Spruce Beetle Epidemic Aspen Decline Management Response (SBEADMR) Project on the Grand Mesa, Uncompahgre, and Gunnison National Forest (GMUG)

Adaptive Implementation Annual Report for 2024

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Introduction and background

The Record of Decision (ROD) accompanying the Final Environmental Impact Statement (FEIS) for the Spruce Beetle Epidemic-Aspen Decline Management Response (SBEADMR) project commits the US Forest Service's Grand Mesa, Uncompahgre, and Gunnison National Forest (GMUG) to utilize an adaptive implementation process through continuous public involvement:

> "*The Forest Service cannot significantly alter the current infestation or rate of decline in spruce stands, but management of associated hazards, economic opportunities, and resilience, as detailed in the purpose and need, are the core of this project. Nor can it accurately project the ultimate location and scale of eventual beetle activity. To achieve the purpose and need in the context of rapidly changing conditions in spruce and aspen stands across the landscape, SBEADMR relies on an adaptive implementation framework to prioritize the sequence and determine precise layout of successive treatments within the analyzed PTAs. Treatment design, incorporating additional monitoring questions, reviewing the effects of previous treatments, and adjusting management towards desired conditions and away from undesirable conditions would also be conducted via the adaptive implementation approach*" (SBEADMR FEIS, Chapter 2, pp. 36-37).

Why this document?

The purpose of this report is to serve as a public record of the annual adaptive management decisions for the SBEADMR project pursuant to the FEIS and ROD. The document explicitly defines the linkages between monitoring and other applied research results, the public engagement process, and the adaptive management decisions made by the GMUG National Forest.

Who is involved?

The adaptive implementation approach involves three groups: 1) the Adaptive Management Group (AMG) originally convened by the Public Lands Partnership; 2) a "Science Team" composed of researchers from Colorado Parks and Wildlife, Colorado State University, the US Forest Service's Rocky Mountain Research Station, and Western Colorado University; and 3) the GMUG Forest Leadership Team (FLT) composed of US Forest Service line officers vested with decision authority (e.g., forest supervisor, deputy forest supervisor, district rangers) and resource specialists.

The AMG's purpose is to assist the GMUG National Forest in applying the adaptive management framework over a multi-year timeframe in accordance with the SBEADMR FEIS and ROD (SBEADMR Adaptive Management Group Operations Manual, version 1, June 2017). The AMG is composed of individuals representing a broad diversity of local and regional interests and perspectives regarding the SBEADMR project's effects on ecological, economic, and social values. The AMG serves as the primary convener and coordinator of continuous public engagement.

The Science Team's activities are supported by funds from the SBEADMR project through cooperative agreements between the GMUG and the team member's institutions. The Science Team's monitoring

and applied research activities are based on: SBEADMR goals and desired conditions described in the FEIS and ROD, “Decision Triggers” described in Table 6, p. 44-48 in the FEIS, and additional objectives and questions defined by public stakeholders. Data collection, analysis, and reporting occurs annually.

GMUG FLT makes final decisions about changes in SBEADMR implementation utilizing a “Management Review” process. The Management Review draws on annual AMG field reviews, annual FLT field reviews with and input from GMUG resource specialists, results from the Science Team and other relevant research, and input from the AMG based on results from the Science Team and other relevant research.

What happened this year?

This table displays linkages between Goals or Decision Triggers identified in the SBEADMR Record of Decision (ROD) or Final Environmental Impact Statement (FEIS), Science Team and GMUG staff monitoring activities and results, the SBEADMR Adaptive Management Group's (AMG) interpretations and recommendations, and the GMUG Forest Leadership Team's Management Review conclusions for 2024

Table 1. Goals and Decision Triggers from the SBEADMR Final Environmental Impact Statement and Record of Decision

Goal or Decision Trigger	Monitoring Actors and Activities	Results and Interpretation to Date	AMG Recommendation	FLT Management Review Conclusion	Comments
More locations from which firefighters can safely and effectively manage fires (Public Safety goal #1, ROD, p. 4)	Science Team conduct pre- and post-treatment surveys of fuel loading. *(1g.,4a)* GMUG fire/fuels staff GIS data on locations of burned slash piles.	In the short term, salvage increased fine surface fuel, decreased litter and duff fuel load. In 2015 sampling, coarse wood fuel loads weren't different between treatments and non-treated areas and are within normal ranges among the treatments. However, as dead trees begin to fall the areas that were not salvaged will have significant amounts of coarse fuel. *(This monitoring was completed in 2017)*	*Recommend that the GMUG use SBEADMR PTAs to create strategic fuel breaks, where appropriate, along POD lines to harden control features for safe and effective response. Those lines should be prioritized in areas that are adjacent to HVRAs.*	*Accept AMG recommendation – the GMUG will continue to prioritize SBEADMR work along PODs lines. Non-POD line SBEADMR projects will also continue.*	
Achieve a balance of habitat structural stages, tree species composition, and seral stage distributions appropriate for each vegetation type across the GMUG (ROD Purpose & Need Desired Condition, p. 3)	Science Team field surveys of tree regeneration and stand structure in unmanaged vs previously managed stands impacted by spruce beetle *(1a-d, 1f, 3d.)*	Spruce saplings, advanced regeneration, and new regeneration are above stocking standards in salvaged, unmanaged and previously managed areas impacted by the spruce beetle outbreak. Seed production has varied from 2018 through 2020. This annual variability is to be expected as Engelmann spruce seed production is known to vary in space and time. While one year (2018 seed production year) is higher than the other two years, it is important to recognize that the treatments (unmanaged, previously harvested, and salvaged) had similar seeds per plot found. This suggests that Engelmann spruce seeds are still present and dispersing on the landscape. The 2023 remeasurements of intensive monitoring plots indicate both the spruce-dominated and spruce/aspen mixed stands continue to recruit a mix of new aspen and Engelmann spruce seedlings. In fact, in the spruce/aspen stands, aspen recruitment is exceeding spruce recruitment (except in previously harvested areas). Standing dead trees are limited in the salvage units compared to the unmanaged and previously harvested stands.	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	

