flycatcher would continue to nest in willow or small riparian trees in the project area. The beetle-killed trees near streams should allow more light to reach the ground. Understory vegetation under these trees would become denser. The flycatcher would utilize the area for foraging on invertebrates, seeds, and berries.	Removing the dead trees in the units would increase the understory vegetation. The flycatcher can utilize the area for foraging. Road closures would remove culverts and rehabilitate the stream back to its natural state. This treatment may increase foraging and nesting habitat for willow flycatchers.	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
Broad Tailed Hummingbird	Broad-tailed hummingbird would continue to nest in living trees in the project area. The understory vegetation would become denser between the standing dead. Flower producing plants would be utilized by the hummingbird to collect nectar. There would be no supplemental tree seedlings planted. Future nesting trees would be produced by the remaining seed source	Nesting habitat would still be available in the smaller diameter conifer trees that were not hit by the beetle epidemic. Removing the dead conifers would increase understory vegetation density. Plants that produce flowers may become more abundant. Hummingbirds would utilize the flowers to collect nectar. Planting of the tree seedlings would provide this species with nesting habitat in the future. Foraging habitat would increase as the road prisms are removed and rehabilitated.	In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. The effects of closing fewer roads are similar to Alternative 2, except it would benefit all wildlife to a lesser degree.
Migratory Birds	Unintentional take of migratory birds should not occur since the mechanical work should be done outside of the nesting season. In all alternatives forage increases with more available sunlight.		

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
Recreation	Moderate short and long-term effects would occur to the recreating public by posing a safety risk by dead-down or potential falling hazards along the trail/road system and in and around dispersed camping sites. Due to the mortality of trees in this area, the severity of this risk could require closure of popular areas for public safety reasons. Roads and trails in the area could result in short and long-term closures; reducing the area open to motorized use.	Moderate short-term effect on the recreating public in the immediate area, particularly along Forest Service roads where the majority of summer dispersed recreation and camping occurs within the project area. Hunting activities could be impaired or interrupted by logging activity in the late summer and fall. The temporary closure of dispersed campsites for landing and loading sites would have a varying impact depending on which campsites are utilized. Permanent closure of these level 1and 2 routes would not significantly reduce access for recreational users and would help prevent route proliferation and related resource damage. Trappers Hollow road is decommissioned and rehabilitated after timber activities. While this route is not part of the Forest Service road system or Motor Vehicle Use Maps, the public has in recent years been allowed access beyond the gate. This access has generally been used for firewood cutting and roadside hunting. This action would likely be perceived by some members of the public as a closure, because in the past they were allowed (or rather not barred from) use of the route.	Effects to the recreating public would be the same as the proposed action except there would be no long-term effects related to permanent road closures.

Table 2.4: Comparison of Alternatives			
	Alternative 1 **No Action**	**Alternative 2** **Harvest– Obliterate Roads**	**Alternative 3** **Harvest – Level 1 Roads**
Scenery/Visual Quality	With this management the landscape would follow natural processes and would comply with all of the VQOs described as management for the analysis area. However the casual visitor would be aware of this long term change in the viewed landscape. The casual visitor may choose not use these travelways when selecting a scenic drive or camping.	This action will visually dominate the viewed landscape because of the size of openings and will have a long term effect until the overstory is replaced. By following the mitigation of sculpting the edge of the stands it could help in keeping the proposed action subordinate within the viewed landscape. The proposed action will go beyond the degree of acceptable change with landscapes being managed in the VQO of retention and may be dominant in stands that are being managed in a VQO of partial retention because of the size of the openings.	This action will visually dominate the viewed landscape because of the size of openings and will have a long term effect until the overstory is replaced. By following the mitigation of sculpting the edge of the stands it could help in keeping the proposed action subordinate within the viewed landscape. The proposed action will go beyond the degree of acceptable change with landscapes being managed in the VQO of retention and may be dominant in stands that are being managed in a VQO of partial retention because of the size of the openings.
Cultural Resources	No effects under any alternative since sites are known, identified and protected. If new sites are found they would be protected under the terms of the contract.		

CHAPTER 3: ENVIRONMENTAL CONSEQUENCES

This section summarizes the biological, social, and physical environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

This EA hereby incorporates by reference the resource specialist reports in the project record (40 CFR 1502.21). These reports contain the detailed data, executive summaries, regulatory framework, assumptions and methodologies, analyses, conclusions, maps, references, and technical documentation that the resource specialists relied upon to reach conclusions in this EA.

The analysis makes the following assumptions:

- Analysis of effects was based on current or average levels of use.
- Current and accurate science was used and scientific uncertainty was disclosed if applicable.

3.1 Past, Present, and Reasonably Foreseeable Future Actions

Each resource section includes a discussion of cumulative effects focused on evaluating the effects of the proposed action in context with relevant effects from past, present, and reasonably foreseeable actions. Past, present, and foreseeable future actions considered in the cumulative effects analyses will vary for each resource. Relevant actions are those expected to generate effects on a specific resource which will occur at the same time and in the same place as effects from the proposed action. Past and present activities are considered part of the existing condition and are discussed in the "Affected Environment (Existing Conditions)" and "Environmental Consequences" section under each resource.

The analysis of cumulative effects is consistent with the direction provided in the 36 CFR 220.4(f)

There is a summary in the next paragraph about the recently past, present (or ongoing), and reasonably foreseeable activities within or near the general area of the North Heber Salvage Projects that are or could contribute relevant effects (i.e., effects that overlap in space and time with effects of the proposed action). This information is not intended to provide an all-inclusive list of relevant actions. The analysis for each resource may not consider all actions listed below or it may consider additional actions not listed.

<u>Past Timber Harvest</u>
The following Table 3.1 shows the harvested acres within the analysis area between 1971 and 2010. The clear cut acres are all in aspen regeneration.

Table 3.1
Harvest Treatments by Type

Type of Treatment	Acres
Clear Cut	507
Salvage	1081
Salvage / Sanitation	101
Selection	6822
Selection / Salvage	1600
Shelterwood Prep	198
Grand Total	10309

The proposed units are entirely within past sales. The following Table 3.2 shows the new sale groupings and which past sales are within that new sale area.

Table 3.2
Proposed Sales and Past Harvest

Proposed Sale Area	Past Sale	Acres
Little South	1986 Dip Vat	109
	1983 Little Bug	16
	1978 Little South Fork	547
Mill Hollow	1973 Shingle Mill	103
	2000 Trapper Hollow	159
	1989 Upper Mill Hollow Salvage	198
	1989 Yellow Lake	64
Roundy Basin	1991 Currant Creek Peak Salvage	269
	1991 Roundy Basin Salvage	209
West Fork	1987 Duchesne II Salvage	459
	1987 West Fork II Salvage	525
Wolf Creek	1996 Arroyo Lobo	337
	1997 Timbuktu	240
	1998 Tim's Hole	331
	1996 Wolf Creek Salvage	163
	Total Proposed Acreage	3729

<u>Ongoing Public Firewood Gathering</u>
Under personal use permit the public is allowed to gather dead and down wood for home use in woodstoves and fireplaces. Given the amount of recent dead trees along the roadsides there has been considerable removal of dead trees adjacent to all open roads in

the area. Standing trees greater than 18 inches DBH are not allowed to be cut for firewood under this permit.

Ongoing Hazard Tree Removals in Mill Hollow Campground and around Granite Education Center

The Mill Hollow Campground sale is expected to be completed in the summer of 2015 and includes the removal of dead spruce in the campground and dead lodgepole pine in a unit near the intersection of roads 70054 and 70283. Near the Granite Education center there is an ongoing project removing dead hazard trees along the road and near the center's buildings. This is substantially complete but some work, including pile burning in the fall is expected to occur for one or two more years. Piles in Mill Hollow Campground will also be burned in that time frame.

Ongoing Grazing and routine maintenance of fences, troughs, etc…

The proposed timber sales are within 11 allotments, 3 of which are cattle and 8 are sheep. Grazing dates vary for each allotment but fall between June 3 and October 15.

Dispersed Camping and recreation (hunting, snowmobiling, etc…)

The area is popular year round for recreation use. Utah State Highway 35 traverses the northern portion of the analysis area and is open for street vehicles during the summer and fall. During the winter this is a popular groomed snowmobile trail and connects the network between Mill Hollow and Soapstone Basin play areas. Roads suitable for passenger vehicles connect Mill Hollow to Strawberry Valley and Heber City.

Ongoing road maintenance including gravel placement, grading and in-kind culvert replacements

Gravel roads are periodically maintained under agreement with Wasatch County who does the actual road grading annually. As needed, and funding allows, deteriorated areas have new gravel placed and culverts cleaned or replaced.

Invasive species treatments

Within the analysis area approximately 3,615 acres are identified as infested with a number of species and monitoring and treatments are ongoing annually.

Vat Diversion tunnel

The Vat Diversion Tunnel is a water diversion tunnel that carries water from the West Fork of the Duchesne River to Currant Creek Reservoir.

Uinta Express Pipeline

The Uinta Express Pipeline Project has been proposed but is currently on hold, pending a decision by the proponents either to continue the project in the future or to withdraw the project from consideration. The proposed pipeline would cross through the north side of the analysis area, in the Wolf Creek/Upper South Fork Provo River area, primarily following and widening an existing corridor.

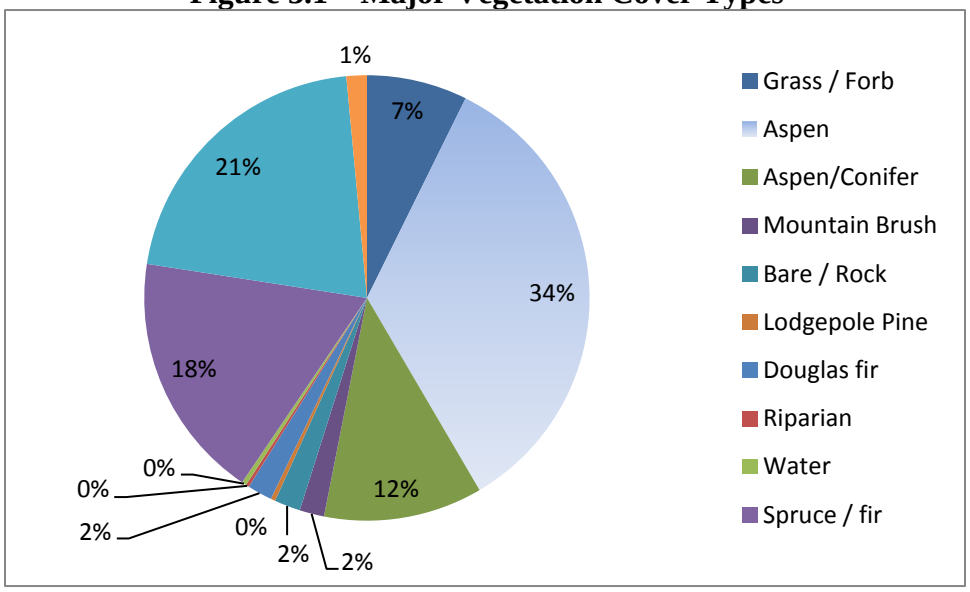
3.2 Biological Environment

3.2.1 Forested Vegetation

AFFECTED ENVIRONMENT

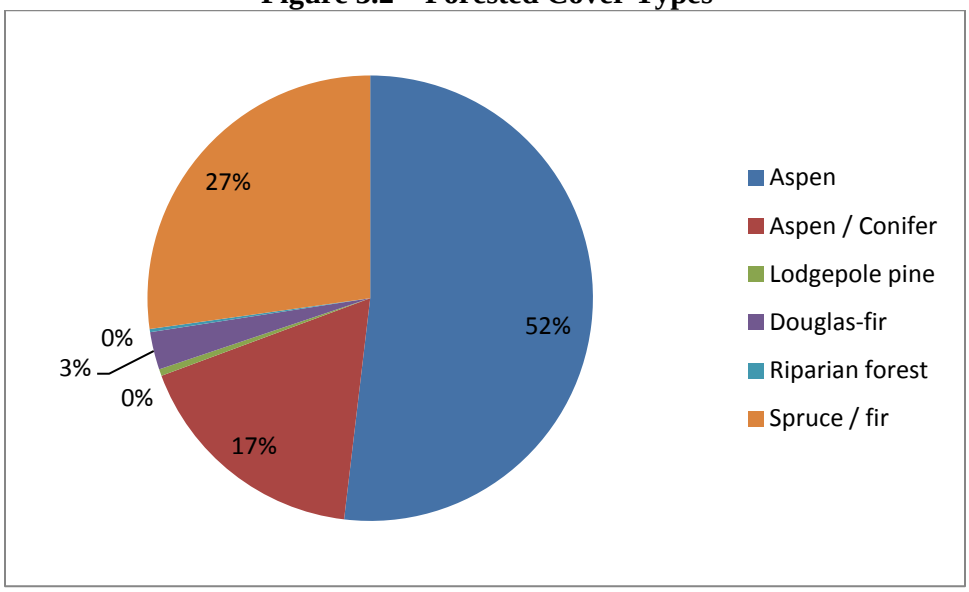
Aspen and mixed aspen vegetation dominates the analysis area. Spruce/fir stands are common throughout the area, and are the next most common vegetation type. There are small areas of sagebrush/grass, open grass meadow parks, moist to wet meadows, and tall forb types interspersed as well. The following Figure 3.1 shows the composition of the major cover types in the analysis area.

Figure 3.1 – Major Vegetation Cover Types



Within the project area there are approximately 61,000 forested acres which is about 66% of the total acres in the analysis area. The following Figure 3.2 shows the forested types that occur on these acres.

Figure 3.2 – Forested Cover Types



Timber harvest activities have been conducted in this area for management of insect and/or disease in conifer stands, and general timber resource and wildlife habitat maintenance and improvement. Approximately 5,590 acres of conifer, primarily in the spruce/fir type, have been harvested within the analysis area using commercial timber sales since 1970. Approximately 1,190 acres of aspen and aspen/conifer mix have also been harvested.

Spruce stands were harvested using an individual tree and small group selection system where about one-third of the stand basal area was removed. The objectives were to remove damaged, diseased and older trees first, then thin the remaining trees focusing on retaining the healthiest trees across all the age classes second. In this process small groups openings (1/10th acre or so) were made to encourage regeneration of the spruce. Aspen and aspen mix stands were clearcut to establish regeneration and create young stands of aspen.

Over the last decade spruce bark beetle (*dendroctonus rufipennis*) has spread across spruce stands on the Heber-Kamas district and caused almost complete mortality in both harvested and un managed stands. Within the analysis area approximately 11,840 acres of spruce / fir forest have been affected with levels of mortality estimated at greater than 90% (Jenkins 2014). This is just over 70% of all the spruce / fir in the analysis area.

The following Table 3.1 shows the stand summary information for several stands in the project area. Data was collected prior to the recent mortality. The FVS modeling was used to simulate an epidemic with 95% mortality in spruce trees greater than 8 inches DBH (Diameter Breast Height).

Table 3.1

NORTH HEBER ANALYSIS - POST EPIDEMIC STAND CONDITIONS												
Name	Stand	Live TPA x Diameter				All Live				All Dead		
		0-1.9	2-4.9	5-8.9	9+	%ES	QMD	SDI	BA	QMD	BA	CF
ARROYO LOBO REFO	105910030	1474	61	4	13	37	1.4	69	18	14.0	100	2095
ARROYO LOBO REFO	105910032	679	32	80	93	11	4.7	267	109	16.3	80	1464
ARROYO LOBO REFO	105910034	224	30	93	26	41	4.9	117	48	14.1	218	3703
	Area Averages	792	41	59	44	30	3.7	151	58	14.8	133	2,421
ROUNDY REFO	110810013	293	0	0	0	13	0.6	3	1	16.5	101	2241
ROUNDY REFO	111710013	229	0	0	17	27	2.5	36	12	15.1	81	1637
ROUNDY REFO	111710012	64	0	0	46	0	8.4	84	43	22.6	44	1140
ROUNDY REFO	111710011	123	25	35	45	59	6.8	121	57	14.9	78	1773
	Area Averages	177	6	9	27	25	4.6	61	28	17.3	76	1,698
LITTLE SOUTH FORK	110500102	88	1283	216	180	77	5	573	237	12.2	65	1242
LITTLE SOUTH FORK	110500103	0	98	0	121	45	9.4	199	106	12.8	47	939
LITTLE SOUTH FORK	110500104	68	1066	47	29	22	3.2	195	68	14.4	128	2674
LITTLE SOUTH FORK	110500101	0	600	18	47	42	4.3	171	67	13.4	106	2120
	Area Averages	39	762	70	94	47	5.5	285	120	13.2	87	1,744
TIMS HOLE REFO	108210005	526	270	23	2	7	2.1	68	20	18.4	4	98
TIMS HOLE REFO	108210012	0	198	0	0	50	3.3	34	12	15.1	140	3236
TIMS HOLE REFO	108210009	776	159	234	47	11	4	275	104	14.4	73	1609
TIMS HOLE REFO	108210011	198	50	37	0	48	3	42	14	13.1	104	1984
TIMS HOLE REFO	108210008	590	148	73	48	26	3.6	170	62	19.6	33	732
TIMS HOLE REFO	108210010	716	127	157	101	12	4.3	284	111	12.8	73	1416
TIMS HOLE REFO	108210016	1695	146	139	33	11	2.6	236	76	13.8	68	1435
TIMS HOLE REFO	108210017	1567	189	221	41	8	3	300	102	12.4	45	871
TIMS HOLE REFO	108210015	1068	70	105	58	5	3.3	220	77	14.0	36	706
	Area Averages	793	151	110	37	20	3.2	181	64	14.8	64	1,343
WEST FORK	110730103	538	1340	176	36	8	3.1	314	108	14.7	84	1905
WEST FORK	110730105	724	56	134	35	17	3.5	178	64	12.3	102	1833
WEST FORK	100730003	100	0	41	109	16	10.1	262	263	14.2	70	1323
WEST FORK	100730008	834	70	0	53	0	3.6	182	66	13.7	62	1057
	Area Averages	549	367	88	58	10	5.1	234	125	13.7	80	1,530

TPA Trees per Acre
% ES Percent of TPA that is Engelmann Spruce
QMD Quadratic Mean Diameter
SDI Stand Density Index
BA Basal Area
CF Cubic Foot Volume per Acre

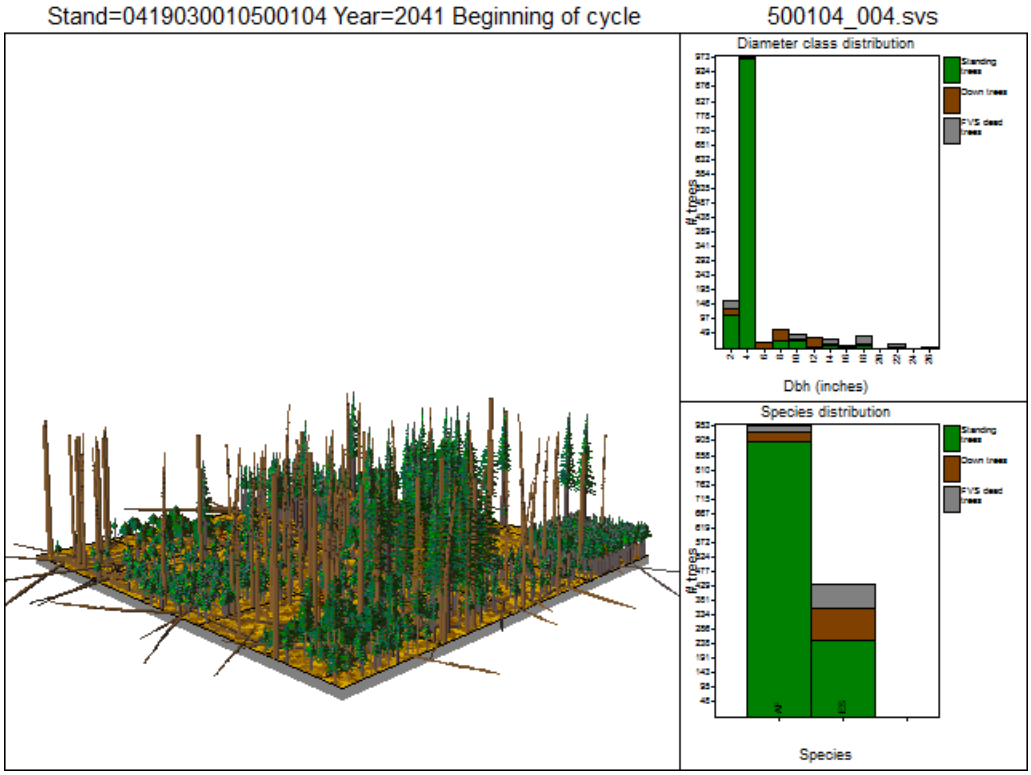
ENVIRONMENTAL CONSEQUENCES / EFFECTS

This section presents the direct, indirect, and cumulative effects to the forested resource under each alternative.

a. Effects Common To All Alternatives

Implementation of either alternative would leave approximately 13,540 acres of mature spruce fir stands in the analysis area left alone to natural processes and recovery. DeLong in 2008 showed, based on long term studies, that the average standing time for dead spruce was 16.5 years, with an average fall rate in a stands of 4.62%. This indicates that snag forests will dominate these landscapes for at least 2 decades or more. Personal observations (Gibson, 2015) in the Flat Top wilderness in Colorado concur that these snag forests, if undisturbed, can persist for several decades.

It can be expected that over time the dead overstory will fall down and the existing regeneration (largely sub alpine fir) will grow to form a new forested stand with a minor component of spruce in the overstory. There will be substantial dead down timber within the stands for many decades. The following simulation shows a stand in the South Fork area 30 years after the epidemic. There is still some standing dead and the live trees are primarily sub alpine fir with about a 4 inch diameter.



b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

In this alternative the stands would go untreated and continue to progress under natural influences. No commercial volume would be removed and under stocked areas would remain so for many decades.

Long (1985) displayed relative stand densities for various stages in the development of stands: 25% of maximum SDI approximates the onset of competitive interaction; 35% of maximum SDI approximates the lower limit of full site occupancy, and 60% of maximum SDI approximates the lower limit of self-thinning (the onset of density-dependent mortality). Maximum SDI represents the biological upper limit for stand density. In spruce-fir the maximum is 625 so the lower limit of full site occupancy is 219 and the upper limit is 375.

Table 3.2 below shows 5 selected sample stands distributed across the project area at years 50 and 100.

Table 3.2

NORTH HEBER ANALYSIS - SELECTED STANDS at 50 and 100 YEARS POST EPIDEMIC - NO ACTION												
Name	Stand	Live TPA x Diameter				All Live				All Dead		
		0-1.9	2-4.9	5-8.9	9+	%ES	QMD	SDI	BA	QMD	BA	CF
ARROYO LOBO	105910030	1474	61	4	13	37	1.4	69	18	14	100	2095
Yr 50		41	1333	70	33	39	3.7	302	111	0	0	0
Yr 100		68	360	286	127	40	7.4	545	264	0	0	0
ROUNDY BASIN	111710013	229	0	0	17	27	2.5	36	12	15.1	81	1637
Yr 50		45	190	64	16	47	5	103	43			
Yr 100		40	36	13	222	52	11.8	404	235	10.29	4	54
LITTLE SOUTH FORK	110500101	0	600	18	47	42	4.3	171	67	13.4	106	2120
Yr 50		40	84	436	62	46	7.2	377	180	11	1	5
Yr 100		94	0	128	262	52	10.5	522	290	9.3	8	81
TIMS HOLE	108210009	776	159	234	47	11	4	275	104	14.4	73	1609
Yr 50		569	94	58	236	15	6.5	499	230	9.5	1	10
Yr 100		302	27	35	191	25	9.6	531	286	11.8	2	48
WEST FORK	110730105	724	56	134	35	17	3.5	178	64	12.3	102	1833
Yr 50		186	389	44	161	21	5.8	373	164	11	1	4
Yr 100		111	462	3	173	29	8.9	540	281	14.7	1	30
	Averages	641	175	78	32	27	3.1	146	53	13.8	92	1859
		176	418	134	102	34	5.6	331	146	6.3	1	4
		123	177	93	195	40	9.6	508	271	9.2	3	43

TPA Trees per Acre
% ES Percent of TPA that is Engelmann Spruce
QMD Quadratic Mean Diameter
SDI Stand Density Index
BA Basal Area
CF Cubic Foot Volume per Acre

No acres of obliterated road prisms would be returned into a forested condition.

In terms of relationship to PFC these acres would remain in a mature stage for a time due to the presence of the dead spruce which continues to provide a mature structure to the stand. There would be no new acres of seedling/sapling structure created.

Understocked areas would not be planted and would contribute to the grass/forb structural acres.

Engelmann spruce percent in terms of trees per acre at year 50 is comparable to the pre epidemic of 35%.

Once the dead snags begin to fall and accumulate there will be a large amount of down trees jackstrawed on the ground. Should a fire occur this would burn hot and long, sterilizing the soil and killing live trees. This would also impede movement by wildlife and livestock through the stand, would be excellent Lynx denning habitat, and would inhibit regeneration of the stand due to much of the bare soil being covered by the down logs.

The following sequence of 3 figures shows the Roundy Basin stand at 50 and 100 years. The images are divided into sample plots to show the variation within the stand and that portions of the stand remain poorly stocked over the analysis period. The stand does not reach Full Site Occupancy (35% max SDI) until after the 50 year interval, in 2074.

Figure 3.3

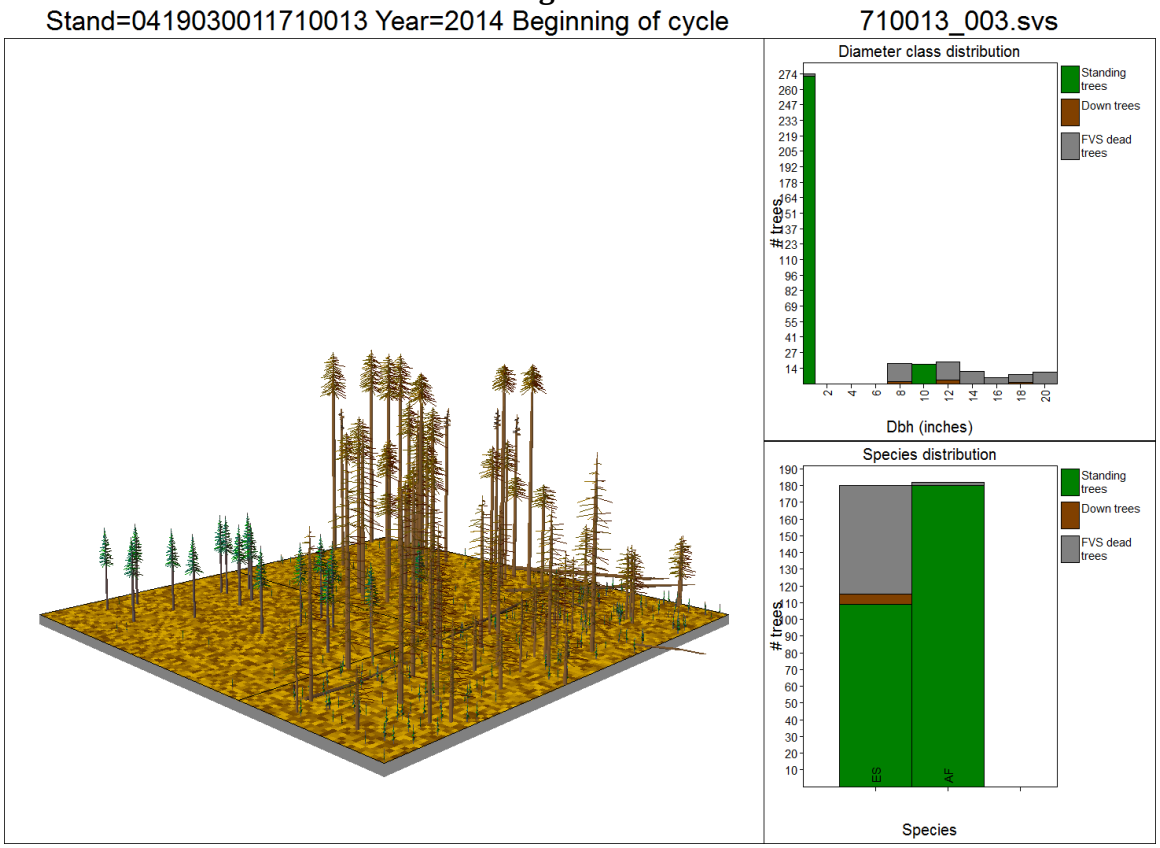


Figure 3.4

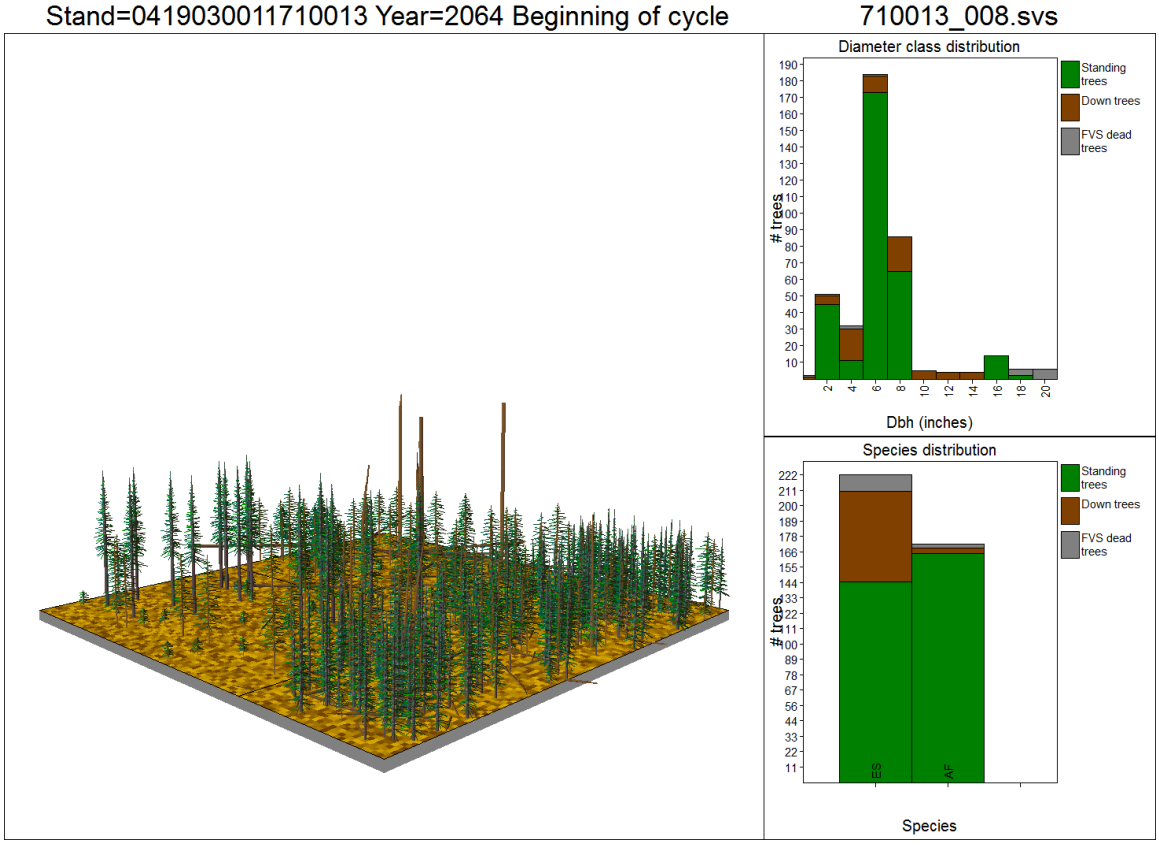
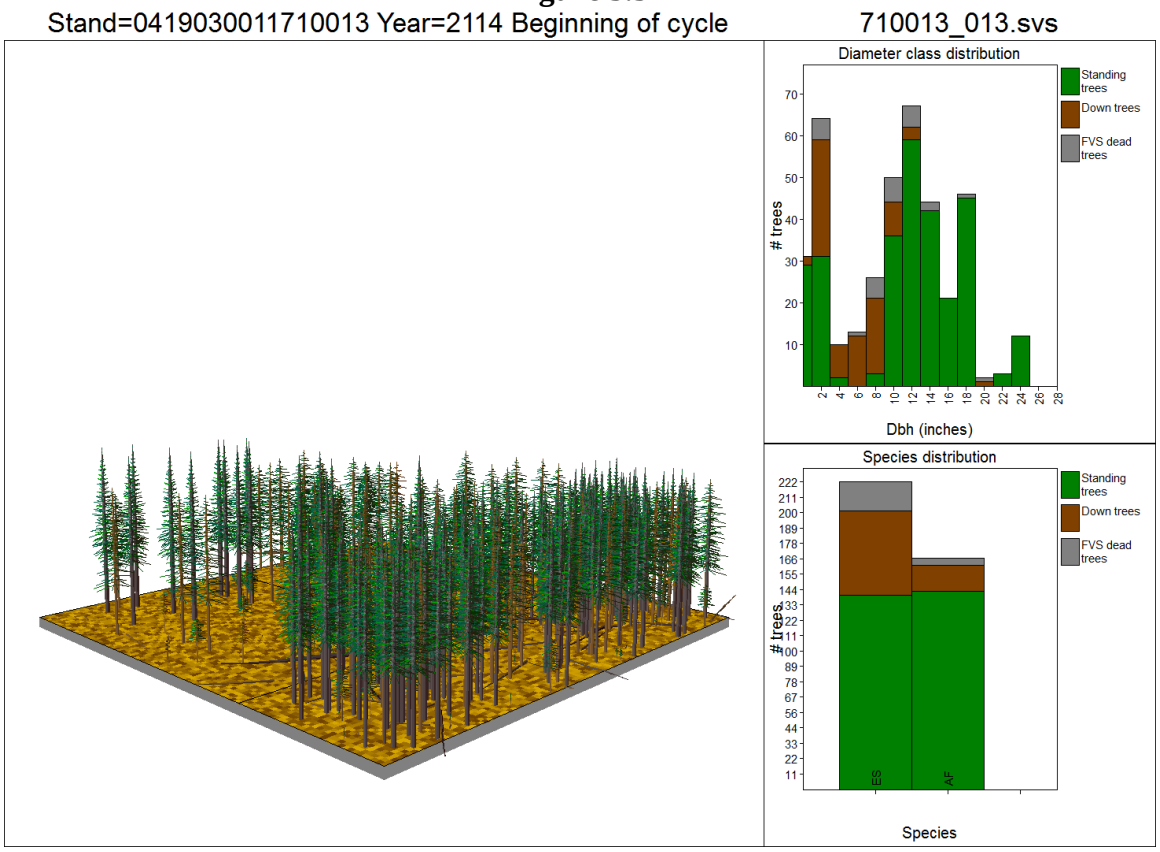

Stand=0419030011710013 Year=2064 Beginning of cycle
710013_008.svs
Diameter class distribution
Standing trees
Down trees
FVS dead trees
trees
Dbh (inches)
Species distribution
Standing trees
Down trees
FVS dead trees
trees
ES
AF
Species

Figure 3.5



2. Cumulative Effects

There are no other vegetation manipulation projects ongoing or proposed except for the Mill Hollow Campground tree removal. In terms of structural stage distribution in spruce there would be less seedling sapling stands in the short term. In the long term as the snag forest decays the developing stands would have a higher percentage of sub alpine fir than in the action alternatives because of the establishment of the shade tolerant sub alpine fir which also has live seed source to provide for seedling recruitment.

<u>c. Alternative 2 – • Full suite of timber and road obliteration activities (Proposed Action)</u>

1. Direct and Indirect Effects

Under this alternative stands would be harvested to remove the standing dead spruce. Following that, areas that do not meet current forest plan stocking rates would be planted with Engelmann spruce. The following Table 3.3 shows the stand characteristics following treatment, at 50 and 100 years for the same 5 sample stands.

Table 3.3

NORTH HEBER ANALYSIS - SELECTED STANDS at 50 and 100 YEARS POST EPIDEMIC - ALTERNATIVE 2												
Name	Stand	Live TPA x Diameter				All Live				All Dead		
		0-1.9	2-4.9	5-8.9	9+	%ES	QMD	SDI	BA	QMD	BA	CF
ARROYO LOBO	105910030	1474	61	4	13	37	1.4	69	18	14.0	100	2095
Yr 50		163	777	29	53	83	4.5	289	114	16.9	0	0
Yr 100		171	85	506	94	80	7.4	538	261	8.5	9	31
ROUNDY BASIN	111710013	229	0	0	17	27	2.5	36	12	15.1	81	1637
Yr 50		146	367	64	19	73	4.5	166	66	19.0	0	0
Yr 100		245	36	133	235	68	8.3	493	249	9.7	8	60
LITTLE SOUTH FORK	110500101	0	600	18	47	42	4.3	171	67	13.4	106	2120
Yr 50		369	19	509	66	55	6.3	465	212	9.9	1	5
Yr 100		274	0	74	270	55	9.1	540	284	10.0	9	110
TIMS HOLE	108210009	776	159	234	47	11	4.0	275	104	14.4	73	1609
Yr 50		394	85	41	256	49	7.8	522	258	10.0	1	14
Yr 100		377	5	31	180	47	9.4	537	286	12.3	2	53
WEST FORK	110730105	724	56	134	35	17	3.5	178	64	12.3	102	1833
Yr 50		387	135	53	172	61	6.5	377	173	11.4	1	6
Yr 100		281	136	0	184	59	8.5	539	276	14.3	2	45
	Averages	641	175	78	32	27	3.1	146	53	13.8	92	1859
	Yr 50	292	277	139	113	64	5.9	364	165	13.4	1	5
	Yr 100	270	52	149	193	62	8.5	529	271	11.0	6	60

Approximately 114 acres of obliterated road prisms would be returned into a forested condition over time.

In terms of relationship to PFC approximately 3,730 acres of structurally young forest would be created spread across the project area.

Understocked areas would be planted and would contribute to the seedling/sapling acres.

Engelmann spruce percent in terms of trees per acre at year 50 is up to 64% comparable to the pre epidemic of 35%. This is due to the planting of Engelmann spruce seedlings following harvest.

Snags that were left for wildlife would begin to fall in a decade or two. However this would not be in sufficient quantities to have the negative effects listed in the no action. Rather it would provide down woody debris for nutrient re cycling. This condition would not be good lynx denning.

The following sequence of 3 figures shows the treated Roundy Basin stand at 50 and 100 years. The stand reaches Full Site Occupancy at about the same time as the untreated stand but with a wider distribution of diameter classes and a higher proportion of spruce. Trees are also more evenly distributed on all plots in the stand.

