

# SBEADMR Science Team 2020 summary report

February 12, 2021

## Impacts of spruce bark beetle and subsequent salvage in Engelmann spruce and Engelmann spruce-aspen forests on forest structure and tree regeneration.

### What did we do in 2020?

- Sampled 45 plots.

	Control	Harvest-Control	Salvage	Total
Spruce	7	11	9	27
Spruce/Aspen	4	9	5	18

- Snowshoe hare scat
- Downloaded temperature sensors (belowground, ground-level, above-ground)
- Collected Seed traps collected from 23 of those 45 plots

### 2) Pre-treatment plots in green tree resiliency treatments (Rainbow)

- 6 small groups (0.2 – 0.3 acres)
- 6 large groups (> 0.5 acres)
- 6 control
- Measurements include
  - Forest structure and composition
  - Seedling inventory
  - Coarse Woody Fuels
  - Litter/Duff
  - Snowshoe hare scat

### New results

- Spruce dominated stands
  - Seed production
    - Previously managed sites averaged 7 seeds per plot, unmanaged 6 seeds per plot, and salvage 7 seeds per plot in 2020.
      - These numbers are much lower than 2019 (61, 28, and 33 seeds/plot, respectively) and comparable to 2018 (6, 2, <1 seeds/plot, respectively)
    - No statistically significant differences between treatments in 2020
  - Snowshoe hare density
    - highest in unmanaged (0.19 hare/ha), followed by previously managed (0.13 hare/ha), and salvaged (0.007 hare/ha)
    - Salvaged sites significantly different than unmanaged ( $p = 0.005$ ) and previously managed ( $p = 0.012$ ) sites
    - Similar to 2018 and 2019 results
- Spruce-aspen dominated stands
  - Seed production

- Previously managed sites averaged 15 seeds per plot, unmanaged 21 seeds per plot, and salvage 6 seeds per plot
      - These numbers are lower than 2019 (49, 33, and 40 seeds/plot, respectively, and higher than 2018, where no seeds were found.
    - No statistically significant differences between treatments in 2020
  - Snowshoe hare density
    - In 2020, mean hare density highest in salvaged stands (0.27 hare/ha), followed by unmanaged stands (0.16 hare/ha), and previously managed stands (0.12 hare/ha).
    - This differs from previous trends
      - Mean hare density in 2019 highest in unmanaged stands (0.51 hare/ha), followed by previously managed (0.10 hare/ha), and salvage (0 hare/ha)
    - No statistical differences between sites

### Interpretation of results for AMG

Over the past 3 years, seed production has varied. 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.

Monitoring of hare pellets in the Engelmann spruce dominated stands has demonstrated that snowshoe hares continue to

In contrast to the Engelmann spruce dominated stands, areas that had a mix of Engelmann spruce and Aspen showed the

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.

## Landscape-scale impacts of spruce bark beetle and climate on forest change

### What did we do in 2020?

In the Elk/ West Elk study area 53 of 68 plots from 2019 were revisited in 2020 to change temperature sensors and count hare pellets. Temperature data are being cleaned winter 2020-21.

In addition to field work, I focused on modeling future patterns of spruce forest distributions under different climate scenarios (A1 = continued warming; B1/B2 not as rapid of warming) for different climate projections for the years 2060 and 2090. The range of future climate projections (different scenarios and models) should provide relatively robust end points for best- and worst-case scenarios for spruce, which is being used as a proxy for Canada lynx habitat. I also modeled landscape connectivity for Canada lynx for the A1, and B1/B2 models for 2060 and 2090.

### New results

Within the Elk/West Elk Study area, 2019 and 2020 data indicates:

- 1) 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 stays high. The 20% threshold is lower than expected.
- 2) 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.
- 3) DHC and hare pellet densities are heterogeneous at fine scales (100-200m).

Results of the spruce forest distribution and future climate modeling 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. These models 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.

### Interpretation of results for AMG

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 area. This fine-scale heterogeneity also contributes to challenges in identifying large areas that are key for Canada lynx conservation.

Spruce and connectivity modeling provides spatial information on where spruce habitat, critical for Canada lynx, and corridors will persist into the future under different warming scenarios. This information 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.

## Assessing socioeconomic impacts of SBEADMR

One of the goals of SBEADMR is to increase economic efficiency of planning and executing of treatments. While the original SBEADMR analysis cost over \$1.0 million dollars this was a one-time cost as that analysis allowed treatments to occur over an 8-12 year period with no additional NEPA. Through 2020, 24 large sales and numerous small sales have been sold treating over 16,000 acres across all five districts of the GMUG. In the past, numerous NEPA documents would have to be written to complete this much work. Current average cost of to complete a single EA is approximately \$250,000-\$300,000 for a single large timber sale.

While SBEADMR did reduce NEPA workload and costs, SBEADMR does require an Interdisciplinary Team (IDT) to complete resource surveys, required clearances, plan treatments and oversee project layout. These steps are documented on treatment design checklists completed for each treatment. The final designed treatment is then written into a contract or other mechanisms for implementation. Finally, Forest Service inspectors oversee project implementation to insure all requirements identified on the checklist and supporting contract provisions are accomplished.