Goal or Decision Trigger	Monitoring Actors and Activities	Results and Interpretation to Date	AMG Recommendation	FLT Management Review Conclusion	Comments
		In spruce stands, spruce overstory and seedling survival is similar across salvage and unsalvaged units. Spruce sapling survival is lower in salvage units compared to unsalvaged units. In spruce-aspen stands, there are no apparent differences in survival across treatment types. This data will be used to parameterize FVS models and predict longer-term trajectories of salvaged and unsalvaged stands, to be reported at the 2025 Annual Meeting. *More detailed findings are in the 2024 SBEADMR Science Matrix.*			
Maintain 5-15% of vegetation at the HUC 12 watershed scale in structural stages 4A, 4B and 4C where biologically feasible. (Decision Trigger, FEIS, Table 6, p. 44)	GMUG Forest Bio updates annually based on FSVegSpatial data	Ten watersheds have 20% or less mature spruce-fir (4A, 4B, 4C). Of those, three watersheds range between 5 – 15%. Six watersheds are less than 5%. Two are 17 and 20%, respectively. There are no pending SBEADMR treatments in the 3-year plan in any of these watersheds. *Appendix A* is a 2023 updated summary table of the HUC12 watersheds referenced above.	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	
In healthier spruce-fir stands, promote regeneration and create multiple age classes (Resilience Goal 1.a., ROD, p. 4)	Science Team pre- and post-harvest surveys of forest stand structure, tree regeneration, and species composition in green treatments. *(2a.)*	No monitoring results to date. Pre-treatment data was collected in the Rainbow TS area in summer 2020. Silvicultural prescriptions for the Bald TS were developed in conjunction with the Science Team with a focus on different methods to increase post-harvest regeneration. Pre-treatment plots for Bald were established in summer 2021. Rainbow TS treatment was completed in 2023. Bald TS is scheduled to go out for bid in Q1 of FY2025. Rainbow and Bald are tentatively scheduled for remeasurement in summer 2028.	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	

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Promote aspen regeneration in live stands, with emphasis on those affected by Sudden Aspen Decline (Resilience Goal 1.c., ROD, p. 4)	Science Team conduct pre- and post- treatment surveys of forest stand structure, tree regeneration, and species composition in aspen treatments *(7a,b)*	The Science Team resampled the Terror Creek Adaptive Silviculture Assessment Timber Sale in Summer 2022 (12 years post-harvest) in an effort to learn more about management's role in promoting aspen regeneration. Science Team interpretation of the new results are: Overall, based on the sprouting density metric alone, early identification of aspen stands that are starting to show symptoms of SAD and clearfelling them would provide opportunities to get substantial initial sprouting AND maintain high levels of sapling density (9500 stems/acre) at least 12 years post treatment. Those stands that had moderate SAD mortality (20-60% SAD mortality) did initially produce substantial higher initial sprouting after clearfelling than the uncut stands, but that difference narrowed through time. In these stands, clearfelling could be used to initiate a high amount of sprouting to offset browsing pressure and reduce future woody fuel loads. In areas that had high SAD mortality (>60% mortality), clearfelling didn't appreciatively increase the sprouting initially or 12 years post. Clearfelling would be appropriate if attempting to reduce surface fuel loads. Overall, clearfelling in the low and moderate SAD impacted stands allowed faster growth of the sprouts than that observed in the uncut stands. This faster growth initially and 12 years post-harvest and the increase in sprout density ensures sufficient recruitment into the overstory and reduces the impact of browsing. A similar trend of fast height growth was observed in the high mortality SAD stands whether they were cut or not. It seems that removing the overstory via harvesting or through high levels of SAD mortality provides more resources (I.e. more light) for sprout growth. *More detailed findings can be found in the 2023 SBEADMR Science Matrix.*	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	

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Provide commercial forest products to local dependent industries at a level commensurate with the GMUG Land and Resource Management Plan direction and in harmony with other Plan goals (Recovery Goal #1, ROD, p. 4)	Science Team & GMUG staff compile and summarize timber production outputs and associated costs and revenue *(5a-d)*	Timber volume sold by fiscal year: 2017 - 69,952 CCF; 2018 - 95,377 CCF; 2019 - 93,152 CCF; 2020 – 76,302 CCF. Commercial Revenue per volume ($/CCF): 2017 $9.16; 2018 $11.14, 2019: $4; 2020: $7 It is not clear at this point how administrative costs have changed over the course of the project. Personnel costs have been identified as the largest issue affecting cost with pre-sale activities being the largest component of cost. There are few small-scale producers utilizing timber from SBEADMR project. Majority of timber utilization is through sawlogs processed by Montrose Forest Products. SBEADMR has not had a significant impact on local producers' employment, but is noted as important for local mill supply chain. SBEADMR timber sales were consistent with GMUG Land Management Plan and the SBEADMR EIS. Pre-treatment Design Checklists were completed for all treatments, design features were identified and assigned the appropriate timber sale contract clauses and provisions and implemented on the ground in accordance with the contract.	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	
Subsequent to salvage, treat fuels, prepare sites, and re-establish and maintain forest cover via replanting where seed sources are lacking (Recovery Goal #2, ROD, p. 4)	GMUG timber staff perform stocking surveys at 1, 3, and 5 years post-harvest. Science Team surveys of post-salvage, unmanaged, and previously managed forest structure, tree regeneration, and species composition; seed trap collection *(1b-d,1f)*	The first SBEADMR treatments were completed on the Gunnison Ranger District in 2019 and replanting was initiated in several areas. Stocking surveys will continue to ensure stands are fully stocked within 5 years of sale closure, so the first results will be available in summer of 2024. 2023 science team monitoring results in intensive plots indicate that all sampled stands have sufficient seedling regeneration. Broadly speaking, salvaged units in spruce stands have lower spruce seedling densities than unsalvaged units (however, this difference is not statistically significant and all sampled stands are well above forest plan stocking standards).	*No changes to SBEADMR needed at this time, because all sampled stands are well above forest plan stocking standards.*	*Accept AMG recommendation.*	By law, stocking surveys are required at 1, 3 and 5 years post-harvest. Within 5 years stands must be fully stocked in accordance with the Forest Plan. Stocking survey data will be reported at 5 years; any notable observations will be shared prior to that as applicable.