Figure 3.6

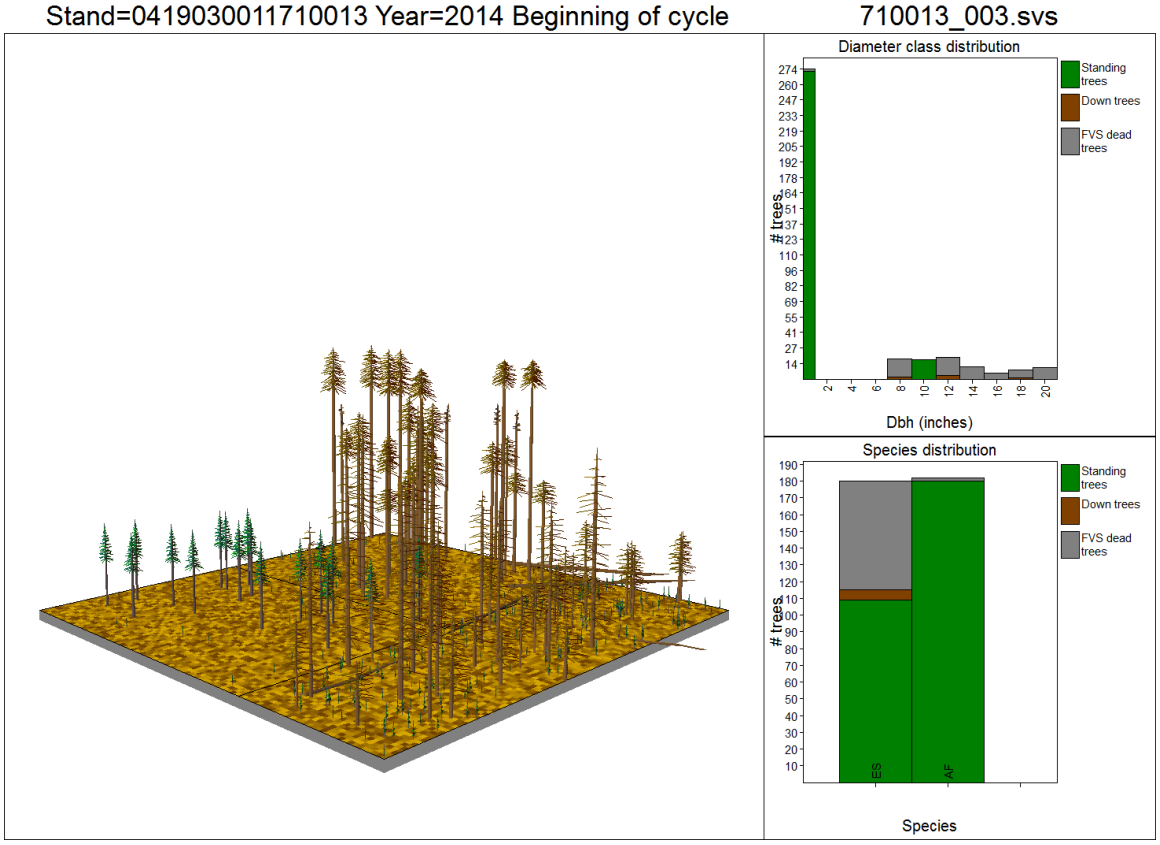

Stand=0419030011710013 Year=2014 Beginning of cycle
710013_003.svs
Diameter class distribution
Standing trees
Down trees
FVS dead trees
trees
Dbh (inches)
Species distribution
Standing trees
Down trees
FVS dead trees
trees
ES
AF
Species

Figure 3.7

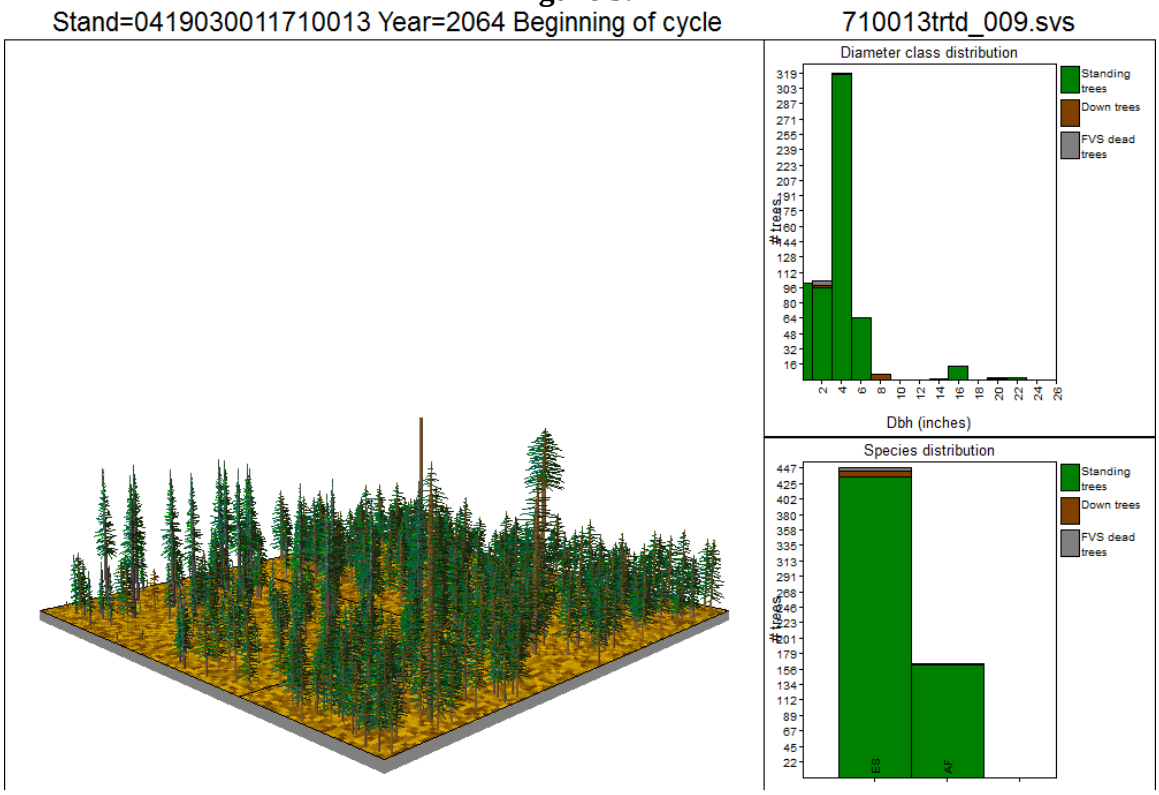
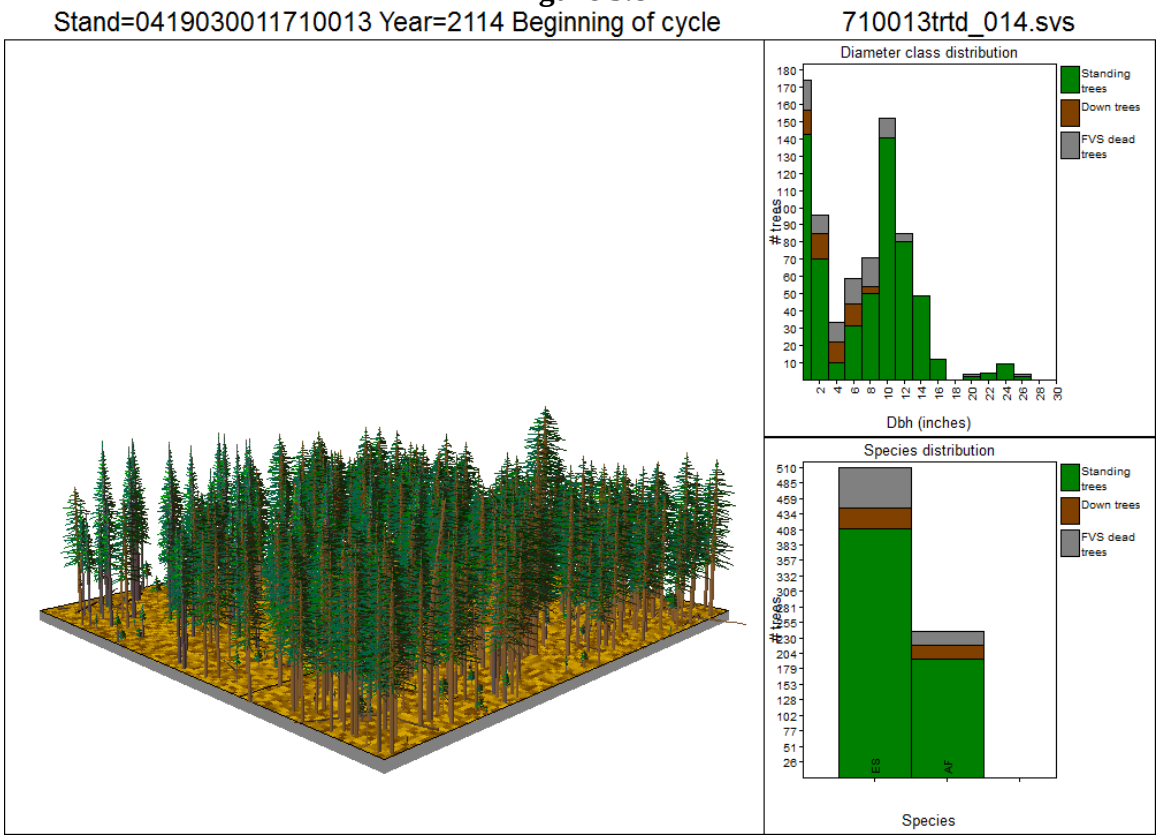

Stand=0419030011710013 Year=2064 Beginning of cycle
710013trtd_009.svs
Diameter class distribution
Standing trees
Down trees
FVS dead trees
trees
Dbh (inches)
Species distribution
Standing trees
Down trees
FVS dead trees
trees
ES
AF

Figure 3.8



2. Cumulative Effects

There are no other vegetation manipulation projects ongoing or proposed except for the Mill Hollow Campground tree removal. In terms of structural stage distribution in spruce there would be more seedling sapling stands in the short term because of the spruce tree planting and the overstory removal that would quickly establish these as the smaller structural class. In the long term the stands would develop with a higher percentage of spruce and larger tree characteristics because of the planting.

<u>d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly</u>

1. Direct and Indirect Effects

This would be the same as Alternative 2 for forested vegetation with the exception that only 45 acres of non-system road prisms would be returned to a forested condition.

2. Cumulative Effects

For the silviculture resource this would be the same as alternative 2.

<u>e. Alternative Comparison</u> – •

The Table 3.4 below shows the averages of the 5 sample stands under both the no action and the treatment alternatives. Both stands develop over the 100 year period in much the same way in respect to many stand parameters. One major difference is the composition of spruce in the stand, which is higher in the treated stands because of the initial tree planting. Another factor in that percentage is the mortality in the young sub alpine fir from the logging activity.

Table 3.4

NORTH HEBER ANALYSIS - AVERAGE VALUES FOR 5 SAMPLE STANDS											
Name	Live TPA x Diameter				All Live				All Dead		
	0-1.9	2-4.9	5-8.9	9+	%ES	QMD	SDI	BA	QMD	BA	CF
Post Epidemic	641	175	78	32	27	3.1	146	53	13.8	92	1859
No Action yr 50	176	418	134	102	34	5.6	331	146	6.3	1	4
Alt 2,3 yr 50	292	277	139	113	64	5.9	364	165	13.4	1	5
No Action yr 100	123	177	93	195	40	9.6	508	271	9.2	3	43
Alt 2,3 yr 100	270	52	149	193	62	8.5	529	271	11.0	6	60

A second area where the action and no action alternatives differ is in respect to changes in structural stages as relates to PFC. The No Action alternative leaves the snag forest to progress naturally as does the surrounding spruce. The action alternatives remove the snag forest and develop a meaningful component of seedling/sapling/young forest in the short term. Table 3.5 below shows these estimates.

Table 3.5

Mapping Class	PFC Distribution	PFC	Existing	No Action	Alt 2,3
1 – Seedling	Grass/Forb about 10%	3,311	25	400*	3,750
1 – Seedling	Seedling/Sapling about 10%				
2 – Sapling/Small Tree	Young Forest about 20%	6,621	260	260	260
2 – Sapling/Small Tree	Mid Aged Forest about 20%				
3 – Mature/Large Tree	Mature Forest about 20%	3311	16268	15873	12,543
4 – Old Forest	Old Forest about 20%	3311			
	Total Spruce-fir acres	16,553	16,553	16,553	16,553

*Note that an estimated 10% of the proposal acres, if untreated will move to grass/forb due to non stocking.

3.2.2 Wildlife

AFFECTED ENVIRONMENT

Wildlife in the area includes upland game, big game, and a wide variety of non-game species. The area is within lynx analysis units #1 and #2 (LAU). Amphibians and aquatic species are found in the Aquatic's report.

Threatened, Endangered, and Forest Service Sensitive Species

No endangered species are known to occur within the analysis area. One threatened species, the Canada Lynx, has primary and secondary habitat within the scope of analysis (USDI, 2013). Seven sensitive wildlife species are known to occur or have habitat within the analysis area. These species are bighorn sheep, spotted bat, Townsend's western big-

eared bat, fisher, flammulated owl, three-toed woodpecker, and northern goshawk (USDA Forest Service, 2013).

Management Indicator Species (MIS)

Northern goshawk, American beaver, and three-toed woodpecker are wildlife management indicator species on the Uinta planning area within the Uinta-Wasatch-Cache National Forest. MIS are discussed in this analysis.

Mammals

The following Table 3.6 shows the mammal species that are known/suspected to have habitat or are found on the Forest and their relationship to the proposed project.

Table 3.6.

Common Name	Status	Location(s)	Habitat in Project Area	Comment
Canada lynx *Lynx canadensis*	Threatened		Yes	Further discussion below.
Fisher *Martes pennanti*	Sensitive		Yes	Currently extirpated from the state (UCDC, 2015). No further discussion.
Spotted Bat *Euderma maculatum*	Sensitive		Yes	Spotted bats roost in caves, mines and cliffs crevices. Since there will be no degradation or disturbance to this habitat component, there will be No Impact on this species. No further discussion.
Townsend's Big-eared Bat *Corynorhinus townsendii townendii*	Sensitive		Yes	Townsend's Big-eared bat roots in caves, mines and cliff crevices. Since there is no degradation or disturbance to this habitat component, there will be No Impact on this species. No further discussion.
America Beaver *Castor canadensis*	MIS		Yes	Further discussion below.
Big horn sheep *Ovis canadensis*	Sensitive		No	Desirable potential habitat is approximately 1 mile away from project boundary, but the nearest population approx. 27 miles north-east (UDWR, 2012). No impact to the closest population is expected. No further discussion.

Common Name	Status	Location(s)	Habitat in Project Area	Comment
Rocky Mountain Goat *Oreamnos americanus*	None		No	Closest habitat is 5 miles away and population is approx. 7 miles north-east of project area. No Impact to the closest population is expected. No further discussion.
Pronghorn Antelope *Antilocarpa Americana*	None		No	Project habitat outside current distribution of species (see Appendix). No further discussion.
Bison *Bos bison*	None		No	Project habitat outside current distribution of species (see Appendix). No further discussion.
Mule Deer *Odocoileus hemionus*	None		Yes	Further discussion below.
Elk *Cervus elaphus*	None		Yes	Further discussion below.
Moose *Alces americanus*	None		Yes	Further discussion below.

The following mammals were reviewed and are found in the project area and are affected by the project.

Herbivores

Elk, Mule deer, and Moose

Mule deer, elk, and moose are known to occur within the North Heber Salvage Proposal. Current population objectives and estimated trends for the Wasatch Mountains, Avintaquin/Current Creek Big Game Management Unit (17B/17C) found 16,800 for mule deer and 5,250 for elk (UDWR, 2013). The Wasatch Mountains, Avintaquin/Current Creek Big Game Management Unit is approximately 966,476 acres (UDWR, 2012). This management unit will be used as the scope of analysis for the big game section. Table 3.6 shows the population objectives and estimates (Wasatch Mountain, Avintaquin/Current Creek Big Game Management Unit-17B/17C) for big game species known to occur within the North Heber Salvage Project, Heber-Kamas Ranger District, Uinta-Wasatch-Cache National Forest, Utah (UDWR, 2013).

Table 3.6
Big Game Population Estimates (percent of objective)

Year	Mule Deer	Elk	Moose
2009	11,200 (62%)	2,800(100%)	N/A
2010	11,700 (64%)	4,200(150%)	49
2011	10,500 (58%)	4,100 (146%)	N/A

2012	14,600 (80%)	5,500 (196%)	56
2013	16,800 (92%)	5,250 (187%)	N/A
Population Objective	18,200	2,800	N/A

N/A-Not available

This project is within summer range for mule deer, spring/fall range for elk, and winter/year-long range for moose. The Wasatch, Avintaquin/Current Creek management unit contains 622,832 acres of summer range for mule deer, 387,251 acres of spring/fall range for elk, and 643,925 acres of winter/year-long range for moose (UDWR, 2012). Since the project area is about 3,730 acres, 0.6% of mule deer range, 1.0% of elk range, and 0.6% of moose range will be affected. Crucial fawning habitat for all species is within and adjacent to the project area. Planting within the units will promote horizontal cover, helping with thermal and hiding cover. Winter range for elk is within the eastern edge of the project boundary near wolf creek summit, while mule deer winter range is approximately 1 mile east. The proposed action occurs in habitat which provides forage, as well as thermal and hiding cover for mule deer, elk, and moose.

The Utah Division of Wildlife Resources (UDWR) conducts big game surveys to determine population estimates (Table). In the past 5 years (2009-2013), elk estimated populations have increased from 2,800 to 5,250 animals (UDWR, 2013). The population objective for elk in this unit is 2,800. The 2013 estimated population is 187% above the population objective. The mule deer population has increased in the past 5 years from 11,200 in 2009 to 16,800 in 2013 (UDWR, 2013). Since the population objective is 18,200 deer for this management area, we are currently below population objective. The UDWR conducted surveys for moose in 2010 and 2012. Population estimates in this unit were 49 and 56 animals, respectively (UDWR, 2013).

American Beaver

The American beaver is the largest rodent native to North America. It occurs throughout most of North America and is fairly common in Utah. It is found in perennial slow-moving streams, ponds, small lakes, and reservoirs. The beaver is a species that uses a wide variety of riparian habitats (NatureServe, 2015).

Summer foods include aquatic succulents such as pond lilies, duckweeds, pondweeds, algae, and fleshy rootstocks of many other species, as well as a wide variety of upland or riparian herbaceous plants (NatureServe, 2015).

Beaver are widely distributed across the Uinta-Wasatch-Cache National Forest in riparian habitats where there is sufficient stream flow and sufficient food resources. However, stream reaches dominated by rocky substrates are not considered desirable beaver habitat (Ministry of Environment, Lands, and Parks, 1998). Beaver colony surveys were initiated in 2004 in a grid of systematically sampled sections across the Uinta Planning Area. There are 24 sections that are thought to contain suitable beaver habitat, and have been surveyed in various years since 2004. The number of sections with active colonies has dropped from the 2004 to 2013 (Table 1.7). This may suggest that there is an overall downward trend with beaver

populations (Forest Service, U.S. Department of Agriculture, 2013). There are two beaver sections within the project boundary. Of these, only one section has been documented to have an active beaver colony.

Table 1.7

Year surveyed	Sections surveyed that contained suitable beaver habitat	Sections containing at least one active colony number (% of suitable)	Active Colonies Observed	Active Colonies per Section Surveyed	Active Colonies per Uinta Planning Area Section	Miles of Perennial Stream Surveyed (miles) within Suitable Beaver Sections	Active Colonies/mile of Perennial Stream Within Suitable Beaver Sections
2004	20	8 (40%)	21	1.05	0.39	24.2	0.87
2005	21	9 (43%)	22	1.05	0.41	24.8	0.89
2006	20	9 (45%)	18	0.90	0.33	24.4	0.74
2007	16	7 (44%)	17	1.06	0.31	24.5	0.69
2008	21	9 (43%)	18	0.86	0.33	26.7	0.67
2009	18	5(28%)	10	0.56	0.19	23.1	0.43
2010	24	4(17%)	5	0.21	0.09	28.9	0.17
2011	23	4(17%)	4	0.17	0.07	28.8	0.14
2012	16	5 (31%)	6	0.38	0.11	17.8	0.34
2013	16	4(25%)	6	0.38	0.11	21.7	0.28

Carnivores

Canada Lynx

Canada lynx evolved within a dynamic boreal forest landscape capable of supporting abundant snowshoe hare populations. The species is known to have an extensive home range and move long distances in relatively short periods of time in this region (Squires & Oakleaf, 2005) (Murphy, et al., 2006). Individual lynx regularly move long distances in order to find and utilize good foraging habitat within the broader landscape matrix. In Utah, and elsewhere in the Continental United States, important foraging habitat for lynx is often more limited than it is in the northern boreal forests of Canada and Alaska.

Historically lynx occurred in the Uinta Mountains on the Uinta-Wasatch-Cache National Forest (Bunnell, Shirley, Flinders, Wolfe, & Bissonette, 2005); however, there have only been 10 confirmed sightings of Canada lynx in the Uinta Mountains in the past 100 years. Prior survey efforts for lynx have been unsuccessful in documenting lynx occurrence including a 2000-2002 Brigham Young University study, 2009-2010 aerial surveys in in the Colorado River drainage of the North Slope of the Uinta Mountains, and 2010-2012 USFWS track surveys. From September 1999 through March 2007, 22 of the 218 radio-

collared lynx reintroduced to the Colorado Rockies by the Colorado Division of Wildlife (CDOW) were documented dispersing through Utah and the Uinta Mountains (CDOW, 2006-2007). The majority of lynx satellite locations occurred within the western half of the mountain range (CDOW, 2007-2008). The lynx moved through Utah but did not take up residency.

Literature suggests that Lynx require approximately 0.5 snowshoe hares/hectare (ha) to successfully recruit their young into the population (Ruggiero, et al., 1999). From 2004-2013, snowshoe hare density estimates obtained from fecal pellet counts in conifer and mixed conifer-aspen stands on the Uinta-Wasatch-Cache National Forest over three ranger districts (Kamas, Evanston, and Mountain View) averaged 0.71 hares/ha (Uinta-Wasatch-Cache National Forest, 2012) thus indicating that the prey base for lynx on the Forest should be sufficient for some degree of population persistence. The U.S. Fish and Wildlife Service (USFWS) in 2003 stated that there is no evidence of lynx reproduction in Utah and concluded that lynx that occur in Utah are dispersers rather than residents because most of the few existing records correspond to cyclic populations highs, and boreal forest habitat in Utah is remote and far from source lynx populations (USDI, Fish and Wildlife Service, 2009).

No Critical Habitat for the Canada lynx has been identified in Utah (USDI, Fish and Wildlife Service, 2009). Most high elevation conifer forests and mixed conifer-aspen forests within the Uinta Mountains are managed as a Lynx Analysis Unit (LAU), approximating the average size of an adult female lynx's home range. LAUs are used for basing management decisions and for the scope of analysis for the proposed project.

The North Heber Salvage Project is found within LAU #1 and #2 as shown bleow in Figure 3.6. These LAUs include suitable habitat for Canada lynx and their primary prey, the snowshoe hare.

Figure 3.6

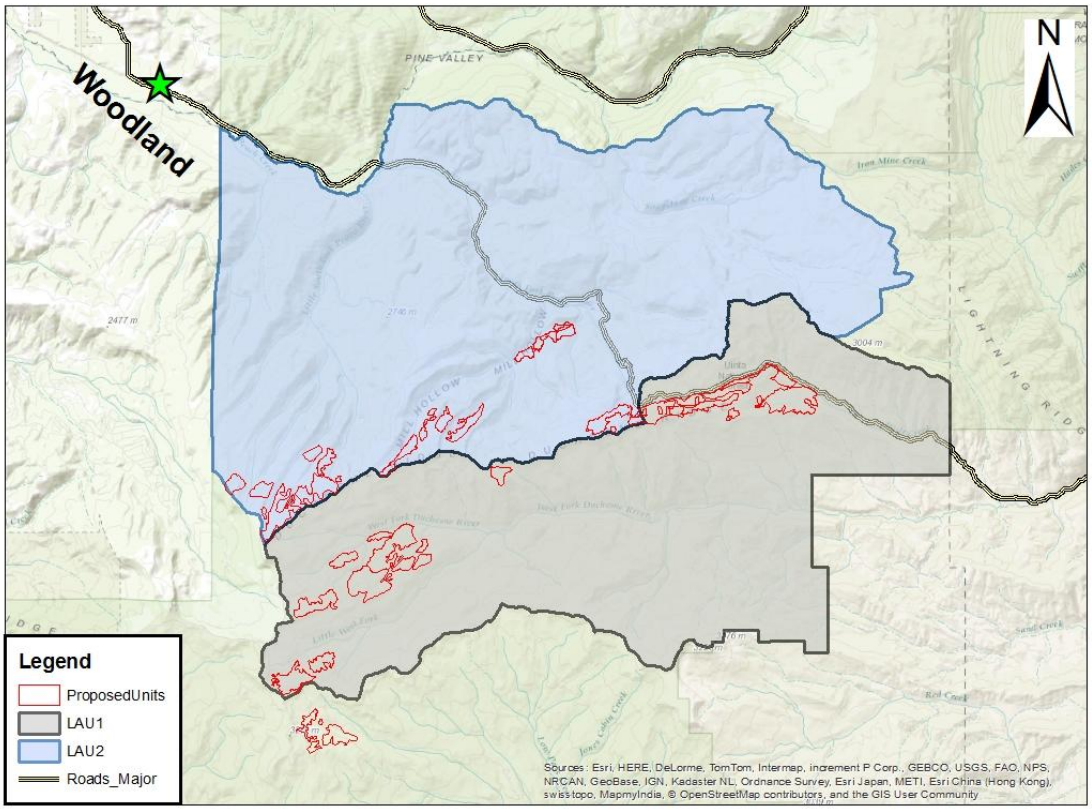


Table 3.8 shows the total area within the Canada lynx analysis unit (LAU) 1 and 2 and the area within the North Heber Salvage Project on the Heber-Kamas Ranger District, Uinta-Wasatch-Cache National Forest, Utah.

Table 3.8
LAU Acreage in Proposal Area

	LAU #1	LAU #2
Total Size	41,675	56,573
Potential treatment area within suitable lynx habitat	2,052	1,091
Past disturbances within 10 years	172	1,200
Foreseeable Action-Cold Springs Timber Sale	129	747
Total Changed including proposal	2,353	3,038
Percentage of LAU changed	5.6%*	5.4%*

*Percent of maximum suitable habitat that could potentially be treated.

The North Heber Salvage Project has 2,217 acres of proposed units that are within LAU #1 (41,675 acres). Within those units, there are approximately 2,052 acres of suitable lynx habitat that are proposed to be treated with timber harvest. Past disturbances within this LAU total 172 acres and foreseeable future action is 129 acres. The Uinta Forest Plan

states, “Vegetation management shall not change more than 15% of Canada lynx habitat within a Lynx Analysis Unit (LAU) to an unsuitable condition within a 10 year period” (USDA Forest Service, 2003). Approximately 5.6% of lynx habitat within LAU #1 has been altered within the 10 year period. There are also 1,294 acres of the North Heber Salvage Proposal in LAU #2 (56,573 acres). Of those acres, approximately 1,091 acres are within suitable lynx habitat that will be harvested. Past disturbances within this LAU total 1,200 acres and foreseeable future action 747 acres. Approximately 3,038 acres in total will be classified as unsuitable lynx habitat (5.4% of LAU#2) after this project is completed. These percentages are below the 15% lynx habitat change within a 10-year period. These numbers reflect the maximum suitable habitat that could potentially be treated by the proposed project while the actual treated habitat will more than likely be less.

Birds

The following Table 3.9 shows bird species that are known/suspected to have habitat or found on the Forest and their relationship to the proposed project:

Table 3.9
Potential Bird Species in Project Area

Common Name	Status	Location(s)	Habitat in Project Area	Comment
Yellow-billed Cuckoo *Coccyzus americanus*	Threatened	Wasatch County, Utah	No	Nest in low riparian hardwoods (nest 2500-6,000’ elevation). Not present in the proposed project area. No Impact. No further discussion.
Greater Sage-grouse *Centrocercus urophasianus*	Sensitive, Candidate	Wasatch County, Utah	No	Closest occupied habitat is approx. 0.85 miles south-east of project. No impact to birds or habitat. No further discussion.
Peregrine Falcon *Falco peregrinus*	Sensitive	Wasatch County, Utah	No	Not found in the project area (see Appendix). No Impact. No further discussion.
Bald Eagle *Haleitus*	Sensitive	Wasatch County, Utah	No	In Utah, bald eagles are primarily winter residents. Habitat needs to include open bodies of water for feeding and large, mature trees for nesting, roosting, and perching (Degraff, Scott, Hamre, Ernst, & Anderson, 1991). Closest habitat is approximately 10 miles away. No Impact to birds or habitat. No further discussion.
Flammulated Owl *Otus flammeolus*	Sensitive	Wasatch County, Utah	Yes	Further discussion below.
Northern goshawk *Accipiter gentalis*	Sensitive, MIS	Wasatch County, Utah	Yes	Further discussion below.

Migratory birds	Migratory	Wasatch County, Utah	Yes	Further discussion below.
Three-toed Woodpecker *Picoides dorsalis*	Sensitive, MIS	Wasatch County, Utah	Yes	Further discussion below.

The following birds were reviewed and found in the project area and are affected by the project:

Predatory Birds

Flammulated Owls

This species occurs in mountain ranges throughout Utah (UCDC, 2015). Flammulated owls prefer ponderosa pine forests but will also use forests of spruce-fir, Douglas-fir, lodgepole pine, aspen, and pinyon-juniper (Degraff, Scott, Hamre, Ernst, & Anderson, 1991). Large diameter (20 inch dbh) dead trees with cavities at least as large as northern flicker cavities are important site characteristics. Flammulated owls are strictly nocturnal and eat insects and other terrestrial invertebrates, such as spiders, centipedes, and scorpions (UCDC, 2015). There are approximately 60,344 acres of flammulated owl habitat within the scope of analysis, of which up to 3,294 acres within the treatment units may be impacted. In 2005, flammulated owl surveys were done at Bench Creek and Log Hollow. One flammulated owl was detected in the Bench Creek area and none at Log Hollow. Bench Creek is approximately 2 miles north-west of the project area.

Northern Goshawk

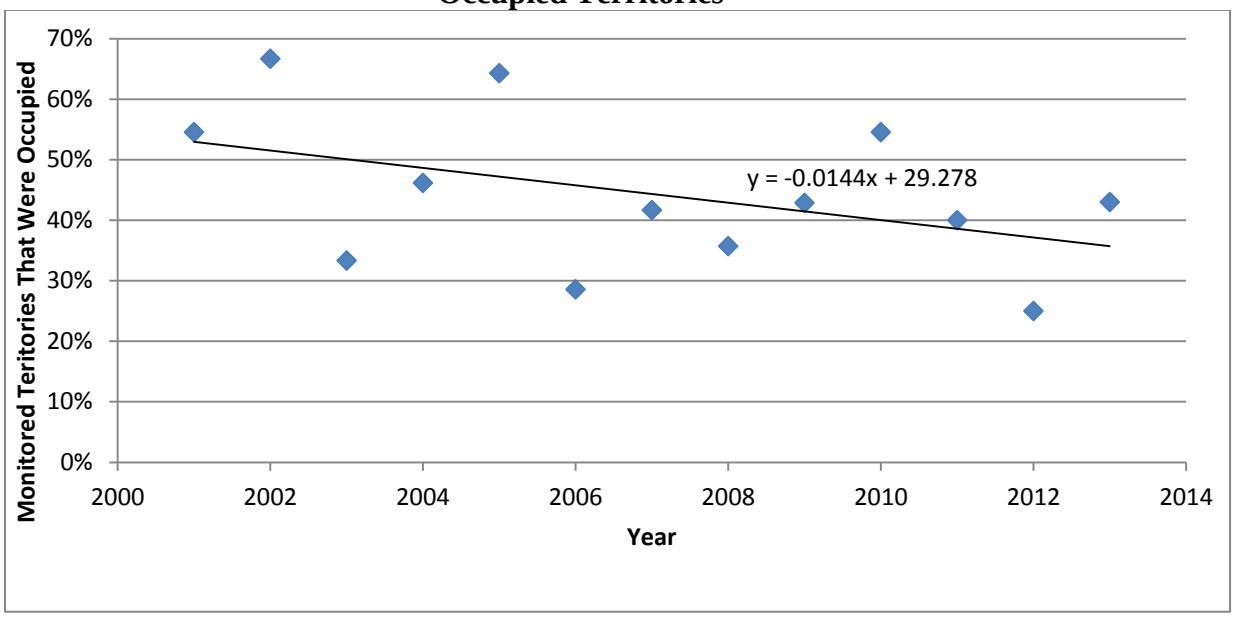
The northern goshawk is a sensitive species and is also classified as a MIS on the Uinta-Wasatch-Cache National Forest. Northern goshawk habitat is present in the project area. Goshawks in this area tend to nest in mature conifer and aspen/conifer stands. There are three main components of a goshawk's home range (~6,000 acres): nesting area, post fledging-family area (PFA), and foraging area. Nest areas contain one or more stands of large, old trees with dense canopy cover. Most goshawks have 2 to 4 alternate nest areas within their home range; alternate nest areas are used in different years, but some nests may be used for decades. The goshawk PFA surrounds the nest areas within a home range, totaling ~420 acres and because of its size, includes a variety of forest types and conditions. The foraging areas are ~5,400 acres in size. Home ranges of goshawks during nesting season vary from 235 to 8,645 acres (Squires & Reynolds, 1997). The goshawk is a forest habitat generalist that uses a wide variety of forest ages, structural conditions, and successional stages.

Goshawks forage on a wide variety of prey, depending on prey availability. Common prey species include mammals, such as ground squirrels, rabbits and hares, as well as birds, including forest grouse, woodpeckers, jays, and other bird species.

One of the primary reasons this species was selected as an MIS is that prey abundance, foraging habitat, and nesting habitat for the goshawk are potentially affected by important management activities on the Forest, including fire and fuels management and timber management. There are approximately 60,344 acres of goshawk habitat within the scope of analysis. Of this, up to 3,294 (5.9%) acres within the project units may be impacted. Since goshawks diet and habitat use can overlap with the owls, it can be used as a representative to the bigger group.

The Uinta-Wasatch-Cache National Forest conducts annual surveys to monitor goshawk territory occupancy. Results of these surveys are summarized in the MIS Goshawk Report (UWCNF, 2014). These surveys indicate that the trend in occupied territories have declined slightly since 2001. There are two known territories in the project area, one of which is within a unit boundary. Both territories were occupied in 2014. These two territories will be protected, as stated in the forest plan. Any new territories found will also be protected. The following Figure 3.7 shows the percent of occupied territories for all MIS goshawk territories in the Uinta Planning Area from 2001-2013, Uinta-Wasatch-Cache National Forest, Utah.

Figure 3.7
Occupied Territories



Migratory Birds

Migratory birds

Migratory birds are protected by a variety of Federal laws, but are primarily protected by the Migratory Bird Treaty Act of 1918 (16 USC 703-712). This act, as amended, was established to protect migratory birds by making it illegal to pursue, hunt, take, capture, kill, or possess migratory birds or any part, nest, or egg of any such bird (16 U.S.C. 703-7012). In January of 2001, Executive Order, 13186 was issued on the Responsibilities of

Federal Agencies to Protect Migratory Birds. It specifies the need to avoid or minimize any adverse impacts on migratory birds. The order addressed the need to restore and enhance the habitat of migratory birds (MOU, 2008).

While an emphasis is placed on riparian area protection for migratory birds, almost all bird species that could be found in Utah are considered migratory birds. They occupy a wide range of habitat types. The Utah Birds Records committee lists 456 species of birds in the *Field Checklist of the Birds of Utah* (Utah Bird Records Committee, 2014). Consequently, all habitat types have the potential to have a neo-tropical bird associated with it.

Two North American Breeding Bird Survey (BBS) route (Soapstone #85156 and Heber Mountain #85206) is found in and adjacent to the North Heber Salvage Project. (On file at: Uinta-Wasatch-Cache National Forest, Heber- Kamas R.D.). The soapstone route begins near the Soapstone Summer Home Area, continues south to the Duchesne Ridge, west to Lake Creek summit, where it stops here and continues on the Left Fork Current Creek road where it ends. The Heber Mountain route begins off forest along the Lake Creek road, heads up to Lake Creek Summit, continues south-east to Co-op Creek road, and ends at highway 40 near strawberry reservoir. Broad-tailed hummingbirds (Utah Partners in Flight Priority Species), Willow flycatcher (U.S. Fish and Wildlife Birds of Conservation Concern), Cassin's Finch (U.S. Fish and Wildlife Birds of Conservation Concern), and Brewer's sparrows (Utah Partners in Flight Priority Species and U.S. Fish and Wildlife Birds of Conservation Concern) were identified along this route in one or multiple years. This is shown in Table 3.10.

Table 3.10
Breeding Bird Survey Species

Species Common Name (Scientific Name)	Food Habits	Nest Location	Distribution/Habitat Association
Willow Flycatcher (Empidonax traillii) (BBC)	Feeds mainly on invertebrates, though some seeds and berries are eaten.	Nests are built in willow, rose, or other riparian trees usually in a vertical fork.	Occurs throughout the northern and central U.S. during the breeding season, and winters in southern Mexico and Central America. Breeding sites are in low scrub, thickets, or grove of small trees, and often near watercourses.
Cassin's Finch *(Carpodacus cassinii)* (BBC)	Primarily on buds, fruits, and seeds, especially those of ponderosa pine. Occasionally insects.	Tree nester, out on a branch, high in a conifer	Breeds from southern Alberta, Canada, to the west-central Mexico, though most of the breeding range remains occupied all year. In Utah, Cassin's finch is a year-round resident that is found statewide in high and mid-elevation forests.

Broad-tailed hummingbird (*Selasphorus platycercus*) (PIF)	Omnivore, nectar and insect forager.	Tree nester, found in nests ranging from 3 to 30 feet off the ground.	The breeding range extends discontinuously from eastern Guatemala north through Mexico and the western United States. Winters in Mexico and Central America. In Utah, the broadtail breeds in riparian or adjacent habitats, both in lower valleys and at higher elevations.
Brewer's sparrow (*Spizella breweri*) (BCC, PIF)	Primarily insectivorous during the breeding season though their diet consists mostly of grass and weed seeds in winter.	Nests, tight cups of grass and forbs. Nests are typically placed between 8-20 inches high; they are usually in the top half of the shrub.	Breed primarily in shrub steppe habitats in Utah and are considered to be shrub steppe obligates by Braun et al. (1976). However, they may also breed in large sagebrush openings in pinyon-juniper habitat or coniferous forests.
	Information taken from the Utah Conservation Data Center 2015.		