## What did we do in 2020?

To approximate administrative costs to complete planning, contract preparation and on-the ground oversight the following data was compiled for salvage treatments:

- Percent time spent by Forest Service personnel by work category based upon a 261-day work year. The number days spent completing these tasks were then multiplied by each employee's cost-to-government.
  - Planning – IDT meetings, coordination with partners, completion of resource surveys and require clearances, completion of treatment design checklist, contract preparation.
  - Pre-treatment layout – prescription development treatment unit layout, cruise, engineering support –road logs and design, etc.
  - Treatment implementation – Contract administration including inspections. Both vegetation management and road contract administration are included.
- Forest Service non-road related contract work – stand exams, treatment layout, resource surveys, tree planting, etc. Actual awarded contract costs were used.
- Forest Service road related costs – road work designed or completed through contract.
- Science Team costs – funds provided to the Science Team to complete monitoring and inform SBEADMR on use of best available science.
- Adaptive Management Group (AMG) - funds provided to pay a facilitator and other support to AMG.

Data was compiled for commercial timber harvest output and revenue for fiscal years 2017-2020 to capture how timber output and revenue have changed over the project timeframe. This information was used to calculate the amount of revenue collected per volume of timber harvested in CCF. The revenue collected for the project include stumpage collections, brush disposal deposits, surface rock deposits, road maintenance deposits, and deposits for reconstruction engineering services. Information on no bid timber sales and non-commercial treatments was also gathered.

One of the goals of the socioeconomic monitoring is to assess how producers are utilizing wood harvested from the project area, what firms are benefitting from these wood products, and how these producers vary over the project duration. Employment impacts of SBEADMR project implementation on non-government entities is also an area of interest. Data to address these goals was gathered from local producers to understand potential supply chain impacts of the project implementation.

### New results

To establish a common metric for measurement both cost per acre treated and volume of timber sold (CCF) were used. Table 1 displays costs for each metric adjusted for inflation.

Table 1. Approximate costs in 2020 per acre treated and timber volume (CCF) sold on the Grand Mesa, Uncompahgre and Gunnison National Forests. These data are specific to salvage treatments unless specified.

<b>Salvage Treatment Summary Table (adjusted for inflation at 3.1%)</b>	<b>Cost per acre treated</b>	<b>Cost per CCF sold</b>
Treatment Planning, layout, prep, road design and oversight	\$327	\$19
Treatment Implementation - Contract administration	\$89	\$5
Forest Service contracts - non-roads	\$35	\$2
<b>Total Non-road</b>	<b>\$478</b>	<b>\$29</b>
Forest Service contracts - Roads	\$381	\$22
<b>Total Road</b>	<b>\$381</b>	<b>\$22</b>
Science Team (resiliency and salvage)	\$24	\$2
Adaptive Management Group	\$3	\$1
Collaboration	<b>\$27</b>	<b>\$3</b>
Grand Total	<b>\$859</b>	<b>\$52</b>

Timber revenue and volume was gathered to analyze how it has changed over the duration of the project. Revenue for FY 2019 and FY 2020 has not been fully collected so it is not reported here.

Table 2. Commercial revenue collected per timber volume (CCF) sold for SBEADMR project for FYs 2017-2018.

<b>Fiscal Year</b>	<b>Stumpage Collected</b>	<b>Brush Disposal Deposit Collected</b>	<b>Surface Rock Deposits Collected</b>	<b>Road Maintenance Deposits Collected</b>	<b>DRES Deposits Collected</b>	<b>Total Collections</b>	<b>Total CCF</b>	<b>\$ per CCF</b>
2017	\$413,497	\$78,052	\$36,993	\$10,679	\$8,709	\$547,930	<b>59,818</b>	<b>\$9.16</b>

2018	\$668,039	\$85,785	\$41,877	\$3,419	\$4,575	\$803,695	<b>72,131</b>	<b>\$11.14</b>
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Over \$1.5 million in revenue has been collected over the SBEAMR project with Montrose Forest Products (MFP) being the largest purchaser. There have not been any non-commercial treatments implemented to date for SBEADMR. No bid timber sales are also monitored for the project. There has been only 1 no bid since the inception of SBEAMR, the Kannah Timber Sale in 2020. This was due to winter logging restrictions. Through collaboration with the Grand Mesa Nordic Club, these winter logging restrictions have been adjusted and industry is now supportive of the sale and it will be advertised in 2021.

Wood harvested from the SBEADMR project has been utilized primarily by MFP (60%), followed by the Colorado State Forest Service (CSFS) (26%), the Wild Turkey Federation (7%), and other small producers (7%). MFP has utilized the timber to produce various dimensional studs through its milling operations. The wood harvested by the CSFS was used for sawtimber. There were only 6 different producers for the project between FYs 2016-2020 dominated by MFP. Wood utilization has not had direct impacts on non-government employment for the local economy. Montrose Forest Products reports that no additional manpower has been added to sawmilling staff nor have they added loggers or log truckers as a direct result of SBEADMR timber but without SBEADMR timber sales it would be difficult to continue operating the sawmill at current capacity.

#### Interpretation of results for AMG

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 that are utilizing timber from the project area, with the overwhelming majority coming from MFP. SBEADMR has not had a significant impact on local producers' employment, but is noted as important for local mill supply chain (MFP). As harvest moves from salvage to resiliency or green treatments there will be opportunities to compare how personnel costs vary between the two types of treatment.