Goal or Decision Trigger	Monitoring Actors and Activities	Results and Interpretation to Date	AMG Recommendation	FLT Management Review Conclusion	Comments
Maintain soil productivity, minimize human-caused erosion, eliminate or minimize soil damage from machine pile burning, and maintain integrity of associated ecosystems (Decision Trigger, FEIS, Table 6, pp. 44-45)	GMUG resource specialist conduct spot inspections and post-treatment monitoring for soil disturbance; see other goals for information relevant to ecosystem integrity.	All SBEADMR treatment checklists indicate treatments are designed commensurate with this requirement. Five units of the Sargent's Mesa timber sale were monitored in 2023 for detrimental soil disturbance (DSD) following the National Soil Disturbance Monitoring Protocol (Page-Dumroese et a. 2009). Results ranged between 8% and 13% and meet GMUG Forest Plan and Regional Forest Service direction that require impacts to not exceed 15%.	*No changes to SBEADMR needed at this time, because monitored units were all below 15% detrimental soil disturbance limit.*	*Accept AMG recommendation.*	GMUG Forest Plan and Regional direction requires that detrimental soil disturbance does not exceed 15% of an activity area (e.g. timber sale unit).
No more than 30% of lynx habitat in a Lynx Analysis Unit (LAU) is converted to a stand initiation structural stage (>90% loss of tree overstory) due to natural or human-caused disturbance (Southern Rockies Lynx Amendment Standard VEG S1; Decision Trigger, FEIS, Table 6, pp. 44-45)	GMUG Forest Biologist track structural stages in LAU annually based on FS databases (FACTs, FSVegSpatial)	As of 2021, the Cathedral and Stewart Creek LAUs exceeded the threshold, almost entirely due to habitat converted to unsuitable from natural disturbance (tree mortality from spruce beetle and other pathogens). Cathedral is at 41%; Stewart Creek LAU is currently at 40%. Within the last 25 years, timber harvest contributed 0.2 and 0.4% to habitat conversion to unsuitable in these two LAUs, respectively. There have been four SBEADMR timber sales in these two LAUs, all salvage sales that were awarded in FY2017, prior to the 2020 change detection update which was used to update lynx habitat mapping in 2021. Salvage harvest occurs primarily in stands already converted to unsuitable lynx habitat due to beetle activity, does not contribute to further habitat conversion, and project design features include protection of live spruce-fir understory. No management activities that could convert lynx habitat are planned in these LAUs. Other than these LAUs, no other LAUs have reached the 30% threshold. *Appendix B reflects current lynx habitat status by LAU (updated March 5, 2024).*	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	The 2020 change detection update to FSVeg, which updated the GMUG's lynx habitat mapping in 2021, reset lynx habitat acres and resulted in identifying LAUs with more than 30% of lynx habitat in an unsuitable condition. These LAUs will not have future vegetation management that would convert additional habitat to an unsuitable condition while they remain above the 30% threshold.
No more than 15% of lynx habitat in a Lynx Analysis Unit (LAU) would be regenerated via forest vegetation management over a 10-year period starting in 2009 (Southern Rockies Lynx Amendment Standard VEG S2; Decision Trigger, FEIS, Table 6, pp. 44-45)	GMUG Forest Biologist tracks annually based on FACTs	All statistics related to lynx habitat were updated for the last 25-year period (1998 – 2023). To accurately determine the amount lynx habitat converted to unsuitable, an analysis of all management actions from 1998-2023 was completed. The SBEADMR EIS assumed a 25 percent incidental loss to lynx habitat resulting from salvage treatments and a 15 percent loss from resiliency treatments. Roads in lynx habitat was considered a 100 percent loss. 5 LAUs are at or exceeding 15% unsuitable, due to overstory tree mortality from the spruce-beetle epidemic. When analyzing acres converted to unsuitable only from forest management, no LAUs are at 15% unsuitable. See GMUG Lynx Analysis Units	*No changes to SBEADMR needed at this time, because no LAUs are at or exceeding 15% unsuitable due to forest vegetation management.*	*Accept AMG recommendation.*	Unlike SRLA Standard Veg S1, Standard Veg S2 is measured *only* from impacts due to forest vegetation management. We estimate that it takes 25 years for a spruce-fir stand to recover following treatment, such that understory trees grow above average snow-depth, then becoming suitable habitat for snowshoe hares and lynx again.