Three-toed woodpecker

The three-toed woodpecker is a migratory bird, Management Indicator species, and a Forest Service Sensitive species. In Utah this species is generally found in subalpine conifer forests above 8,000 feet (Parrish, Howe, & Norvell, 2002). On the Uinta-Wasatch-Cache National Forest, it has been detected primarily in spruce/fir, Douglas-fir, and lodgepole pine forest types. There are approximately 18,121 acres within the scope of analysis, of which 3,085 acres are within the project area. They forage on beetle larvae and other insects that flourish in large, dead or dying conifers. Conifers also provide nesting cavities for the woodpeckers. There are 13 MIS survey points within the scope of analysis, with one point being inside a unit. Over the past 11 survey years, only two survey points have not recorded a three-toed woodpecker. The point inside the project unit has been surveyed seven times out of 11 years. Woodpeckers were present five out of the seven years. No nest sites were observed, but if any are found, they will be protected, as the forest plan outlines (USDA Forest Service, 2003). Three-toed woodpeckers can be a representative group for other migratory birds that utilize large dead or dying trees.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

Brewer's sparrows primarily nest in shrub steppe habitats. Sagebrush will not be removed in any alternatives. In the short term, the increase of grasses and forbs may increase insect densities near the edge of conifer and sagebrush communities. Brewer's sparrows may forage at these edges. In the long term, the conifer stands will mature, which will

reduce the understory density and diversity. These alternatives may slightly increase insect densities for Brewer's sparrow in the short term and will have no impact on nesting habitat.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

Big game species will continue to lose hiding/thermal cover as the trees continue to lose their needles and fall to the ground. New growth of forbs and grasses will grow between the down trees where sunlight hits. Ungulates may have a hard time navigating through all the down trees to reach the new growth. Eventually the down trees will rot away. In the long term, thermal and hiding cover would eventually return to the areas where the outbreak of beetles scoured the land. Since restocking efforts will not happen in this alternative, the advancement in the seral stages may take longer, especially in areas that lack a sufficient seed source. Without any road closures, the hunting pressure will remain constant.

The effects of the beetle epidemic to Canada lynx habitat will remain on the landscape. The reduction of conifer needles has lowered the quality of year round habitat for lynx and their primary prey, the snowshoe hare. Snowshoe hares rely on a high density of conifer stems and/or branches that protrude above the snow for food and cover during the winter. Prey species may disperse from the area until the minimum vegetation height returns. Without the planted seedlings, areas that lack a sufficient seed source will take longer to reach this minimum height (above average snow depth). Beneficial denning habitat will be created as the beetle-killed trees fall within the dense understory cover. Without any road closure, competition between lynx and other predators will remain constant. Snowmobiles compact the snow, which allows other predators to access higher elevation areas to hunt.

Beaver will continue to use suitable habitat in the project area to build colonies. The beetle-killed trees that fall across streams may be used by beaver as a foundation to build dams. Conifer trees are not a preferred food source for beaver. The reduction of conifer density may allow other tree species, such as aspen to re-establish. Aspen, along with willows, are a preferred food source. Beaver will travel up to 300 feet from a stream for food (Olsen, 1994). New aspen growth within this range will benefit beaver. Roads that are near or cross streams will not be considered to be closed in this alternative. Illegal off-road use or disperse camping near the streams may reduce habitat for beaver. Also, beaver are a furbearer in Utah. Hunting pressure will remain constant since it is easy to access streams from the roads.

The predatory bird group (flammulated owl and northern goshawk) requires mature forests to hunt and nest. Territories of these birds may be degraded due to the reduction of canopy cover, depending on the extent of the beetle kill in their territories. As large, mature conifer trees lose their needles and begin to fall, predatory birds may move out of the area to seek better nesting habitat. In the long term, the forest should go through its

seral stages, becoming more mature and return to the habitat these birds and their prey prefer to occupy.

The 3,730 acres timber harvest will not occur. Species, such as the three-toed woodpecker, that are dependent on these large, dead conifer trees will continue to forage and nest in them. In the long term, beetles will move elsewhere since there will be few, if any, large live conifers in the area. In turn, species that feed on these beetles will move also. Cavity nesters will have nesting habitat until forage in the area dwindles or the trees finally fall.

Cassin's finch will use the remaining live conifer trees to nest in. The understory will become denser between the standing dead. This species will utilize the area to forage on buds, seeds, fruits, and insects. Since restocking efforts will not happen in this alternative, the advancement in the seral stages may take longer, especially in areas that lack a sufficient seed source. Roads that are vegetated will continue to provide foraging habitat, while roads that lack vegetation will be passed over.

Willow flycatcher will continue to nest in willow or small riparian trees in the project area. The beetle-killed trees near streams should allow more light to reach the ground. Understory vegetation under these trees will become denser. The flycatcher will utilize the area for foraging on invertebrates, seeds, and berries. Roads that are near or cross streams will not be considered to be closed in this alternative. Illegal off-road use or disperse camping near the streams may reduce habitat for the willow flycatcher.

Broad-tailed hummingbird will continue to nest in living trees in the project area. The understory vegetation will become denser between the standing dead. Flower producing plants will be utilized by the hummingbird to collect nectar. There will be no supplemental tree seedlings planted. Future nesting trees will be produced by the remaining seed source. Roads that currently provide flowering plants will continue to be used, while roads that lack vegetation will be passed over.

2. Cumulative Effects

Under the no action alternative the forested stands would continue to develop following natural processes. Snag forests would fall down over time and sub alpine fir understories would develop into mature trees within the dead and down. Since there would be no activity, there would be no cumulative effects.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

The project area is classified as summer range for mule deer, spring/fall range for elk, and winter/yearlong range for moose. This area has crucial fawning areas for mule deer and elk. Winter range is not a limiting factor for moose in Utah. Moose use thick stands of conifer for shelter in the winter and thermoregulation during the summer (UDWR, 2009). Elk and mule deer also use these stands as thermoregulation when they are in the

area. Thermoregulation and hiding cover is being reduced due to the needles casting off the trees. Removing the dead timber will return the forest to an earlier seral stage that will produce more forage for these ungulates. Planting seedlings will provide thermoregulation and hiding cover in the long term. Re-opening the old road prism during implementation of the sale may contribute to added hunting pressure. After each sale is complete, the roads will be obliterated and rehabilitated to a natural state. There are 45.5 miles of roads that are being considered for rehabilitation. This may return up to 66 acres of habitat that has been lost. Returning the road prism to a natural contour may hinder illegal off road travel that destroys habitat for all wildlife. Therefore, the proposed action may disrupt big game movements in the 3,730 acres of habitat within the units as the project is implemented, but it will increase forage in the short term, lessen the hunting pressure by reducing the road densities, and promote future thermoregulation and hiding cover. It is not expected to impact population viability and trend of any big game species.

Effects to Canada lynx and its habitat would vary depending upon the impact of the spruce beetle epidemic to each stand. Several of these large conifer trees have already lost their needles. This reduces the dense cover which lynx and their prey prefer. The removal of live conifer trees (due to operational safety or the likelihood they will blow down) would also reduce foraging and hiding cover. However, the mosaic pattern that would be produced would still provide habitat for these species within the treatment boundaries. The ¼ acre patches of dense standing dead that are left will eventually fall, creating potential denning areas for lynx. Planting tree seedlings will provide indirect beneficial effects by stimulating the growth of conifer trees in areas that are scarce. The reduction of road density will benefit lynx by increasing the vegetation on the roads where there are currently none. The increase in vegetation will provide foraging and cover for both lynx and their prey. Also, the removal of roads may reduce snowmobile use in certain areas. Snowmobiles compact snow on roads, which allow other predators to search for food in inaccessible areas. Reducing the compaction would give lynx its' physical adaptation advantage back and reduce competition pressure during winter months. Long term effects on these treatments will provide dense, understory vegetation that lynx and their prey can utilize year round (10-30 years). Therefore, the proposed action **"**may affect, but not likely to adversely affect**"** Canada lynx or its habitat since the treatment units are designed to have long term beneficial effects.

Most of this project will not occur near beaver habitat. The Riparian Habitat Conservation Area (RHCA) puts a buffer around streams that restricts any mechanical treatments to occur. Buffers range from 100'-300', depending on the ranking of the stream. Beaver will travel up to 300 feet from a stream for food (Olsen, 1994). Willow and aspen are a preferred food source for beaver. The removal of beetle-killed conifer trees may benefit this species by allowing aspen to return. As aspen grows near the streams, beaver will utilize it for food and dam building material. Road closures will remove culverts and rehabilitate the stream back to its natural state. This will improve beaver habitat. Hunting pressure may be reduced since streams may become less accessible. Therefore, the proposed action may slightly benefit beaver by promoting food and dam building materials near streams.

Flammulated owls nest in cavities created by other species. Nesting habitat will be lost as the dead trees are removed. However, nesting trees will still be available within the units as snags trees and islands of ¼ acre dead/live trees will be left. Preferred roosting habitat appears to be in large live trees with significant overhead protection or dense vegetation (Linkhart, 2013). Many of the beetle-killed trees have lost this important characteristic with the loss of needles. Prey species may disperse since exposure on the bare trees has increased. Planting the seedlings will stimulate the conifer stands and eventually replenish preferred roosting habitat (which contains overhead protection for these owls and provide cover for prey species). Removing the road prism will restore vegetation that will benefit flammulated owls by increasing habitat. Therefore, this treatment "may impact individuals but is not likely to cause a trend to federal listing or loss in viability" to flammulated owls since quality roosting habitat has been degraded due to the beetle epidemic, supplementing conifer tree seedlings will ensure proper reforestation of conifer stands, and re-contouring roads will reestablish lost habitat.

Northern goshawk territories may be degraded due to the reduction of canopy cover, depending on the extent of the beetle kill in the territories. This species nests in areas that provide overhead protection in mature stands. The loss of needles from the epidemic reduces this protection. Nesting habitat will still be available in the aspen/conifer stands and in the patches of dead/live conifer trees that meet this requirement. Prey species may disperse due to the lack of available cover. Planting tree seedlings will provide indirect beneficial effects by stimulating the growth of foraging and hiding cover for goshawk prey. After these trees mature, they will provide potential nesting habitat. Removal of the road prism will restore vegetation that will benefit goshawks by increasing habitat. Therefore, this treatment "may impact individuals but is not likely to cause a trend to federal listing or loss in viability" to northern goshawks since the beetle epidemic has lowered the quality of nesting and foraging habitat in the area already, supplementing conifer tree seedlings will ensure proper reforestation of conifer stands, the known territories will be protected, and re-contouring roads will reestablish lost habitat.

Spruce beetle larvae are an important prey of three-toed woodpeckers, so the proposed action would have short-term and long-term negative effects on three-toed woodpecker habitat. However, the proposed action is focused on salvage of already dead or dying trees, which provide minimal spruce larvae for three-toed woodpeckers because the food resource is largely gone. Nesting habitat will be lost as the dead trees are removed. Nesting trees will still be available within the units as snags trees and islands of ¼ patches of dead trees will be left. Implementation of the proposed action would remove up to 3,085 acres (17% of the scope of analysis area) of three-toed woodpecker habitat. If any three-toed woodpecker nest tree is found prior to project implementation, it would be protected according to Forest Plan standards WL&F-7 (USDA Forest Service, 2003). Therefore, this treatment "may impact individuals but is not likely to cause a trend to federal listing or loss in viability" to three-toed woodpeckers since nest trees are still available, the spruce beetle larvae food source is mostly gone, and the conifer tree seedlings will supplement the reforestation effort.

Willow flycatchers nesting habitat (riparian woody vegetation) should not be disturbed since the target removes large, dead conifer trees and the RHCA has a buffer. Removing the dead trees in the units will increase the understory vegetation. The flycatcher can utilize the area for foraging. Road closures will remove culverts and rehabilitate the stream back to its natural state. This treatment may increase foraging and nesting habitat for willow flycatchers.

Cassin's finch breeds in open coniferous forests. Nests tend to be placed >16 feet above ground, often well out on a lateral branch or near the trunk within three feet of the top of trees (Hahn, 1996). Nesting habitat has been lost where trees stand bare. Removing large living trees will add to the loss of nesting habitat. As the understory vegetates, Cassin's finch will be able to utilize these areas to foraging on buds, seeds, fruits, and insects. Planting of the tree seedlings will provide this species with nesting trees in the future. Foraging habitat will increase as the road prisms are removed and rehabilitated. This treatment type may have short term negative effects by reducing some nesting sites for Cassin's finch, but will be beneficial since it will promote regrowth for foraging and nesting habitat in the future.

Broad-tailed hummingbird may lose some potential nesting habitat where live trees are removed. However, nesting habitat will still be available in the smaller diameter conifer trees that were not hit by the beetle epidemic. Removing the dead conifers will increase understory vegetation density. Plants that produce flowers may become more abundant. Hummingbirds will utilize the flowers to collect nectar. Planting of the tree seedlings will provide this species with nesting habitat in the future. Foraging habitat will increase as the road prisms are removed and rehabilitated. This treatment type will reduce some nesting trees for broad-tailed hummingbirds, but will improve foraging conditions in the short term.

2. Cumulative Effects

Cumulative impacts are those effects that occur as a result of past, present, and reasonably foreseeable future actions. Given the mobility of wildlife species, the scope of analysis, as written above, was chosen as the cumulative affects area for all species except lynx and big game. Cumulative impacts will be analyzed using their respective scope of analysis. Terrestrial habitat and species in this area have been influenced by a range of activities, including, but not limited to the list below:

1. Recreation impacts (motorized/nonmotorized): Recreational activities of various kinds span the action area and the number of visitors continues to grow due to the proximity of the area to the Wasatch Front. The assessment of cumulative impacts from recreational activities includes impacts to loss of individuals from vehicle collision, in upland and riparian areas due to developed campsites, the establishment of dispersed camp sites and user-developed roads accessing these sites, legal and illegal ATV use, and general foot, horse and vehicle traffic. The heaviest recreational use occurs from June through September. Recreation impacts will continue to occur, which may result in additional disturbance to all wildlife species.

There are approximately 188.7 miles of roads that are not accounted for in the proposed project. All wildlife has lost approximately 274.5 acres of habitat from recreation management within the scope of analysis.

Lynx are not disturbed with roads that have low speed, low traffic. The risk of being hit by a vehicle rises as the traffic and speed limit increases. Potential lynx habitat has been lost through the creation of these roads. There are 246 acres being affected by recreation management within this scope of analysis (excludes the proposed action acres).

Elk and moose tend to avoid roadways from 300 feet to 1640 feet, respectively (Laurian, 2008). Moose will visit 164 feet from roads at certain times of the year, which may be the result of moose looking for sodium in vegetation or roadside salt pool (Laurian, 2008). Mule deer tend to avoid elk, so they will use roadways more often than elk. Habitat loss for all species is associated with developed roads (approximately 581.2 miles within the scope of analysis that are outside of the proposed project). Developed roads will discourage elk and moose from using 21,134 and 115,535 acres of potential habitat, respectively (miles of road only account for forest service lands).

2. Vegetation Management: Several vegetation projects are being implemented or have been completed within the project area, including pile burning, mechanical removal, and thinning. Foreseeable future projects would be hazard tree removal in Mill Hollow Campground and around Granite Education Center. Also, personal firewood harvest will be ongoing.

   Vegetation management accounts for 6,924 acres (excludes the proposed action and recreation impact acres) within the scope of analysis.

   All past, present, and foreseeable vegetation management acres within the scope of analysis have been included in the proposed action for Canada lynx. There is no additional effect.

   Vegetation management accounts for 4,977 acres (excludes the proposed action and recreation impact acres) within the big game scope of analysis.

3. Livestock grazing- There are three cattle allotments and eight sheep allotments within the scope of analysis. Competition for resources between wildlife and livestock takes place during the summer months. The annual operating plan accounts for this competition and alleviates impacts. Foreseeable future actions would be ongoing livestock grazing and maintenance on fences, troughs, etc.

   The cumulative effect of livestock grazing will continue to impact wildlife species across the scope of analysis (67,805 acres, excluding the proposed project, recreation impacts, and vegetation management).

Competition for forage between livestock and lynx' prey may occur. This competition will happen in areas such as aspens stands with a well-developed understory. There are 41,152 acres being affected by grazing within this scope of analysis (excludes the proposed action, recreation impacts, and vegetation management acres).

The big game scope of analysis encompasses livestock use across the Uinta-Wasatch-Cache National Forest. Livestock grazing affects 244,910 acres within this scope of analysis (excluding the proposed action, recreation impacts, and vegetation management acres).

4. Timber management: The most recent timber sales within the allotment boundaries occurred from 1955 to 1988. Roads associated with these and previous timber harvests likely had impacts on wildlife during harvest, and the roads that are still present within the scope of analysis continue to provide easy access, resulting in increased hunting pressure and additional disturbances in the area. Roads that have been used in prior timber harvest are in the forest service road system and are analyzed above in the Recreation impact section. There are no foreseeable future timber projects since there will be few merchantable trees remaining following the proposed harvest. All acres being affected by timber harvest within the scope of analysis have been accounted for in the sections above.

5. Uinta Express Pipeline: This pipeline proposal, currently on hold, is a foreseeable future project that goes through the scope of analysis. The project proposes to extend the current utility right away to accommodate an additional underground pipe. Impacts to all wildlife in the area would be localized and short term. All acres being affected by this foreseeable future project have been accounted for above.

The salvage sale and cumulative impacts can influence up to 78,728 acres within the scope of analysis on wildlife species and/or their habitat. Cumulative impacts within the big game scope of analysis influences up to 365,147 acres and lynx analysis area will influence up to 45,123 acres.

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

In this alternative, all harvest activity is the same as Alternative 2; therefore, the effects to wildlife species and their habitat are the same. Refer to the effects analysis under Alternative 2. After completion of harvest activities, all system roads would be returned to the previous level 1 status, not obliterated or reclaimed. The project area has 28.8 miles of level 1 system roads. Non-system roads used would be reclaimed as in the proposed

action. There are 16.7 miles of non-system roads. The effects of closing fewer roads are similar to Alternative 2, except it will benefit all wildlife to a lesser degree. This alternative may reclaim up to 24 acres of destroyed habitat for all wildlife species.

2. Cumulative Effects

Cumulative effects impacting wildlife species are the same effects identified in Alternative 2. The acres pertaining to the system roads would be shifted from the harvest proposal to recreation impacts. This would slightly increase recreation impacts to wildlife in all analysis areas. The overall acres impacted by the Alternative 3 action and the cumulative impacts will remain the same as in Alternative 2.

3.2.3 Fisheries

AFFECTED ENVIRONMENT

The analysis area for direct and indirect effects to fisheries and aquatic species are the Little South Fork Provo River (160202030201), Mill Hollow-South Fork Provo River (160202030104), Wolf Creek (140600030102), Headwaters West Fork Duchesne River (140200030101), and Currant Creek Reservoir (140600040401) 6th field HUC sub-watersheds. There is some slight overlap into Lake Creek and West Fork Duchesne River sub watersheds, but in both cases it is <6 acres near a ridgeline; therefore impacts will be minimal and there will be no further discussion. This geographic scope is chosen because the populations of aquatic species exist at the watershed scale and each species may use different portions of the watershed throughout its lifecycle. The cumulative effects analysis area will also be the 6th field HUC sub-watersheds because of the potential for activities outside the project area to deliver sediment to streams and riparian areas. Sediment delivered to streams may travel downstream into or out of the project area. The only exceptions may be if treatments in a particular sub-watershed are limited to a small area and are not within a riparian corridor.

Threatened, Endangered, and Forest Service Sensitive Aquatic and Semi-Aquatic Species

No threatened or endangered aquatic species are known to occur within the project area or within the Currant Creek, Upper Provo River, and West Fork Duchesne Management Areas. Activities within the project area have the potential to affect listed species downstream in the Colorado River drainage, but since no water will be used from streams or ponds in the project area there will be no direct, indirect or cumulative affects to the endangered June sucker, bonytail, razorback sucker, Colorado pikeminnow or the humpback chub. These species were evaluated in the Biological Assessment, but will not be discussed further in this report. According to the Intermountain Region Sensitive Species List updated in February 2013 (USDA Forest Service, 2013) three sensitive species have suitable habitat or occur within the sub watersheds, including Bonneville cutthroat trout (*Oncorhynchus clarki utah*), Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*), and boreal toad (*Anaxyrus boreas*). No Columbia spotted frog (*Rana luteiventris*) populations have been found in the project area and no

habitat was identified by the Gap Analysis (U.S. Dept. of Interior, National Biological Service, and Utah State University, 1997); therefore they will not be discussed further.

Within the project area, Bonneville cutthroat trout have been documented in Little South Fork Provo River, Upper South Fork Provo River, Dip Vat Hollow, and Mill Hollow. They may also be present in the lower reaches of Bear and Buck Hollow. Bonneville cutthroat trout can be found in a number of habitat types, ranging from high-elevation mountain streams and lakes to low-elevation grassland streams. In all of these habitat types, however, the Bonneville cutthroat trout requires a functional stream riparian zone, which provides structure, cover, shade, and bank stability (Sigler & Sigler, 1996). Bonneville cutthroat trout are primarily insect-eaters, but large individuals also eat fish. They spawn in streams over gravel substrate in the spring. Range-wide threats to the Bonneville cutthroat trout include habitat loss and alteration, predation by or competition with nonnative fishes (brown and brook trout), and hybridization with nonnative fishes, such as the rainbow trout.

Colorado River cutthroat trout have been documented in the West Fork Duchesne River, Vat Creek, Little West Fork Duchesne, and the tributaries to Currant Creek Reservoir. Colorado River cutthroat trout inhabit cool, clear, high-elevation streams and primarily consume invertebrates, although adults also will eat small fishes (Sigler & Sigler, 1996). Four types of habitat are needed for various stages of all trout's life history: spawning habitat, rearing habitat, adult habitat, and over-wintering habitat. Spawning gravels typically are washed downstream in reaches with high gradients or covered with silt in low gradient reaches that gain sediment, so suitable spawning gravels are often the limiting habitat factor. A number of threats to Colorado River cutthroat trout were identified; these include non-native fish, timber harvest, roads, trails, motorized trails, grazing, developed recreation sites, and special uses authorized in riparian zones on National Forest System lands.

Boreal toads have been found in the Little West Fork Duchesne drainage. No additional populations have been found within or near the project area, but there is suitable breeding habitat (forested wetlands) throughout the project area. There are historical observations of boreal toad in the Soapstone drainage, Nobletts Creek, Wolf Creek Summit, and in Lake Creek but there have been no recent observations in these locations. Boreal toads are relatively independent of water compared to other amphibians, but they must re-hydrate daily. In Utah, breeding habitats include low velocity, low gradient streams, off-channel marshes, beaver ponds, small lakes, reservoirs, stock ponds, wet meadows, seeps, and associated woodlands (Fridell, Comella, Garnett, Zettle, Smith, & Harstad, 2000)(Thompson & Chase, 2001). Boreal toads use stream corridors as routes for movement during the summer (Adams, Schmetterling, & Young, 2005); (Schmetterling & Young, 2008) and breed in forested wetlands (UDWR, 2005). Boreal toads, sometimes travel up to 1.5 miles away from water (Muths, 2003); (Bartelt, Peterson, & Klaver, 2004) and may use upland habitats repeatedly as adults (Bartelt, Peterson, & Klaver, 2004); (Goates, 2006). Threats to boreal toads include acidification, pesticides, contaminants, disease (e.g., chytrid fungus), fire, habitat fragmentation, livestock grazing, predation and non-native fish introduction.

Management Indicator Species (MIS)

Management Indicator Species are representative species whose habitat conditions and population changes are used to assess the impacts of management activities on similar species in a particular area. Bonneville and Colorado River cutthroat trout are management indicator species (MIS) for aquatic habitats on the Uinta-Wasatch-Cache National Forest. These species were discussed in the previous section.

Site-Specific Resource Conditions

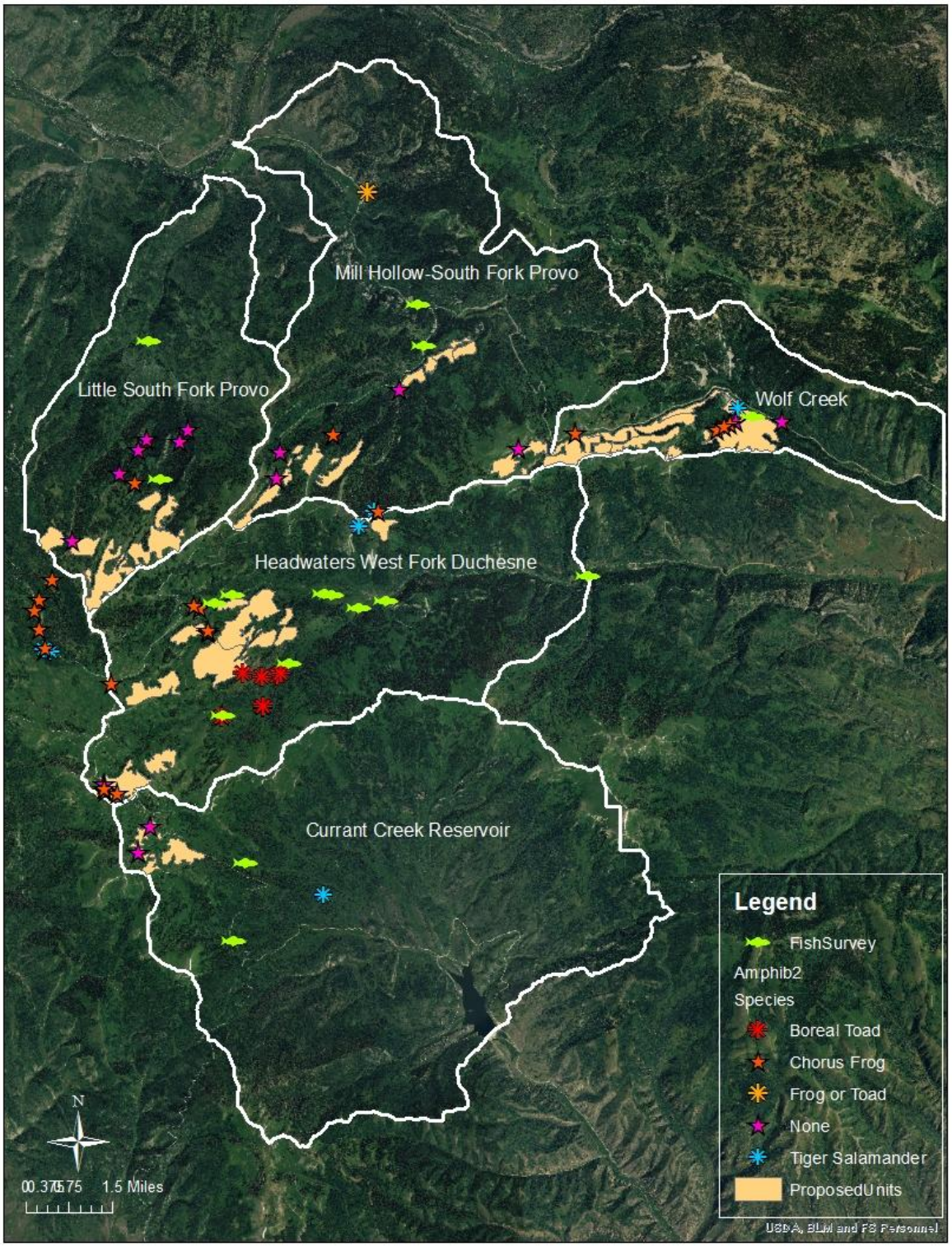
The project area includes five sub-watersheds, Little South Fork Provo, Mill Hollow-South Fork Provo, Wolf Creek, Headwaters West Fork Duchesne, and Currant Creek Reservoir. With the exception of a few locations, fish or habitat surveys were conducted annually from 2003 to 2007. Beginning in 2008, the survey frequency decreased. All but two sites were sampled at least twice between 2008 and 2014. The most recent data will be used to describe current conditions. Information from previous years will be included if necessary. Amphibian surveys were conducted in ponds and wetlands adjacent to, downstream of, or within proposed harvest units.

(1) Little South Fork Provo Sub watershed:
Two streams were sampled in the Little South Fork Provo Sub watershed; Dip Vat Hollow and Little South Fork Provo River.

Prior to 2013, Dip Vat Hollow had not been surveyed other than a Headwaters Survey conducted in July 2002. The Headwaters Survey consisted of walking portions of the drainage to identify the potential upper limits of fish habitat, but no actual sampling of fish occurred. The 2013 survey location was downstream of the two primary forks. Just upstream of the fork there is a barrier waterfall. A few pools upstream of the waterfall were electrofished, but no fish were observed. What appeared to be Bonneville cutthroat trout

were the only fish captured in the reach. There were an estimated 269 cutthroat trout per mile, and on average they would be considered slightly skinny (k-factor =0.96). Biomass was estimated at 22 pounds/acre. Fish were fairly small (80-189mm), which is not surprising considering the size of the stream. Some limited habitat data was also collected at the site. Bank stability was good at 97% with most of the reach closer to 100%. There was evidence of grazing, but overall the habitat was in good shape. Large woody debris was abundant and the primary substrates were cobble and gravel. The percent of fine sediment < 6.35mm was measured at one site (44.6%) and was within the range identified in the Forest Plan.

Figure 3.8
Map of fish and amphibian survey locations in or adjacent to the North Heber Salvage Project Area, Heber-Kamas Ranger District, Utah.



Little South Fork Provo River was sampled in 2009 and 2011. The estimated number of Bonneville cutthroat trout per mile declined from 361 per mile in 2009 to 294 in 2011. Biomass declined from 52 pounds/ acre in 2009 to 19 pounds/acre, and condition factor declined from 1.03 in 2009 to 0.87 in 2011. Because a decline occurred during the most recent survey a review was done of prior years' sampling. In 2007 a 1-pass sample was conducted, so the minimum estimate of abundance was 270 fish per mile. The actual abundance was likely higher. The percent fine sediment was measured in 2005, 2006, and 2009. In 2005, five samples were collected and the average percent fine sediment was 38% (range: 30-42%), in 2006 five samples were collected and the average fine sediment was 67% (59-76%). In 2009, fine sediment was measured and was at 39%. Bank stability within in this reach decreased from 91 to 79.5% which is still above the level identified in the Forest Plan (75%), but a walking survey of this drainage will be done in 2015 to determine whether the issues observed in our reach are more widespread. There is a livestock crossing within the reach which may lead to greater localized impacts. This site will be resurveyed in 2015.

In the Little South Fork Provo sub watershed, amphibian surveys were conducted in those portions of Bear, Buck, and Dip Vat Hollows that were near proposed harvest units. Only two ponds were located near the Dip Vat Hollow drainage and chorus frogs were the only amphibian observed. Additional spring habitat was found in other locations, but no amphibians were observed, but pond habitat was limited.

(2) Mill Hollow-South Fork Provo Sub watershed:
There were two sites sampled in the Mill Hollow-South Fork Provo River sub watershed; Mill Hollow Creek and Upper South Fork Provo River.

The Mill Hollow sample reach is downstream of Mill Hollow Reservoir, and was only surveyed in 2013. A variety of trout species were captured in the site, but overall small numbers. Cutthroat trout were the most abundant species with an estimated 186 per mile. Brook trout were estimated at 48 per mile, tiger trout at 32 per mile, and cutthroat rainbow hybrids at 16 per mile. Riparian habitat in this reach was in great shape and large woody debris was plentiful. Bank stability was estimated at 100%. The percent of fine sediment in spawning gravel was somewhat high (57%), but was only measured in one location which may not be representative of the reach or stream. Mill Hollow Reservoir is a popular fishing destination; therefore it is stocked with a variety of fish species.

Upper South Fork Provo River was most recently sampled in 2011 and 2014, at which time the estimated number of Bonneville cutthroat trout per mile increased from 332 to 1,246 per mile. The estimated number of brook trout per mile also increased from 103 in 2011 to 410 in 2014. Some possible explanations for the increase are: 1) habitat within the reach changed between surveys because in 2011 there was a beaver pond at the lower end of the reach, and this pond had been breached in 2014; 2) seasonal use of the reach varies, and 3) because low water in tributary streams forced fish to seek refuge in the larger main stem. Bank stability

was >90% in both years and the stream banks were well vegetated. Fine sediment has varied over the years, but is currently within the range identified in the Forest Plan (0 to 60%).

In the Mill Hollow-South Fork Provo sub watershed, amphibian surveys were conducted in locations adjacent to or near proposed harvest units. The only amphibians observed were chorus frogs and tiger salamanders. A few of these locations were also surveyed in 2005 and 2006 with similar results.

(3) Wolf Creek Sub watershed:
No fish surveys were conducted in this sub watershed because there are no fish-bearing perennial streams in the project area. The survey site selected on Wolf Creek (near Blue Lake) was dry both times it was visited (2007 and 2013). In 2009, UDWR found the stream dry upstream of the diversion structure which is located just upstream of the Forest Boundary.

In the Wolf Creek sub watershed, amphibian surveys were conducted at Wolf Creek summit, Blue Lake, and Tim's Hole. There are historical observations of boreal toad at Wolf Creek summit; therefore, since boreal toads are most easily observed during the breeding season, this area was surveyed in June 2013 shortly after snowmelt. The only amphibian documented was a single chorus frog that was heard in a small pond. No amphibians were observed at Blue Lake, but it was devoid of emergent vegetation and did not appear to be ideal amphibian habitat. Tim's Hole which has four distinct ponds and a wet meadow was surveyed in June 2014, but the only amphibians observed were tiger salamanders and chorus frogs.

(4) Headwaters West Fork Duchesne Sub watershed:
Four sites were sampled by the Forest in the Headwaters West Fork Duchesne Sub watershed, including Little West Fork Duchesne River, Vat Creek, West Fork Duchesne River, and Upper West Fork Duchesne River. Pass Creek was sampled previously, but has a barrier waterfall just upstream of the confluence with the main stem. UDWR has sampled additional locations in Little West Fork and the main stem West Fork Duchesne.

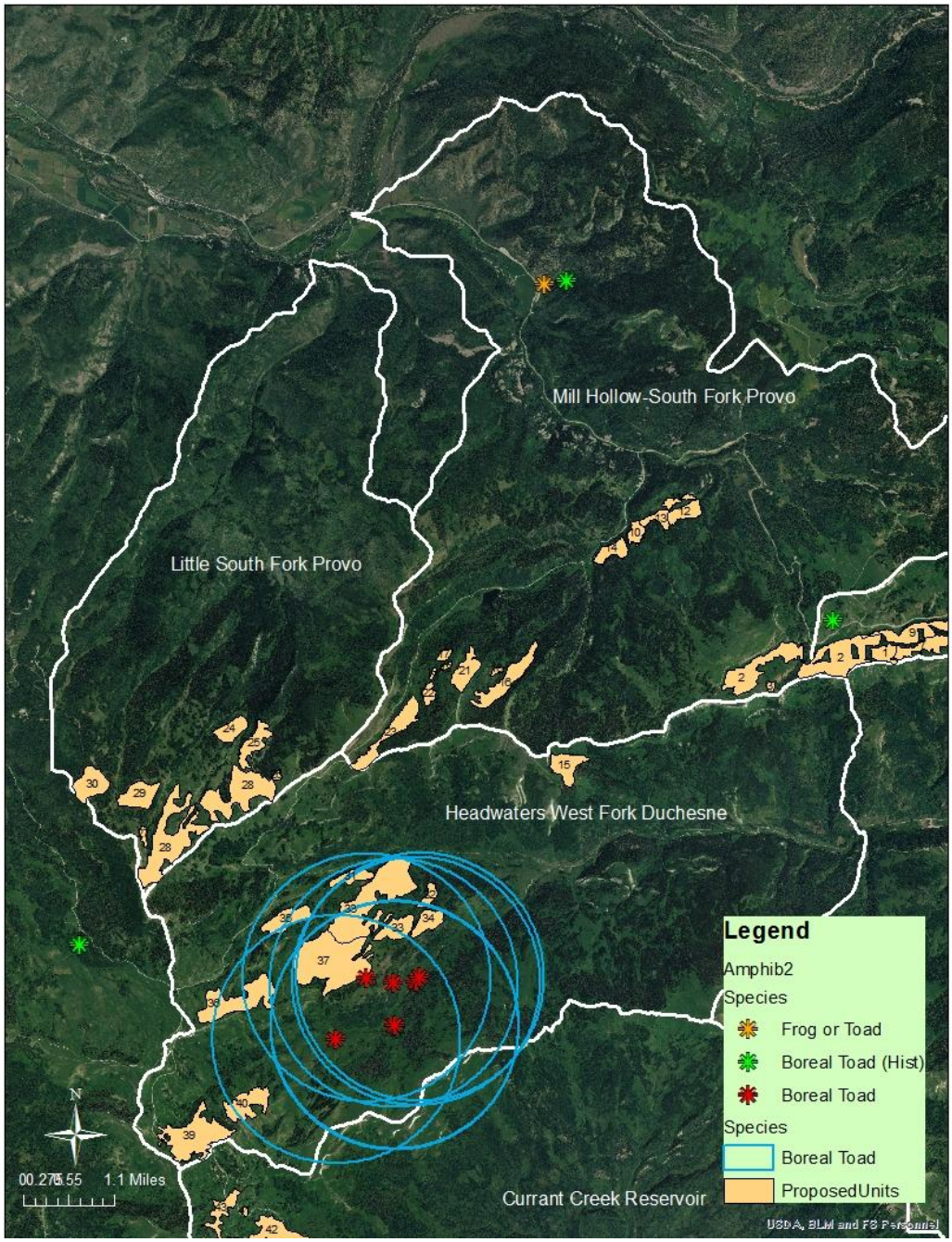
Little West Fork Duchesne was surveyed by Forest crews in 2009 and 2013. During that time the estimated number of Colorado River cutthroat trout per mile increased slightly from about 212 in 2009 to 315 in 2013. More fish were captured in 2009, but there were three times as many fish <100mm than captured in 2013. Although fewer fish were captured in 2013, in general they were larger. Condition factor for both years indicated the population was healthy (k-factor >1.0). The estimated biomass was also greater in 2013 (62 pounds/acre) than in 2009 (27 pounds/acre). Some of the variation observed between years may be due to survey timing, as the site was surveyed a month earlier in 2013. Fish may use different habitats at different times of the year. Sculpin were also captured at this site. In 2009, UDWR sampled two additional sites further upstream in the drainage. At the mid-drainage site there were an estimated 293 cutthroat trout per mile and at the upper site there were an

estimated 72 per mile. In 2014, UDWR also sampled our regular MIS site in the lower part of the drainage and estimated there were 382 cutthroat trout per mile, which is slightly higher than what we found in 2013. Habitat collected during the Forest surveys does not appear to have changed much between 2009 and 2013. Bank stability within our reach increased slightly from 95% in 2009 to 98% in 2013. Fines <6.35mm in spawning gravel were measured in both years. In 2009 four samples were taken with an average of 32.7% (range: 16.3 to 52.1%), but only one sample was collected in our survey reach in 2013 and the estimated fines were 58%. In 2013 additional fines data was collected further upstream in the drainage, and the average percent fines for four sites was estimated at 41.7% (range: 28.6-47.7%). The average percent of fine sediment in spawning gravel in Little West Fork Duchesne is within in the range identified in the Uinta Forest Plan.

Vat Creek is the most downstream tributary sampled on the West Fork Duchesne River. No physical impacts to habitat will be analyzed because there are no harvest units in or near this drainage. Any impacts analyzed would be limited to fish since cutthroat trout in the West Fork Duchesne drainage are being managed as a metapopulation. Vat Creek was most recently surveyed by the Forest in 2008 and 2013, and during that time the estimated number of Colorado River cutthroat trout per mile increased from 318 in 2009 to 347 in 2013. However, the 2013 estimate is a minimum estimate of abundance as more fish ≥100mm were captured in the second pass; therefore, the actual estimate of fish per mile is likely higher. Biomass increased from 18 pounds/acre in 2009 to 33 in 2011. The condition factor decreased slightly, but fish were considered healthy in both years. Riparian vegetation within our reach was thick and bank stability was 100% in both years.

West Fork Duchesne River was most recently sampled by Forest crews in 2009 and 2013, during which time the estimated number of Colorado River cutthroat trout per mile increased from 462 in 2009 to 1,115 per mile in 2013. A review of the data suggests the number of fish per mile varies a lot in this location. In 2007, there were an estimated 2,060 fish per mile and that was a minimum estimate of abundance as only a 1-pass survey was done. One possible explanation is that during low-flow year's fish move out of tributaries into the main stem to rear during the summer, but since numbers also increased in the tributaries, this may not be the case. The sample date may have also influenced the estimate as the 2013 survey was completed a month earlier than the 2009. Biomass also increased from 42 pounds/acre in 2009 to 97 in 2013. In 2013, Forest Crews sampled an additional site on the West Fork Duchesne River upstream of the confluence with Little West Fork near Camp Hollow. The estimated number of cutthroat per mile was 394, but since the same number of fish ≥100mm were captured in both passes the estimate is the minimum abundance. The biomass was estimated at 26 pounds/acre and condition was at 1.07. In 2014, UDWR sampled three additional sites in this drainage, one near Camp Hollow and two sites upstream of the Lake Fork confluence. At the Camp Hollow site UDWR estimated 574 fish per mile which is higher than what we observed just upstream in 2013.

Figure 3.9.
Map showing current (red asterisk), historical, and potential boreal toad locations in the North Heber Salvage Project Area, Heber-Kamas Ranger District. A 1.5 mile buffer (blue circles) around current locations, identifies potential habitat.



At the location near the Lake Fork confluence they estimated there were 773 cutthroat trout per mile and at the most upstream site on West Fork Duchesne they estimated there were 95 fish per mile in 2014. The cutthroat trout population in the West Fork Duchesne drainage appears to be healthy and not limited by spawning

habitat. Habitat data collected during the Forest surveys did not change much between years. Bank stability within our sample reached increased from 92% in 2009 to 100% in 2011. Substrate within this reach is primarily small boulders and cobbles, which helps minimize impacts to stream banks. The percent of fine sediment was last measured in 2007, at that time it varied from 39 to 61% with an average of 47%. Fines were also measured in 2006 and varied from 19 to 53% (average: 35.7%), indicating that this parameter is highly variable from site to site. Bank stability at our upper site was 95% and fines measured at one location were 36%.

In the Headwaters West Fork Duchesne sub watershed, amphibian surveys were conducted at several ponds within or near harvest units, but chorus frogs were the only amphibian identified during Forest surveys. In 2009, boreal toads were observed in the Little West Fork Duchesne drainage for the first time in many years; therefore, UDWR returned in spring 2010 to confirm the presence of a boreal toad breeding population. The Little West Fork Duchesne drainage has been surveyed each spring since then, and boreal toads of various life-stages have been observed each year (3.9). Confirmed locations are downstream of proposed harvest units, but boreal toads may migrate long distances during the non-breeding season.

(5) Currant Creek Reservoir Sub watershed:
Although several tributaries have been surveyed in the Currant Creek Reservoir sub watershed the two nearest to the proposed harvest unit are Left Fork Currant and Tut creeks, but only Left Fork Currant Creek will be discussed because it is the closest stream to the harvest units identified in this sub watershed. In addition, the stream channels adjacent and downstream of the harvest units do not stay perennial all the way to Left Fork Currant Creek; therefore, the potential for downstream delivery of sediment is limited, particularly considering there will be no harvest within RHCA's. UDWR has sampled additional locations within this sub watershed, but they are on other tributaries to Currant Creek Reservoir.

Left Fork Currant Creek was most recently surveyed by Forest crews in 2009 and 2011. The estimated number of Colorado River cutthroat trout per mile increased from 275 in 2009 to 394 in 2011. In contrast, the estimated biomass had decreased almost 50% from what was estimated in 2009. A review of the fish data indicates there were no fish <100mm captured in 2011. This pattern was observed at other locations in 2011, and the most likely cause was very high flows that occurred during the spawning period. Many of our sample locations were inaccessible until late-July. The condition of fish ≥100mm actually improved in 2011, but fish were considered healthy in both years. Bank stability within the reach also declined in 2011(2009: 94%; 2011 83%), and may have been caused by high flows or grazing. The percent of fine sediment was measured at one site in 2011 and three sites in 2009. There was an increase from 40% in 2009 to 46% in 2011; but it is still well within the range identified in the Forest Plan. Adjacent to our sample reach, there is still evidence of roads that were closed in the early 1990's, one of which crosses the

stream at the lower end of the sample reach. This site is scheduled to be resurveyed in 2016.

In the Currant Creek Reservoir sub watershed, amphibian surveys were conducted in areas adjacent to the proposed harvest units. The only amphibians observed were chorus frogs, and not in all locations.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

This section presents the direct, indirect, and cumulative effects to the resource under each alternative. Issues relevant to aquatic resources are 1) sediment delivery to water and 2) aquatic and TES species.

Most of the perennial streams within the project were identified as recovery streams for Bonneville or Colorado River cutthroat trout (Little South Fork Provo River, South Fork Provo River, Vat Creek, West Fork Duchesne, Little West Fork Duchesne River, and Left Fork Currant Creek); therefore, the perennial portions will have 300 foot buffers on each side of the stream. Mill Hollow was not identified as a recovery stream for Bonneville cutthroat trout; therefore, buffers along the perennial portion of this stream are 200 feet on each side of the stream. All intermittent and ephemeral streams within the project area will have 100 foot buffers on each side of the channel. With the exception of wetlands in Little West Fork Duchesne, which have a 200 foot buffer to protect boreal toads, all other wetlands within the project area will have 100 foot buffers.

a. Effects Common To All Alternatives

With the exception of hazard trees, no cutting of trees will occur in riparian habitat conservation areas (RHCAs) under all three alternatives; therefore, the one realized indirect effect common to all alternatives is a slower vegetative recovery rate in the riparian area which may manifest an effect on fisheries resources over the long-term. Following high tree mortality, recruitment of large woody debris (LWD) will increase. (Delong, Sutherland, Daniels, Heemskerk, & Storaunet, 2008) found the average standing time for spruce was 16.5 years and 21.4 years for fir. They also found that about 13% of spruce and about 14% of fir stood for more than 20 years. Other local factors such as wind may influence these standing times. Because of the increase in LWD loads within the stream, there would be decreased sediment transport in the channel and thus improved spawning conditions as well as increased habitat complexity for fish. Once much of the LWD had decayed you would expect there would to be a decline in fish habitat conditions, but based on decay rates and standing times for dead trees, this may only be for a limited period of time if at all. There are likely some trees in the RHCA's that will not die, and eventually these trees and some of the new growth in or adjacent to the riparian area will be recruited as LWD. (Hyatt & Naiman, 2001) found that most wood decayed from the channel within 50 years, but some wood remained for much longer periods. For stream side buffers to be effective at recruiting LWD, the width needs to be similar to the average height of a mature tree (Sweeney & Newbold, 2014). Since most areas will have 100-300 foot buffers, Alternative 1-3 should be similar in regards to the

vegetative recovery rate as trees outside buffers are not recruited.

b. Alternative 1 - No Action Alternative

Under the no action alternative, no timber harvest would occur, and no improvements would be made on approximately 28.8 miles of level 1 road, 18.3 miles of non-system road, and 34 known stream crossings located within or adjacent to proposed harvest units (Table and 3.12).

1. Direct and Indirect Effects

In the absence of ground-disturbing activity, there are no direct effects of a 'No Action' alternative on aquatic resources. In addition, the realized indirect effects of a 'No Action' alternative are limited to (1) a slower rate of vegetative recovery; (2) delivery of sediment from roads and the risk if a drainage structure that was left in place following prior harvest activities were to fail, and (3) an increased risk of fire as fuels increase.

The slower rate of vegetative recovery is common to all alternatives as was described above. There has been little or no use on many of the roads identified for reopening; therefore many have likely stabilized and re-vegetated to some degree, but it is also possible that some still deliver some level of sediment to nearby streams. If additional drainage structures were to fail, there would initially be a large but short-term pulse of sediment followed by smaller long-term pulses of sediment until the crossing stabilized and re-vegetated. The effect to fisheries resources and recovery time would vary by time of failure, location, and whether the failed crossing was on a perennial or intermittent stream. In a perennial fish-bearing stream a large pulse of sediment during the spawning or incubating period could smother eggs or fry, resulting in the partial or complete loss of a year-class. A large pulse could also cause some mortality or injury of juvenile or adult fish and aquatic insects. Long-term sources of fine sediment may cause chronic impacts to fish health or aquatic insects (i.e., declines in EPT taxa richness, loss in productivity) (Kaller & Hartman, 2004) (Jones, Murphy, Collins, Sear, Naden, & Armitage, 2011). During a long-term smaller pulse spawning habitat may experience somewhat higher proportions of fine sediment pulse, but populations in most areas are not currently limited by spawning success (West Fork Duchesne, Little South Fork Duchesne, and South Fork Provo River) and have actually increased in recent years. Table 3.11 shows miles of non-system and level 1 roads proposed for reopening and the number of stream crossings to be rehabilitated within each HUC6 following harvest.

Table 3.11

HUC6	Roads within 300 feet of a Stream or Drainage*		All Roads to Close*		Crossings to Rehab*
	Non System	Level 1	Non System	Level 1	
Little SF Provo	0.23	1.98	1.13	7.16	8

Mill Hollow-SF Provo	0.51	1.80	2.55	6.03	6
Wolf Creek	0.55	0.24	3.62	6.36	2
Headwaters WF Duchesne	0.55	0.37	9.14	6.93	4
Currant Creek Res.	0.83	1.22	1.87	2.30	14
Total	2.67	5.61	18.31	28.78	34

*Estimates were determined using Forest GIS Layers; the actual mileage and the number of crossings may be different.

Table 3.12 shows the number of crossings, miles of roads within 300 feet of a stream or drainage, and total miles of non-system and level 1roads proposed for obliteration by alternative.

Table 3.12

HUC6	Crossings Rehabilitated (#)*			Roads within 300 feet of a Stream or Drainage (mi)*			All Roads Obliterated (miles)*		
	Alt1	Alt2	Alt3	Alt1	Alt2	Alt3	Alt1	Alt2	Alt3
Little SF Provo	0	8	8	0	2.21	1.98	0	8.29	1.13
Mill Hollow-SF Provo	0	6	6	0	2.31	1.80	0	8.58	2.55
Wolf Creek	0	2	2	0	0.79	0.24	0	9.98	3.62
Headwaters WF Duchesne	0	4	4	0	0.92	0.37	0	16.04	9.14
Currant Creek Res.	0	14	14	0	2.05	1.22	0	4.17	1.87
Total	0	34	34	0	8.28	5.61	0	47.06	18.31

*Estimates were determined using Forest GIS Layers; the actual mileage and the number of crossings may be different

If a fire were to occur in the project area, it may lead to increased delivery of sediment to stream channels directly from burned riparian areas and/or from increased overland flow from burned upland areas. Impacts would be similar to those described previously and would continue until the area had stabilized and re-vegetated. The fire history of this area is limited because of high elevation and rain typically accompanies lightning storms, but with the increased fuel load from dead trees; the risk may increase to some degree.

All though road-related effects appear to result from doing nothing, they are actually long-term effects from prior timber harvest; therefore, they are not indirect effects of the no-action alternative. If the 'No Action' alternative is chosen, then there would be little or no direct or indirect effects to aquatic fauna or aquatic habitat.

2. Cumulative Effects

The cumulative effects analysis area for aquatic resources will also be the 6th field HUC sub-watersheds because of the potential for activities outside the project area to deliver sediment to streams and riparian areas. Sediment delivered to streams may travel downstream into or out of the harvest units. The only exceptions may be if treatments in a particular sub-watershed are limited to a small area and are not within a riparian corridor.

This section addresses how the No Action Alternative would potentially contribute cumulatively to the past, ongoing, and reasonably foreseeable activities' effects to MIS, listed fish species, and fisheries resources as defined by the National Environmental Policy Act of 1970. The 'No Action' alternative does not have the potential to contribute to any cumulative effect of past, ongoing, or foreseeable actions on the fisheries resources of the Little South Fork Provo, Mill Hollow-South Fork Provo, Wolf Creek, Headwaters West Fork Duchesne River, and Currant Creek Reservoir sub watersheds because there are no direct effects, and the indirect effects could be considered discountable.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

(a) Timber Harvest: Under this alternative, timber harvest activities would have little or no direct or indirect effects on fish, amphibians, or their habitats because other than hazard trees, no harvest or removal of vegetation will occur in Riparian Habitat Conservation Areas (RHCAs). Direct effects would be those that are caused by a harvest activity that occur at the same location and time of the activity (i.e., direct mortality, injury, loss of spawning habitat, immediate displacement, compaction of amphibian habitat, etc.). Indirect effects would be those caused later in time and space (i.e., loss of productivity from chronic sediment exposure, delivery of sediment downstream to spawning habitat, indirect mortality due to loss of cover or increased water temperature, etc.).

All stream channels and wetlands will have buffers 100 to 300 feet wide, and additional design criteria will further reduce the risk of sediment delivery to nearby stream channels (Davies & Nelson, 1994). Rashin et al. (Rashin, Clishe, Loch, & Bell, 2006) found that when sources of erosion are more than 33 feet from stream channels, it was unlikely that sediment would be delivered to the stream unless routed by a concentrated drainage. (Sweeney & Newbold, 2014) found in a review of the literature that in general buffers about 98 feet wide trap about 85% of sediments, but wider buffers are more likely to trap the finer silts and clays that may flow through narrower buffers. There will also be no operation of equipment in stream or wetland buffers other than at stream crossing structures which limits impacts to amphibian habitat from bank compaction. To further protect boreal toad, efforts will be made to minimize disturbance of riparian areas in known occupied boreal toad habitat during the active breeding season (4-5 weeks following snowmelt) and buffers in known habitat will be 200 feet as required by the Forest Plan (Appendix D) (USDA Forest Service, 2003). After the breeding season, there is a small chance for some boreal toads from the Little West Fork Duchesne drainage to migrate up to 1.5 miles from known breeding habitat, which would include most of the harvest units within the West Fork Duchesne drainage, but most toads disperse shorter distances. Two studies found the average home range for two populations was 236 and 617 yards^2, which are both well outside most of the proposed harvest units (Keinath & McGee, 2005).

The treatment of hazard trees may have some direct effects on fish or fish habitat such as displacement of fish or water and the potential for injury or death. While this does pose a risk to individual fish, the effect is not great enough to have an impact to the population as a whole. Hazard trees and other dead and down trees will not be removed from RHCA's, but rather left in place to provide a source of LWD for the stream. Stream temperatures may also be impacted by removal of forest canopy (indirect effect). (Sweeney & Newbold, 2014) found in their review of the literature that studies with buffer widths <98 feet showed variable effects on temperature, but measureable temperature changes were difficult to detect with larger buffers.

(Litschert & MacDonald, 2009) found that skid trails in riparian areas were the primary pathway for sediment delivery from forest harvest units to nearby streams. However, since there will be no operation of equipment or removal of trees and vegetation in riparian buffers the potential for sediment delivery from skid trails to stream channels or wetlands is minimal (Rashin, Clishe, Loch, & Bell, 2006). To minimize additional surface impacts, skid trails from the previous harvest will be used, with the exception of those in riparian areas. Water bars will be installed on skid trails and no skidding will take place on slopes >40%, both of which further reduces the potential delivery of sediment to nearby stream channels.

All landings within each sub watershed would make up less than 10 acres, with the exception of the Wolf Creek sub watershed where landings would make up about 16 acres. If possible, former landings will be reused to minimize additional impacts, but some new landings may be required in all sub watersheds. Within most sub watersheds, there are a few landings within RHCAs, but they are associated with prior logging roads, and most are adjacent to intermittent streams. Final landing locations will be approved by the Sale Administrator. Forest Plan requirements and additional design criteria should help to minimize delivery of sediments from landings (i.e., *Timber-10 Guideline: Log landings should not be located on areas where surface runoff will discharge directly into the channel or within Riparian Habitat Conservation Areas*). Slash produced from logging operations will be piled and burned. Most log landings will have a burn pile associated with it. To prevent long-term erosion, landings will be re-contoured to the original surface contour, ripped, and seeded. Coarse woody debris will be spread on site to provide for long-term soil productivity. Any sediment delivery from a landing would be short-term because re-contouring and seeding would be required within 1 year following harvest.

In summary, the use of buffers 100 to 300 feet in width and eliminating harvest in RHCA's will minimize any direct and indirect effects of timber harvest activities on fish, amphibians, and their habitat. Any effects would be minimal and will not cause an effect great enough to harm the health of the cutthroat trout populations in the Little South Fork Provo River, West Fork Duchesne drainage, and Currant

Creek drainage, or the boreal toad population in Little West Fork Duchesne.

(b) Road Construction/Rehabilitation:
Under this alternative, road construction, rehabilitation, maintenance, and culvert installation or removal may have some direct or indirect effects to fish, amphibians, or their habitats because of sediment delivery to nearby streams or wetlands, but the effects would be temporary and in many cases short-term (<1 year). Road work in this project includes reconstruction, obliteration, maintenance, and culvert removal. Under Alternative 2, up to 47 miles of level 1 and non-system roads would be returned to a useable condition to facilitate timber harvest. In addition, there are an estimated 34 known stream crossings on these roads some of which may need some level of work prior to hauling timber. Reconstruction of level 1 and non-system roads has the potential to deliver sediment into the stream network because of stream crossings and because portions of these roads are located within 300 feet of a stream or drainage. The potential for sediment delivery increases with proximity to the stream, but as mentioned previously 100 foot buffers have been found to capture about 85% of sediment (Sweeney & Newbold, 2014). Delivery of sediment may cause short-term negative effects to fish from elevated turbidity (Robertson, Scruton, Gregory, & Clarke, 2006), which could temporarily displace or cause physiological stress to individual fish within the immediate vicinity (Bash, Berman, & Bolton, 2001). Fish can typically tolerate high levels of suspended sediment, but tolerance is size and temperature dependent (Robertson, Scruton, Gregory, & Clarke, 2006). Sediment delivery could also reduce productivity in certain segments of streams due to losses in aquatic invertebrate production and reduced quality of spawning habitat (Suttle, Power, Levine, & McNeely, 2004). However, the proposed road maintenance activities would reduce sediment delivery by improving and maintaining road surface conditions. Many of these roads may be delivering some level of sediment currently. Sediment production at stream crossings and reconstruction of level1and non-system roads would likely be greatest during the construction season and would decline over time. (Kreutzweiser & Capell, 2001) found that roads and stream crossings were the largest source of sediment in forestry operations, but sediment sources at stream crossings declined within 2 years. In their study, other than road maintenance, no other sediment trapping devices were used. Under this alternative all roads proposed for reconstruction would be maintained during harvest to reduce erosion and sedimentation, and sediment-buffering devices will be installed below all fill slopes within 300 feet downhill distance of streams or drainage. These sediment buffering devices should help to prevent much of the sediment produced from roads and at stream crossings from entering the channel. Once roads are obliterated and re-vegetated, culverts removed, and stream channels re-contoured; sediment delivery to stream channels should fall below pre-project levels, resulting in a long-term reduction of sediment delivery to Little South Fork Provo, West Fork Duchesne, Mill Hollow, Wolf Creek and Currant Creek drainages.

Haul routes in many areas would also require some maintenance prior and during

timber hauling. The improvements made to the existing road network prior to hauling should reduce the amount of road-derived fine sediment currently being delivered to nearby streams. Sediment buffering devices will help to further reduce the potential for sediment delivery to streams. Hauling should have little additional impact in most sub watersheds as most of the hauling will occur on well-maintained gravel roads. The primary source of sediment would likely be from dust at stream crossings and those portions of roads within the RHCAs. In the Little South Fork Provo sub watershed, there are three stream crossings. The Mill Hollow-South Fork sub watershed has five stream crossings, three of which are on the main Mill Hollow Road. The Wolf Creek sub watershed has seven stream crossings on haul roads, but four are on a paved highway (Hwy35). The remaining three are on intermittent channels. In the Headwaters West Fork Duchesne sub watershed there are seven stream crossings, five on perennial streams and two on intermittent channels, but as in other watersheds, most crossings are on well-maintained gravel roads. Road packages included in the timber sales will require roads be returned to and maintained at a certain level prior to hauling. Although some dust will be produced near stream crossings, the effects should be minimal as much of the haul road network is on well-maintained gravel roads. Sediment buffering devices will be used as necessary to reduce delivery to nearby streams. Overall hauling should have limited effects to aquatic species.

There are also old logging roads in the units (both level 1 and non-system) that will not be used during this removal. These will be treated or not treated according to their condition. Treatment of these additional roads would further reduce the potential for sediment delivery and may lead to a further decrease in current sediment levels. The removal of any additional structures also reduces the risk of failure over the long-term.

In summary, the proposed action may cause some short-term impacts to aquatic habitat conditions in nearby streams; however, over the long-term aquatic habitat conditions should improve. Fish populations may experience some short-term reductions in productivity, but with the obliteration of roads and the removal of drainage structures, cutthroat trout habitat should see a reduction in sediment levels. Therefore, I conclude that the proposed action "**may impact individuals, but is not likely to cause a loss of viability for cutthroat trout".** No boreal toad populations have been identified within harvest units, but there are nearby populations in Little West Fork Duchesne. Some toads could potentially disperse into nearby harvest units, but most would likely migrate shorter distances. The potential for sediment delivery from harvest units in the headwaters is limited due to design features included in the proposed action. Therefore, I find that this project "**May Impact Individuals, but would not likely result in a trend toward Federal listing or reduced viability for the population of the species"** for boreal toads.

2. Cumulative Effects: The incremental environmental impact or effect of the proposed action, together with impacts of past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). The other activities that may cause a cumulative effect to this resource are:

(a) Past and Present Actions:

Grazing- Within the project area there are several cattle, sheep, and common use allotments that are likely delivering some level of sediment to nearby streams. Most of the allotments are sheep, which prefer to graze in upland areas, which should minimize impacts to riparian areas with proper herd management. As dead trees in riparian zones die and fall down they should provide an additional barrier to streamside access in some locations. This will further reduce any potential grazing impacts. The West Fork Duchesne River cutthroat trout population is healthy and does not appear to be limited by spawning at this time. The Little South Fork Provo population shows some signs of impacts, but considering the headwater tributaries were well vegetated, it is possible the impacts are localized. A survey will be made of the drainage in 2015, and any issues identified will be addressed. The direct and indirect effects of the proposed action should not have a measureable affect to this population, and over the long-term the project should provide a beneficial effect by the obliteration of project roads and the removal of drainage structures.

Timber Harvest – The most recent timber sales are the same harvest units in the proposed action. Most areas have likely stabilized and revegetated. There may be some level of sediment being delivered from roads or drainage structures, but considering much of the area has likely re-vegetated it should be limited. The proposed action would obliterate many of the roads and remove drainage structures which will be beneficial to aquatic habitats in the long-term. There may be some short-term effects, but over the long-term there will be a beneficial impact.

Prescribed or Wild Fire –There have been 213 fires in the project area from 1948 to 2013, and only 15 of those were >1acre. The most recent fires of any size were the Tim's Hole Fire in 1976 (35 acres) and the South Hollow Fire in 2001 (2,121 acres). It is likely the area within the Tim's Hole fire has stabilized and re-vegetated to the extent that it is not producing any measureable levels of sediment. The South Hollow Fire located in the Little South Fork Provo drainage may still have some localized sources of sediment being delivered due to the steep nature of portions of this drainage that burned. The only prescribed fire in the project area is pile burning around the Granite Education Center, which is likely delivering little or no sediment to nearby streams as piles should be at least 50 feet from nearby stream channels.

National Forest System Roads, Motorized Trails and Trails –There are several Forest Service Roads open to motorized use within the project area, and maintenance of these roads is ongoing and likely generates some sediment.

However, any improvements in drainage also and will continue to provide a benefit by reducing sediment delivery to nearby stream channels. The only trails present in the project area are a series of motorcycle trails in the Little South Fork Provo River sub watershed, which have likely received little or no maintenance in recent years; therefore, they may deliver some level of sediment to nearby stream channels.

M*otorized Recreation Use:* unauthorized use of roads and trails and creation of unauthorized trails by OHVs has occurred in the North Heber Salvage Project Area. Unauthorized roads and trails in the vicinity of or in RHCAs may deliver some level of sediment to nearby channels.

Dispersed and Developed Recreation – Developed and dispersed recreation such as camping, hunting, fishing, and hiking have historically occurred and will continue to occur throughout the project area. This activity may have impacts to aquatic habitat, particularly those sites or activities that occur in riparian areas. Removal of vegetation, trampling, and compaction of stream banks can increase the amount of water and sediment that is delivered to the stream. The 2014 Rainbow Gathering took place in the West Fork Duchesne River headwaters, but based on an inspection of the area following the gathering, there should be little impact to nearby streams. Trails were rehabilitated and vegetation lost due to trampling had already begun to regrow in the month following the gathering. Camping buffers were enforced in riparian areas, which should have minimized impacts.

Hazard Tree Removal and Firewood Cutting – Hazard tree removal is occurring in the Mill Hollow Campground and around the Granite Education Center, but likely has little impact to nearby streams due to the small area. The Mill Hollow drainage was not identified as a recovery stream for Bonneville cutthroat trout, but supports small populations of a variety of species similar to what is stocked in the reservoir. Firewood cutting has historically occurred and will continue to occur in the project area. Impacts to aquatic resources from this activity occur when permit requirements are not adhered to, such as cutting in riparian areas. This activity has the potential to deliver sediment to streams and wetlands, remove future sources of LWD, compact banks, and trample other riparian vegetation; however, this activity is limited to areas that are adjacent to roads.

Vat Tunnel Diversion – water is diverted from West Fork Duchesne to Currant Creek Reservoir, but this has few impacts to the project area which is located upstream of the diversion. Cutthroat trout populations in this drainage and in the project area are healthy and do not appear to be limited by water or spawning. This diversion structure is a barrier to upstream migration of fish, but there are non-native fish downstream, so this structure is providing a benefit to upstream cutthroat trout populations.

(b) Reasonably Foreseeable Future Actions:

Roads and Trails – Road maintenance and use have occurred and will continue to occur near or within the project area. There is likely some level of sediment

delivery to nearby streams which will continue in the future. With the exception of a series of motorcycle trails in the Little South Fork Provo sub watershed, there are no other system trails in the project area. If user-create routes increase in the future this activity has the potential to impact aquatic habitats.

Grazing – Is likely to continue into the future; therefore, any impacts to the aquatic resource will continue at some level, but the annual operating plans have been and will continue to be administered to address any resource issues that may arise. Because no harvest will occur in RHCAs, the long-term increase in LWD may make access to streams more difficult for livestock in some locations.

Timber Harvest – It is unlikely that much timber harvest would occur within or adjacent to the project area as few merchantable trees would remain following the proposed harvest. It would likely be close to 100 years before the area would be suitable for harvest, and in that time any disturbance would have stabilized and revegetated.

Wildfire - Wildfire could occur at any time in the future and the effects of these events are unpredictable.

Uinta Express Pipeline – Currently on hold. But if it does go forward in the future, within the Project Area, the effects of the construction of the pipeline would be limited to the Wolf Creek drainage and the Upper South Fork Provo River. There would be some short-term effects to wetland habitat near Tim's Hole, but as seen in the current pipeline corridor, the effects would be short-term. On the Forest, there would be one stream crossing on Wolf Creek (intermittent) and two on the Upper South Fork Provo River; therefore, the impacts would be localized and short-term. The cutthroat trout population in the South Fork Provo River is healthy and had increased significantly between 2011 and 2014.

In summary, the proposed project should not contribute cumulatively to the past, ongoing, and reasonably foreseeable activities effects to MIS, listed fish species, or amphibians to the extent that would

<u>Alternative 3 – •Timber activities then roads returned to level 1 status and treated accordingly</u>

1. Direct and Indirect Effects:

(a) <u>Harvest</u>: All proposed harvest activities under this alternative are the same as Alternative 2; therefore, the effects to fish, amphibians, and their habitats are the same. Refer to the effects analyses under Alternative 2.

(b) <u>Roads</u>: The direct and indirect effects to aquatic resources from reconstruction, maintenance, and hauling are the same as those in Alternative 2, but the long-term effects/benefits from closing/obliteration will be different under this alternative. Non-system roads will be obliterated; culverts removed, and stream crossings recontoured (18.31 miles; Level 1 roads will not be obliterated, but will be returned to a level 1 status (28.75 miles). Possible work items include but are not

limited to (1) remove drainage structures (n=34), reshape the channel and streambanks at crossing sites to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of streambanks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site and (2) implement suitable measures such as ripping or pocking to promote infiltration of runoff and intercepted flow and desired vegetation growth on the road prism and other compacted areas (i.e. subsoil prism). Road prisms would be left intact for future use.

For non-system roads, the long-term benefits from this alternative are the same as Alternative 2, but will likely be at a reduced level for Level 1 roads. If culverts are left in place there would be a risk of failure, and although efforts to promote infiltration of runoff are made they may not be as effective as re-contouring the road. Maintaining the road prism may also lead inadvertent unauthorized use. Overall there should be a reduction in sediment delivery below current levels and a reduction in the risk of culvert failure because of the obliteration of non-system roads.

2. **Cumulative Effects**: The incremental environmental impact or effect of the proposed action, together with impacts of past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). The other activities that may cause a cumulative effect to this resource are the same as those identified in Alternative 2. The overall level of sediment delivery would be slightly higher since Level 1 roads would not be obliterated under Alternative 3.

3.2.4 Botany

AFFECTED ENVIRONMENT

Rare Plants

Threatened and Endangered

The US Fish & Wildlife Service shows only one threatened plant species for Wasatch County, which is Ute ladies'-tresses (*Spiranthes diluvialis*), on their August 01, 2013, Listed and Candidate Species, Species Listed, "*Species By County Report*", (USFWS 2013). There is no suitable habitat for this federally listed plant within the project area, as the species' known upper elevation range is 7,000 feet and the project area units are all well above that elevation. Vegetation and elevation maps of the entire project area were reviewed, and botanical surveys were conducted in the project area units and adjacent areas in both 2013 and 2014 and no threatened or endangered plant species were found.

Region 4 Sensitive Plant Species

The US Forest Service (USFS) Region 4 sensitive species list was published February 2013. (USDA Forest Service, 2013)

The Forest Plan states that there are no known TES plant species within the CCMA and no TES plant species sites were located during botanical surveys conducted for this project within the CCMA.

The Forest Plan also states that there is only one known TES plant species, Dainty moonwort (*Botrychium crenulatum*), (BOCR), a sensitive species, found within the UPMA. The known (original) site of Dainty moonwort within the UPMA, in Silver Meadow, is approximately one and one quarter air miles north of Unit 9 of the Wolf Creek sale area in the proposed North Heber Salvage Project Area. In 1994 at this site 10,000+ Dainty moonworts were recorded as observed. This site will not be impacted by any of the proposed project activities.

The Forest Plan also states that there are no known TES plant species found in the WFDMA, although Duchesne River twinpod (*Physaria stylosa*), a state-identified rare plant, was documented within the management area, (USDA 2003). Since the Forest Plan was written there have been several sites of the Duchesne River twinpod apparently located within the UPMA, as indicated in the plant information compiled by the Utah Natural Heritage Program, (Franklin 2005). None of the known sites of this state rare plant are within project area sale units and no new locations were noted during botanical surveys. Several of the known sites of this species in the WFDMA are located by the 091 road which will be used for hauling timber, so there could be some minimal short-term dusting, but no long-term consequences are expected from hauling activities. This plant species within the UPMA is located near the 060 road, but are along a section of the road not being used as part of any haul route so there will be no issues.

There had been only one other sensitive species element occurrence located within the WFDMA, since the Forest Plan was written, which was a site of Dainty moonwort located just north of Forest Road 050 approximately one half air mile northeast of Units 32 and 33 of the proposed West Fork sale area. This small population of only a few Dainty moonworts was located in 2004 during a botanical survey for a proposed fuels project. During a revisit in 2005 it was observed that there was an increase in numbers of moonworts, but that the population was still under 20 plants. This Camp Hollow site is located in a relatively dry portion of the riparian area adjacent to the upland vegetation. This site will not be impacted by any of the proposed project activities.

During botanical surveys for this project, (North Heber Salvage), an additional four sites of Dainty moonwort were located within the WFDMA, all four of which are located within proposed sale units of the West Fork sale area, (1 within Unit 35 and 3 within Unit 37). Another four new sites of Dainty moonwort were located within the UPMA, during botanical surveys, three of which are located within the project area boundary, but outside of proposed sale areas and units. The fourth new site is located within Unit 2 of the Wolf Creek sale. This small fern tends to occur in moist to wet locations however, as noted above the Camp Hollow site is located in a drier portion of the riparian area

adjacent to the upland vegetation and one of the new sites was located on a native surface road bed. Table 3.13 below shows the numbers of BOCR located at each site in 2013 and 2014.

Table 3.13

New Site Name	2013 BOCR Count	2014 BOCR Count	Site Elevation	Management Area	Sale Area Name and Unit#
Corral	11	6	9,180	WFDMA	West Fork Unit #35
FS026 North	6	3	9,260	WFDMA	West Fork Unit #37
FS026 South	43	47	9,278	WFDMA	West Fork Unit #37
Quartet	N/A	4	9,247	WFDMA	West Fork Unit #37
Mill Hollow	9	No Revisit in 2014	9,100	UPMA	Mill Hollow (North of Sale Area) Not in Sale Unit
Mill Hollow East	60	No Revisit in 2014	9,000	UPMA	Mill Hollow (North of Sale Area) Not in Sale Unit
Mill Hollow South	11	No Revisit in 2014	9,020	UPMA	Mill Hollow (North of Sale Area) Not in Sale Unit
Wolf Creek	4	1	9,502	UPMA	Wolf Creek Unit #2

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

1. Direct and Indirect Effects

With no cutting of trees occurring in riparian habitat conservation areas, (RHCAs), under all three alternatives, (with the exception of hazard trees), an indirect effect for all alternatives would a slower rate of recovery in riparian vegetation.

2. Cumulative Effects

None in common.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

Rare Plants

Threatened and Endangered

There is no suitable habitat within the project area for threatened and endangered plants, [Ute ladies'-tresses (*Spiranthes diluvialis*)], therefore this alternative would have no effect on threatened and/or endangered plants if implemented.

Region 4 UWC Sensitive Plant Species

Dainty moonwort *(Botrychium crenulatum) and* **Slender moonwort** *(Botrychium lineare)*

Potential impacts to both the *Botrychium* species could still occur from ongoing activities.

Eight new Dainty moonwort sites were located within the project area during botanical surveys for this project and other undiscovered sites may exist as well within the project area.

There is potential habitat within the analysis area, and therefore potential for presence for slender moonworts to occur, (although surveys have thus far been unsuccessful in locating any of these tiny ferns).

The US Fish and Wildlife service reports that Slender moonwort *(Botrychium lineare)* may be a early seral colonizer of disturbed areas, and that it may tolerate some disturbance since it appears to be a habitat generalist and is found in disturbed habitats. (NatureServe 2014). It likes disturbance, early seral roadsides (i.e., disturbed areas) in seemingly early seral, open habitat, dominated by low-growing forbs rather than shrubs or trees and is known to occur in grass- and forb-dominated openings in forests characterized by coniferous trees such as pine, spruce, and fir species, (Beatty, B.L., et al. 2003). It also appears that Dainty moonwort will colonize disturbed areas, as demonstrated by one of the new sites located in 2013, which was found growing in an old native surface roadbed. Under the action alternative, disturbance from the proposed projects may or may not potentially benefit the botrychium species, and thus the no action alternative may or may not be of detriment or benefit to the botrychium species if selected. It is not known how dainty or slender moonworts respond to passive management, (no action), or to active management, (proposed projects), techniques. It is likely that each species needs light to moderate disturbances in their habitats for establishment and growth, while intense disturbances, both natural and human, in and around occupied habitats may threaten any existing populations. However, management strategies and other disturbances that potentially pose a threat to existing *Botrychium* populations (e.g., timber harvest, road and trail creation etc.) could also create suitable habitat for future populations (Beatty, B.L., et al. 2003). Snags not harvested would

eventually fall and provide down woody debris, but in higher amounts that would not be as good for forest health as the lower amounts that would occur with the action alternatives and harvest of dead standing trees. The no action alternative will likely result in changes in habitat conditions within the project area over time as dead and dying trees eventually fall, resulting in changes to microclimates within the once forested areas.

2. Cumulative Effects

No treatments would be implemented, so effects to the sensitive plant species from project activities would not occur under this alternative. Change over time with the dead and dying trees and ongoing activities most likely will result in changes to habitat for Dainty and Slender moonworts. The no action alternative in combination with the other past, current and reasonably foreseeable uses is expected not to have any long-term cumulative effects on this rare plant species.

c. Alternative 2 – • Full suite of timber and road obliteration activities

Threatened and Endangered

There will be no direct, indirect or cumulative effects to any threatened or endangered species or their habitat from the North Heber Salvage Project. There is no suitable habitat within the project area for Ute ladies'-tresses (*Spiranthes diluvialis*).