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		Statistics spreadsheet for details (Appendix B).			In places, treatments occur in habitat considered unsuitable for lynx due to tree mortality from beetles (especially where beetle-induced tree mortality affected single-storied stands). In those instances, timber harvesting does not change the habitat status.
No more than 3% of lynx habitat on the GMUG NF will be thinned. Pre-commercial thinning and similar practices intended to reduce seedling/sapling density is limited to stipulations described in SRLA Veg S5. (Southern Rockies Lynx Amendment Standard VEG S5, Decision Trigger, FEIS, Table 6, pp. 44-45)	GMUG Forest Biologist track thinning activities annually in FACTS.	We do not anticipate thinning in lynx habitat under SBEADMR treatments. SBEADMR activities in lynx habitat are mostly salvage and resiliency harvest. Prior to SBEADMR, 131 acres have been treated in lynx habitat under the WUI exemption. up to 37,840 acres of lynx habitat on the GMUG can be treated under the WUI exemption. The current Forest balance is 37,653 acres. We do not expect to approach this threshold with the SBEADMR project.	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	
Wildfire and cumulative management activities will not exceed 25% of HUC12 watershed as determined by weighted acres of mechanical harvest, roads, and severe fire. (Decision Trigger, FEIS, Table 6, pp. 44-45)	GMUG staff track acres of management in FACTS and INFRA	In 2023, a total of 2,085 acres of additional disturbance occurred in 5 watersheds across the GMUG. Watersheds with active timber management received the highest level of disturbance. No thresholds were exceeded. Since 2020, two watersheds were identified with a red and yellow flag: Little Blue Creek; (27%) on the Alpine Plateau exceeds the 25% threshold. However, the Forest Service only administers 2,479 acres of the 22,327-acre watershed (11%) with the remainder being managed by Bureau of Land Management (BLM) or as private land. Willow Creek (23%) exceeded the 20% yellow trigger in the EIS but again, the Forest Service only administers 13 percent of the 14,784-acre watershed with the remainder largely in BLM ownership. No additional treatments have occurred in either watershed after 2020.	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	Watershed impacts are tracked annually through the Forest Service Activities Database – FACTS. All activities, not just those associated with SBEADMR are tracked, including natural disturbances such as wildfire. The Equivalent Roaded Acre methodology was used – 1 acre of road impact is one acre of watershed impact; 4 acres of vegetation treatment or wildfire equals 1-acre of watershed impact (25 percent).

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Document that treatments are being implemented as planned; identify relevant improvements to procedures or exemplary practices to benefit future treatments (Annual IDT Treatment Review, Appendix D. FEIS)	Biannual treatment review field trip with GMUG staff, subject matter specialists, and stakeholders. Annual review of administrative processes and procedures (including SBEADMR checklist) by GMUG staff.	GMUG staff and SBEADMR AMG members completed a BMP treatment review in the Rainbow TS on the Gunnison RD in summer of 2023. Generally, GMUG staff found full evidence that design features selected for review were implemented and effective and the AMG concurred with those findings. Partial evidence was found for design features regarding soil impacts and burn piles. For soil impacts, there was continued discussion of how soil impacts in landings tend to be higher and the importance of re-using landing sites as much as possible. For burn piles, there was discussion about how to modify SP-4 to meet the intent of the design feature, while allowing for a pile to have one dimension longer than 50 feet. AMG members suggested allowing flexibility within SP4 to exceed the 50' standard up to 100' in length subject to all other stipulations of the design standard and approval of GMUG timber staff. GMUG Forest Service Representatives Kyle Rogers and Chris Olson suggest this updated language to SP-4 based on discussion at the BMP review (new text in red): "To facilitate complete burning, piles shall be compact in size and shape, and free of soil. Piles will not be less than 12 (twelve) feet in height. Piles shall not be constructed as windrows, rather the size of each pile's footprint shall be minimized. The size of each pile's footprint shall not exceed 50 feet in any dimension, unless approved by Forest Service Representative. Piles shall be of a size and location which will not impair road use or result in damage to residual timber. Piles shall be located at least 50 feet from residual timber." The full BMP field review report can be found in Appendix C.	*Recommend moving forward with updated version of SP-4 in previous column, and that the GMUG continues to reuse landing sites as much as possible.*	*Accept AMG recommendation; update design feature checklist.*	Additional modifications to SP-4 were incorporated in SBEADMR checklists in 2020 (after the Rainbow checklist was signed). Incorporating the recommended 2024 change into the newer SP-4 results in the following: *'To facilitate complete burning, piles shall be compact in size and shape, and free of soil. Piles shall not be constructed as windrows; rather the size of each pile's footprint shall be minimized. Piles shall be of a size and location that will not impair road use or result in damage to residual timber. Piles shall be located at least 50 feet from residual timber. During treatment planning, interdisciplinary teams will consider retaining piles away from roads when doing so does not preclude achievement of other resource objectives of the treatment (e.g. fuel loading levels and visuals) to provide habitat for hares and other wildlife.* • *Piles associated with large sales or as determined by the Timber Sale Contractor will not be less than 12 feet in height. The size of each pile's footprint shall not exceed 50 feet in any dimension, unless approved by Forest Service Representative.* • *Piles constructed by hand crew or small machinery (e.g., dozers), typical of non-commercial project, will not be less than 6 feet in height. The size of each pile's footprint shall not exceed 20 feet in any dimension.'*

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Continue the public participation and collaborative learning that occurred during the planning phase, encourage and support the continuation of collaborative workgroup efforts throughout implementation (FEIS Appendix E, Public Engagement in Adaptive Implementation, Goal p. 2)	Science team questionnaire and AMG participation tracking (6a-b)	The SBEADMR process is generally meeting its goals of diverse participation, collaborative learning, developing shared understanding and agreement, transparency, responsiveness, trust- and relationship-building, and a participatory collaborative process. Some key accomplishments include: ○ Developed a collaborative learning space to collectively learn about forest management in spruce forests. Having an independent funded science team was a key ingredient. ○ Co-developed a process and structure for stakeholder engagement throughout implementation and monitoring and adaptive management. In 2022, the AMG reviewed, refined, and prioritized several recommendations to improve the collaborative process based on Science Team results. In 2023 – 2024, as the SBEADMR project is now 8 years into a projected 8-12 year implementation period, the AMG Subgroup has been discussing how the AMG might move forward as SBEADMR projects wind down. There is consensus within the subgroup to focus on collaborative learning.	*Recommend that the AMG continues in its current form. Consider hosting topic-area focused collaborative learning symposia to serve as a 'bridge' to future collaboration on the GMUG.*	*Accept AMG recommendation.*	
Ensure implementation of treatments is responsive to…new scientific information. (FEIS Appendix E, Public Engagement in Adaptive Implementation, Goal p. 2)	Science team questions not specifically linked to in earlier goals – lynx focus *(1e,3b-c)*	*(1e)* From 2018-2020, monitoring of hare pellets in the Engelmann spruce dominated stands has demonstrated that snowshoe hares continue to utilize areas that were impacted by the spruce beetle. However, in 2020, field data suggested that salvage areas had lower hare density. Hare pellet counts in the salvage areas were always lower in the previous years, but not statistically significant. In contrast to the Engelmann spruce dominated stands, areas that had a mix of Engelmann spruce and aspen showed that initially hares favored the unmanaged and previously managed stands. However, in 2020, salvaged stands had higher hare pellet counts (i.e. higher hare use), although the variability did not detect significant differences among treatments. Based on these variable results, exploration of options to mitigate impacts to dense horizontal cover during salvage should be considered. It is critical to continue to steer salvage away from high-quality Canada lynx habitat. A significant outstanding question at this time is the longevity of salvage impacts on hare density and why it varies from year to year.	*No changes to SBEADMR needed at this time; updated data confirms previous results and interpretation from science team.*	*Accept AMG recommendation*	This question is not specifically linked to the earlier goal but is a question posed specifically to the Science Team in response to public concerns expressed during the NEPA process. It represents a higher level of research and conversation conducted at a broader landscape scale. The results of this level of research may help inform SBEADMR design and implementation.