Region 4 UWC Sensitive Plant Species

Under this alternative, if selected, the proposed projects within the North Heber Salvage Project Area would be authorized to occur in a manner that is consistent with direction in the Wasatch-Cache National Forest 2003 Revised Forest Plan and with other applicable laws and regulations, as well as in accordance with design features and mitigation measures.

Sensitive Plants:
The proposed action alternative would not change habitat conditions for sensitive species for which there is potential or suitable habitat or known occurrences located within the analysis area, in habitat where proposed projects will not occur, (RHCAs).

Dainty moonwort *(Botrychium crenulatum) and* **Slender moonwort** *(Botrychium lineare)*

There will be no direct or indirect impacts and therefore no cumulative effects to Forest Service R4 sensitive plant species, with the potential exception of Slender moonwort and undetected sites of Dainty moonwort, for which a determination is made of "May impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the population or species".

Under this Alternative, (the proposed action) timber harvest and associated activities

would take place and impacts to vegetation, soils, water and other resources from these activities would occur, including any impacts positive or negative, (if any), that may affect slender moonwort, (should it occur within the analysis area) and any undetected sites of Dainty moonwort or potential habitat for these species within the analysis area. There is potential habitat within the analysis area, and therefore potential for presence for slender moonwort to occur in some areas expected to be harvested, (although surveys have thus far been unsuccessful in locating any plants). Harvest of timber and associated activities effects on moonworts could vary depending on the landscape context, intensity of the disturbance and biological characteristics of the species. Upland moonwort populations occurring under trees or shrub canopies would be more likely to be impacted by timber harvest activities than meadow populations of moonworts, because meadows would be less impacted or not impacted at all by timber harvest. Timber harvest and thinning activities often are associated with the use of heavy machinery and road construction. Existing populations of slender moonwort and potentially unknown sites of Dainty moonwort could be threatened or extirpated by log skidding, decking, and road construction, improvement and/or maintenance associated with logging activities. On the other hand, thinning and other disturbances associated with timber harvest may open up areas of suitable habitat for *Botrychium* species, including slender moonwort. Landscape diversity may be important in providing a mosaic of patches for *Botrychium* dispersal and establishment through time and space. A possible key conservation element may be preserving landscape diversity to facilitate establishment of additional populations. Light to moderate habitat disturbances may be needed to create habitats and microsites for some moonworts, especially those that occur in meadows and openings in densely vegetated communities. Future populations of *Botrychium* species, may rely on disturbances to create habitat. The responses of *Botrychium* species to fine- and broad-scale changes in habitat are not understood in sufficient detail to evaluate effects of management or changes in natural disturbance patterns. While intense disturbances, such as structure construction, will likely destroy habitat for *Botrychium* species, moderate disturbances could likely create new habitat. (Beatty, B.L., et al. 2003). Potential habitat for slender moonwort does occur within the project area. Direct and indirect effects to this species from timber harvest is unknown at this time. The US Fish and Wildlife service reports that slender moonwort (*Botrychium lineare*) may be an early seral colonizer of disturbed areas and that it may tolerate some disturbance since it appears to be a habitat generalist and is found in disturbed habitats (NatureServe 2014). It also appears that Dainty moonwort will colonize disturbed areas, as demonstrated by one of the new sites located in 2013, which was found growing in an old native surface roadbed. Disturbance from timber harvesting and associated activities may or may not potentially benefit the *botrychium* species. But it is expected that any impact positive or negative would be relatively minimal as current Forest Plan Standards and Guidelines would be followed during timber harvest in the project area and there are also no known occurrences of slender moonwort within the analysis area itself and no sites were located during field surveys. The haul routes for this timber sale would pass by the three new Mill Hollow sites and the West Fork Sale sites, however, no impacts are expected, (the original population at Silver Meadow has shown no noticeable adverse effects from travel that has occurred past the site for past timber sales, recreational use, and/or other uses, (and which continues to occur). It is anticipated that timber harvesting and associated

activities will not cause a trend toward federal listing of slender moonwort or Dainty moonwort or affect their viability.

2. Cumulative Effects

The affected areas for cumulative effects on rare plants (Dainty moonwort and Slender moonwort) include national forest within the analysis area and also consider the natural ranges of distribution for the individual plant species.

Some of the sites that potentially provide habitat for moonwort may have been impacted by overgrazing and/or other uses with the settlement of the area (historic use). The positive or negative effects of livestock (and other herbivores) on *Botrychium* populations and habitat quality presumably depend on *Botrychium* biology (e.g., response to herbivory), type of grazer (e.g., cattle, sheep), timing of grazing (e.g., season), grazing intensity (e.g., stocking density), habitat type (e.g., meadow or forest), and site conditions (e.g., topography, moisture, invasive plants). The specific effects of herbivory and livestock activity on *Botrychiums* are not known. Herbivore activity could be beneficial if it reduced competition of palatable species with *Botrychium*, opened up suitable microsites for *Botrychium* colonization, reduced shrubby encroachment onto suitable grassland habitat, or aided in the dispersal of *Botrychium* spores. Herbivore activity could be detrimental if it repeatedly caused the loss of spores, caused soil compaction or soil erosion, altered community dynamics to favor an unsuitable community type, facilitated weed invasion, or trampled individuals and disturbed belowground structures, (Beatty, B.L., et al. 2003).

Livestock grazing at the current level is not expected to limit or harm current potential habitat and in some cases may be of benefit as moonworts can be found along disturbed areas. Moderate disturbances could likely create new habitat, (Beatty, B.L., et al. 2003). Evidence of grazing was noted at the newly located Wolf Creek Dainty moonwort site which is located in the South Fork Provo Allotment; at the new Corral site, FS026 South site, and the Quartet site which are all located within the Lake Creek Allotment. These two allotments are grazed by sheep. At one site a trampled moonwort was found. Loss of above ground portions of the moonwort are unlikely to destabilize the whole moonwort population on a site because a large proportion of the total population is normally underground and protected at any given time (Johnson-Groh et al. 2000), and (Johnson-Groh, C 2000).

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

This would be the same as Alternative 2 for TES.

2. Cumulative Effects

For the TES plants effects would be the same as Alternative 2.
There would be very minimal to no difference between this Alternative 3 and Alternative 2 in regard to effects to TES plant species.

3.2.5 Range/Livestock Management

AFFECTED ENVIRONMENT

The proposed timber sales are within 11 allotments, 3 of which are cattle and 8 are sheep. The Little South Fork sale is in a common use area where both cattle form the Little South Fork and sheep from the Dip Hollow allotment graze the area. Most of these allotments are the result of combining other allotments together and reducing the numbers and or season of use to bring the grazing use in the balance with the needs of the resources so standards and guidelines can be met. In the past some of the grazing systems have been changed to designate the pasture with the timber sale area in it as the rest to help protect reforestation.

The 11 Allotments are part of the permittees base operation by providing summer forage. These allotments are managed with an intensive grazing system and standards and guidelines are met by using fencing, herding, placement of salt, water developments and rotating pastures.

The timber sale areas often have large meadows within the forested areas that are grazed by livestock. Most of the areas within the proposed timber sale have some transitory range as a result of previous timber sales. This transitory range is not considered part of the base forage need for the allotment. These areas are grazed lightly while livestock move through the area on their ways to more suitable forage. The amount of grazing in these areas depends largely on the amount of residual trees, the amount of downfall and ease of being able to move through the forested area to more suitable range.

Each allotment has at least one herder associated with it to help manage the livestock but each allotment is different in the complexity of the herding required. The amount of herding needed depends in a large degree upon the size of the area, the intensity of the grazing system, availability of water, and barriers to the movement of the livestock. Table 3.14 shows which allotments are in the proposed treatment units.

Table 3.14
Allotments Within Proposed Treatments

Sale Name	Sale Acres	Sale Acres within Allotment	Allotment
Little South Fork	673	673	Dip Hollow
		673	Little South Fork Cattle

Mill Hollow	523	22	Heber Mountain
		299	Upper Lit So Fork
		159	Neeley Basin
		43	West Fork
West Fork	984	691	Lake Creek
		298	Little West Fork
Roundy Basin	478	209	Currant Creek
		269	Little West Fork
Wolf Creek	1071	68	Neeley Basin
		89	South Fork Provo
		6	West Fork
		908	Wolf Creek

Table 3.15
Allotment Details

Allotment	Allotment Acres	No Livestock	On Date	Off Date
Dip Hollow	4478	1174	1-Jul	30-Sep
Little South Fork Cattle	20838	182	15-Jun	11-Oct
Heber Mountain	4397	1213	1-Jul	30-Sep
Upper Lit So Fork	5527	1141	6-Jul	26-Sep
Neeley Basin	4973	1115	5-Jul	28-Sep
Lake Creek	4508	1213	1-Jul	30-Sep
Little West Fork	5529	1200	1-Jul	30-Sep
Currant Creek	23638	1198	16-Jun	15-Oct
South Fork Provo	3120	1130	1-Jul	25-Sep
West Fork	9886	429	3-Jun	13-Oct
Wolf Creek	8577	1100	21-Jun	30-Sep

ENVIRONMENTAL CONSEQUENCES / EFFECTS
a. Effects Common To All Alternatives

No common effects.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

There will be little change in the management of grazing on these allotments. Livestock will continue to be herded to get the needed distribution with little to light use within old timber sales.

Range improvements will continue to be maintained and reconstructed as needed by the permittees.

Movement of livestock within the allotment will remain the same with use of trails and roads to move around and through timber sale areas. Herder camps will continue to be located in traditional camp sites.

2. Cumulative Effects

The cumulative effects analysis area for livestock grazing is the boundaries of the associated Allotments. This area is chosen because change in the management of one area of the allotment may necessitate the change in the management of the entire allotment and have an effect on the overall livestock operation of the permitees.

The other activities that may cause a cumulative effect to this resource are:

1. Past Timber Harvests
2. Ongoing firewood harvest by the public, primarily along roadsides
3. Ongoing hazard tree removals in Mill Hollow Campground and around Granite Ed Center – includes pile burning
4. Ongoing Grazing and routine maintenance of fences, troughs, etc…
5. Dispersed Camping and recreation (hunting, snowmobiling, etc…including Family of light gathering)
6. Ongoing road maintenance including gravel placement, grading and in-kind culvert replacements
7. Invasive species treatments
8. Vat Diversion tunnel and pipeline
9. Uinta Express Pipeline

Most of these activities are generally considered on going activities and the management of the livestock has been developed to account for the year to year occurrences. The exceptions are the once in a while happenings such as timber harvest, hazard tree removal and Uinta pipeline express. Because these activities only happened once in a while the general management of the livestock does not take them into consideration and adjustments must be made when they occur. For the cumulative area the biggest adjustments needed are due to timber sales. These sales increase herding and change the rotation of the grazing system. Most of the past timber sales are old enough that the

management of livestock has resumed normal operations.

The exception is on the Wolf Creek Allotment which was the result of combing three allotments into two and removing one herd of sheep. This was done to bring grazing use within the standards and allow for a better rotation system. In the last 19 years this allotment has had part or all of 7 timber sales within its boundary. All of the sales required an increase in herding and in some cases the grazing rotation of pastures has been changed so that the sale area is conceded the rest pasture. This was done to provide the needed protection for reforestation. The other pastures are used on a deferred basis to provide rest for the rangeland vegetation. With the No Action alternative the Silver Meadows Timber sale will be the last sale within the boundaries that will need to be protected. Thus in a very few years the grazing system will be able to be fully implemented as was the intent of combining the allotments.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

Since the timber sale areas are not to be fenced, this alternative will have little effect on the base amount forage available for livestock. Some transitory range will result because of the removal of overstory. This transitory range will be part of the reforestation area and will increase the need of herding to keep livestock out while seedlings become established. This need to increase herding will be mitigated somewhat by leaving slash within the reforestation area. The slash will act as a deterrent to livestock access to the new seedlings. Though an increase of herding will be required even with the slash it will not be as time consuming as it would be without the slash..

Fences, water developments and other structures that are damaged by the timber harvesting activities will be repaired to standard by the logging operator in a manner that the structure is fully functional when livestock are in the area. This mitigation insures the livestock operator will not need to spend more time fixing structures and that the structures will be operational in a timely manner to help in the management of the livestock.

The effect of road closures will vary depending upon how the road is closed and how much it slows the movement of livestock. If the road is closed in a manner that it blocks passage of livestock then there will need to be more herding to move livestock around the forested area to get to the next grazing area. Also if the closure blocks access then the livestock will try to find a way through the forested area and make a new trail which will increase the amount of grazing in the transitory area. This may negate the effect of the slash being left behind to protect the seedlings. If the road closure is such that livestock can still trail down it easily then the effect will be very small.

2. Cumulative Effects

The difference between Alternative 1 and Alternative 2 is management of livestock on the Wolf Creek allotment. The Silver meadow sale needs protection for the next few years. The possibility of another sale on this allotment could be a need to reduce numbers or grazing season in order to meet the standards and guidelines of the Forest Plan. This in turn would necessitate a change of the permittees operation. This impact has been mitigated by setting the sales in this allotment to be cut last. This will allow time for the Silver Meadow sale to become reforested and grazing can again occur in the area. Even with this mitigation the full benefit of combing allotments and reducing numbers will not available for several more years

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

The effects of this alternative in regards to forage, herding to keep livestock out of reforestation areas and range improvements is the same as Alternative 2.

By putting the roads back to level one the movement of livestock and grazing patterns will not change and an increase in herding will not be necessary.

2. Cumulative Effects
The cumulative effects area and activities are the same as Alternate 1 and 2.

The cumulative effects are the same as Alternative 2.

3.2.6 Invasive Species

AFFECTED ENVIRONMENT

The infestations of invasive plants within the project area are small and scattered but when lumped together they cover approximately 3,613.9 acres. Many of these infestation have multiple species within the infestation thus when listed by species in the tables below the numbers of acres exceed that of the overall infestation. (See Tables 3.15 and 3.16)

Table 3.15
Acres of invasive species within the project area

Species	Common Name	Acres
Acroptilon repens	Russian knapweed	4.4
Arctium minus	burdock	4.5
Cardaria draba	whitetop	16.5
Carduus nutans	musk thistle	2650.0

Cirsium arvense	Canada thistle	2133.0
Cirsum vulgare	bull thistle	2.0
Conium maculatum	poison hemlock	667.3
Cynoglossum officinale	houndstongue	0.0
Leucanthemum vulgare	oxeye daisy	0.2
Linaria vulgaris	yellow toadflax	0.1
Melilotus officinalis	yellow sweetclover	121.9
Verbascum thapsus	woolly mullein	308.3
	total	5,908.4

The infestations of invasive plants within the proposed sale areas when lumped together cover approximately 262.0 acres. These infestations are basically associated with old roads and landings from the previous sales. Though the inventory shows several acres the actual density (plants per acre) is relative small. In many cases these infestations have been established for several years and do not seem to be expanding.

Table 3.16
Acres of invasive species within the proposed sale areas

Species	Common Name	Acres
Carduus nutans	musk thistle	254.4
Cirsium arvense	Canada thistle	259.0
MEOF Melilotus officinalis	yellow sweetclover	8.9
Verbascum thapsus	woolly mullein	8.9
	Total	531.2

The early detection, rapid response and integrated treatment of noxious weeds is the standard direction for control of invasive weeds in the area. Control efforts are usually prioritized so that new species, new infestations and the more aggressive plant species are treated first. The more common and already established infestations that are less aggressive are monitored and treated as resources are available.

In the past when these areas were harvested funds were allocated to monitor and treat invasive plants infestations. When these funds ended and the infestations had been controlled it was considered that the reestablishment of native vegetation would be able to compete for the light and water needed for the remaining invasive plants. Thus the remaining infestations within the old sales are not a priority when considering infestation located in the project area and the Heber-Kamas Ranger District.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

No common effects.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

There will be little change in the control, treatment and spread of invasive plants..

2. Cumulative Effects

The cumulative effects analysis area for invasive plants is the project area. This area was chosen because of the potential for scattering of seeds.

The other activities that may cause a cumulative effect to this resource are:

1. Past Timber Harvests
2. Ongoing firewood harvest by the public, primarily along roadsides
3. Ongoing hazard tree removals in Mill Hollow Campground and around Granite Ed Center – includes pile burning
4. Ongoing Grazing and routine maintenance of fences, troughs, etc…
5. Dispersed Camping and recreation (hunting, snowmobiling, etc…including Family of light gathering)
6. Ongoing road maintenance including gravel placement, grading and in-kind culvert replacements
7. Invasive species treatments
8. Vat Diversion tunnel and pipeline
9. Uinta Express Pipeline

Most of these activities are generally considered on going activities and management of invasive plants will continue to be prioritized as before.

b. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

The removal of the overstory will allow more sunlight to reach the ground and logging equipment will scarify the soil so that there becomes a good seed bed. This with the potential for invasive seed to be brought into the area by logging equipment increases the probability of invasive plants to become established. But, it has been observed from past timber sales in the area that with funds available for treatment new infestation seldom become established within the actual cutting area and those that do become established

are out competed as the reforestation takes place. The road and landing areas become the prime spot for new infestations. This potential is reduced by adherence to the Forest Plan Standard and Guidelines. Use of some of the timber receipts to treat and control infestations for a few years after the sale, the quick revegetation of the roads and reforestation of the trees to block out the sun light will limit the expansion and establishment of invasive plant infestations.

2. Cumulative Effects

The cumulative effects analysis area and activities for Alternative 2 are the same as Alternative 1.

The cumulative effect with the proposed sales is quite similar to Alternative 1. This is because the sale areas are treated to control invasive plants for several years after the logging operations stops. This limits the establishment of infestations within the area and minimizes transportation of seed into adjacent area. When Forest Plan Standard and Guidelines in regards to logging equipment are followed there is little chance that the equipment will transport invasive seeds to other places.

c. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

The effects of this alternative in regards to invasive plants are the same as Alternative 2.

2. Cumulative Effects

The cumulative effects for this alternative are the same as Alternative 2.

3.3 Social / Economic Environment

3.3.1 Heritage Resources

Affected Environment

West Fork Duchesne Management Area:
A number of ancient Native American campsites have been identified, reflecting the significance of this area to people as both a travel way and a place to hunt, gather wild plants, and carry out other facets of their lives. One of these sites was excavated in the 1990s, revealing important information on this high elevation use. The area was also used by historic Utes as a travel route between the Uintah and Ouray Ute Indian Reservation and Heber Valley. The entire management area was originally part of the Uintah and Ouray Ute Indian Reservation. Historic European American sites include those related to logging, livestock grazing, and Forest Service management.

Upper Provo Management Area:
Ancient Native American use of this area is evidenced by a number of campsites. Known historic European American sites include sawmills, an iron mine, logging camps, and the camps of livestock grazers; some of these sites are eligible for the National Register of Historic Places.

Currant Creek Management Area:
This area was used by both ancient Native Americans and historic era Utes (those using the area in the last 150+ years); a few archaeological sites have been located that document this use. Very little archaeological work has been done in the area; as a result, no sites form the historic period have been documented. However, it is likely that grazing, logging, and recreation campsites exist.

Direct, Indirect and Cumulative Effects all Alternatives

One newly identified prehistoric site was identified through these survey efforts.

Table 3.17
Newly Identified Sites Located Within the Area Potential Effect (APE)

Site Number	Site Name/ Description	NRHP Eligibility	Treatment Type
42 WA 417 UWC-789	Grimes/ Parker Site. Prehistoric Artifact Scatter.	Eligible	Within APE, will be avoided by project and any associated ground disturbance.

The new site is a prehistoric artifact scatter located in a meadow outside one of the proposed cutting units. Any potential impacts to this site will be mitigated by physically avoiding the site. The new site is technically outside of the APE footprint for this undertaking as it does not occur directly within a cutting unit. The USDA Forest Service recognizes a potential to affect this site through accessing the timber unit, and/or staging vehicles on the site. Therefore the Uinta-Wasatch-Cache National Forest will avoid any physical impacts to this site during project implementation. With avoidance mitigation in place the USDA Forest Service has made the determination of No Historic Properties Affected as per 36 CFR800.4(d)(1), and believes the project should proceed as planned.

If an adverse effect to a cultural resource is noted, the Forest Service is compelled to mitigate those adverse effects in keeping with 36 CFR 800, and Forest Service Manual (FSM) 2360: Heritage Program Management.

In compliance with 36 CFR 800, and the National Historic Preservation Act, The USDA - Forest Service, in consultation with the Utah State Historic Preservation Officer (SHPO), has made the determination that the proposed treatments in the North Heber Salvage proposed area will not adversely affect historic properties as per 36 CFR 800.5(b).

Since there are no direct or indirect effects to heritage resources, consequently, there will be no cumulative effects resulting from the proposed action or any of the alternatives. The Heritage Resources Report is available in the project record.

3.3.2 Timber Management Resources

AFFECTED ENVIRONMENT

Economic impacts for the timber program have been addressed at the forest level in the revised Forest Plan. That analysis estimated employment and employee compensation estimated to result from the implementation of each alternative. Estimates of job and income impacts were made with IMPLAN Input-Output models. IMPLAN estimates combine direct, indirect and induced effects into the total impact. The measure for "jobs" includes both full and part-time jobs. The measure for "income" is employee compensation. Impact areas (the counties affected by implementation) were based on U.S. Department of Commerce, Regional Economic Information System, 2000. These areas are defined as functioning economies based on commuting patterns. Each economic area includes, as far as possible, both the place of work and the place of residence of the labor force. The Forest plan analysis determined that the timber program on the Uinta National Forest provides an annual average of 59 wood products related jobs, and generates $9.6 million annually in direct output (Uinta National Forest Revised Forest Plan FEIS, Tables 3-98 and 3-97). Active sawmills in both Kamas and Heber purchase the timber offered from the Heber-Kamas Ranger District.

Non-commodity values were not included in this analysis because these resources are evaluated under each specific resource section. Title 40, Code of Federal Regulations for NEPA (40 CFR 1502.23) states "For the purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are qualitative considerations". Effects on resources are documented in individual resource sections in the FEIS.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

Financial Efficiency

Tables 3.18-3.20 display the Net Value of the costs and revenues associated with each alternative, for this proposal. The cost of environmental document preparation is not shown, because those costs are incurred regardless of the final alternative chosen in the Decision Notice. It is not a requirement that timber sales produce financial benefits. Only that this information be considered in the decision. There are other non-tangible benefits that may result that are not expressed in dollar revenue. For example improved roads in the area would result in better access for recreational activities. Local jobs may be created

and income to local business may increase as an indirect result of the project. Forest Plan Objectives for structural stage diversity would be met.

Table 3.18
Net Value of Costs and Revenues Alternative 1

Sale Prep Costs	0
Temp Road Costs	0
Revenue	0
Net Timber Value	0
Road Obliteration	0
Proposal Value	0

Table 3.19
Net Value of Costs and Revenues Alternative 2

Sale Prep Costs	1,364,792
Temp Road Costs	47,000
Revenue	1,600,163
Net Timber Value	188,371
Road Obliteration	564,000
Proposal Value	-375,629

Table 3.20
Net Value of Costs and Revenues Alternative 3

Sale Prep Costs	1,364,792
Temp Road Costs	117,500
Revenue	1,600,163
Net Timber Value	117,871
Road Obliteration	0
Proposal Value	164,871

The No Action Alternative, Table 3.18 shows that no costs are incurred, nor revenues gained.

Table 3.19 the Proposed Action shows a negative proposal value because this includes the costs of obliterating the roads. However this is not a true cost to the timber resource and would be paid for by other funding sources. It is included here as information regarding the entire cost of the proposal.

Alternative 3, Table 3.20 shows no road obliteration cost. The cost of temp roads, as in Alternative 2 does include the expense to the timber revenues to return the roads to level 1 status.

In order to project the financial analysis for the required 60 year period some reasonably foreseeable assumptions needed to be made about future management scenarios. Due to the heavy levels of infestation in the spruce it can be assumed that within the near future

there will not be another entry. The stands not harvested in this entry will be dominated by subalpine fir and will not be of merchantable size within the time frame.

Costs and revenues for each of the activities are based on experienced costs and professional judgment, and represent the best estimated costs to implement the alternative. Costs include sale preparation (marking/cruising, appraisal, contract preparation, advertising, etc.), sale administration, temporary road construction and obliteration, and post-sale activities (planting, and regeneration surveys). Revenues are based on recent timber sell values on the Heber-Kamas Ranger District.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

No timber volume would be available to the local industry other than what is currently under contract. Without a long term supply it is likely that local mills would go out of business or operate at reduced levels because there would be no wood to harvest within a reasonable haul distance. If they were to travel farther this would increase their operational costs due to increased fuel cost and driver time.

2. Cumulative Effects

The cumulative effects analysis area for timber management and economics includes all of the UWC National Forest because that is the working circle for timber operators from Kamas, Duchesne, Evanston and Mountain View.

Sales expected from the North Heber Proposal comprise a significant portion of the total sale offer from the UWC to the local industry. Failure to offer these sales would result in less volume available and could affect the purchasers outside of the immediate Heber-Kamas area.

Timber offer from the sales on Evanston and Mountain View are primarily dead lodgepole pine. The North Heber Sales are dead Engelmann spruce, which provides a different product opportunity (large boards, houselogs, different grain patterns) that would not be available in the No Action Alternative.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

State and local economies would be directly and indirectly affected by the monetary inputs this project represents. Timber products provided to the raw material markets through direct timber sales would contribute to the continuing operation of lumber mills. This would add directly and indirectly to the local and state economies through employment and tax revenues. This project represents opportunity for input to local and regional economies because of the proposed harvest activities. Employment opportunities in the wood products industries would be available.

2. Cumulative Effects

Sales expected from the North Heber Proposal comprise a significant portion of the total sale offer from the UWC to the local industry. Ability to offer these sales would result in more volume available to local purchasers and those outside of the immediate Heber-Kamas area.

Timber offer from the sales on Evanston and Mountain View are primarily dead lodgepole pine. The North Heber Sales are dead Engelmann spruce, which provides a different product opportunity (large boards, houselogs, and different grain patterns) that would be available in the Action Alternatives.

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

Same as Alternative 2 for the Timber Resource and Economics.

2. Cumulative Effects

Same as Alternative 2 for the Timber Resource and Economics.

3.3.3 Recreation Resources

AFFECTED ENVIRONMENT

The Currant Creek Management Area is removed from the urban centers along the Wasatch Front. Recreational use occurs year-round with most use by residents of northern Utah. Recreation activities within the area include moderate amounts of dispersed and developed camping, fishing, hunting, off-highway vehicle (OHV) use, and general dispersed area use. The Currant Creek Campground and Reservoir are destinations for weekend recreationists and hunters. These are the only developed recreational facilities within the management area. Overall, recreational use is light as compared to the areas immediately adjacent to the Wasatch Front. The Recreation Opportunity Spectrum (ROS) classes applied to the management area are summarized in Table 3.21 below.

Table 3.21
ROS Acreage

ROS Class	Acres
Primitive	270
Semi-Primitive Motorized	15,600
Roaded Natural	23,490

Roaded Modified	3,510

This management area contains approximately 86 miles of classified roads used to access the Forest for recreation and resource management purposes. The primary arterial routes include Tut Creek, Co-op Creek, and Currant Creek Roads. More than 50 percent of the Currant Creek Road (#083) segment from the Currant Creek Dam to Low Pass Road (#106) passes through landslide prone areas. There is a high maintenance cost associated with maintaining this road segment.

The Upper Provo Management Area provides views of high mountain meadows and aspen make this area quite scenic. Recreation use is moderate. Recreation activities include dispersed camping, hunting, and fishing, as well as snowmobiling during winter months. There is a limited trail system within the area that provides motorized opportunities for ATV and motorcycle use. The Mill Hollow Campground and Wolf Creek Summit Campground are located within the management area. Recreation use is anticipated to increase over the next several years, with driving for pleasure being a key recreational activity.
The Recreation Opportunity Spectrum (ROS) classes applied to the management area are summarized in Table 3.22 below.

Table 3.22
ROS Acreage

ROS Class	Acres
Semi-Primitive Motorized	24,830
Roaded Natural	23,230
Roaded Modified	5,700

State Highway 35, the Wolf Creek Highway, traverses the management area. This management area contains 126 miles of classified roads used to access the Forest for recreation and resource management purposes. The primary arterial route in this area is the Mill Hollow-Duchesne Ridge Road (#054); from the Wolf Creek Highway to Mill Hollow Reservoir this road is narrow and encroaches upon the stream. The majority of roads in this area are managed for passage by high clearance vehicles.

The Little South Fork Trail (open to non-motorized use and motorcycles) is located in this management area and .37 miles of the trail are within sale units. Currently this trail is used lightly and mostly by mountain biker seeking adventure type riding (lower trail maintenance levels, long distance, obstacles that require bike to be carried, etc.). Blowdown trees have prevented motorized use in recent years. Trail will be kept open during operations and will rebuilt by contractor after logging work is complete.

The Tim’s Hole Trail is located in this management area and .68 miles of the trail are within sale units. No information is known about this trail and it likely does not exist on the ground.

The Wolf Creek Trail is located in this management area .42 miles of the trail are within sale units. It takes hikers from the Wolf Creek Campground to the ridge and receives very little use. The trail has been protected in previous sales and will be during this sale as well.

In **The West Fork Duchesne Management Area** Recreation activities and opportunities are generally related to hunting, fishing, and camping, and some driving for pleasure. There are no developed recreational facilities within the management area. The Recreation Opportunity Spectrum (ROS) classes applied to the management area are summarized in the Table 3.23 below.

Table 3.23
ROS Acreage

ROS Class	Acres
Semi-Primitive Motorized	21,700
Roaded Natural	12,670
Roaded Modified	7,240

There are approximately 79 miles of roads within the management area, the majority of which are maintained for high clearance vehicles. The primary arterial route is Lake Creek Road (#083). The West Fork Duchesne Road (#050) parallels the West Fork of the Duchesne River and continues onto the Ashley National Forest.

The Current Creek Road Snow Trail is located in this management unit and 1.12 miles of the trail are within sale units. This trail will not be affected by the sale due to it being an over the snow route for winter use.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

Effects on recreation from timber activities generally include visual impacts and noise and dust nuisances created from road construction; noise, dust, and the change in the scenery as a timber stand is thinned and slash accumulates, created from timber cutting, and skidding; noise, dust created from hauling timber out of the forest; constant action of falling timber and movement of heavy equipment. During the short period of time salvage operations are occurring, forest visitors in the area or in close proximity would be displaced which could cause higher concentrations of campers in other campgrounds or dispersed sites.

Effects of no treatments include increasing devastating fire hazard potential, increasing safety hazards as trees start to fall over in ever increasing numbers and at random, increasing hindrances for walking through the forest and more fallen trees blocking passage on roads and trails. Potential ground disturbance as fallen trees block roads and trails and force traveler to detour around possibly across more sensitive areas. If conditions warranted, camp sites could be closed due to hazardous conditions singly or

all at once for one or several seasons. Forest visitors would be displaced to find other camping sites remaining open. Use of the Forest would be concentrated into areas remaining open.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

If no action were taken, moderate short and long-term effects would occur to the recreating public by posing a safety risk by dead-down or potential falling hazards along the trail/road system and in and around dispersed camping sites. Due to the mortality of trees in this area, the severity of this risk could require closure of popular areas for public safety reasons. Additionally, visual effects would occur from vast stands of dead and downed trees in this popular area. Over time, as more of these trees fell, roads and trails in the area could result in short and long-term closures; reducing the area open to motorized use. Winter snowmobile use could experience similar effects, especially since this area is open to cross-country travel, and a groomed snowmobile trail is located in the proposed area. In the long term, as these trees are either removed by private wood cutters or through natural decomposition, the area would result in large open areas that would likely experience exacerbated illegal vehicle and ATV activity.

Indirect long-term effects would likely occur to hunting in the area due to decreased forage and cover for wildlife populations, thus displacing or reducing hunting opportunities.

2. Cumulative Effects

Cumulative effects to the recreating public would not occur since there would not be any action in this alternative.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

Implementation of the proposed timber sale would have a moderate short-term effect on the recreating public in the immediate area, particularly along Forest Service roads where the majority of summer dispersed recreation and camping occurs within the project area. Hunting activities could be impaired or interrupted by logging activity in the late summer and fall. The length of the snowmobile season may be shortened if any snow removal is conducted during the shoulder seasons. Any temporary road construction or improvement could exacerbate illegal vehicle and ATV activity. The road system that accesses the proposed timber sale area are narrow roads with minimal to no turnouts for vehicles that meet on the road. Public safety and uninterrupted access should be a priority.

The temporary closure of dispersed campsites for landing and loading sites will have a varying impact depending on which campsites are utilized. Any temporary campsite closure should be signed as soon as this location is determined for logging activity. Extended closures should be avoided. Campsites used for logging activities should be returned to previous condition and in a useable condition.

Long-term effects to the recreating public will come in the form of road closures. A majority of the 27 miles of roads that will be closed will not affect legal vehicular travel as these roads are old logging roads, Operational Maintenance Level 1, that are closed (and generally gated-off) to the public. Spurs and short sections of redundant routes currently managed as Operational Maintenance Level 2 (including Shingle Mill Spur .55 miles, Old Smith Basin/Coop Rd Align .13, Roundy Basin Spur .37 miles) will be permanently closed and rehabilitated following timber activity. However, these roads while classified as level 2, are actually currently behind a gate or some other physical closure. Thus, permanent closure of these level 1and 2 routes will not significantly reduce access for recreational users and will help prevent route proliferation and related resource damage.

Additional long-term road closure related effects will be experienced as .47 miles of the Trappers Hollow road is decommissioned and rehabilitated after timber activities. While this route is not part of the Forest Service road system or Motor Vehicle Use Maps, the public has in recent years been allowed access beyond the gate. This access has generally been used for firewood cutting and roadside hunting. This action will likely be perceived by some members of the public as a closure, because in the past they were allowed (or rather not barred from) use of the route. Again, physically closing this route will help meet the plan set forth by the Forest Service Motor Vehicle Use Map and help prevent route proliferation and related resource damage.

Other short-term and long-term effects may be experienced by visitors that use old logging roads for pedestrian or horse travel. While this activity would not be prohibited during or following logging activity such travel may be more difficult if old road grades are not available.

2. Cumulative Effects

There are no cumulative effects to the recreation resource or recreational experiences of Forest visitors in the project area as a result of any of the proposed actions. This area is heavily used by Forest visitors; mostly related to dispersed camping, hunting and ATV use. The majority of conflicts between recreationalists occur due to the intensity of use the area receives and where motorized and non-motorized uses occur in similar places, particularly when motorized travel is on illegal routes and interacts with non-motorized users. This plan does not attempt to resolve those conflicts; however the proposed action could exacerbate these conflicts by opening up additional areas or if temporary roads created for timber activities are not appropriately reclaimed.

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

Effects to the recreating public would be the same as the proposed action except there would be no long-term effects related to permanent road closures.

2. Cumulative Effects

Cumulative effects to the recreating public would be the same as the proposed action except there would be no long-term effects related to permanent road closures.

3.3.4 Scenery, Visual Quality

AFFECTED ENVIRONMENT

This upland plateau that is bordered and bisected by river valleys and interspersed with natural basins creates the landform that hosts a mosaic of conifer and aspen stands. The deep greens of Engelmann spruce has been replaced by grey skeletons left behind by the spruce bark beetle epidemic that killed up to 90% of the species within the project analysis area. Aspen and mixed aspen vegetation dominate nearly a half of the analysis area. Spruce/fir stands are common throughout and are the next most common vegetation type occupying about a quarter of the viewed landscape. Bare/rock scenes fill another quarter of the characteristic landscape with small areas of sagebrush/grass, open grass meadow parks, moist to wet meadows, and tall forb types interspersed the area as well.

A majority of the spruce are located in upper elevations at the headwaters of the chief streams within the analysis areas, such as the West Fork Duchesne; Little South Fork Provo Rivers and along Wolf Creek and are not a major component of the viewed landscape outside of these drainages.

Because this is a plateau landscape the analysis is contained within viewsheds that follow travelways along river valleys and keep the analysis almost entirely within the project analysis area. Visual quality objectives management in this forested landscape respond to these travelway viewsheds and where timber management has occurred in the past. Observations into the project area are limited and screened by landforms restricting most views to the middleground and foreground.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

Issue Statement:
What is relative degree of importance that management actions are evident to the casual visitor?

<u>a. Effects Common To All Alternatives</u>

1. Direct and Indirect Effects

Implementation of either alternative would leave approximately 13,540 acres of mature spruce fir stands in the analysis area left alone to natural processes and recovery. DeLong in 2008 showed, based on long term studies, that the average standing time for dead spruce was 16.5 years, with an average fall rate in a stands of 4.62%. *(Gibson 2015)* See Vegetation/Silviculture Resource Technical Report Gibson 2015 for more detailed description of effects of the spruce bark beetle on spruce and standing time of dead.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

With this management the landscape would follow natural processes and would comply with all of the VQOs described as management for the analysis area. However the casual visitor would be aware of this long term change in the viewed landscape specifically along Highway 35 where Wolf Creek runs adjacent to the Hwy and also along FS Road 50 West Fork Duchesne on the north facing slopes until the overstory is replaced. The casual visitor may choose not use these travelways when selecting a scenic drive or camping.

2. Cumulative Effects

No vegetation manipulation would occur except for hazard tree treatments in the Mill Hollow Campground and along major roadways for safety purposes. There would be no cumulative effects as a result of other past, present or reasonably foreseeable future actions.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

With the removal of the dead spruce the proposed action will visually dominate the viewed landscape because of the size of openings and will have a long term effect until the overstory is replaced. By following the mitigation of sculpting the edge of the stands it could help in keeping the proposed action subordinate within the viewed landscape.

The proposed action will go beyond the degree of acceptable change with landscapes being managed in the VQO of retention and may be dominant in stands that are being managed in a VQO of partial retention because of the size of the opening in the long term, see table 3.24 for the acres of VQO by unit. Once the overstory is established in the long term within these landscapes the proposed action may not be apparent. It is anticipated that there will be no manipulation of these landscapes for the next 150 years until stands are again viable for harvest. See Gibson 2015.

Once the dead spruce has been removed and tree planting has occurred many haul roads will be obliterated, through scarification and planted with native seed. Where these haul road intersect with maintained roads the road prism will be re-contoured to mimic the surrounding landscape to where it is out of sight of a casual visitor traveling a maintained road 200 to 400 feet. The treatment will include natural appearing barrier installation of logs, and rock to avoid re-entry by the recreating public. Once vegetation has established in these areas the action will not be evident and would comply with the degree of acceptable change managed for in all VQOs.