Goal or Decision Trigger	Monitoring Actors and Activities	Results and Interpretation to Date	AMG Recommendation	FLT Management Review Conclusion	Comments
		Compiled monitoring results from 2017-2020 and 2023 show that in spruce dominated stands, snowshoe hare density is highly variable from year to year, but consistently much lower in salvage plots compared to unsalvaged plots (5-8 years post-harvest). We expect that these salvaged stands will eventually return to being suitable lynx habitat as forest regenerates. In spruce-aspen stands, snowshoe hare density is also highly variable from year to year, but salvaged units have seen an increase in hare density in the last 2 years sampled (2020 and 2023) compared to the first 3 years of sampling (2017-2019). This is largely due to increases in DHC due to aspen regeneration. *(3b)* 53 of 68 plots in Elks/West Elks study area from 2019 were revisited in 2020 to change temperature sensors and count hare pellets. Based on data from 2019 and 2020: • As expected, hare pellet densities in spruce-fir dominated forests that have not been impacted by spruce beetle, tend to increase with increasing DHC. However, pellet counts do not increase linearly but instead increase rapidly at 20% DHC and stay high. The 20% threshold is lower than expected. • DHC is extremely heterogeneous on the landscape, with close plots (200m) with similar slope, aspect, elevation and fire history often having large differences in DHC measurements. This is hypothesized to reflect fine scale variability in soils, soil water availability and canopy closure. • DHC and hare pellet densities are heterogeneous at fine scales (100-200m). The increase in pellet counts at 20% suggests that lower levels of DHC could provide valuable hare habitat in spruce-fir forests that have not been impacted by spruce beetle. The heterogeneous nature of DHC at relatively fine scales (<100-200m) stresses the challenges of quantifying DHC within treatment areas. Fine-scale heterogeneity in DHC and hare pellet counts means that it is challenging to identify large areas that are key for Canada lynx conservation. CPW lynx monitoring update at 2023 meeting: The statewide lynx population appears to be relatively stable. Snowshoe hares continue to use habitat impacted by bark beetles, and favor areas with high dense horizontal cover (especially subalpine fir DHC). Red squirrel population sizes show a negative response to spruce beetle outbreaks (and outbreak severity).			

Goal or Decision Trigger	Monitoring Actors and Activities	Results and Interpretation to Date	AMG Recommendation	FLT Management Review Conclusion	Comments
Ensure implementation of treatments is responsive to…new scientific information. (FEIS Appendix E, Public Engagement in Adaptive Implementation, Goal p. 2)	Science team questions not specifically linked to in earlier goals – climate focus *(3a, 3c, 3e)*	*(3c)* Results of modeling future patterns of spruce forest distribution under different climate scenarios show that there is a very large range of potential future spruce cover scenarios – from a rapid decline to almost no spruce cover by 2060 and basically no cover in 2090 in the A1 climate scenario to relatively modest declines in the B1/B2 scenario. These models also show where on the landscape efforts to maintain spruce forests for habitat for Canada lynx and other subalpine species will most likely be successful. Models of landscape connectivity for Canada lynx for the A1, and B1/B2 models for 2060 and 2090 continue to identify the eastern portion of the Gunnison basin as a critical area for connectivity for Canada lynx between the San Juan Mountains and northern Ranges in Colorado. These model results could be used to identify locations on the landscape where spruce would be anticipated to persist into the future or where management should focus on maintaining spruce on the landscape (corridors). This information can be used to identify appropriate treatments, exclusion of treatment or post-treatment management including reforestation. *(3e)* Temperature sensor data indicates that overall, salvage sites have later snowmelt and cooler temperatures (surface and 2m) compared to non-harvested control sites. The overall influence is a shorter growing season. Moreover, the combination of later snowmelt and cooler conditions would be expected to decrease soil moisture stress on seedlings. These conditions would be expected to mitigate recent and projected warmer temperatures and decreased precipitation, and facilitate spruce establishment. However, spruce establishment is a complicated process with more influences than summer season weather conditions.	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	This question is not specifically linked to the earlier goal (climate focus) but is a question posed specifically to the Science Team in response to the increased awareness and concern for impacts of climate change. It represents a higher level of research and conversation conducted at a broader landscape scale. The results of this level of research may help inform SBEADMR design and implementation.

Goal or Decision Trigger	Monitoring Actors and Activities	Results and Interpretation to Date	AMG Recommendation	FLT Management Review Conclusion	Comments
Ensure implementation of treatments is responsive to… public input. (FEIS Appendix E, Public Engagement in Adaptive Implementation, Goal p. 2)	Public comments from stakeholders & GMUG response	The following represent the main themes of comments received during the 30-day comment period on out-year treatment plans presented at the 2023 Annual Stakeholder meeting: *No comments were received in 2024.*	*No changes to SBEADMR needed at this time.*	*Accept AMG recommendation.*	

Table 2. HUC12 Watersheds on the GMUG with 20% or less of Spruce-fir (Local Type = TSF) forest area in habitat structural stage 4A, 4B, or 4C

HUC 12 Name	Spruce-fir Total Acres (TSF)	Spruce Fir Acres 4A/B/C (TSF)	Percent of Spruce-fir in 4A/B/C
McKee Draw	38	0	0
Calamity Creek	38	0	0
Blue Creek	354	0	0
Little Henderson Creek-East Muddy Creek	3,144	4	<1
Wells Gulch-Gunnison River	112	0	0
Texas Creek	5,538	362	7
Outlet Cochetopa Creek	137	13	10
Long Branch Creek	196	30	15
North Lobe Creek-West Creek	47	8	17
Deer Creek	113	23	20

Table 3. **Lynx Analysis Unit Habitat Tracking from 1998 – 2023[1]**

Lynx Analysis Unit	Lynx Habitat Acres	Lynx habitat affected from harvests 1998-2023	Lynx habitat converted to unsuitable from harvests 1998-2023	Total Unsuitable Lynx Habitat (vegetation management and natural disturbance)	Percent of lynx habitat affected from harvests	Percent of lynx habitat converted to unsuitable from harvest	Total Percent Unsuitable
Alpine	33,843	1,565	347	1,878	4.6	1.0	6
Amphitheater	26,066	6	1	1,342	0.02	0.003	5
Anthracite	19,027	0	0	111	0	0	1
Bald Mountain	30,788	4	1	1,201	0.01	0.003	4
Beckwith Mountain	49,536	0	0	254	0	0	1
Black Mesa	27,461	684	128	3,429	2.5	0.5	12
Brush Creek	37,135	0	0	485	0	0	1
Castle Pass	29,401	23	3	834	0.08	0.01	3
Cathedral	21,078	163	33	8,583	0.8	0.2	41
Cebolla	41,846	253	63	6,384	0.6	0.2	15
Chalk Mountain	22,210	411	62	13	1.9	0.3	0
Chester	22,945	1,064	218	1,360	4.6	0.9	6
Chimney Rock	22,475	0	0	46	0	0	0
Cochetopa	18,708	461	87	3,584	2.5	0.5	19
Cottonwood Lakes	24,309	1,080	186	357	4.4	0.8	1
Crater Lake	32,895	1,995	302	419	6.1	0.9	1
Dallas Creek	17,505	0	0	771	0	0	4
Fossil Ridge	26,900	6	1	1,577	0.02	0.003	6
Gothic	29,774	11	2	1,605	0.04	0.006	5

Green Mountain	24,793	85	17	87	0.3	0.07	0
Grizzly Peak	15,824	20	5	470	0.1	0.03	3
Huntsman Mountain	30,636	0	0	290	0	0	1
Iron Mountain	22,444	137	32	1,498	0.6	0.1	7
Island Lake	17,724	149	29	515	0.8	0.2	3
Kannah Creek	11,474	1,648	299	315	14.4	2.6	3
Lake City	23,789	539	120	1,410	2.3	0.5	6
Little Cone	20,320	2	1	1,380	0.01	0.002	7
Lone Cone	23,452	362	64	633	1.5	0.3	3
Los Pinos Creek	21,750	1,354	288	4,288	6.2	1.3	20
Matterhorn	22,994	41	10	468	0.2	0.04	2
Mesa Lakes	17,424	483	77	375	2.8	0.4	2
Mount Gunnison	20,695	0	0	233	0	0	1
Needle-Razor	6,010	271	62	568	4.5	1.0	9
Peeler Lakes (Kebler	23,430	0	0	0	0	0	0
Pitkin	26,075	0	0	2,101	0	0	8
Ragged Mountain	9,862	0	0	61	0	0	1
Red Creek	38,219	1,972	296	4,084	5.2	0.8	11
Rocky Brook	37,910	847	128	1,227	2.2	0.3	3
Sawtooth Mountain	24,196	0	0	1,583	0	0	7
Soap Creek	34,402	0	0	2,855	0	0	8
South Mamm Peak	6,507	0	0	60	0	0	1
Spring Creek	27,448	443	88	246	1.6	0.3	1
Stewart Creek	30,874	432	108	12,245	1.4	0.3	40
The Flat Tops	31,559	397	60	487	1.3	0.2	2
Tincup	34,925	326	56	1,517	0.9	0.2	4
Traver Mesa NEW	27,305	1,868	310	496	6.8	1.1	2

Turret Ridge	28,369	0	0	744	0	0	3
Upper Taylor	26,143	47	10	898	0.2	0.04	3
Upper Tomichi	18,043	6	2	1,741	0.03	0.008	10
Whetstone Peak	15,985	0	0	244	0	0	2
Whitecross Mtn	6,836	0	0	181	0	0	3
Total	1,261,319	19,154	3,494	77,532	1.5	0.3	6

[1] In 2023, vegetation management affecting lynx habitat occurred in the Cottonwood Lakes, The Flat Tops, Tincup, and Upper Taylor LAUs.