The proposed action could create approximately 3,725 acres of structurally young forest

across the project area because understocked areas would be planted and would contribute to the seedling/sapling acres. In approximately 50 years Engelmann spruce trees per acre could be up to 64% as compared to the pre epidemic of 35% because of the planting of Engelmann spruce seedlings following harvest. See Gibson 2015. In general the viewed landscape would meet the desired scenery of the casual visitor in the long term because the desire structure of a green overstory would be returned.

Table 3.24 - Acres of VQO by Unit

Unit #	Acres Modification	Acres Partial Retention	Acres Retention	Total Acres per Unit	Unit #	Acres Modification	Acres Partial Retention	Acres Retention	Total Acres per Unit
Unit-1			33.84	33.84	Unit-23		96.38		96.38
Unit-2		21.50	274.56	296.06	Unit-24	1.41	47.17		48.58
Unit-3			6.47	6.47	Unit-25		60.44		60.44
Unit-4			61.75	61.75	Unit-26		6.24		6.24
Unit-5	25.88			25.88	Unit-27	6.44	3.76		10.20
Unit-6			54.13	54.13	Unit-28	29.38	364.14		393.51
Unit-7	3.01		95.35	98.36	Unit-29	27.51	45.93		73.44
Unit-8	129.05	110.41	91.97	331.43	Unit-30	37.49	39.64		77.13
Unit-9			162.78	162.78	Unit-31	0.01	38.44		38.45
Unit-10		27.47		27.47	Unit-32		23.45		23.45
Unit-11			17.02	17.02	Unit-33	85.55	262.93		348.48
Unit-12		32.08	11.54	43.62	Unit-34	22.52	25.87		48.38
Unit-13		24.99	3.24	28.23	Unit-35		70.30		70.30
Unit-14		42.31		42.31	Unit-36		157.91		157.91
Unit-15		63.84		63.84	Unit-37		296.86		296.86
Unit-16		102.59		102.59	Unit-39	0.59	180.77		181.36
Unit-17		11.54		11.54	Unit-40		87.17		87.17
Unit-18		4.63		4.63	Unit-41		4.44		4.44
Unit-19		4.42		4.42	Unit-42		119.50		119.50
Unit-21		60.48		60.48	Unit-43	5.89	53.86		59.75
Unit-22		20.36		20.36	Unit-44		25.66		25.66
					Grand Total of Acres	**374.73**	**2,537.47**	**812.65**	**3,724.85**

2. Cumulative Effects

There are no other vegetation manipulation projects ongoing or proposed except for the Mill Hollow Campground tree removal and some hazard tree removal along major travelways. With the overall size of the stands being removed and the dominance of

aspen and aspen/mix conifer within the project area the proposed action should not have a cumulative effect with any past, present, or foreseeably future projects.

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

This would be the same as Alternative 2 for scenery with the exception that only 45 acres of non-system road prisms would be returned to natural contour.

2. Cumulative Effects

For the scenic resource this would be the same as alternative 2.

3.3.5 Transportation, Engineering Resources

AFFECTED ENVIRONMENT

Miles of classified roads remain relatively unchanged. The Forest is well accessible with many roads in-place and functioning. Roads (primarily arterial and collector) are maintained and constructed to a standard that is providing a safe facility. Local roads provide access to and through the area. Available funding is focused on public safety and ecosystem integrity, while balancing access needs and desire to maintain a minimum road system. When possible, roads or portions of roads that have negatively affected watershed and aquatic conditions are relocated or hardened. The project crosses three management areas.

Currant Creek Management Area

This management area contains approximately 86 miles of classified roads used to access the Forest for recreation and resource management purposes. The primary arterial routes include Tut Creek, Co-op Creek, and Currant Creek Roads. More than 50 percent of the Currant Creek Road (#083) segment from the Currant Creek Dam to Low Pass Road (#106) passes through landslide prone areas. There is a high maintenance cost associated with maintaining this road segment.

Desired Future Condition
Currant Creek Road (#083) has been relocated across the Currant Creek Dam to the West Side Currant Creek Road (#471). Through this relocation, critical access to the Currant Creek Campground and Work Center is maintained, a maintainable road across stable soils is provided, and classified road miles are reduced. A motorized trail from the Currant Creek Dam to Low Pass Road has been constructed utilizing the original Currant Creek Road alignment, maintaining motorized access around Currant Creek Reservoir and associated portions of this management area.”

West Fork Duchesne Management Area

There are approximately 79 miles of roads within the management area, the majority of which are maintained for high clearance vehicles. The primary arterial route is Lake Creek Road (#083). The West Fork Duchesne Road (#050) parallels the West Fork of the Duchesne River and continues onto the Ashley National Forest.

Desired Future Condition
Opportunities to relocate or harden portions of the West Fork Duchesne Road (#050) are completed, thereby improving aquatic, water, and watershed resources."

Upper Provo River Area

State Highway 35, the Wolf Creek Highway, traverses the management area. This management area contains 126 miles of classified roads used to access the Forest for recreation and resource management purposes. The primary arterial route in this area is the Mill Hollow-Duchesne Ridge Road (#054); from the Wolf Creek Highway to Mill Hollow Reservoir this road is narrow and encroaches upon the stream. The majority of roads in this area are managed for passage by high clearance vehicles.

Desired Future Condition
The Mill Hollow Road (#054) from the Wolf Creek Highway to Mill Hollow Reservoir is reconstructed, providing safe and dependable access to the Granite School District facility, Mill Hollow Campground, and Reservoir, and providing consistent connectivity through the Forest."

Consideration of Best Available Science - The scientific integrity of the discussions and analyses in this report are based on best available science and this includes discussion of the methodology used in the analysis, scientific sources that are relied upon and referenced, relevant literature that is reviewed, scientific literature that is cited by the public are considered when shown to be relevant, opposing views are discussed when they are raised by the public or other agencies, and the disclosure of incomplete or unavailable information.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

1. Direct and Indirect Effects

No Direct or Indirect effects in common.

2. Cumulative Effects

Under all of the alternatives, use of roads during timber hauling or increased traffic due to the selected vegetation treatment alternative causes loss of and greater degradation to the road surfaces and higher rates of sediment transport into the adjacent vegetation and stream courses, especially under wet and saturated conditions.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

Existing travel routes will remain untouched by timber harvest or log hauling and would receive maintenance according to annual operation and maintenance plans. Road maintenance would remain unchanged from current practices. There would be no change in management of road classifications or road closure efforts. Roads that are now contributing to sediment transport and general degradation will not be addressed under this alternative. Roads that were ‘improperly closed’ will not receive work to correct any existing current issues unless addressed by a separate management effort or proposal at some other time.

Potential user conflicts would remain unchanged.

2. Cumulative Effects

Under all of the alternatives, use of roads during timber hauling or increased traffic due to the selected vegetation treatment alternative causes loss of and greater degradation to the road surfaces and higher rates of sediment transport into the adjacent vegetation and stream courses, especially under wet and saturated conditions.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

Under this alternative, roads identified as haul routes will receive maintenance that may not have been identified for treatments under annual roads maintenance plans. The operation will increase travel on haul routes and improvements may contribute to increase public access potentially increasing user conflicts.

Approximately 27 of the 76 road miles affected are currently under 'Operational Maintenance Level 1' closed to travel. After timber haul is complete, roads will be decommissioned following criteria stated in FSM 7734.1 and removed from National Forest System Road system. In addition, approximately 2 miles of road will be closed and returned to Operational Maintenance Level 1 status or some other form of closure. The closure treatments will vary in methods but will follow the guidance outlined by Forest Service directives.

Table 3.24
Operational Maintenance Levels

ID	Name	Operational Level	Miles
70520	SHINGLE MILL SPUR 1	2 - HIGH CLEARANCE VEHICLES	0.55
70206	LITTLE SOUTH FORK 7	1 - BASIC CUSTODIAL CARE (CLOSED)	0.25
70237	(OLD SMITH BASIN/COOP RD ALIN)	1 - BASIC CUSTODIAL CARE (CLOSED)	1.28
70237	(OLD SMITH BASIN/COOP RD ALIN)	2 - HIGH CLEARANCE VEHICLES	0.13
70906	LITTLE SO. FK. TIMBER SALE #10	1 - BASIC CUSTODIAL CARE (CLOSED)	0.47
70035	WEST FORK ACCESS SPUR 2	1 - BASIC CUSTODIAL CARE (CLOSED)	1.19
70040	WEST FORK ACCESS SPUR 4	1 - BASIC CUSTODIAL CARE (CLOSED)	1.20
70524	MILL HOLLOW RIDGE	1 - BASIC CUSTODIAL CARE (CLOSED)	1.36
70523	SHINGLE MILL SPUR 2	1 - BASIC CUSTODIAL CARE (CLOSED)	0.29
70903	LITTLE SO. FK. TIMBER SALE #5	1 - BASIC CUSTODIAL CARE (CLOSED)	0.52
70908	LITTLE SO. FK. TIMBER SALE #12	1 - BASIC CUSTODIAL CARE (CLOSED)	0.80
70907	LITTLE SO. FK. TIMBER SALE #11	1 - BASIC CUSTODIAL CARE (CLOSED)	0.60
70905	LITTLE SO. FK. TIMBER SALE #9	1 - BASIC CUSTODIAL CARE (CLOSED)	0.41
70904	LITTLE SO. FK. TIMBER SALE #8	1 - BASIC CUSTODIAL CARE (CLOSED)	0.51
70718	SHINGLE MILL SPUR 3	1 - BASIC CUSTODIAL CARE (CLOSED)	0.59
70559	LOBO TS	1 - BASIC CUSTODIAL CARE (CLOSED)	1.31
70537	WOLF CREEK RIDGE 2	1 - BASIC CUSTODIAL CARE (CLOSED)	1.26
70902	LITTLE SO. FK. TIMBER SALE #3	1 - BASIC CUSTODIAL CARE (CLOSED)	0.45
70900	LITTLE WEST FK. TIMBER SALE #1	1 - BASIC CUSTODIAL CARE (CLOSED)	0.27
70536	WOLF CREEK RIDGE TS 1	1 - BASIC CUSTODIAL CARE (CLOSED)	0.87
70533	DUCHESNE RIDGE TS	1 - BASIC CUSTODIAL CARE (CLOSED)	0.81
70316	TIMS HOLE	1 - BASIC CUSTODIAL CARE (CLOSED)	2.98
70207	LITTLE SOUTH FORK 4	1 - BASIC CUSTODIAL CARE (CLOSED)	1.39
70204	LITTLE SOUTH FORK 2	1 - BASIC CUSTODIAL CARE (CLOSED)	0.63
70538	WOLF CREEK RIDGE TS SPU*	1 - BASIC CUSTODIAL CARE (CLOSED)	0.12

70026	LITTLE WEST FORK LOOP	1 - BASIC CUSTODIAL CARE (CLOSED)	3.02
70522	TIMBER ROAD	1 - BASIC CUSTODIAL CARE (CLOSED)	0.59
70627	ROUNDY BASIN SPUR	2 - HIGH CLEARANCE VEHICLES	0.37
70379	SAWMILL SPUR	1 - BASIC CUSTODIAL CARE (CLOSED)	0.83
70447	TIMBER SALE ROAD	1 - BASIC CUSTODIAL CARE (CLOSED)	0.15
70205	LITTLE SOUTH FORK 1	1 - BASIC CUSTODIAL CARE (CLOSED)	0.47
70278	RIGHT FORK SOUTH DIP VAT	1 - BASIC CUSTODIAL CARE (CLOSED)	0.52
70539	WOLF CREEK RIDGE SPUR	1 - BASIC CUSTODIAL CARE (CLOSED)	0.35
70525	MILL HOLLOW RDG SPR 1	1 - BASIC CUSTODIAL CARE (CLOSED)	1.14
70382	TANK HOLLOW CUTOFF	1 - BASIC CUSTODIAL CARE (CLOSED)	0.42

Non system roads used or timber operator constructed ‘temporary roads’ would be reclaimed.

Roads in the proposed areas that were closed were not properly closed or treated and are currently contributing to sediment transport. After timber haul is completed, roads identified for decommissioning or closure would meet definitions identified in the Appendix found in the Transportation Specialist Report. The most effective form of closure is a total obliteration of the entire road prism and re-contouring or reshaping the roads back to original slopes. This form of closure allows the soils to go back to original form and when vegetation is re-established will not contribute to overall sedimentation issues any greater than surrounding soils. Partial obliteration that leaves the road prism intact for most of the length of roads will allow regeneration of plant matter easily on the road prism surfaces if they are not accessed by Forest users. Drainage structures will need to be addressed and accounted for the time that the road remains un-maintained. Culverts left in place without maintenance tend to plug and raise the potential for catastrophic failure and sedimentation. Road prisms that are left intact are inviting to the travelling public as well and sometimes become used extensively causing resource damage.

Decommissioning or conversion of National Forest System Roads supports efforts to maintain a minimum road system while maintaining access to Forest users.

2. Cumulative Effects

Under all of the alternatives, use of roads during timber hauling or increased traffic due to the selected vegetation treatment alternative causes loss of and greater degradation to the road surfaces and higher rates of sediment transport into the adjacent vegetation and stream courses, especially under wet and saturated conditions.

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

Under this alternative, roads identified as haul routes will receive maintenance that may not have been identified for treatments under annual roads maintenance plans. The operation will increase travel on haul routes and improvements may contribute to increase public access potentially increasing user conflicts. These effects are the same as the proposed action.

Roads in the proposed areas that were closed, opened for hauling, and closed after operations are complete would remain in-place and on the National Forest System Road database. Treatments to improve haul routes would provide for reduced short-term resource impacts. Culverts left in place without maintenance tend to plug and raise the potential for failure and sedimentation. The long-term effects to the road system are expected to be similar to the No Action alternative.

Decommissioning or conversion of National Forest System Roads supports efforts to maintain a minimum road system while maintaining access to Forest users.

2. Cumulative Effects

Under all of the alternatives, use of roads during timber hauling or increased traffic due to the selected vegetation treatment alternative causes loss of and greater degradation to the road surfaces and higher rates of sediment transport into the adjacent vegetation and stream courses, especially under wet and saturated conditions.

3.4 PHYSICAL ENVIRONMENT

3.4.1 Soils

AFFECTED ENVIRONMENT
The North Heber Salvage project lies within the Upper Provo, West Fork Duchesne, and Currant Creek Management Areas. Management Areas are described in Chapter 5 of the Uinta NF 2003 Land and Resource Management Plan (Forest Service, 2003).

Sedimentary rock is the most common form of bedrock exposed on the land surface. Limestone, shale, and sandstone outcrops are common throughout both Wolf Creek and West Fork of the Duchesne river drainages. Igneous and metamorphic rock is found near the upper parts of the West Fork drainage and these have had some influence on the present landforms. Volcanic and orogenic activities have greatly altered the sedimentary rockbeds where dip and scarp slopes are readily identified in the eastern part of the survey area. Three major landforming processes account for the present geomorphologically unique units in the survey area; glaciation, volcanism, and stream erosion and deposition. Stream erosion and deposition have essentially masked any

volcanic landforms such as lava flows, etc. Stream erosion and deposition is the most active process which has occurred since glaciation. Mass stability is a problem in some landtypes, but no active landslides have been observed in the survey area. LS1 is located on a Landslide Landtype Association. This association is identified by several features, the most prominent are flowlike configuration, interrupted drainages, hummocky or benchy surface, changed vegetation patterns, slip scars, and active movement of materials.

Soils in the area developed from a wide variety of site features. These include glacial canyons (GC), glacial moraines (GM), stream canyons (SC), plateaus (PL), landslide (LS), and tectonic mountain (TM) (Appendix A of specialist report). Due to the large mapping scale and wide variety of site features the soil characteristics are described in a broad, general manner. The soils range from shallow (0-20 inches) to deep (40+ inches). The A-horizon, commonly referred to as topsoil, is shallow on soil types GC5, PL4, SC1, and TM1. Soil types PL4, SC1, and TM1 have bedrock within 20-40 inches of the surface. These four soil types may have limited revegetation potential depending where on the landscape they occur. The A-horizon is where much (but not all) of the physical, biological, and chemical processes occur. The subsurface soils become increasingly rocky with some soil types containing greater than 60% rock fragments. T-factor ranges from two to five tons/acre/year. PL4 and SC1 are shallow to bedrock and have a 2 T-factor rating. (Five tons/acre/year lost is roughly equivalent to the thickness of a dime). Compaction potential is slight to moderate. Information about the types of soils that occur within the analysis area can be found in the Uinta NF Soils Report Wolf Creek, West Fork Duchesne Soils, 1976 and NRCS, Uinta NF Area, Utah, Parts of Juab, Sanpete, Utah, and Wasatch Counties (unpublished survey area ver. Date 12-01-2010). Table 3.25 contains a summary of pertinent soil characteristics from this survey.

Table 3.25
Soil Types and Properties within Treatments

Soil Number	Name	Acres	Harvest Units	Surface Soil Texture	Depth of A horizon (inches)	Avail. Water Capacity	T- Factor (tons/acre)[2]	Compaction Potential[3]	K-Factor[1]
GC5	Gralic 45% of unit Sluice 40% of unit	305	4,6,8	ext. cobbly fine sandy loam; clay loam	6 33	Low Low	5 5	Slight Moderate	0.24 0.37
GC11	Wildcow	33	8	silt loam	9	High	4	Moderate	0.37
GM2	Glacial Moraine	40	16,17	v. gravelly loam	13	Very Low	5	Slight	0.20
GM7	Kamak	26	2,6	ext. cobbly clay loam	8	Very Low	5	Slight	0.05
GM8	Glacial Moraine	252	10,13,14, 16-19, 21-23,42	gravelly silt loam	15	Moderate	4	Moderate	0.37
LS1	Tonigut	115	36,42,43, 44	ext. cobbly fine sandy loam	15	Very Low	5	Slight	0.17

Soil Number	Name	Acres	Harvest Units	Surface Soil Texture	Depth of A horizon (inches)	Avail. Water Capacity	T- Factor (tons/acre)[2]	Compaction Potential[3]	K-Factor[1]
PL3	Woodhurst	82	1,5,7,15	v. cobbly loam	10	Very Low	5	Slight	0.28
PL4	Midfork	465	32,33,34, 37,40	gravelly loam	7	Very Low	2	Moderate	0.20
SC1	Tetonville	67	4,8	cobbly sandy loam	4	Very Low	5	Slight	0.10
SC4	Ledgfork	46	15	ext. cobbly loamy sand	10	Very Low	2	Slight	0.15
SC5	Elwood	258	2,12,31, 32,33	v. stony loam	11	Very Low	5	Slight	0.32
SC9	Buena Vista	688	11,12, 35-37, 39,40	gravelly loam	10	Very Low	5	Moderate	0.28
SC10	Stream Canyon	206	26,28	gravelly silt loam	14	Moderate	5	Moderate	0.43
SC12	Marosa	451	1,2,3,6, 7,9	gravelly silt loam	15	Low	3	Moderate	0.32
TM1	Tectonic Mountain	30	2,42,44	ext. stony loam	2	Very low	3	Slight	0.28
TM20	Tectonic Mountain	19		gravelly loam	8	Low	5	Moderate	0.28
TM21	Tectonic Mountain	150	21,23,24, 25	gravelly loam	11	Low	2	Moderate	0.20
TM22	Tectonic Mountain	331	28,29,30	gravelly loam	9	Very Low	3	Moderate	0.24

Note: Rock outcrops and soil series with less than 5 acres were not included in the table.

[1]**Kf** indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

[2]**T Factor** is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

[3]**Compaction** potential rating based on Soil Interpretative Guide, 2010.

Field reviews and GIS analysis were conducted to assess areas of soil disturbance due to management activities. Based on GIS data, previous harvests have occurred within proposed timber units. Harvests have taken place from 1973 through 2004 (Appendices B and C). Temp roads, skid trails, and landings are still visible on the landscape in most of the units. They can be seen as old road prisms, areas with sparse vegetation, lack of tree regeneration, and corn flower patches. In many areas old temporary roads have earth berms to keep unauthorized use from occurring on them. It seems to have worked as many road prisms are barely visible. Where feasible, past harvest constructions would be used for the North Heber project to limit new soil disturbance. Areas that would not be re-used would include structures that were improperly placed per current best management practices (ie; stream corridors, meadows).

There are three cattle allotments and eight sheep allotments within the North Heber project. Impacts of grazing on the soil resources are usually limited to areas where

livestock bed, lounge, trail, or access water. Impacts could include compaction, removal of groundcover, and soil displacement. There are no range improvements, such as troughs or ponds, within the proposed harvest units. Livestock impacts were not noted to be common. Sheep and cattle grazing resulted in high impacts to soil resources during the early 1900s before active grazing management took effect in the area. Since then, a gradual improvement in land conditions has occurred as indicated by increased ground cover, lack of compacted areas, and absence of active soil erosion in most areas within grazing allotments.

A wide variety of recreational use occurs throughout the project area including dispersed camping and ATV trails creating areas of compaction and increased erosion. There are approximately 29 miles of level-1 roads 18 miles of non-system trails within the project area. Roads and trails created for recreational and administrative use are considered a total resource commitment and are not considered for soil resource disturbance. They are still noted to be areas of increased erosion and potential sedimentation. The 18 miles of non-system trails are not part of the transportation system. These trails are at various levels of recovery and equates to about 68 acres of disturbance due to compaction. Not all acres would be considered detrimental.

Table 3.26
Field Data within Harvest Units

Date	Transect Number	Sale Area	Soil Health Rating	Disturbance Protocol Rating
07-16-13	01071613	Roundy Basin	Satisfactory	N/A
07-16-13	02071613	Little South	Satisfactory	N/A
07-17-13	01071713	Little South	Satisfactory	N/A
07-17-13	02071713	Little South	Satisfactory	N/A
07-17-13	03071713	Little South	*Impaired	N/A
07-18-13	N/A	Little South	Satisfactory	1
07-23-13	N/A	Little South	Satisfactory	1
07-25-13	N/A	Little South	Satisfactory	1
08-12-13	N/A	Wolf Creek	Satisfactory	1
08-13-13	N/A	Roundy Basin	Satisfactory	1
08-14-13	N/A	Wolf Creek	Satisfactory	1

08-15-13	N/A	Wolf Creek	Satisfactory	1
08-26-13	N/A	Mill Hollow	Satisfactory	1

*Sample area was within a heavily used area and not typical of the overall unit.

Summary

Overall, soils within proposed harvest units appear to be in satisfactory condition. Overall rating of the units was 1 with 0 and 1 ratings for individual points based on the soil disturbance protocol. A rating of 1 indicates that management activities are still present on the landscape but soil health has not been impaired. Forest floor (twigs, needles, leaves) ranged from 0 to 6 inches. Signs of compaction, rutting, erosion, or burning where noted throughout units with past harvest. These were due to pile burns, landings, and main skid trails left to recover naturally Also due to roads left in place as level 1 roads, which have little prism remaining but are still compacted. While these conditions were noted, they were not noted as being widespread or common in the project area. Current soil health is satisfactory within the areas proposed for harvest.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

No common effects.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

This alternative maintains the existing condition of the project area and provides a base line to evaluate the effects of the action alternatives. Under the No Action alternative, current management plans would continue to guide management of the project area. Timber harvest would not occur at this time. Beetle killed and beetle infested trees would remain and eventually fall increasing the fuel load on the surface.

Soil Erosion

Forests generally have very low erosion rates unless they are disturbed in a manner that exposes bare soil to the erosive energy of water and wind. Evidence of soil erosion due to management activities is minimal in the project area. Such evidence would include rills and gullies, pedestalled vegetation, lichen lines, depositional areas, and increased sedimentation into waterbodies. Soil erosion rates would remain unchanged from existing conditions.

Soil Disturbance

There would be no new soil disturbance effects to the soil resource from timber harvest activities, temporary road reconstruction, or pile burning with the No Action Alternative. Disturbance would remain unchanged from existing conditions. With the increased downed trees due to beetle kill there would be an increase in fuel loading. For the soil resource this has the potential to reduce soil health as resident fire time on the surface would increase, causing larger areas of high burn severity. In addition, excessive downed wood slows vegetation growth and is not necessarily indicative of higher nutrient stores to the soil.

2. Cumulative Effects

Cumulative effects include a discussion of the combined, incremental effects of human activities. For activities to be considered cumulative their effects need to overlap in both time and space with those of the proposed actions. For the soil resource, the area for consideration includes the timber harvest units and temporary roads to access the units since effects to soil resources are site specific.

For past, present, or future activity to overlap in time, the effects on soils from the activities must overlap. Since physical soil changes (detrimental compaction, detrimental displacement, detrimental erosion, severe burning, and puddling) can persist on the landscape for greater than 20-40 years activities from at least the 1960s are considered. Biological soil conditions change quicker. Revegetation occurs within 1 to 5 years under most situations and organic matter begins to rebuild in 10 years but may take greater than 50 years to reform humus.

Since there would be no activity with the No Action there are no Cumulative Effects.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

Soil Erosion

Effects of the Proposed Action Alternative relate to the potential increase in soil erosion during and after project implementation. Forests generally have very low erosion rates unless they are disturbed in a manner that exposes bare soil to the erosive energy of water and wind. Disturbances include timber harvest activities and post-harvest operations. The practices that maintain soil productivity, such as leaving organic material on the soil surface, reducing the area impacted by skid trails and landings, and maintaining hydrologic function also reduce the risk of soil erosion.

A. Harvest Activities -

Ground based harvest reduces ground cover on skid trails, at trail junctions, and landings. Soil productivity could be impacted from loss of topsoil associated hillslope, skid-trail, and temporary road erosion. On main skid trails and landings it is assumed that 100% of the vegetation would be removed. On lightly used trails (one or two passes) ground cover is not anticipated to be reduced along the entire trail length. The removal of vegetation cover can cause increased impacts by rain drop splash and concentrated flow of water. This in turn can cause increased displacement of soil particles, erosion and sediment transport into streams.

B. Temporary Roads -

Soil productivity could be impacted from loss of topsoil due to erosion from temporary roads. Design features and BMPs have been incorporated to limit temporary road construction in riparian areas and to reuse past temporary roads when available. Constructing waterbars, ripping landings, and seeding will help minimize erosion and accelerate revegetation and reduce potential soil erosion.

C. Pile Burning –

Burning of larger slash piles can increase erosion by eliminating protective cover and altering soil properties. Burning large slash piles "cook" the underlying soil where excessive heat is retained in the pile and transferred to the soil. This could cause localized areas of soil sterilization, reduced water infiltration, and loss of groundcover, all of which increase the potential for wind and water erosion and the potential for invasive weed colonization. BMPs and design features, such as burning slash at landings, have been incorporated to minimize areas of new disturbance associated with pile burning.

Soil Disturbance

Effects of the Proposed Action Alternative relate to a potential increase in detrimental soil disturbance caused by harvest activities, temporary road construction, and pile burning.

Soil Compaction is the increase in soil bulk density that results from the rearrangement of soil particles in response to applied external forces. *Soil Puddling* is the destruction of soil structure and the associated loss of macro-porosity that results from working the soil when wet. Soil compaction and puddling are of concern because of effects on roots and water relations.

Compacted and puddled soils both have lower aeration porosity and lower hydraulic conductivity and infiltration rates. Lower aeration porosity results in reduced gas exchange that can adversely impact oxygen levels in the soil air, affecting physiologic function of roots which can lead to root die off under wetter conditions. Lower hydraulic conductivity and infiltration rates result in increased runoff during rainfall and snowmelt

events. This can lead to increased net export of water from a cut block, potentially impacting downslope sites, natural drainage features, and other resource values from erosion and sedimentation. Water export also means less water stored on site for summer drought. Compacted soils can also remain wetter longer, further affecting seedlings by being colder in addition to poorly aerated (Curran, 1999).

A. Harvest Activities –

Soil compaction and displacement at landing sites, staging areas, temporary roads, and on main skid trails is expected due to equipment operations. Soil compaction is associated with an increase in soil bulk density, or a reduction in pore space, within the soil profile, which limits water and air movement, which then affects root movement and nutrient availability. Soil displacement is expected to be small and localized and may occur where logs are lifted from the forest floor or at landings. Detrimental effects can be long-lasting (50+ years). However, the impacts of compaction depend largely on site conditions affecting air and water balance in the rooting zone (Powers et al., 2004; Page-Dumroese et al., 2006).

Soil compaction can occur as a result of applied loads, vibration, and pressure from equipment that is used during timber harvesting. Soil compaction is most likely to occur on wet soils. Wet soils have little or no bearing strength and cannot support timber harvesting equipment without suffering compaction, puddling, and rutting (Curran, 1999).

Compaction is not expected to be a concern on the secondary skid trails which typically receive one or two passes. Many of the harvest areas are quite rocky and as such have a slight compaction potential (Table 3.25). Areas that do become compacted or displaced could be rehabilitated by ripping or roughening the soil to restore proper water infiltration, redistributing displaced topsoil, constructing waterbars, and seeding with native species. Plant root expansion, freeze/thaw cycles, and rodent activities will continue to rework the soil to improve soil structure naturally.

Merchantable material could be removed as patches or clearcuts. Clear cuts within harvest units have the potential to remove the future nutrient source for the soil which lowers productivity of the future timber stand. Leaving slash, both coarse woody debris (>3 inches) and fine woody material will help provide for future nutrient cycling and limit erosion. Coarse woody debris is an important component of a functioning ecosystem. Decayed soil wood forms long lasting, high moisture microsites important as an environment for nitrogen fixation and for symbiotic ectomycorrhizal association between certain fungi and conifer feeder roots (Harvey et al., 1987; Harvey et al., 1991; Graham et al., 1994).

Typically about 10% of the harvest units could be expected to have soil disturbance. However, monitoring of past harvests indicate that from 0 to 8% of the unit would be considered detrimentally disturbed. For this project many of the past skid trails, temporary roads, and landings would be utilized where possible which will minimize

areas of new soil disturbance. There are approximately 187 landings (1/4 acre in size) anticipated for the proposed action (Appendix B). This equates to approximately 46.75 acres of compaction within the 3,730 acres proposed for harvest. Following use, landings, skid trails, and temporary roads would be roughened and/or slash or other woody debris would be scattered across the surface.

B. Temporary Roads –

Approximately 29 miles of level 1 roads and 18 miles of non-system roads will be used to access harvest units. These are already on the landscape. Most of the impacts to the soil resource occurs with the creation of the road or trail itself. The presence of a road commits a soil resource and where roads occupy formerly productive land, they affect site productivity (Gucinski et al., 2001). Once the road is established impacts continue through processes such as mass wasting, surface erosion, sedimentation, and creation of pioneered routes across the landscape. Loss of productivity associated with road-caused accelerated erosion is site specific and highly variable in extent (Gucinski et al., 2001).

Any upgrade work necessary should occur within the existing road prism so minimal new soil disturbance would be expected on temporary roads that are reused. However, what would occur is that any progress the ecosystem had made towards recovery since the last harvest entry would be lost. New temporary roads are not anticipated but if they are required they would be areas of new soil displacement and compaction.

C. Pile Burning –

Prescribed burning of slash can increase erosion by eliminating protective cover and altering soil properties. If slash is machine piled the nutrient rich topsoil is frequently scraped off the surface and mixed with the slash pile. Burning of large slash piles may sterilize the underlying soil because heat is retained in the pile and transferred into the soil. Soil heating can destroy soil structure, affecting both total porosity and pore size distribution which, in turn, affects infiltration and water holding capacity.

Burn piles can also create environments for invasive plants such as cheatgrass and knapweed. Existing soils have developed in association with native vegetation. Noxious (invasive) weeds have the potential to alter nutrient cycles, moisture regimes, and erosion rates of soil systems. Soil and water losses have occurred where tap-rooted weeds have replaced native grasses. Conversion from natural site to invasive species can result in loss of soil nutrients and siltation of streams.

Slash piles would be located on log landings, where possible, which will help reduce soil disturbance areas within the proposed harvest units.

2. Cumulative Effects

Legacy soil disturbance that has occurred as a result of past activities forms the foundations of the soil condition on the landscape today. Past and current activities within

the project area that could be considered detrimental to the soil resource have been accounted for in the existing conditions of this document.

Timber Harvest
Past timber harvests have occurred within all but a few proposed timber harvest units. Past harvests and the proposed activities have been accounted for. No future timber harvests within the project area have been proposed.

Grazing
There are four cattle allotments and eight sheep allotments within the activity area. Impacts of grazing on the soil resource are usually limited to areas where livestock bed, lounge, trail, or access water. Impacts include compaction, removal of groundcover, and displacement and are included in the existing condition section of this report. A potential indirect effect of the proposed action as it relates to livestock grazing and soil is the release of grasses in harvested areas, opening up areas were forage was previously not available. This in turn could create potential areas that livestock concentrate. This would be short term, until tree regeneration out-competed the grasses.

Roads and Trails
Road and trail construction or maintenance has and continues to occur in the project area. These routes currently exist on the landscape and any maintenance would be completed within the existing road prism. Although roads and trails are part of the transportation system and therefore not included in the effects analysis, they do contribute to erosion, sedimentation, and disruption of hydrologic function of the ecosystem. To that effect Alternative 2 would return more acres to the productive land base than Alternative 3.

Recreation
Recreation such as OHV use, camping, hunting, and hiking have and will continue to occur throughout the project area. Impacts associated with these activities tend to include soil compaction and removal of vegetation at camp sites and impacts associated with road/trail use for access. Generally, the percentage of the analysis area affected by dispersed camping is minimal, resulting in negligible impact to the soil resource. It is anticipated that these effects will increase over time as forest recreation increases.

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

This alternative would be the same as the Proposed Action alternative with respect to soil erosion and detrimental disturbance effects due to harvest activities, temporary road upgrading or construction, and pile burning. Alternative 3 differs with the treatment of the roads after completion of harvest activities. All system roads would be returned to the previous level 1 status; not obliterated or reclaimed. Non-system roads used would be reclaimed as in the proposed action.

2. Cumulative Effects

Legacy soil disturbance that has occurred as a result of past activities forms the foundations of the soil condition on the landscape today. Past and current activities within the project area that could be considered detrimental to the soil resource have been accounted for in the existing conditions of this document.

Timber Harvest
Past timber harvests have occurred within all but a few proposed timber harvest units. Past harvests and the proposed activities have been accounted for. No future timber harvests within the project area have been proposed.

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There are four cattle allotments and eight sheep allotments within the activity area. Impacts of grazing on the soil resource are usually limited to areas where livestock bed, lounge, trail, or access water. Impacts include compaction, removal of groundcover, and displacement and are included in the existing condition section of this report. A potential indirect effect of the proposed action as it relates to livestock grazing and soil is the release of grasses in harvested areas, opening up areas were forage was previously not available. This in turn could create potential areas that livestock concentrate. This would be short term, until tree regeneration out-competed the grasses.

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Road and trail construction or maintenance has and continues to occur in the project area. These routes currently exist on the landscape and any maintenance would be completed within the existing road prism. Although roads and trails are part of the transportation system and therefore not included in the effects analysis, they do contribute to erosion, sedimentation, and disruption of hydrologic function of the ecosystem. To that effect Alternative 2 would return more acres to the productive land base than Alternative 3.

Recreation
Recreation such as OHV use, camping, hunting, and hiking have and will continue to occur throughout the project area. Impacts associated with these activities tend to include soil compaction and removal of vegetation at camp sites and impacts associated with road/trail use for access. Generally, the percentage of the analysis area affected by dispersed camping is minimal, resulting in negligible impact to the soil resource. It is anticipated that these effects will increase over time as forest recreation increases.

Soil Resource Summary

Soil health in the North Heber project area is currently satisfactory based on qualitative and quantitative field data collected.

Proposed harvest activities are not expected to cause long-term impacts to soil health. Of the 3,730 acres potentially 487.75 – 533.75 acres could have soil disturbance (compaction, rutting, displacement, burn scars) due to harvest activities. Of those acres

373 acres of harvest disturbance is based on a typical 10% of the unit used for primary and secondary skid trails. Approximately 46.75 acres would become compacted due to landing areas. Additionally, 47 miles (68-114 acres) of soil disturbance would occur where temporary road construction occurred. Existing road prisms would be used to access proposed harvest units as much as possible. For the soil resource utilization of these routes is preferred since they are within existing disturbed areas. Although those areas are at different stages of recovery and that recovery would be lost.

The effects of the temporary road construction and landings would be short-term as these would be reclaimed by the end of the project. Measures such as sub-surface roughening of the soil to alleviate compaction and restore hydrologic function, re-contouring to original slope, and placing woody debris and rock on these areas would help restore the system. Slash could also be placed on these roads to provide erosion control and to prevent unauthorized use.

Proposed harvest activities within units could also result in increased bare ground and increased soil erosion rates. However, the topography within most of harvest units is low angle slopes or flat plateaus, so erosion above T-values is unlikely. The risk of erosion would diminish as vegetation returns over 1-5 years. Design features and BMP's have been incorporated into the project to protect the soil resource from adverse impacts to long-term soil health.

Cumulatively, with the implementation of recommended soil project design features and BMP's the Alternatives 2 or 3 would have very little direct or indirect effects on long-term soil health. It is expected with either action alternative the resiliency and health of the soil resource will improve in the long-term as fuel loading potential is minimized and the area moves toward a more diverse ecosystem. Consequently, it is the conclusion of this analysis that cumulative detrimental soil effects would be minimal as a result of the proposed harvest activities.

Effects to the soil resource would be temporary and minimal based on existing conditions, the implementation of either Alternative 2 or 3, foreseeable future actions, and monitoring results. It is expected that adverse long-term impacts to soil health would not occur provided Forest Plan standards and guidelines, recommended design features, and BMP's are followed to minimize the impacts of soil erosion and loss of soil porosity within the timber harvest units and the associated transportation system.

Alternatives 2 and 3 would not lead to adverse impacts to the hydrologic function of the soil nor long-term soil health and meets Uinta NF Forest Plan standards and guidelines (2003) and regional guidelines (Forest Service, 2011).
Table 3.27 shows soil disturbance by alternative.

Table 3.27
Soil Disturbance by Alternative

	Alternative 1	Alternative 2	Alternative 3
Landings created	0	46.75 acres	46.75 acres
Harvest activities (based on 10% layout)	0	373 acres	373 acres
Temporary roads upgraded	0	47 miles	47 miles
Temporary roads restored	0	47 miles / 68-114 acres	18 miles / 26-44 acres

Note: Acres restored is based on a range of 12ft and 20ft of road base needed for various harvest activities and topography.

3.4.2 Hydrology

AFFECTED ENVIRONMENT

This section includes general information on the project area for the North Heber Project. The North Heber Project is located in Wasatch County, Utah, on the Uinta-Wasatch-Cache National Forest east of Heber City. The project area includes about 3,730 acres of previously harvested timber units located across a 92,260 acre portion of the Heber-Kamas Ranger District. Discussed below are precipitation, drainage patterns, water resources (stream, floodplain, and wetland resources), and water quality.