Appendix C: Annual Interdisciplinary Team Treatment Review

Annual Interdisciplinary Team Treatment Review
Rainbow TS
July 20,2023

Adaptive Management Group (AMG) Review
August 3, 2023

Review Team:

Name	Position
Carlyn Perovich	Forest Ecologist
Lauren Rupiper	East Zone Timber Management Assistant
Arthur Haines	East Zone Silviculturist
Mike Battaglia	Research Forester, Rocky Mountain Research Station
Lance Asherin	Forester, Rocky Mountain Research Station
Dayle Funka	Gunnison District Ranger
Gina Rone	Forest Soil Scientist
Virginia Hudspeth	Climate Adaptation Resource Assistant
Sarah Lowe	Gunnison District Wildlife Biologist
Chris Olson	Forest Service Representative
Kyle Rogers	Sale Admin/Forest Service Representative

Name	Position
Dave Carr	Fuels Specialist
Pat Medina	East Zone Fire Management Officer
Matt Quinn	Gunnison RD Rec Management Specialist
Dusty Jager	Gunnison RD Rangeland Management Specialist
Jack Starkebaum	Gunnison RD Forester
Hank Lochhead	Gunnison RD Harvest Inspector
Jake Jaraczeski	Gunnison RD Forester
Chad Wellman	Gunnison RD Civil Engineeer
Emily Nutgrass	Gunnison RD Environmental Coordinator
Ashley McCay	Gunnison RD Wildlife Tech
Scott Lahey	Gunnison RD Forestry Tech

Rating Scale:

- *3- Full Evidence*
- *2- Partial Evidence*
- *1- Insufficient evidence*

Step 1 – Was the Treatment Checklist Completed with all appropriate signatures?

Evidence

The Checklist was completed and signed by all specialists having a resource that could be affected by the Cathedral Treatment. The District Ranger reviewed the Checklist and concurred with its contents. The Timber Contracting Officer also reviewed the Checklist and ensured all requirements were tied to appropriate contract provisions

Rating: 3 – Full Evidence. Checklist was completed by all applicable resource specialists, Line Officer and Timber CO.

Was the Treatment designed to meet the Purpose and Need as stated in the SBEADMR EIS?

Evidence:

- The Rainbow TS is a green-tree resiliency treatment. Prescriptions were carried out in accordance with the Silvicultural Prescription Matrix (Appendix A of the FEIS).
- The treatment met the purpose and need of SBEADMR, specifically:
    - Resiliency to increase the forest ability to respond to multiple and interacting stresses by promoting regeneration and create multiple age classes of trees.
    - Recovery to provide commercial products to local dependent industries at levels commensurate with Forest Plan direction.
    - Design features were applied where needed to minimize environmental impacts and/or to achieve desired outcomes.

Rating: 3 – Full evidence

Step 2 – Treatment level Review of design features

Were Design Features applicable to the treatment identified on the Checklist and incorporated into mechanisms (contract clauses) to ensure they are followed during treatment Implementation?

Rating: 3- Full Evidence. The Checklist was completed by all applicable staff on the District or Supervisors Office. Each specialist identified what specific design features (DF) should be applied. The Timber Contracting Officer reviewed the checklist for consistency with SBEADMR environmental documents and ensured all DF were linked appropriately to timber sale contract clauses.

Is there evidence that design features were implemented as specified in the contract or other authorizing document?

The following design features were selected for review by the ID Team and AMG. These design features were selected because they would be readily visible in the field, relevant to this project, and/or of particular interest to the ID Team and AMG.

Design Feature Reviewed	Evidence of implementation	Evidence of Effectiveness (readily observable)
Wildlife, Fish, and Rare Plants **WFRP-12** Areas supporting live advanced regeneration with >35% Dense Horizontal Cover in blocks greater than 0.3 acres will be avoided to the extent possible during layout [and during harvest operations], while allowing feasible operations.	**Describe design feature, including year implemented.** Evidence: DHC in areas between groups looks good; we expect it was probably higher prior to spruce budworm. **Recommendations:** None **Rating:** 3 – full evidence **AMG Comments:** In some spots DHC appeared lower than the prescribed standard due to spruce bud worm infestation.	**If Implemented, was the design feature-in a readily observable way, effective?** Evidence: Generally yes, though DHC has decreased due to spruce budworm. It is challenging to mitigate this though, as DHC/multi-storied stands are conducive to spruce budworm population success/reproduction. Recommendations: Continue to look for ways to mitigate spruce budworm impacts. **Rating:** 3 – full evidence **AMG Comments:** Concur with evidence and recommendations.
Water Quality and Soil Productivity **WQSP-1A**	**Describe design feature, including year implemented.**	**If implemented, was the design feature-in a readily observable way, effective?**

Maintain the organic ground cover of each activity area so that pedestals, rills, and surface runoff from the activity area are not increased. The amount of organic ground cover needed will vary by different ecological types and should be commensurate with the potential of the site.	**Evidence:** Organic ground cover and soil within groups looks good; landings are more highly impacted; you can see effects to soil where tracked equipment turns. **Recommendations:** Landings are generally just more highly impacted areas. Continue to re-use landings as much as possible. Soil Scientist recommends waiting for at least 1 winter season after piles are burned to allow landings to recover before doing detrimental soil disturbance monitoring **Rating:** 2 – partial evidence **AMG Comments:** It was noted on one "landing site" remediation has not been completed.	**Evidence:** There is a good balance of ground cover for soil health and exposed mineral soil that is conducive to spruce regeneration. **Recommendations:** Revisit landings after piles are burned, ripped, and seeded to re-assess soil impacts. **Rating:** 3 – full evidence **AMG Comments:** Concur with evidence and recommendations.
Water Quality and Soil Productivity **WQSP-7B** Skid trail locations will be agreed to by the Forest Service in advance of construction; spacing will be approximately 100 feet apart, allowing for topographic variation and skid trail convergence. Spacewater bars as appropriate on skid trails according to slope and soil type as indicated below: (see **Unified Soil Classification - ASTM D 24871)**	**Describe design feature, including year implemented.** **Evidence:** Skid trails generally go from group to group, so no convergence needed. Spacing for skid trails is greater that 100' apart; skid trail visited has low/no slope so water bars not needed. **Recommendations**: None **Rating:** 3 – full evidence **AMG Comments:** Concur with evidence and recommendation.	**If Implemented, was the design feature-in a readily observable way, effective?** **Evidence:** Yes, no undesirable impacts to soil and water due to skid trail location or spacing were observed. **Recommendations:** None **Rating:** 3 – full evidence **AMG Comments:** Concur with evidence and recommendation.