Elevation and Precipitation
Elevations within the North Heber Project area and analysis sub watersheds range from approximately 7,080’ to 10,520’. Annual precipitation values in the analysis sub watersheds vary greatly with elevation. Annual precipitation at the lower end of the analysis area, near Woodland, UT is approximately 15”, while the headwaters of the analysis area receive approximately 31” per year. Most precipitation in the analysis area falls as snow, however monsoonal moisture regularly brings wetting rains during the summer months.

Drainage Patters and Streamflows
The analysis area is located within 5 sub watersheds that are tributaries to the Provo River, the Duchesne River, and Currant Creek. The 5 Subwatersheds are located on the western slopes of the Uinta Mountains, at the headwaters of the larger watersheds. Streamflows within the sub watersheds are primarily influenced by snowmelt, with peak flows generally occurring from May to June. Rainfall from summer thunderstorms is generally localized and can result in short duration flashflood discharges that may exceed spring snowmelt flows.

Stream, Floodplain, and Wetland Resources
Streams in the analysis sub watersheds occur in three distinct geomorphic regions: the headwaters, moderately steep confined canyons, and broad alluvial plains. The

headwaters are heavily influenced by glacial activity with hummocky terrain and numerous lakes, wetlands, and meadows. Perennial streams tend to originate from these headwaters features, transition into moderately steep river canyons, and finally, into the larger river valleys with broad alluvial plains. The stream types, stream lengths, lake, pond, reservoir, and wetland acreages within the analysis sub watersheds are summarized in Table 3.28. The locations of wetlands, lakes, ponds, reservoirs, and streams within the Project Area are displayed in Figure 3.10.

Figure 3.10
Aquatic Resources within the North Heber Project Area.

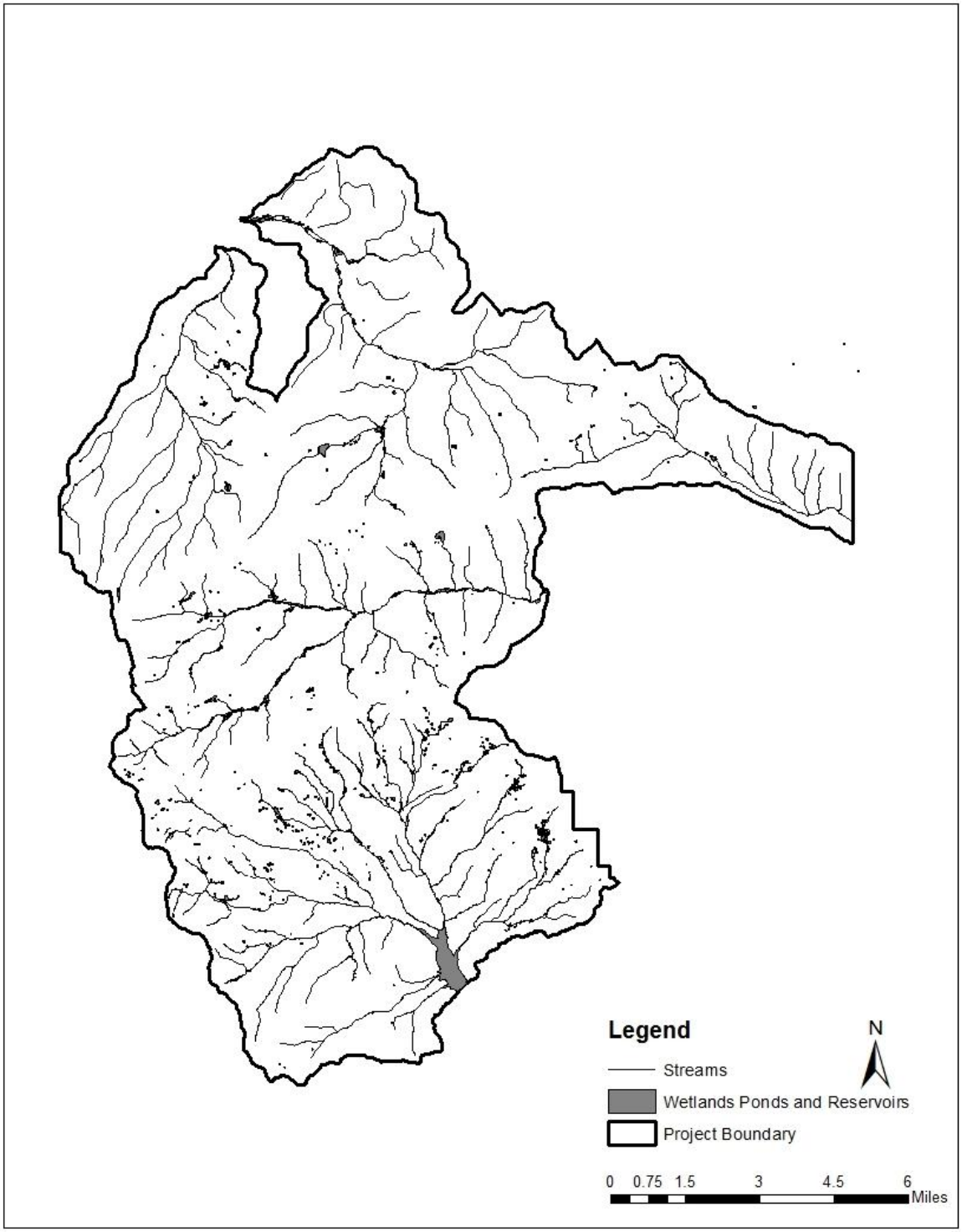


Table 3.28
Analysis Sub watershed Water Resources

Sub watershed	Perennial Streams (mi)	Intermittent and Ephemeral Streams (mi)	Lakes, Ponds, and Reservoirs (ac)	Wetlands (ac)*
Currant Creek Reservoir	74.1	23.4	396.0	210.0
Headwaters West Fork Duchesne River	42.8	11.8	39.2	246.0
Little South For Provo River	30.3	7.8	16.7	59.2
Mill Hollow-South Fork Provo River	30.6	26.6	26.0	141.3
Wolf Creek	13.7	25.3	13.2	4.8

*Does not include wetland features outside UWCNF boundary

Floodplains are defined by Executive Order (EO) 11988 as "lowland and relatively flat areas adjoining inland and coastal waters". Floodplains have also been defined in various ways but for this analysis, these areas are defined as flat areas adjacent to streams that are composed of unconsolidated depositional material derived from sediments transported by the related stream, based on definitions contained in (Fairbridge 1968). The extent and function of floodplains in the analysis area are dependent on a number of factors, the most influential being geomorphic/landscape setting. Floodplains on the headwater streams, where the proposed project activities are located, are generally only a few feet wide.

Water Quality

Every two years, the Utah Department of Environmental Quality-Division of Water Quality (UT DEQ) is required by the federal Clean Water Act to conduct a comprehensive analysis of water quality data associated with the State's surface waters to determine whether surface water quality standards are being met and designated uses are being supported. These integrated reports satisfy the reporting requirements outlined in sections 305(b) and 303(d) of the Clean Water Act and are submitted to the U.S. Environmental Protection Agency (EPA) for approval. Once approved, they are used to guide water resource management decisions. The objective of the analysis is to:

- Determine whether each designated use assigned to an assessment unit is "attaining" or "impaired;"
- If impaired, determine the pollutant(s) causing impairment;
- Compile descriptive information about the surface water; and
- Provide future monitoring priorities.

If impaired and development of a Total Maximum Daily Load (TMDL) is needed, the surface water is placed on the federal 303(d) List. An impaired water is not placed on this list when alternative pollution control requirements are in place that will bring the surface

water into compliance with its standards (e.g., a consent decree), if an approved TMDL is being implemented, or if the impairment is solely due to natural conditions.

The UT DEQ sets narrative and numeric surface water standards for water quality based on the uses people and wildlife make of the water. These designated "beneficial uses" are specified in the standards for individual surface waters, or if the surface water is not listed in the rule, the designated uses are determined by the tributary rule. Surface waters frequently have multiple beneficial uses. Water quality is assessed as fully supporting or impaired based on standards established to protect each beneficial use (UT DEQ 2010).

The North Heber Project is located within the Little South Fork Provo, South Fork Provo, West Fork Duchesne, and Currant Creek Upper UT DEQ Water Quality Assessment Units. The beneficial uses of water within these assessment units, as designated by the Utah Department of Environmental Quality, Division of Water Quality, are:

> Class 1C - Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.
> Class 2B – Protected for secondary contact recreation such as boating, wading, or similar uses.
> Class 3A – Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
> Class 4 – Protected for agricultural uses and including irrigation of crops and stock watering.

All beneficial uses within these assessment units are being supported and the assessment units and tributary streams are listed as "not impaired".

Municipal Watersheds

As noted above, surface water within the North Heber Project area has been designated by the State of Utah as Class 1C, protected for domestic purposes. However none the land within the analysis area for the project lies within formally designated municipal watersheds.

Road Impacts to the Analysis Subwatersheds

Road densities are used to assess the direct and indirect effects of roads within the analysis sub watersheds and are reported in mileage of road per sub watershed square mileage. Road-stream crossings are of particular importance due to the fact that they often have a direct effect of contributing substantial amounts of sediment to stream channels (Gucinski et al. 2001) and are potential sites for stream capture by the road. Flow capture by roads that results in erosion of the road prism can result in indirect effects to stream channels in the form of excessive sedimentation. Table 3.29 displays existing road densities and stream crossings within the analysis sub watersheds. Roads included in this analysis are all NFS roads within the analysis sub watersheds and non-system roads that have been identified for obliteration under Alternative 2.

Table 3.29
Existing Miles of Road, Stream Crossings, and Road Density within the Analysis Subwatersheds

Analysis Sub watershed	Miles of Road	Road-Stream Crossings	Sub watershed Road Density (mi/mi^2)
Currant Creek Reservoir	61.5	55	1.3
Headwaters West Fork Duchesne River	49.4	28	1.6
Little South Fork Provo River	27.6	17	1.4
Mill Hollow-South Fork Provo River	60.8	33	1.8
Wolf Creek	41.7	33	2.3

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

None in common.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

Under the No Action Alternative, the vegetation treatment and transportation system restoration activities described under the Proposed Action would not occur in the project area. Water quality, watershed function, road densities, and vegetation composition would remain unchanged from the existing conditions described above, because no treatments would be implemented. The potential for detrimental effects to watershed resources and water quality would remain unchanged.

2. Cumulative Effects

Under this alternative, no treatments would be implemented. Water quality, stream channel, RHCA, and wetland conditions would remain unchanged from the existing condition.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

Timber Harvest Activities

Under Alternative 2, approximately 3,730 acres of timber have been identified for mechanical treatment. These areas would be harvested using a combination track mounted feller-buncher harvesters and chainsaws. Harvested material would be mechanically removed using rubber tire log skidders along designated skid trails. Landings would be accessed through the use of existing road prisms. The level 1 and non-system roads identified for restoration under the Proposed Action would be obliterated and rehabilitated upon the completion of harvest activities. RHCA buffers would be established around all streams, springs, seeps, lakes, ponds, and wetlands within, or adjacent to the cutting units. Mechanized entry into RHCAs and removal of material within RHCAs would not be permitted. Skid trail and landing construction would not be permitted within RHCAs. Hazard trees within RHCAs may be felled if necessary.

As a result of RHCA establishment around sensitive features, there would be no direct effects to water resources from the proposed mechanical timber harvest and removal as all treatments would occur outside of sensitive areas.

The indirect effects to water resources that would result from mechanical timber removal include increased runoff, stream channel sedimentation, and impacted water quality.

These indirect effects would be the result of upland disturbance and displacement of soils, removal of soil ground cover, reduction in porosity, and increase in soil compaction within these areas. However, these indirect effects to water resources are not expected to occur due the establishment of RHCA buffers and incorporation of project design features for watershed resource protection. The establishment of undisturbed buffers along streams in areas of timber harvest has been found to effectively mitigate effects related to accelerated runoff, erosion, and channel sedimentation (Litschert and MacDonald 2009).

The establishment of RHCAs will provide an undisturbed corridor adjacent to sensitive features and will allow for continued large woody debris recruitment, non-point source pollutant buffering, maintenance of riparian vegetation and habitat, and stream shading. The implementation of additional watershed protection measures for treatments in upland areas outside of RHCAs, such as the use of track mounted harvesting equipment, a 40% slope restriction, skid trail designation, and restrictions on logging operations when soils are saturated will further reduce the possibility of detrimental soil disturbance and erosion that could result in indirect detrimental effects to water resources. Soil resource effects that could indirectly affect watershed function, namely increases in compaction and bulk density and reductions in porosity and infiltration rates are addressed in the Soil Resource Report.

The relationship between removal of vegetation (timber harvest) and increases in water yield are well established, with the majority of increases occurring during spring runoff. Climate primarily determines the magnitude of large flood events (Dunne 1978); however, land use practices have been shown to increase peak flows (Troendle 1987). The reduction in tree density i.e. canopy cover, results in a reduction in the amount of transpiration of groundwater and also the amount of canopy interception of rainfall/snowfall which increases the amount of the precipitation available for runoff as stream flow. This is the water yield increase associated with timber harvest in a watershed. The amount of water yield declines as the tree canopy recovers with re-growth.

Watersheds exhibit great natural variability in flow, and can accommodate some increase in peak flows without damage to stream channels and aquatic organisms. Increases in average high flows can cause a variety of channel effects, including increases in channel width, depth, erosion, and sediment deposition. Substantial increases in peak flows generally lead to a subsequent increase in sedimentation. If the amount of water yield increase exceeds the capacity of the stream channel, increased streambank and channel erosion occur.

Due to the existing conifer mortality from beetle activity throughout the North Heber Project area and the subsequent decrease in transpiration, water yield and runoff conditions are likely increased from pre-disturbance conditions. Based on research by Troendle et al (Troendle 2010), water yield increases would result in measurable changes in stream discharge if more than 20 percent of the watershed were treated. Treatments proposed within the analysis sub watersheds are presented in Table 3.30 and range from

0.7 percent to 7.3 percent of the sub watershed area. Considering research and existing vegetation conditions (extensive conifer mortality), no measurable increases in water yield are projected to result from implementation of this alternative.

Table 3.30
Proposed Treatments by Sub watershed and Expected Increases in Water Yield under Alternatives 2 and 3.

Analysis Sub watershed	Sub watershed Acreage	Treatment Acreage	Percent of Watershed Treated	Water Yield Increase (inches)
Currant Creek Reservoir	30,010	210	0.7	0.07
Headwaters West Fork Duchesne River	20,079	1,319	6.6	0.66
Little South Fork Provo River	12,653	662	5.2	0.52
Mill Hollow-South Fork Provo River	22,014	618	2.8	0.28
Wolf Creek	12,466	909	7.3	0.73

Road Reconstruction and Obliteration

Under Alternative 2, approximately 47.1 miles of currently closed roads road would be obliterated. This mileage is comprised of 18.3 miles of non-system roads and 28.8 closed maintenance level 1 roads. Many of these roads would be used to connect landings to the open NFS roads. The current condition of these routes varies greatly, however at a minimum, most have defined prisms with stream crossing and ditch relief culverts already in place. Under Alternative 2, all 47.1 miles of road would be obliterated. Obliteration techniques would vary based upon existing condition and landscape setting, but at the minimum would include removal and rehabilitation of stream crossing structures. An intermediate level of treatment would include stream crossing restoration and prism subsoiling. The maximum level of treatment would include stream crossing restoration and full re-contouring of the road prism.

Direct effects to watershed resources from road maintenance and reconstruction are expected to be minimal within the project area due to the fact that the vast majority of the road maintenance and reconstruction would be located in upland areas. Field surveys of the existing road network indicated that most of the closed roads that would be opened for log hauling already have functional culverts in place and would only require routine cleaning during utilization. This would minimize the amount of direct stream channel sedimentation that would result from re-opening the closed roads. Any sedimentation that does occur during the opening and utilization of the roads could result in indirect effects to downstream water quality during high flow events. It is expected that through the implementation of the Forest Plan Standards and Guidelines, BMPs, and standard timber sale contract provisions, sedimentation from roads would be minimized and would not result in detrimental effects to water quality or result in impacts to the established beneficial uses of the downstream waterbodies.

Following completion of the harvest, all non-system and Maintenance Level 1 National Forest System roads identified for treatment would be obliterated and removed from the landscape. This would result in a direct effect to watershed function through a reduction in existing road densities and stream crossings within the analysis sub watersheds. Table 3.31 displays the miles of road, number of stream crossings, and road densities within the analysis sub watersheds under Alternative 2. All three of these metrics would be reduced under this alternative when compared to the existing condition, or Alternative 1. This reduction in road related effects would result in an improvement in watershed condition.

Table 3.31
Miles of Road, Stream Crossings, and Road Density and Under Alternative 2

Analysis Sub watershed	Miles of Road	Road-Stream Crossings	Sub watershed Road Density (mi/mi^2)
Currant Creek Reservoir	57.3	41	1.2
Headwaters West Fork Duchesne River	33.3	24	1.1
Little South Fork Provo River	19.3	9	1.0
Mill Hollow-South Fork Provo River	52.3	27	1.5
Wolf Creek	33.7	31	1.7

2. Cumulative Effects

The past, present, and future foreseeable vegetation management projects that have the potential to result in an increase in water yield are considered in the following cumulative water yield analysis. Under Alternatives 2 and 3, an estimate is based on the amount of timber harvest in the Action Alternatives plus the water yield increase from past harvests that do not occupy the same area as the units proposed for additional harvest in the North Heber Project. The estimate of the cumulative percent equivalent clearcut area ranges from 1.6 to 11.0 percent of the sub watershed areas. Assuming a water yield increase of 0.1 inch for every 1 percent of watershed area harvested, estimates of the cumulative water yield increase from pre-harvest and pre-beetle epidemic conditions in the Currant Creek Reservoir, Headwaters West Fork Duchesne River, Little South Fork Provo River, Mill Hollow-South Fork Provo River, and Wolf Creek sub watersheds are 0.2, 0.8, 0.7, 1.0, and 1.1 inches respectively. However, many of the past harvest activities taken into consideration for this analysis, as well as those proposed in the North Heber Project, were not or would not be harvested using a clearcut prescription. Therefore, these water yield estimates are most likely greater than what has or would actually occur. Based on the research presented above, the cumulative amount of vegetation treatments within the analysis sub watersheds has not been great enough to have resulted in a measureable increase in streamflows.

The project level effects to water resources discussed above are expected to be minimal in both the size of the areas which will be impacted and the duration of time for which the

impacts will exist. When these effects are considered with the effects of other past, present and foreseeable future projects in the analysis sub watersheds, detrimental cumulative effects to stream channels, riparian resources, and wetland resources would not occur as result of the implementation of either Action Alternative.

Past and present activities have resulted in the existing conditions, as they relate to water quality. As discussed above, the Proposed Action is expected to result in very little channel sedimentation and subsequent impacts to water quality. Under the existing condition, streams in the analysis sub watersheds do not exhibit degraded water quality. Streams within the analysis sub watersheds currently meet Utah water quality standards for the established beneficial uses. The cumulative effects of the Proposed Action when considered with other past, present, and reasonably foreseeable future activities would not result in detrimental effects to water quality or a failure of the receiving waterbodies to meet their established beneficial uses.

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

Timber Harvest Activities
The timber harvest activities proposed under Alternative 3 are the same as those proposed under Alternative 2. As such, the environmental effects will be the same as described under Alternative 2.

Road Reconstruction and Obliteration
Under Alternative 3, the same amount of road reconstruction work described above under Alternative 2 would occur. As such, the environmental effects will be the same as described under Alternative 2. However, under Alternative 3, the Maintenance Level 1 Roads would not be obliterated. They would remain on the landscape, but would be administratively closed to public use. As part of the administrative closure the Level 1 roads would be blocked with barricade devices to prevent unauthorized use. The prisms would be maintained in their post-harvest condition. All stream crossing structures would be removed and water bars would installed as needed to prevent concentrated flows on the road prism.

The direct effects to water resources that would result from the proposed road obliteration and administrative closure work proposed under Alternative 3 would be similar to those effects previously discussed under Alternative 2. This is due to the fact that direct impacts to water resources from activities under this alternative would be mitigated through removal and restoration of all stream crossings. However, maintaining the Level 1 roads on the landscape would result indirect effects to watershed function. Many of the level 1 roads have revegetated since their last use. In order to be used for log hauling they would have to be brushed and bladed. This work combined with the heavy truck traffic would compact soils and eliminate any natural recovery that has occurred since the roads were last used. Leaving the roads on the landscape would also result in higher sub

watershed road densities than would occur under Alternative 2. The road densities, stream crossings, and road mileage on the landscape under Alternative 3 are displayed in Table 3.32.

Table 3.32
Miles of Road, Stream Crossings, and Road Density and Under Alternative 3

Analysis Sub watershed	Miles of Road	Road-Stream Crossings	Sub watershed Road Density (mi/mi^2)
Currant Creek Reservoir	59.6	41	1.3
Headwaters West Fork Duchesne River	40.3	24	1.3
Little South Fork Provo River	26.5	9	1.3
Mill Hollow-South Fork Provo River	58.3	27	1.7
Wolf Creek	40.1	31	2.1

2. Cumulative Effects

Same effects as for Alternative 2 for water resources.

3.4.3 Fuels

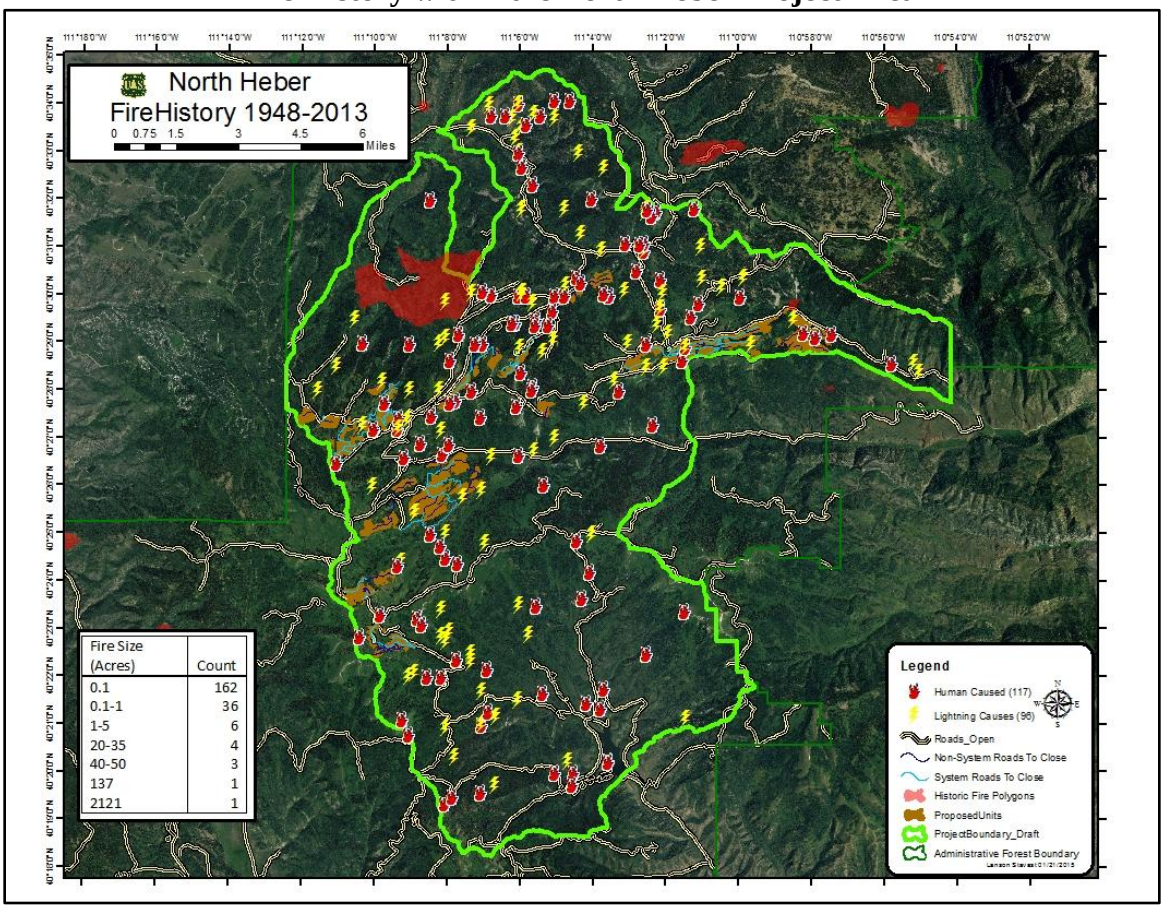
AFFECTED ENVIRONMENT

Disturbance History

The Uinta-Wasatch-Cache fire history information shows information for fires in the area, starting in 1948 up through 2013. There have been a total of 213 fire starts within the project area (Figure 3.11). There have been 96 human caused fires (45%) and 117 lightning caused fires (55%). The majority (96%) of the fires have been 10 acres or less. The largest fire was the South Hollow fire in 2001 at 2,121 acres. There is an average of 3 fire starts per year in this area.

The area has been affected over the past few years with beetle kill in the pines and spruces. The beetle kill is bringing changes in the age classes and species diversity within the project area (See figures 3.12 &3.13).

Figure 3.11.
Fire History within the North Heber Project Area



Fire Regime Condition Class

Four different Fire Regime Condition Class Assessments have been done with in the project area (Figure 3.12 and Table 3.33). The condition classes for the project area are 41% unclassified, 59% as condition class 2 and <1% as condition class 3.

FRCC is a measure of the departure from the natural fire regime at the landscape scale. FRCC classes are defined as:

FRCC 2: Moderate departure (34-66% departure): Fire regimes have been moderately altered. Fire frequencies may have increased or decreased by one or more return intervals, causing moderate changes in fire behavior and vegetation structure.

FRCC 3: High departure (67-100%): Fire regimes have been substantially altered. Risk of losing key ecosystem elements is high. Fire frequencies may have departed by multiple return intervals. This may result in dramatic changes in fire size, intensity/severity, and landscape patterns. Vegetation attributes have been substantially altered.

Figure 3.12.
Fire Regime Condition Class within the North Heber Project Area

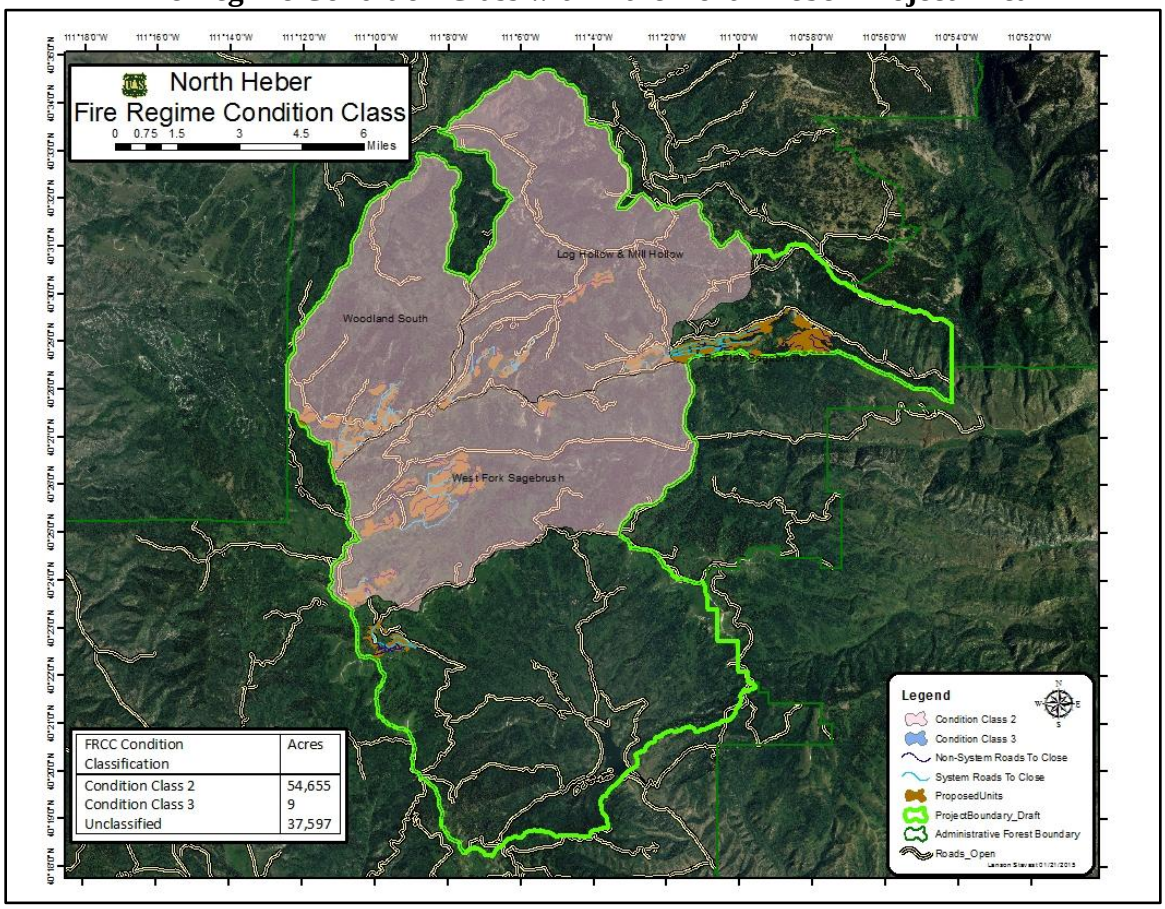


Table 3.33
Fire Regime and Condition Class by Area

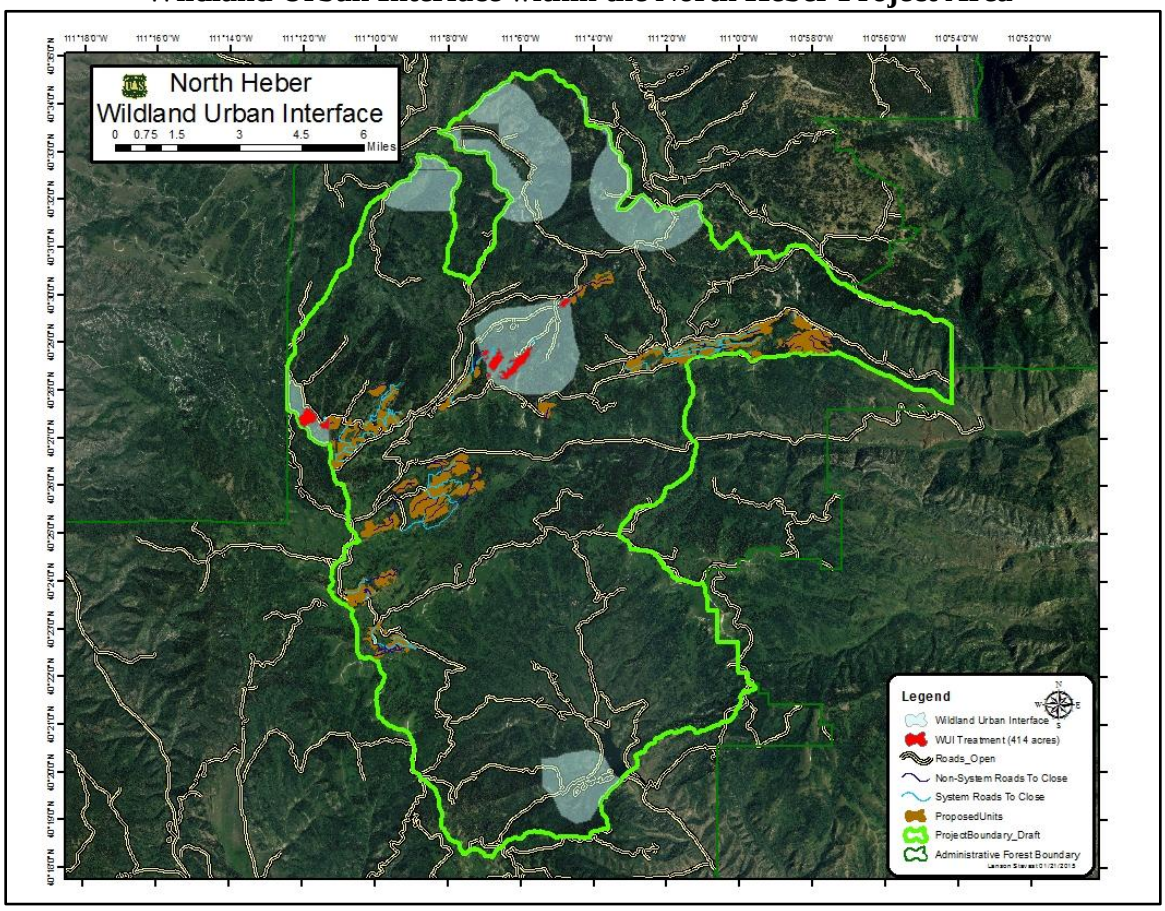
Name	Fire Regime	Condition Class	% Departure
Log Hollow & Mill Hollow	III	2	65
West Fork Sagebrush	IV	2	55
Woodland South	III	2	64
Buckley Sage	III	3	70

These FRCC assessments show that the majority of the project area is moderately departed from what the natural fire regime at the landscape scale. It also shows that the majority is at the high end of condition class 2 about to move into condition class 3. Most of the departure from natural was an overabundance of late seral vegetation and very little early seral vegetation.

Wildland Urban Interface

There are approximately 414 acres within the Wildland Urban Interface (Figure 3.13). Timber Lakes is listed on Utah's Communities at Risk (Utah FFSL 2013) and is located approximately 3 miles to the west of the western most treatment unit. Timber Lakes has an overall score of 11 for the Fire Risk which is toward the Extreme Risk end of the scale. Piuta Camp is also listed and is 2.4 miles north of the northern most treatment unit and it has an overall score of 8. Diamond Bar-X is also listed and is located 4.8 miles North West of the northern most group of treatment units it has an overall score of 11. The "Overall Score" represents the sum of multiple risk factors analyzed for each community. Examples of some risk factors are fire history, local vegetation, and firefighting capabilities. The Overall Score can range from 0 (No risk) to 12 (Extreme risk). This score allows Utah's fire prevention program officials to assess relative risk and create opportunities for communications with those communities on the list.

Figure 3.13.
Wildland Urban Interface within the North Heber Project Area



Fire Behavior

As conifers die there is an interesting fuel cycle; in the beginning as the trees are dying and the needles turn red the fire danger is high. As the needles fall off the trees, but the trees are still standing the fire danger drops. As the trees start to fall over 10-15 years after they are dead the fire danger dramatically increases, due to the fuel loading on the ground. Right now the fire danger is low. The needles have fallen off the trees for the most part and the trees are still standing. The overall existing fuel model for the timber sale units is Moderate Load, Humid Climate Timber Shrub (TU2) (Scott & Burgen 2005). The primary carrier of fire is moderate litter load with a shrub component, and with flame lengths between 1 and 10 feet and rates of spread between 0 and 100 chains/hour (1 chain=66 feet) depending on the wind speed and the dead fuel moisture (Scott & Burgen 2005).

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

The FRCC will continue to change, with all of the beetle kill and loss of the older trees

the amount of older seral vegetation will decrease and the amount of early seral vegetation should increase, possibly bringing the condition class closer to the natural state, but also maybe bringing to a state with too much early seral vegetation.

Fire occurrence would remain low with a low frequency of large fires.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

Fuel loading will continue to increase as the beetle killed trees begin to fall to the ground. This increase in fuel loading will change the fuel model from the existing TU2 to a TL5 Where the primary carrier of fire is high load conifer litter, light slash and mortality fuel (Scott & Burgen 2005). Rates of spread would be between 0 and 25 chains per hour and flame lengths of between 0.6 and 5 feet depending on the winds (Scott & Burgen 2005).

Human caused fires would remain at the same level because public access would remain the same. Keeping all of the existing system and non-system roads/trails would allow better firefighter access, and would provide more options to use roads and trails as barriers to fire spread.

There will be no direct effects from smoke, because there will be no pile burning. However, with the increased fuel loading, should a wildfire occur there will be more smoke than the 2 alternatives, due to the increased smoldering that occurs with larger fuels.

2. Cumulative Effects

The cumulative effects analysis area for fire and Fuels is the project boundary, which is the watershed boundary. This area is chosen because it is larger than the actual treatment units and is easily defined. With the no action alternative there would be no cumulative effects, because nothing new is being added to what is already occurring within the project area.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

Fuel loading would decrease in the area with the removal of timber for lumber and the burning of slash piles. The fuel model would likely move from the TU2 to a TU1, where the primary carrier of the fire would be a low load of grass and/or shrubs (Scott & Burgen 2005). The rate of spread would be between 0-20 chains per hour and the flame lengths would be between 0.3 feet and 4.5 feet depending on the winds (Scott & Burgen 2005).

However, with the decreased fuel loading, should a wildfire occur there will be decreased smoke due to the decrease in smoldering that would occur due to the lack of larger fuels.

Human caused fires may change because public access would decrease into the area. Removing existing System and Non-system roads would decrease firefighter access and reduce the options to reduce fire spread by using the roads and trails.

2. Cumulative Effects

The cumulative effects analysis area for fire and Fuels is the project boundary, which is the watershed boundary. This area is chosen because it is larger than the actual treatment units and is easily defined. The other activities that may cause a cumulative effect to this resource are:

1. Past timber harvests
2. Past wildfires
3. Ongoing firewood harvest by the public, primarily along roadsides
4. Ongoing hazard tree removals in Mill Hollow Campground and around Granite Ed Center – includes pile burning
5. Past hazard tree removal and pile burning in Currant Creek Campground
6. Ongoing grazing and routine maintenance of fences, troughs, etc…
7. Dispersed camping and recreation (hunting, snowmobiling, etc…)
8. Ongoing road maintenance including gravel placement, grading and in-kind culvert replacements
9. Invasive species treatments
10. Vat diversion tunnel
11. Uinta Express Pipeline

All of these resources combined with the alternative 2 will cause a change in the fuel profile within the project area. All these activities combined will tend to reduce the amount of fuels that will be available to burn and will reduce the fire hazard within the project area.

<u>d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly</u>

1. Direct and Indirect Effects

Fuel loading would decrease in the area with the removal of timber for lumber and the burning of slash piles. The fuel model would likely move from the TU2 to a TU1, where the primary carrier of the fire would be a low load of grass and/or shrubs (Scott & Burgen 2005). The rate of spread would be between 0-20 chains per hour and the flame lengths would be between 0.3 feet and 4.5 feet depending on the winds (Scott & Burgen 2005).