Slash Piles SP-4 To facilitate complete burning, piles shall be compact in size and shape, and free of soil. Piles will not be less than 12 (twelve) feet in height. Piles shall not be constructed as windrows, rather the size of each pile's footprint shall be minimized. The size of each pile's footprint shall not exceed 50 feet in any dimension. Piles shall be of a size and location which will not impair road use or result in damage to residual timber. Piles shall be located at least 50 feet from residual timber.	**Describe design feature, including year implemented.** **Evidence:** All observed slash piles are > 12 feet high. Some piles do have one side that is > 50 ft long (one pile measured in Unit 4 has a 60' long side) **Recommendations:** IDT agrees that while intent of SP-4 is good, it is not always possible to meet the 50' limit specified, and is better to have one pile that is slightly long than 2 piles that meet the 50' max. Recommend modifying SP-4 to remove "The size of each pile's footprint shall not exceed 50 feet in any dimension." Also recommend continuing to look for opportunities to use air curtain burners (biochar) – though this will not be feasible in all situations. **Rating:** 2 – partial evidence. **AMG Comments:** Consider allowing flexibility within SP4 to exceed the 50' standard up to 100' in length subject to all other stipulations of the design standard and approval of GMUG timber staff.	**If Implemented, was the design feature-in a readily observable way, effective?** **Evidence:** While we have not yet burned these piles, fuels & fire staff agreed that they looked well-constructed and were likely to burn well. **Recommendations**: Assess after piles are burned. **Rating:** 3 – full evidence. While SP-4 was not followed exactly, IDT agreed that is was followed as well as possible given the amount of wood material. **AMG Comments:** Concur with evidence and recommendations.

Step 3 – Monitoring Score card

Was identified treatment level monitoring completed?

Pages 64-66 identifies treatment level monitoring. Items selected for monitoring are listed below.

Fire and Fuels

Monitor a sample of pile burn scars for bare soil and, on scars located on slopes and in swales, for the presence of rills, gullying, or soil movement. **If** >100 sq. ft. of burn scar consists of bare soil; minor rilling or gullying present within or adjacent to burn scar; minor deposition of soil downslope

of scar, **then** treat bare soil and erosion according to District protocols, which may include one or two of the following: addition of mulching, scarification, inoculation with adjacent soils, seeding, etc. **If** monitoring reveals >200 sq. ft. of burn scar consisting of bare soil, multiple rills or gullying, gullying 2-3" deep within burnscar, or significant deposition of soil downslope of scar, **then** elevate treatment application.

Finding: *Piles have not yet been burned; monitoring will occur after burning.*

Range and Weeds

A. Post-treatment invasive plant species:

Inspect and document all limited term ground-disturbing operations in infested areas for at least three (3) growing seasons following completion of the treatment.

Finding: Not applicable - there are no known areas of invasive plant infestation within the treatment area.

Transportation

All newly constructed roads in treatment area will be decommissioned within 5-years of sale closure (WQSP-8). Complete monitoring to ensure this has been completed and report in appropriate database of record.

Finding: All temporary roads have been fully decommissioned as of July 2023. Sale admin has ensured that this is completely. There is no official database of record for temporary road decommissioning.

Soil and Water

Pre and post-sale soil monitoring will be conducted.

Finding:

Pre-sale soil monitoring was completed in 2018. Post-sale monitoring will occur 2-3 years after piles are burned.

Silviculture

Complete stocking surveys in order to certify treatment unit fully stocked. This includes species composition and age class as required by National Forest Management Act (NFMA).

Finding: Stocking surveys will occur to certify stands are fully stocked over the next 5-years (year 1,3 and 5 post-closure).

Adaptive Management Group Review

Date: 8-3-2023

AMG Members attending the review

Member	Organization or Interest Group	Regular member or alternate
Enno Heuscher	AMG – Conservation/Environmental	Regular
Andy Goldman	AMG – Montrose County – West Zone	Alternate
Justin Musser	AMG Montrose County	Regular

General Public Attending (Non-AMG)

Tom Eager	Retired USFS
Zach Dutra	Lake Fork Conservancy
Mike Kusar	Montrose Forest Products
Cooper Griffith	Montrose Forest Products
Chris Jauhola	Former AMG member – Conservation/Environmental

At the conclusion of each treatment review AMG members are asked to evaluate how the Forest Service is doing based upon SBEADMR goal indicators.

SBEADMR Goal Indicator	Number of AMG Responses	Range and Average of all responses	Additional Comments
		1 = Strongly disagree, 2 = Disagree, 3 = Neither agree or disagree, 4 = Agree, 5 = Strongly agree, NS = Not sure. Provide	
Did the Forest Service demonstrate evidence that actions identified on the Checklist were implemented as designed and in a readily observable way, effective?	1	Average: 5	**Comment:** Within the limited examples of design features chosen for observation and review on the field trip. **Forest Service response:** We agree that more examples would be good – open to ways to fit these into a limited time frame.
Did the Forest Serve demonstrate openness to public comments and a willingness to adjust management actions toward the goal of improved environmental performance?	1	Average: 5	**Comment:** FS Team was eager to receive feedback from AMG members. **Forest Service response:** We always appreciate hearing from the AMG – thank you!
Did the review provide you information that the SBEADMR project is being implemented in accordance with complete NEPA and specifically the Treatment Design Checklist?	1	Average: 5	**Comment:** *none* **Forest Service response:**
Did the format of the review facilitate your understanding of treatment actions and design features implemented to minimize adverse impacts and/or achieve a desired outcome?	1	Average: 5	**Comment:** Very educational regarding BMPs for designing and reviewing a resiliency treatment. **Forest Service response:** Thank you!
Do you have other suggests that would strengthen the review process toward the goal of continual learning and improved environmental outcomes?			**Comment:** Within time constraints, allow for multiple examples of the implementation of a given design feature. **Forest Service response:** Agreed – thank you for the suggestion.