Human caused fires may change because public access would decrease into the area. Returning the roads to level 1 status would still allow for firefighter access, but the level 1 roads may or may not be a suitable to stop fire spread depending upon revegetation and levels of administrative use.

However, with the decreased fuel loading, should a wildfire occur there will be decreased smoke due to the decrease in smoldering that would occur due to the lack of larger fuels.

There will be direct effects from smoke, because there will be pile burning. If all piles were burned in one day (which is unlikely) PM_{10} emissions are estimated to be 9.4 tons, and $PM_{2.5}$ emissions are estimated to be 8.2 tons (FERA, 2014). Generally about 10 piles would be burned per day over a period of a few months, so PM_{10} and $PM_{2.5}$ emissions would be estimated at 0.3 ton/day for each. The smoke from these burns is expected to move toward the northeast away from the receptor sites listed above (See Figure 10), except Camp Piuta, which is not likely to be active during the months when piles are generally burned on the Uinta-Wasatch-Cache National Forest. The smoke modeling (Blue Sky Playground 2.0 beta; USFS AirFire Team, 2013) shows that the maximum daily $PM_{2.5}$ emissions would be 10-20 $\mu g/m^3$ (See figure 3.14).This amount is below the EPA standard of 35 $\mu g/m^3$ (EPA, 2014).

2. Cumulative Effects

The cumulative effects for fire and fuels are the same as in Alternative 2.

3.4.4 Air Quality

AFFECTED ENVIRONMENT

The project area is located within Utah airshed 16 which consists of anything over 6,500 feet in elevation. The project area is not located within a Class I airshed or a nonattainment area.

A National Weather Service clearing index greater than 500 is required prior to burning. Smoke approval is required through Utah Division of Air Quality, and the executive secretary of the Utah Air Quality Board through the Interagency Smoke Coordinator (Utah Airshed Group, 2006).

Winds are generally out of the southwest during the day. Night winds generally follow the drainages down canyon.

Table 3.34
Smoke Sensitive Receptors

Receptor	Direction	Distance (miles)
Timber Lakes	West	3
Camp Piuta	North	2.4
Diamond Bar-X	Northwest	4.8
Heber	West-Northwest	11.6
Woodland	Northwest	8.5
Francis	Northwest	11.5
Kamas	Northwest	13.5
Hanna	East-Southeast	8.8

a. Effects Common To All Alternatives

Effects to air quality vary between the action and no action alternatives therefore there are none in common.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

There will be no direct effects from smoke, because there will be no pile burning. However, with the increased fuel loading, should a wildfire occur there will be more smoke than the 2 alternatives, due to the increased smoldering that occurs with larger fuels.

2. Cumulative Effects

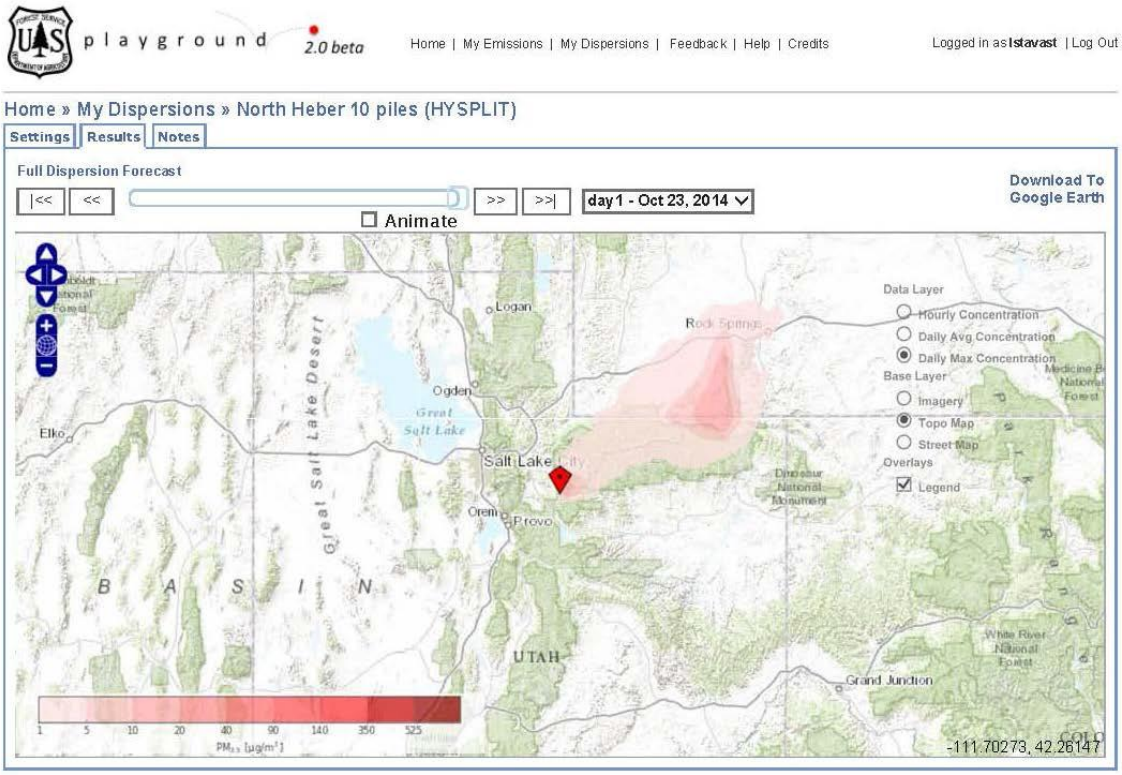
No cumulative effects are anticipated in regards to smoke management.

c. Alternatives 2 and 3 – Action Alternatives.

1. Direct and Indirect Effects

There will be direct effects from smoke, because there will be pile burning. If all piles were burned in one day (which is unlikely) PM_{10} emissions are estimated to be 9.4 tons, and $PM_{2.5}$ emissions are estimated to be 8.2 tons (FERA, 2014). Generally about 10 piles would be burned per day over a period of a few months, so PM_{10} and $PM_{2.5}$ emissions would be estimated at 0.3 ton/day for each. The smoke from these burns is expected to move toward the northeast away from the receptor sites listed above (See Figure 3.14), except Camp Piuta, which is not likely to be active during the months when piles are generally burned on the Uinta-Wasatch-Cache National Forest. The smoke modeling (Blue Sky Playground 2.0 beta; USFS AirFire Team, 2013) shows that the maximum daily $PM_{2.5}$ emissions would be 10-20 $\mu g/m^3$ (See figure 3.14).This amount is below the EPA standard of 35 $\mu g/m^3$ (EPA, 2014).

Figure 3.14
Smoke Dispersion from 10 Piles on North Heber Project



2. Cumulative Effects
No cumulative effects are anticipated in regards to smoke management.

3.4.5 Climate Change

AFFECTED ENVIRONMENT

Climate change is a subject widely debated by scientists, natural resource managers, and others. Climate change is not a new phenomenon and has occurred in the distant past during human history. Most notable was the interglacial warming period that occurred around the time of the first millennium when European settlers sailed along the northern coasts of Greenland. During this warming period, sea lanes in northern Greenland were free of ice. A few centuries later, those same sea lanes refroze and today remain blocked with ice. Conversely, photographic evidence shows Alaskan glaciers retreating miles over a period of a few decades.

A number of reports (State of Utah, 2007) have concluded that climate is already changing; that the change will accelerate, and that human greenhouse gas (GHG) emissions, primarily carbon dioxide emissions (CO_2), are the main source of accelerated climate change. Projected climate change impacts include air temperature increases; sea level rise; changes in the timing, location, and quantity of precipitation; and increased

frequency of extreme weather events. These changes will vary regionally and affect renewable resources, aquatic and terrestrial ecosystems, and agriculture.

In Utah, climate change is predicted to result in warmer, drier climates. *"Utah is projected to warm more than the average for the entire globe and more than coastal regions of the contiguous United States. The expected consequences of this warming are fewer frost days, longer growing seasons, and more heat waves. Studies of precipitation and runoff over the past several centuries and climate model projections for the next century indicate that ongoing greenhouse gas emissions at or above current levels will likely result in a decline in Utah's mountain snowpack and the threat of severe and prolonged episodic drought in Utah is real."* (State of Utah, 2007)

While uncertainties will remain regarding the timing, extent, and magnitude of climate change impacts, the scientific evidence predicts that continued increases in GHG emissions will lead to increased climate change.

Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO_2 absorbed from the atmosphere and its release through respiration, decomposition, and burning. Over longer time periods, indeed as long as forests exist, they will continue to absorb carbon and offset some of the carbon emissions.

ENVIRONMENTAL CONSEQUENCES / EFFECTS

a. Effects Common To All Alternatives

The implications of climate change are far reaching, and almost every human activity could possibly contribute in small measures to climate change. It is not currently feasible to quantify the indirect effects of individual or multiple projects on global climate change, and therefore, determining quantified effects of those projects on global climate change cannot be made at any scale. However, this is not necessary to understand the relative differences between the alternatives.

In the context of forest vegetation management, the Forest Service generally can respond to climate change through ecological restoration—by restoring the functions and processes characteristic of healthy, resilient ecosystems. More resilient ecosystems have a greater potential to withstand the ecological stresses associated with climate change, and help maintain long-term carbon sequestration capability in forests and grasslands**.** There are two types of climate change effects: (1) the effect of a proposed project on climate change (GHG emissions and carbon cycling), and (2) the effect of climate change on a proposed project.

In the context of this project, the affected environment is limited to the confines of the project boundary. An analysis of the impacts this project may have on climate change shall be a result of forest management activities as they are proposed herein.

b. Alternative 1 - No Action Alternative

1. Direct and Indirect Effects

Under the No Action Alternative, forest restoration and movement toward healthy, resilient ecosystems would be limited to that occurring naturally over time. There would be no immediate change to the current trend for carbon storage or release in the project area. Carbon currently stored in the dead and live trees would continue to be stored there. Over time as these trees fall and decay, carbon stored in them would be transferred to the soil or released into the atmosphere. Grass and forbes, brush, and trees growing in the project area would continue to sequester carbon. Over time non-forested areas would store less carbon than a regenerated young forest. Over time, standing dead trees will fall and create heavy loading of large fuels. If ignited, intense wildfires could result and much of the carbon currently stored in the standing trees would be added to green house gasses in the planet's atmosphere.

2. Cumulative Effects

When considered in a cumulative context, National Forests buffer local climates and are large interstate regions that protect and shade forest floors from the warming effects of direct sunlight. These provide green vegetation that consume and store carbon dioxide while oxygen is respirated into the atmosphere.

c. Alternative 2 – • Full suite of timber and road obliteration activities

1. Direct and Indirect Effects

Under the Proposed Action Alternative, restoration will be initiated and regeneration of a diverse forest (aspen, subalpine fir, and spruce) will result in a healthier, more resilient ecosystem. The Proposed Action would increase tree growth and reduce fuel loadings. This would mitigate potential future greenhouse gas emissions and reducing the potential loss of long-term ecosystem carbon sequestration capability from wildfires. Carbon stored in the timber removed through the planned timber harvest would not be released into the atmosphere should a wildfire occur.

The trees being harvested would mostly end up as building materials where the carbon content is maintained as carbon sinks when lumber is used in construction projects. New tree growth would restart the process of growing more potential carbon sinks as new lumber products are grown in the form of stumpage.

Equipment used in harvest activities would release small amounts of greenhouse gasses into the atmosphere. However, this impact would likely have occurred elsewhere as timber industry would likely find somewhere else to harvest trees in response to demand for wood products.

When this project is isolated and analyzed in the presence of the multitude of human activities occurring over the entire planet, then the impacts from this project would be so insignificant that no consequence can be quantitatively measured. The impacts of the proposed actions contained herein would have minuscule negative effects, if any at all.

The Proposed Action would contribute no detectable or measureable change to climate change.

2. Cumulative Effects

When considered in a cumulative context, National Forests buffer local climates and are large interstate regions that protect and shade forest floors from the warming effects of direct sunlight. These provide green vegetation that consume and store carbon dioxide while oxygen is respirated into the atmosphere.

d. Alternative 3 – • Timber activities then roads returned to level 1 status and treated accordingly

1. Direct and Indirect Effects

From a carbon standpoint this would be essentially the same as alternative 2 with the exception that the road prisms left in Level 1 status would not be returned to a forested condition.

2. Cumulative Effects

When considered in a cumulative context, National Forests buffer local climates and are large interstate regions that protect and shade forest floors from the warming effects of direct sunlight. These provide green vegetation that consume and store carbon dioxide while oxygen is respirated into the atmosphere.

CHAPTER 4. CONSULTATION

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

ID TEAM MEMBERS:

Name and Affiliation	Contributions
Jim Gibson Uinta-Wasatch-Cache NF	IDT Leader/ Editor Silviculture/Timber/Climate
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David Hatch Uinta-Wasatch-Cache NF	Visuals and Scenery
Tom Flanagan Uinta-Wasatch-Cache NF	Cultural Resources
Jana Leinbach Uinta-Wasatch-Cache NF	Botany/ TES Plants
Brendan Waterman Uinta-Wasatch-Cache NF	Hydrology
Anthony Gray Uinta-Wasatch-Cache NF	Wildlife
Jim Percy Uinta-Wasatch-Cache NF	Range /Invasive Species
Lans Stavast Uinta-Wasatch-Cache NF	Fuels/Air Quality
Stacey Weems Uinta-Wasatch-Cache NF	Soils
Kellie Whitton Uinta-Wasatch-Cache NF	Fisheries
Klein Houston Uinta-Wasatch-Cache NF	Engineering/Transportation
Evan Glenn Uinta-Wasatch-Cache NF	Recreation

FEDERAL, STATE, AND LOCAL AGENCIES:
Animal Plant Health Inspection Service
Ashley National Forest
Bureau of Reclamation, Provo Area
Bureau of Indian Affairs
Farm Bureau
Kamas City
Manti-La Sal National Forest
US Fish and Wildlife Service
Utah DEQ, Division of Air Quality

Utah Division of Water Rights
United States Department of Interior
Utah Department of Public Safety
Utah Division of Water Resources
Utah Reclamation Mitigation and Conservation Commission
Wasatch County Board of Supervisors
TRIBES:
Northern Ute Indian Tribe

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APPENDICES

Appendix A – Response To Comments

This section will summarize the public involvement for this project. A list of agencies, organizations, and individuals contacted during scoping is presented above in Section 4. Comments received are listed in a table format by commenter and a response is noted to how that comment or concern was addressed in this analysis.
On August 28, 2014, a letter providing information on the Proposed Action was mailed to individuals and groups, including federal, state, and local agencies, and affected Indian tribes. A legal notice of Proposed Action was published in the *Provo Daily Herald*, newspaper of record on September 3, 2014 initiating the start of the 30-day comment period concurrently with a public scoping period.

This comment period was the sole opportunity for the public to provide early and meaningful participation on the proposed action prior to a decision being made by the Responsible Official. The proposed project would implement the Land and Resource Management Plan for the Uinta National Forest and would not be authorized under the Healthy Forests Restoration Act. The project is subject to the objection process found in 36 CFR 218, and in particular 36 CFR 218.7, parts (a) and (b). The project will be subject to a 45 day objection period after the final environmental analysis and draft decision document have been circulated for public comment but before a final decision is made.

Public Comments Received
Three responses were received during the scoping/comment period (Table A.1). A copy of the letters is in the project file. A content analysis was conducted on the public comments. All comments received to date and the response of the IDT to each comment or concern is presented in Table A.2.

Table A.1
Comments Received

Letter #	Date Received	Name	Affiliation	City/State/Zip
1	09/19/2014	Matt Williams	Chevron Pipe Line Company	Salt Lake City, UT 84119
2	09/29/2014	James Thompson	Individual	Salt Lake City, UT 84109
3	09/10/2014	Bobbie Williams	Friends of the Western Uintas	Kamas, UT, 84036

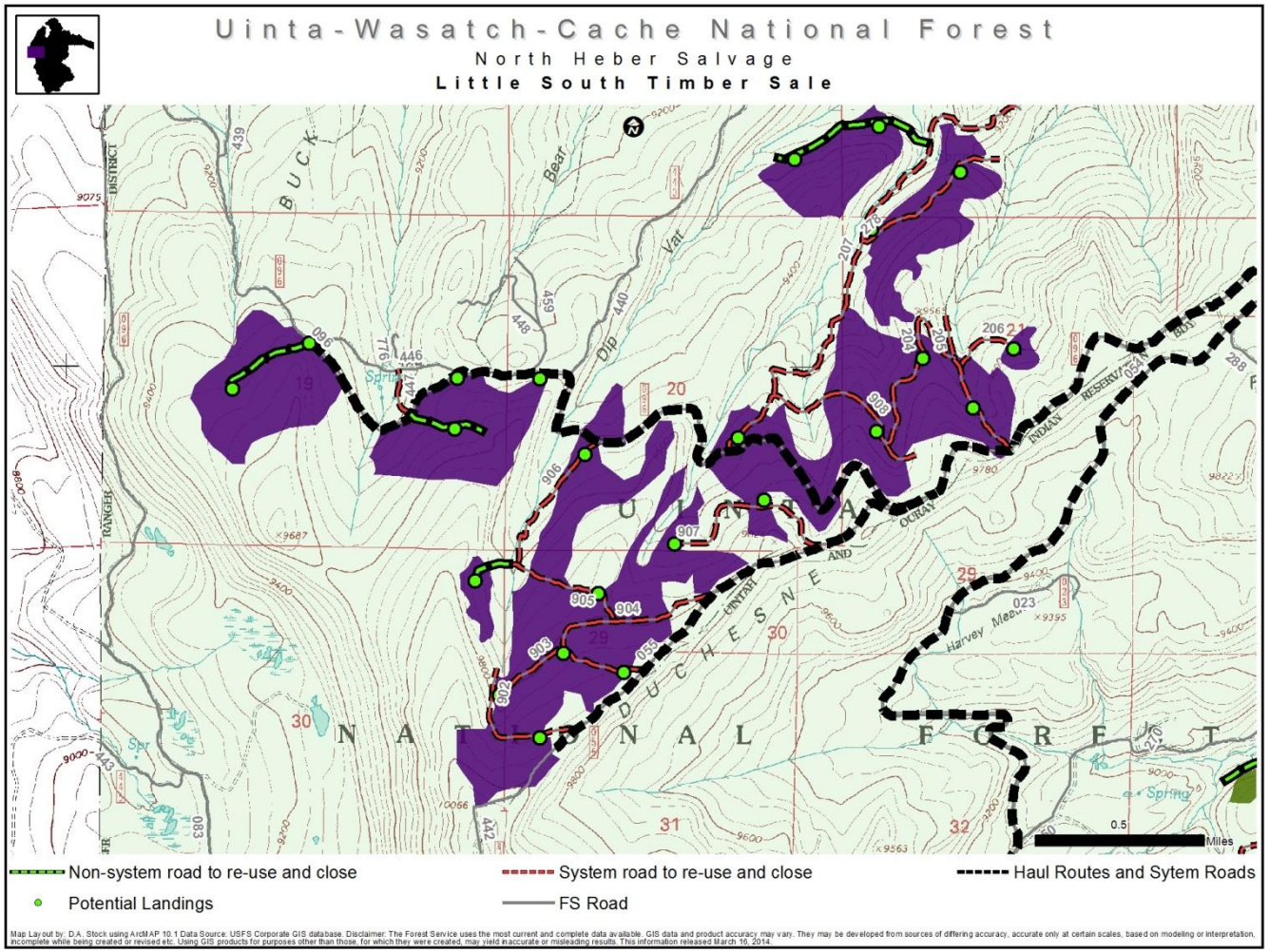
Table A.2
Response to Comments

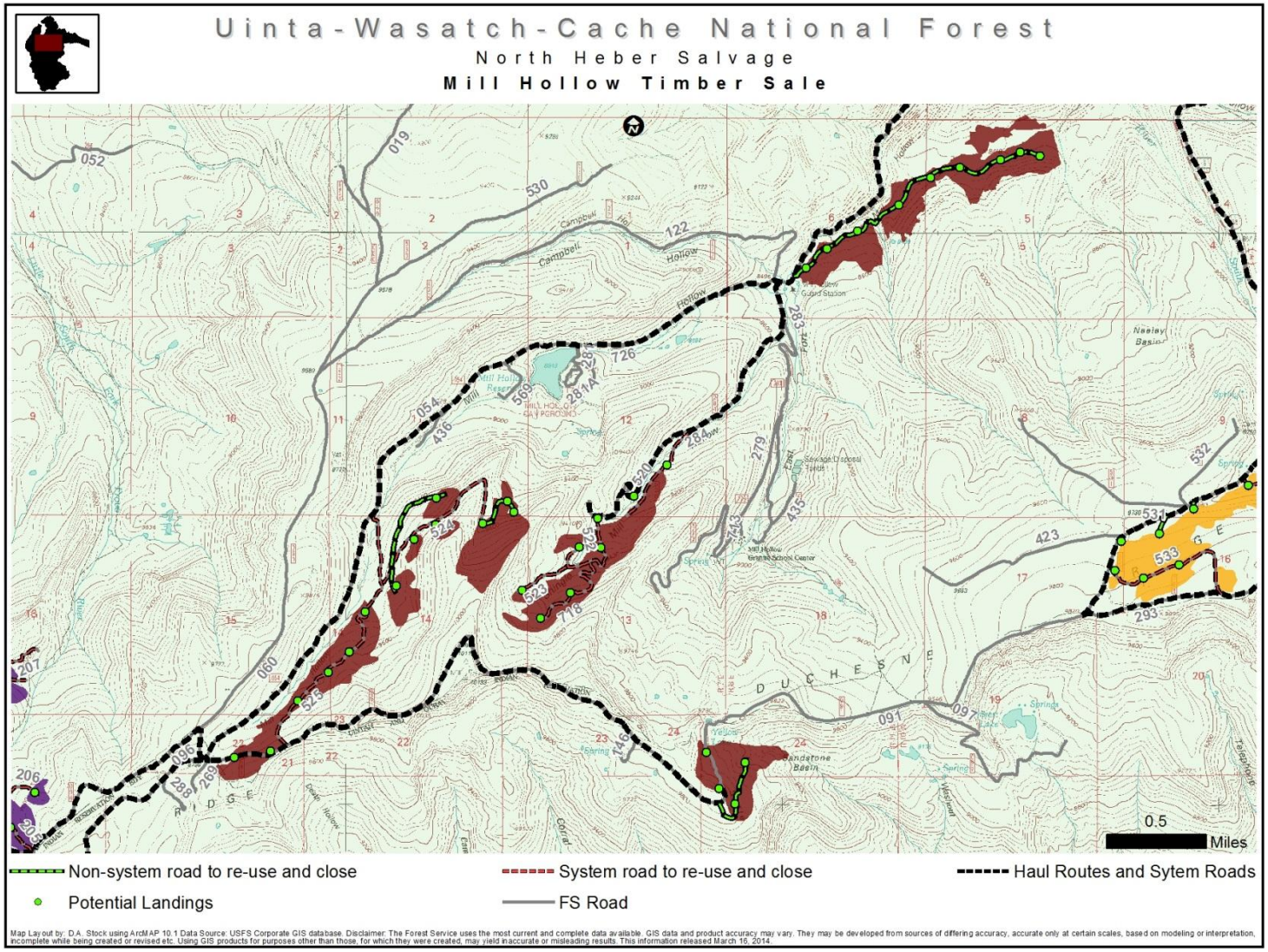
Comment #/ Source	Comment	Resource Area	Response
1-1	Chevron has a right of way that crosses a portion of the area and shall not be impaired or interfered with.	General	The Forest Service is aware of the pipeline and it's relation to proposed activities. All activities are within past treatments that were designed around the pipeline/
1-2	Details of any crossings or encroachments must be discussed in advance with Chevron Representatives. Specifications and details are provided in the letter along with the forms to complete and contact information.	General	The Forest Service will be contacting representatives from Chevron well before any activities are planned on the ground and will certainly heed the attached specifications for crossings. The only area where treatments affect the pipeline are near Tim's Hole and crossings will be on existing system roads or at designated crossing used in the previous treatments.
2-1	For the most part I support the project, mainly because the trees proposed for harvesting are already dead, and because old road prisms, temporary roads, and skid trails that are no longer needed will be obliterated.	Timber	Thank you for your support.
2-2	I'm hoping that once the dead trees are cut, that something can be done to lessen the view of unsightly remaining stumps. I know it may be more expensive, but maybe cutting them closer to the ground is possible, or turning them over, or something, so that the harvested area doesn't end up looking like a "bombed out" clearcut.	Scenery	Contract requirements include stumps to be cut at less than 12 inches from the ground. Logging slash will be either lopped and scattered or piled and burned. Regardless, timber harvest activities are unsightly for a couple of years after harvest until the vegetation has re grown and slash begun to deteriorate.

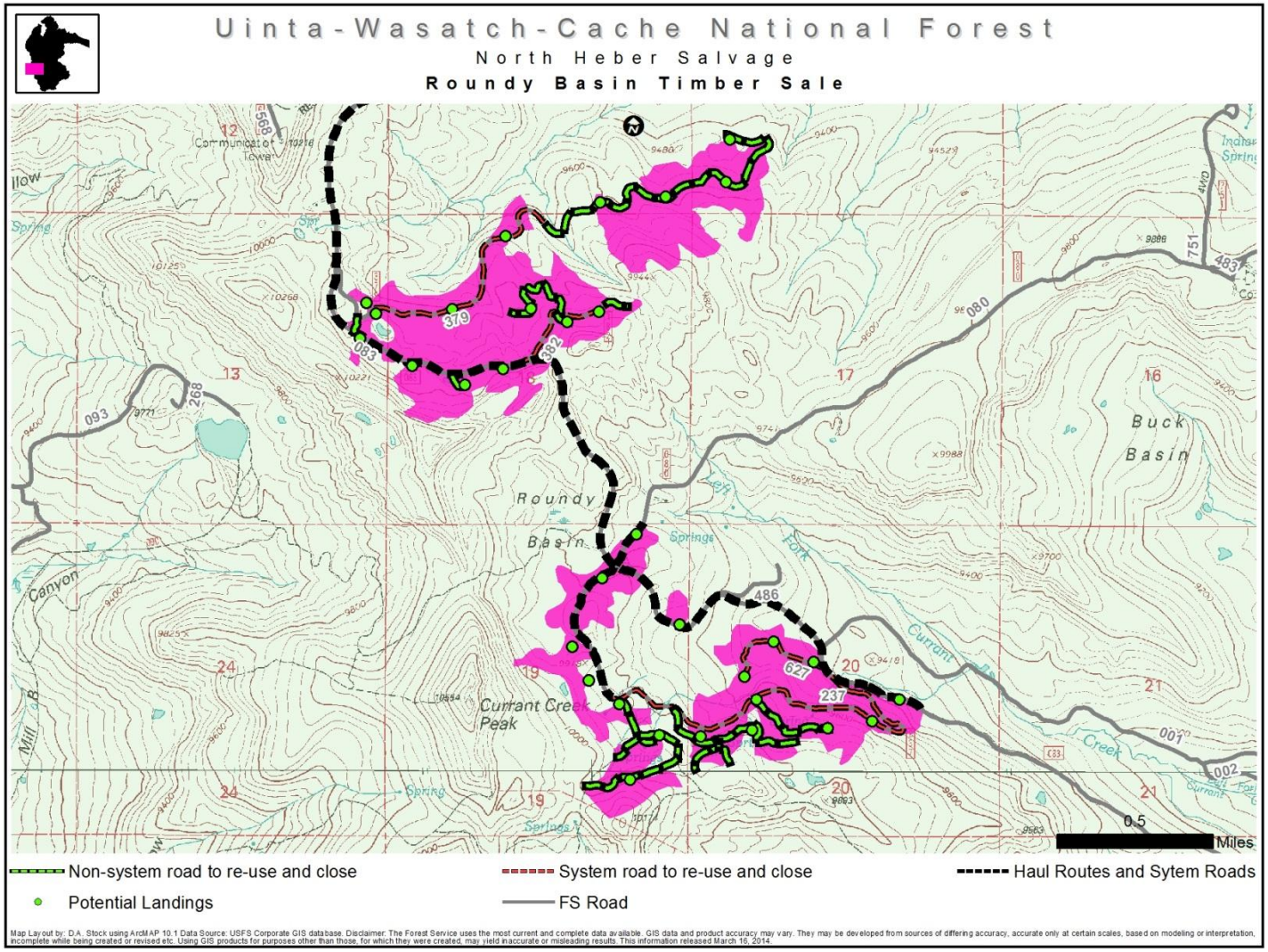
Table A.2
Response to Comments

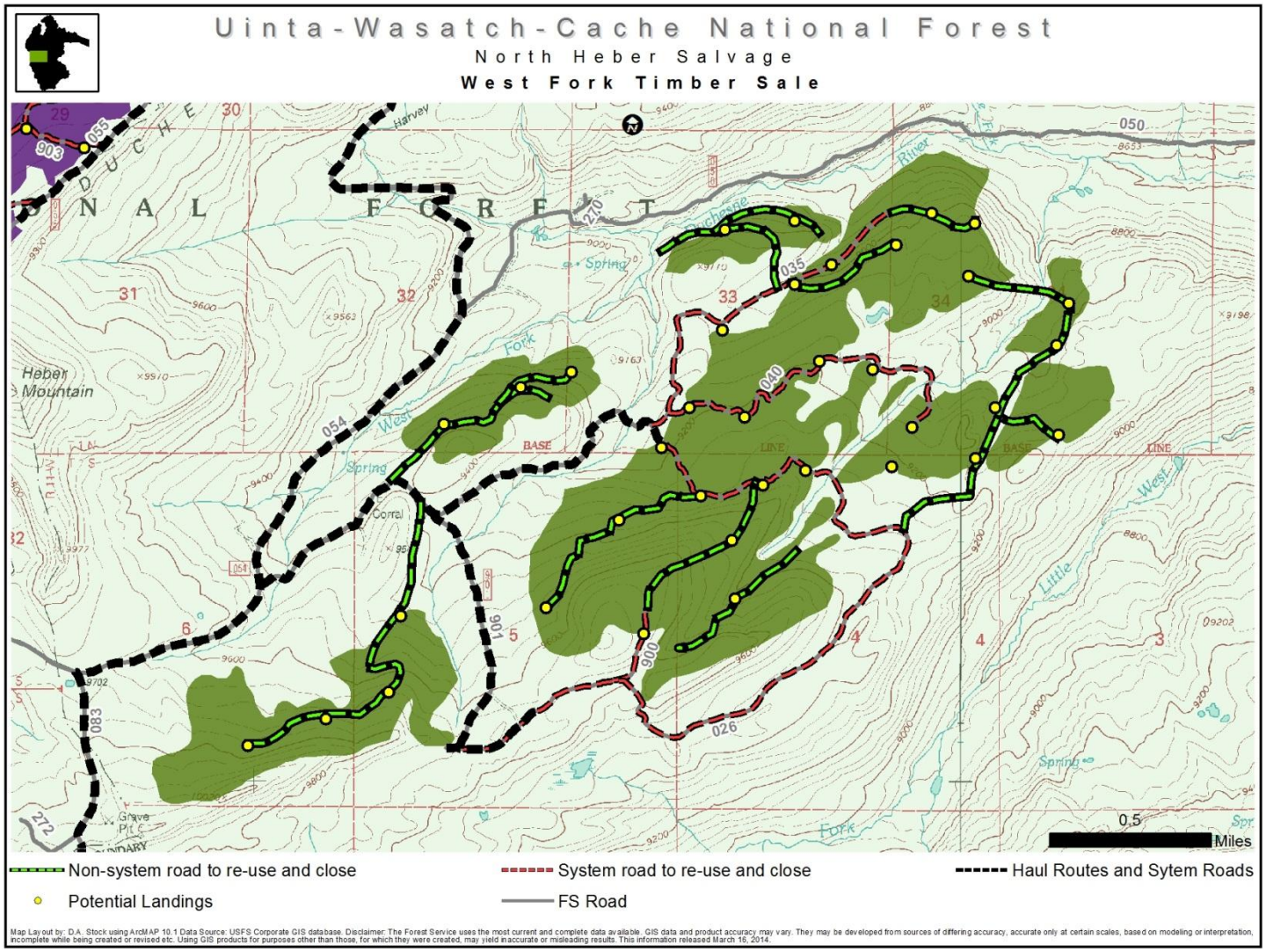
Comment #/ Source	Comment	Resource Area	Response
3-1	We feel this proposal is good for the regeneration of our forest and the Forest Service Revenue, where the Forest Service is making money on the salvage (not spending tax payer money). It also helps our local lumber company's putting people to work as it offers a much needed product to the area.	Timber	Thank you for your support. The project will provide opportunities for local industry and speed up the regeneration of the forest.
3-2	We support multiple use of our forest and timber sales are part of that multiple use.	Timber	Thank you for your support.

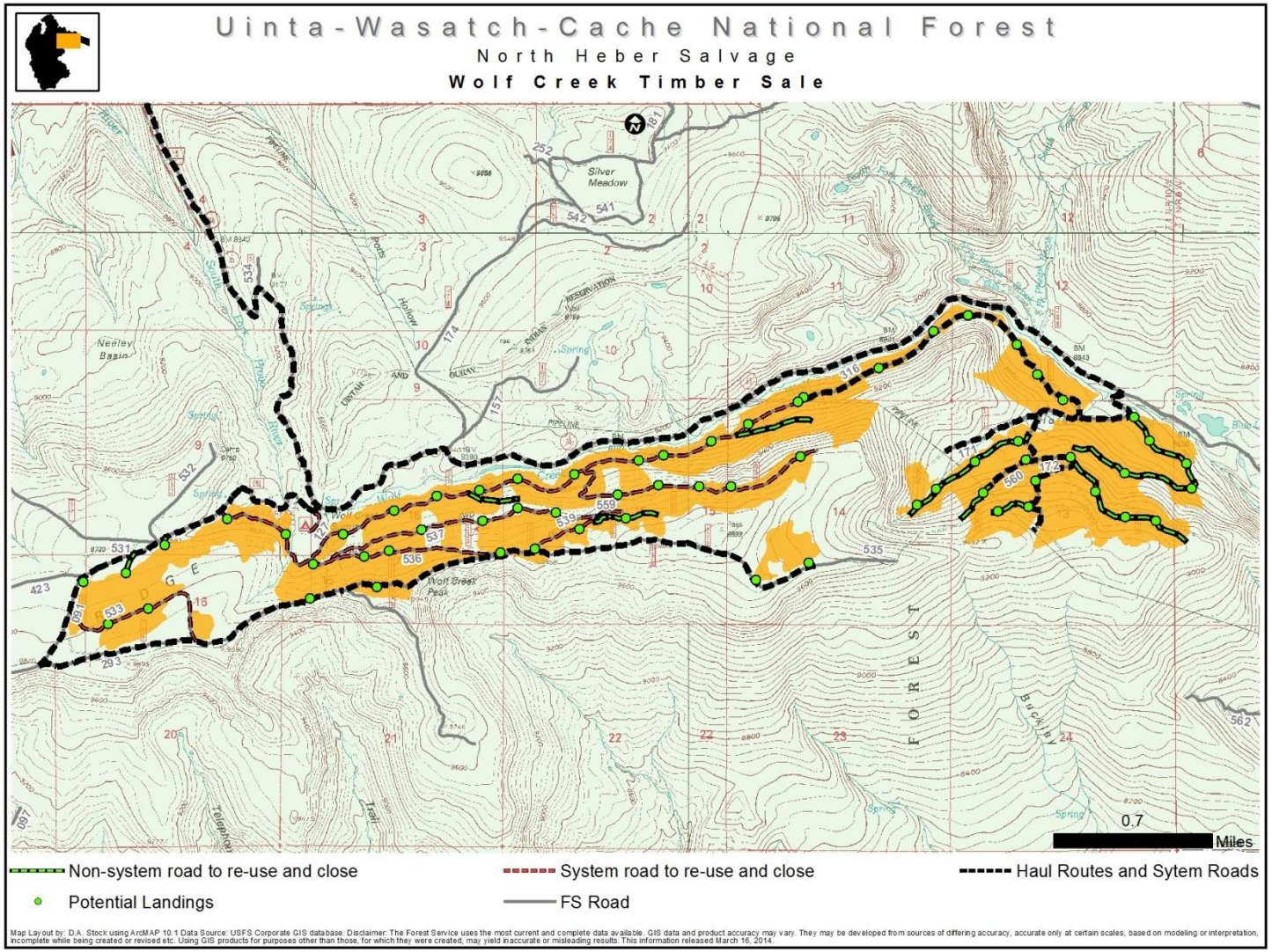
Appendix B – Detailed Project Maps




Uinta-Wasatch-Cache National Forest
North Heber Salvage
Mill Hollow Timber Sale
0.5
Miles
Non-system road to re-use and close
System road to re-use and close
Haul Routes and Sytem Roads
Potential Landings
FS Road
Map Layout by: D.A. Stock using ArcMAP 10.1 Data Source: USFS Corporate GIS database. Disclaimer: The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised etc. Using GIS products for purposes other than those, for which they were created, may yield inaccurate or misleading results. This information released March 16, 2014.


Uinta-Wasatch-Cache National Forest
North Heber Salvage
Roundy Basin Timber Sale
Roundy Basin
Buck Basin
Currant Creek Peak
Communication Tower
379
382
083
486
627
237
080
751
093
268
0.5
Miles
Non-system road to re-use and close
System road to re-use and close
Haul Routes and Sytem Roads
Potential Landings
FS Road
Map Layout by: D.A. Stock using ArcMAP 10.1 Data Source: USFS Corporate GIS database. Disclaimer: The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised etc. Using GIS products for purposes other than those, for which they were created, may yield inaccurate or misleading results. This information released March 16, 2014.


Uinta-Wasatch-Cache National Forest
North Heber Salvage
West Fork Timber Sale
Heber Mountain
Harvey
Spring
Corral
BASE
LINE
0.5
Miles
Non-system road to re-use and close
System road to re-use and close
Haul Routes and Sytem Roads
Potential Landings
FS Road
Map Lay out by: D.A. Stock using ArcMAP 10.1 Data Source: USFS Corporate GIS database. Disclaimer: The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised etc. Using GIS products for purposes other than those, for which they were created, may yield inaccurate or misleading results. This information released March 18, 2014.


Uinta-Wasatch-Cache National Forest
North Heber Salvage
Wolf Creek Timber Sale
Silver Meadow
Neeley Basin
Wolf Creek Peak
0.7
Miles
Non-system road to re-use and close
System road to re-use and close
Haul Routes and Sytem Roads
Potential Landings
FS Road
Map Layout by: D.A. Stock using ArcMAP 10.1 Data Source: USFS Corporate GIS database. Disclaimer: The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised etc. Using GIS products for purposes other than those, for which they were created, may yield inaccurate or misleading results. This information released March 16, 2014.